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PERU MINING 2020



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Dear Reader,

In 2019, investment into Peru's mining industry to the tune of US\$6.15 billion, an increase of over 21% from 2018 and the highest mark since 2015, had created a climate of optimism moving into 2020, despite the sector wrestling with social conflicts and cumbersome bureaucracy. However, the Covid-19 wrecking ball and ensuing lockdown sent the sector into disarray, as the unprecedented pandemic reduced operations to a bare minimum, taking months to return to full capacity.

In parallel to this, political turmoil in Peru amplified in 2020, reaching an unexpected climax on November 9, 2020, as President Martín Vizcarra was controversially ousted by Congress, against public opinion. The hope now is that Francisco Sagasti of the centrist Morado Party, sworn in as interim President to lead Peru until the April 2021 general election, will be able to restore a semblance of calm to a volatile political landscape.

Despite the unprecedented turbulence, the second half of 2020 brought renewed hope to the mining industry, as operations began to ramp up and companies adjusted to 'the new normal'. Foundational to this improved outlook was a dramatic resurgence in metals prices, led by gold, which reached an all-time-high of over US\$2,070/oz in August, and followed by silver, which traded close to the US\$30/oz mark for the first time in seven years. Even more crucially for Peru, copper rebounded to its highest point since June 2018, trading over US\$3.15/lb on the back of robust Chinese demand.

The pandemic has also accelerated the implementation of new technologies at mine sites, as remote work, automation and mechanization suddenly became crucial in minimizing person-to-person contact and conforming to stricter sanitary protocols. Furthermore, the downturn after the super-cycle in 2011 had forced mining companies to modernize operations and become leaner, leaving them well prepared to weather the Covid storm.

To cover these topics and provide a comprehensive guide to the different companies involved in Peru's mining value chain, Global Business Reports has renewed its strategic partnership with the Chamber of Commerce Canada-Peru (CCCP). CCCP is the country's leading binational mining chamber, which promotes commercial relations and investment and is in charge of organizing the Peruvian presence every year at the PDAC Convention in Toronto. The result of this collaboration is the production and distribution of 'Industry Explorations - Peru Mining 2020', an up-to-date review of the current operations and projects and the latest trends in Peru's mining industry.

We would like to thank all of our interviewees for their time and collaboration. We also thank you for choosing *Industry Explorations - Peru Mining 2020* as your source of information about Peru's mining industry.



Carla Martínez
General Manager
Chamber of Commerce Canada-Peru



Alfonso Tejerina
General Manager and Director
GBR

Introduction to Peru

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PERU MINING 2020
Industry Explorations
Global Business Reports

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INTRODUCTION TO PERU



"The mining sector contributes to between 10% and 15% of GDP, but its great importance is the macroeconomic stability it gives to the Peruvian economy. All of our external and fiscal accounts are heavily dependent on this. The mining industry accounts for 60% of Peru's exports and more than 50% of overall foreign investment."

- Claudia Cooper,
President,
Lima Stock Exchange (BVL)

Image courtesy of Nexa Resources

Mining in the Shadow of Covid-19

PERU NEEDS ITS MINING SECTOR TO FLOURISH AFTER THE DEVASTATION OF THE PANDEMIC

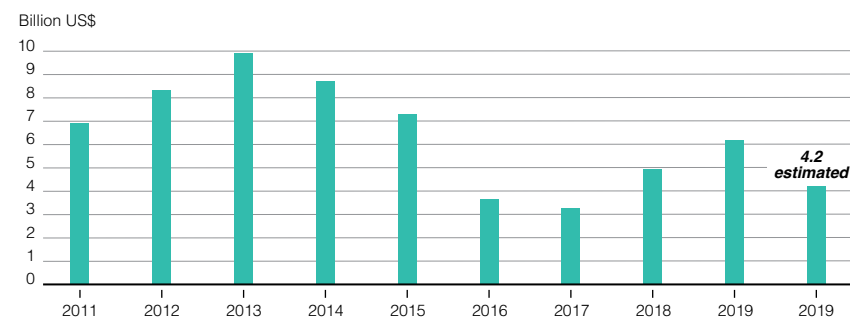
⇒ With the exception of political turbulence – something the country has become accustomed to – 2019 was a year of relative stability for Peru. In contrast to the social unrest and economic volatility that upset some of its South American counterparts, a stable currency and strong fiscal balance sheet had positioned Peru for solid growth above its modest 2.6% GDP appreciation rate in 2019. Mining investment that year to the tune of US\$6.15 billion, the highest mark since 2015, continued to be the cornerstone of Peru’s economic health, with the industry accounting for over 60% of the country’s exports and over 50% of foreign investment. 2020 started on a positive note, as the signing of a “phase one” trade agreement between the US and China on January 15th pushed the price of copper to a nine-month high of US\$2.88/lb. Although cumbersome bureaucracy has threatened the country’s mining competitiveness, the development of large-scale copper projects Mina Justa and Quellaveco offered a near-term path to substantially increase the production of Peru’s biggest mineral export.

By early February, a Chinese dynamic of a different kind conspired to send the red metal crashing to US\$2.50/lb, a 13% drop in reaction to the escalating Covid-19 outbreak, and a precursor to the free-fall in March, that saw copper dive to US\$2.10/lb, its lowest point since 2016. In February, the supply chain had already been disrupted as demand from China weakened and shipping companies became reluctant to expose workers to the virus, creating bottlenecks. While the warning signs were there, few could have predicted the transformational impact of what actually occurred. Despite a 10% drop in attendance and the appearance of hand sanitizer at exhibition booths, the mood at PDAC in Toronto from March 1st to 4th was upbeat, buoyed by a large Peruvian delegation led by Minister of Energy and Mines (MINEM) at the time, Susana Vilca. Merely one week later, the World Health Organization (WHO) would characterize Covid-19 as a global pandemic and, on March 15th, President Vizcarra declared a country-wide stay-at-home order, effectively shutting down the

Peruvian economy and leaving only essential services running. Anglo American withdrew the majority of its 15,000-strong workforce from its Quellaveco project in mid-March, maintaining only critical works, although CEO Mark Cutifani affirmed that the company still expects production to start in 2022. At sites already in production, such as Yanacocha (Peru’s largest gold mine operated by Newmont), critical activity such as heap leaching and environmental maintenance continued as operations scaled down. MMG declared force majeure on copper concentrate supplies from its Las Bambas mine, followed by the company withdrawing its 2020 production forecast for Las Bambas on April 13th. “The first quarter was very challenging for the entire business, but particularly for our largest operation, Las Bambas,” reflected Geoffrey Gao, MMG’s CEO. In the following months, several mining operations would report Covid-19 cases among their workers. A case in point was Antamina, owned by BHP and Glencore, which reported 210 positive cases of COVID-19 on April 27th. Worryingly, 87% of the positive cases were asymptomatic, an indication of how easily the virus can spread undetected. As the first country in Latin America and one of the first outside China to enforce a nationwide lockdown, Peru’s mining industry felt the economic effects more acutely than other leading mineral producers. From January to May, Peru saw copper production down by 22.6%, zinc down 29%, lead down 33%, tin down 26.4%, gold down 32.8% and silver down 31.6%, according to MINEM figures. However, new minister of energy and mines, Jaime Gálvez, revealed that

TOTAL MINING INVESTMENT IN PERU

Source: MINEM



Peruvian copper production in July was only down 2.2% compared with the same period a year earlier. The government’s decisive stance to ensure the health and safety of its population is commendable considering the country relied on only 200 ventilators at the start of the pandemic. However, despite draconian lockdown measures enforced by the government, the challenge of social distancing in a country where 44% of households do not have a refrigerator (according to a 2018 government survey) has made flattening the curve an uphill battle. Official cases rose above 900,000 in September (the 12th highest in the world and 4th highest in South America), but daily death rates that had plateaued to around 200 per day from May to August showed downward trend, averaging under 70 in October. President Vizcarra was able to act quickly due to Peru’s fiscal strength. According to Bloomberg, the Andean country has accumulated savings in the past decade equal to about 15% of GDP, or 117 billion soles (US\$34.4 billion). The theory was that the government could spend savings during the peak of the pandemic and tap into bond markets when conditions became favorable. While this intention was good, the severe lockdown combined with a spiraling virus outbreak had dire fiscal consequences. A September report by Our World in Data charted the Q2 economic decline across 38 countries, showing the percentage decline of GDP relative to the same quarter in 2019. Peru was the worst affected country, with a contraction of 30.2%, in contrast to its neighbor and fellow mining powerhouse, Chile, which declined by 13.7%.

Coordinating recovery through political turmoil

“The lockdown on March 15th caught the mining industry by surprise,” stated Víctor Gobitz, president of the Peruvian Institute of Mining Engineers (IIMP), who has recently taken over as CEO of Antamina. Speaking of the strict protocols to control people and cargo movement that have been necessary to prevent the spread of infections at



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Víctor Gobitz

President

PERUVIAN INSTITUTE OF MINING ENGINEERS (IIMP)



How is the state of emergency affecting Peru and the mining industry in particular?

From a health perspective, the crisis caught Peru in a precarious situation, as, at the beginning of the pandemic, we only had 200 respirators; as of mid-April there are 500 respirators in the country and around 143 are being utilized. Additionally, we do not have enough Covid-19 tests, hence there is not sufficient information available on the main contagion trends.

The lockdown on March 15th caught the mining industry by surprise. The sector presents its own peculiarity, with isolated camps where miners work and live on shifts that are typically 14 days long, with seven days off. To adapt to the pandemic, these shifts could be extended to 30 days of work and 15 days off, or to even longer periods like in the 1990s, if the mining workers agree. Extended shifts will be the new norm when the industry reopens during 2020, with a very strict protocol to control people and cargo movement. The local communities are afraid of coronavirus reaching the High Andes, so we need to assure their safety as well.

Would it be very difficult to extend these protocols to all suppliers and contractors?

The mining industry cannot operate as a fully isolated entity. On top of energy supply, it needs cement, chemical reagents, explosives and many other elements; while the final product, be it concentrate or cathodes and needs to be sent out to the markets. I think we

will see a consolidation period whereby mining operators will try to work with less contractors. In any case, contractors should be able to follow the same shift model as the mining operators themselves.

With mines shut down for a period of one to two months in the best-case scenario, how will companies try to improve production once the state of emergency is lifted?

Every mine is different. In some cases, you can modify your production plan to go to areas with higher grades. In others, if companies have excess capacity in their process plant and their mining fleet, they will probably push for higher volumes. I believe all players will do everything they can to make up for the lost time.

The Peruvian government was praised for tackling the pandemic quickly. How can a balance be made between public health and economic policies?

Certainly, this situation is new for everybody, so, while we are all making mistakes, we should not be criticizing. The central government has been right to lead the process, but the highly fragmented nature of the Peruvian administration makes it very difficult to coordinate the right initiatives at the regional and local levels.

Peru has kept macroeconomic consistency over the last 20 to 30 years, so from a financial perspective we have a more solid position than 30 years ago. Having said that, mining operations,

big construction projects, agriculture and the fishing industry should all come back to work in the coming months with very strict safety protocols. If these industries fail to restart, the Peruvian State will be spending the resources accumulated over the last three decades. That needs to be taken into consideration.

How can the State protect its citizens considering the high levels of informality in Peru?

Just looking at the mining industry, informal gold mining employs around 500,000 heads of family, which is a very large number. It has continued to operate during this crisis. Only by increasing productivity will these people be persuaded to join the formal system. If we achieve that, formalization will create a virtuous circle, as these miners will have access to credit, they will be able to buy new equipment and develop as entrepreneurs.

Will this crisis accelerate the introduction of new technologies to increase automation?

At this moment, people are our first priority; the second priority is keeping the essential care and maintenance on our sites; the third priority will be to restart mining operations. Only when we have a stable operation can we look at new technology and efficiency measures. Right now, I do not think it is the right moment to incorporate disruptive changes that would involve big job losses. The adoption of new technology will have to happen step by step. ■



labor-intensive mine sites, Gobitz emphasized the importance of protecting local communities, afraid of coronavirus reaching the high Andes.

Furthermore, the systemic decentralization of political power in recent years complicated an already daunting task. "The central government has been right to lead the process, but the highly fragmented nature of the Peruvian administration makes it very difficult to coordinate the right initiatives at the regional and local levels," explained Gobitz.

President Vizcarra's decisive action in March drew widespread praise at first, but as the pandemic has worn on, the reaction has soured in some quarters. "The government took way too long to classify mining as a critical activity for the country. Argentina, where mining is not nearly as important to the economy as it is in Peru, decided to put the sector as a top priority and operations restarted after one month, compared to three in Peru," said Ignacio Bustamante, president and CEO of Hochschild Mining, remarking that although Covid-19 is a very atypical situation, the signals and messages received from the government were not clear.

On the other hand, Ricardo Porto, president and CEO of Nexa Resources Perú, believes that the government made clear what was expected from a health and safety standpoint at an early stage. "I would say that hindsight is 20/20, and it is easy to look back and suggest what could have been done better," he reflected. "In my opinion, by prioritizing the health of its citizens, the Peruvian government acted correctly," concluded Porto.

While industry opinions differ on how the government could or should have responded to the pandemic, there is consensus that for Peru to fulfill its geological potential and become a more competitive mining jurisdiction, greater political stability is surely required. At the time of writing (November 2020), Peru has had five ministers of energy and mines in the calendar year.

On February 13th, Susana Vilca replaced Juan Carlos Liu, after it was revealed that Liu's previous company, CONASAC, had provided consulting services to Odebrecht, the construction company embroiled in the Car Wash



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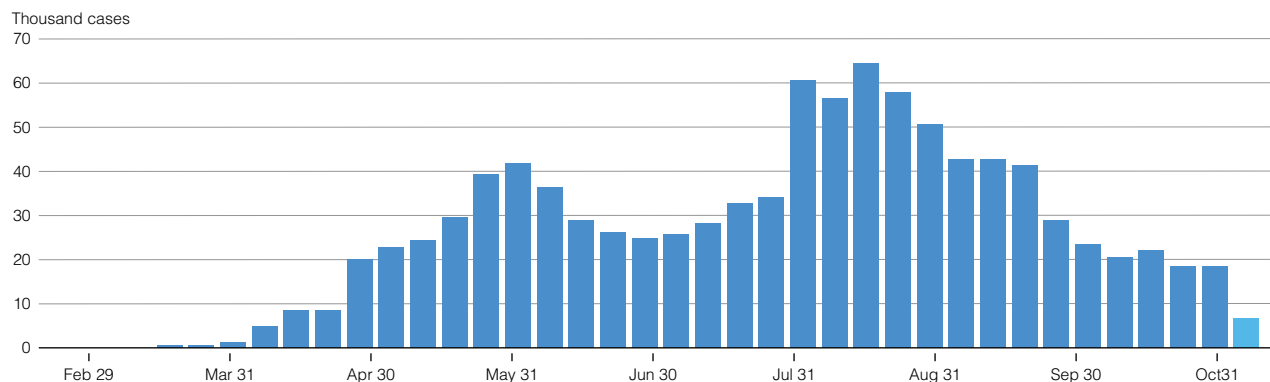
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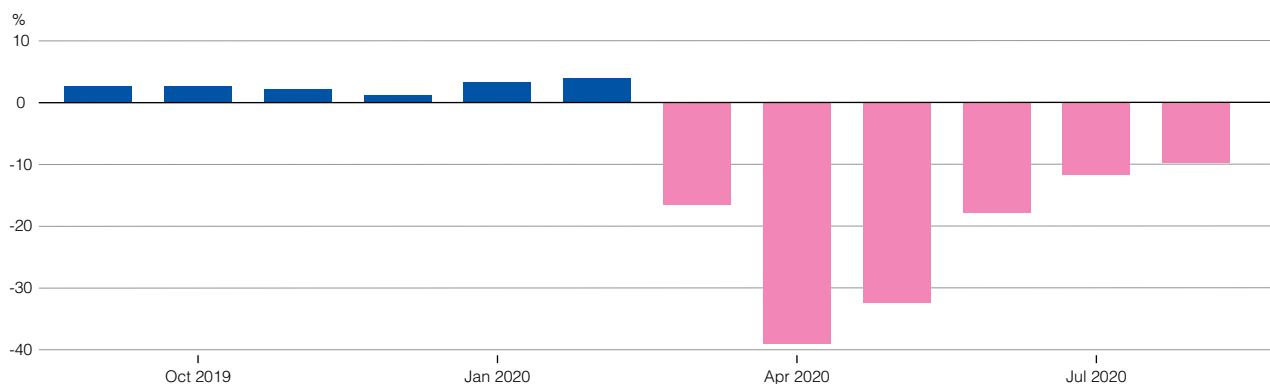
PERU CONFIRMED COVID CASES (UNTIL NOVEMBER 9TH, 2020)

Source: World Health Organization



PERU ECONOMIC GROWTH BY MONTH

Source: INEI - Instituto Nacional de Estadística e Informática



corruption scandal. On July 15th, Vilca was replaced by Rafael Belaunde Llosa, who lasted a mere 22 days before being replaced by Luis Miguel Incháustegui on August 6th.

However, the appointment of Luis Miguel Incháustegui, a former Gold Fields executive known for his experience in social engagement and community relations, was also short lived, as the Vizcarra presidency came to an abrupt end in November. Sensibly, Incháustegui's vice minister, Jaime Gálvez, a previous general director of Mining Promotion and Sustainability at MINEM, was chosen as the country's fifth minister of energy and mines in 2020, allowing for much-needed leadership continuity. While changes at the helm of MINEM continued throughout the year, the political turmoil surrounding the Peru's head office started to intensify in September, as President Vizcarra was accused of being involved in a coverup involving singer Richard Swing, who was awarded contracts by the Ministry

of Culture for entertainment events and motivational speeches between 2018 and 2020. When it emerged that Vizcarra's enemies in congress had been actively plotting against the President and trying to get the military involved, public opinion sharply turned against them.

However, this turmoil reemerged and reached an unexpected climax on November 9, 2020, as Vizcarra was controversially ousted from the presidency by a Congress, against public opinion. The public outcry at the perceived 'coup d'état' and ensuing police violence led to Manuel Merino resigning after less than a week as Interim President. Peru must now hope that the well-regarded Francisco Sagasti, of the centrist Morado Party, will be able to restore a semblance of calm as leader of the nation until the April 2021 general election. Despite the political headwinds, cautious optimism has returned to Peru's mining industry, as operations quickly began ramping back up in Q3 to around

90-95% of pre-Covid level capacity. "Since August the market has been very active; mining companies are making new requests, such as equipment additions to their fleets, with an emphasis on expanding brownfield operations," said Gonzalo Díaz Pró, general manager of Caterpillar distributor, Ferreyros. "The message we are getting is that despite a 20% output reduction in 2020, mining companies expect an equal increase next year," he continued. Another catalyst for this new-found optimism has been high metals prices, headlined by copper reaching the US\$3/lb benchmark in August. The bullish outlook for metals and minerals, bolstered by pent up demand and infrastructure-based government stimulus packages, offers hope for 2021. However, the highest level of stewardship from both the government and the private sector is now required to negotiate this challenging period while the threat of Covid-19 remains a present day reality. ■



Manuel Fumagalli

President
NATIONAL SOCIETY OF MINING, PETROLEUM AND ENERGY (SNMPE)



What is SNMPE's perception about the Peruvian mining industry in 2019?

2019 was a challenging year, notwithstanding having achieved over US\$6 billion in mining investment. About 40% of this investment was sustained solely by three major projects that started construction back in 2018 – Quellaveco (US\$5.3 billion), Mina Justa (US\$1.6 billion), and the Toromocho expansion (US\$1.3 billion) – highlighting the importance of developing new projects. Unfortunately, no new large-scale mining project began construction in 2019, and exploration investment decreased once again. In 2019, there were some US\$356 million invested into exploration, around 14% less than in 2018. To maintain a sustainable organic growth of Peru's mining industry, we must grow exploration to find new mining deposits, develop the existing country project portfolio to bring into production the future mines, and improve the competitiveness of Peru to attract more investment.

In 2019, we had approximately 3% less in the overall amount of exports from the mining sector compared to 2018. Although copper production increased marginally, the average price of copper was approximately 8% lower than in 2018. This impacted the value of copper exports, which represent about 50% of Peru's mining and metals exports. In the case of gold, which is about 30% of total exports, production decreased by 8%, however this was fully offset by higher prices, with an average 10% higher price than in 2018. In the zinc market we saw lower production levels and lower prices.

How can the issue of lengthy permitting times be improved?

Permitting times and regulations have increased in the last decade and, as such, the country has lost competitiveness. The SNMPE is actively working with Government to streamline the permitting processes, cognizant of the importance of attracting investment to the country, while at the same time maintaining the high standards the mining industry has. Due to the importance of fostering exploration, it is currently under discussion to move the ILO 169 public consultation opportunity from the exploration stage to the feasibility mining project development stage, as is the case in several

other mining countries with whom we compete. There is a lot of interest in Peru due to its geological potential and economic stability, but we need to iron out the regulatory permitting challenges that remain as soon as possible.

Why do you believe there have been social tensions with some projects, and what could be done to ease these tensions?

Data shows that approximately 30% of social conflicts arise from unmet expectations in connection to the lack of public services and infrastructure in the remote areas where mining takes place. Another major cause of conflicts comes from negative perceptions about the mining industry and the absence of correct information about our activities. To help ease the social tensions from public services demands, the government has the responsibility to provide the same and build the required infrastructure. The mining sector contributes large sums of money through royalties and taxes, and the government must ensure this capital is directed towards this objective for the benefit of local communities. Closing of social gaps will surely diminish social conflicts. Social tension can also be eased through proper communication about formal modern mining activities to communities, by both the government and the industry.

What is SNMPE's vision for the Peruvian mining industry in the next 12 months?

By 2021, we would like to see the downward trend in exploration investment reversed and hopefully new discoveries announced. We expect the government to implement mining permitting regulations simplifications, in such a way that the country becomes more competitive from an investment point of view. We hope to see the development of new mining projects from the existing country portfolio to support investment levels and production moving forward. We hope for a recovery of zinc and copper production levels, supporting the country's exports, along with gold. Lastly, we expect the government to close social gaps by using the royalties and taxes contributed by the mining industry, thus helping to reduce social conflicts. ■



The SNMPE is actively working with Government to streamline the permitting processes, cognizant of the importance of attracting investment to the country, while at the same time maintaining the high standards the mining industry has.





Image courtesy of MMG Las Bambas

PERU AT A GLANCE

Source: IMF, data for 2019

CAPITAL

Lima

HEAD OF STATE

Francisco Sagasti
(Interim President, November 2020)

GDP

US\$228.9 billion

GDP GROWTH

2.6%

TOTAL INVESTMENT (% OF GDP)

22.1%

GROSS NATIONAL SAVINGS (% OF GDP)

20.2%

CURRENT ACCOUNT BALANCE (% OF GDP)

-1.9%

DEMOGRAPHIC DATA

Source: IMF, data for 2019

POPULATION
32.2
MILLION



UNEMPLOYMENT
RATE
6.7%

GDP PER CAPITA

US\$7,047

GDP PER CAPITA (PPP)

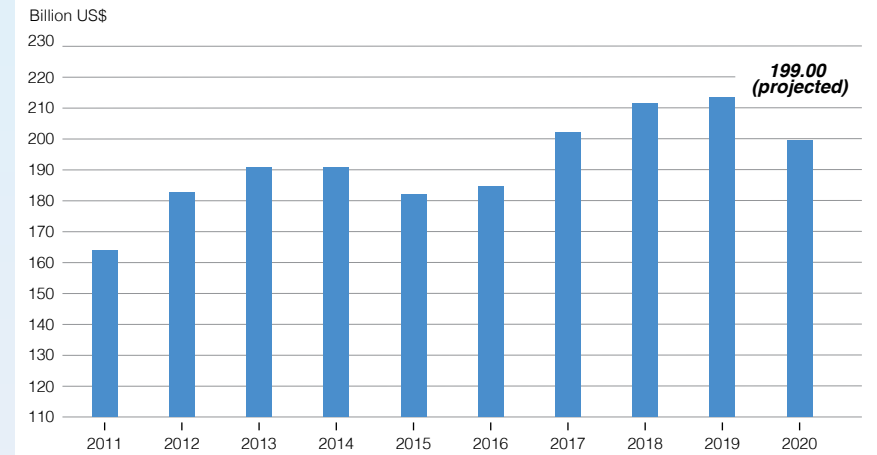
US\$14,719

INFLATION RATE

2.2%

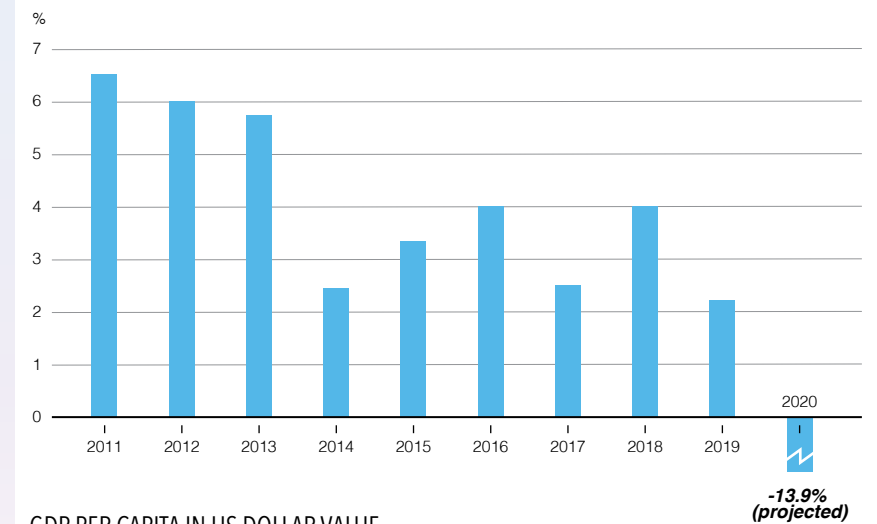
GDP EVOLUTION IN US DOLLAR VALUE

Source: IMF



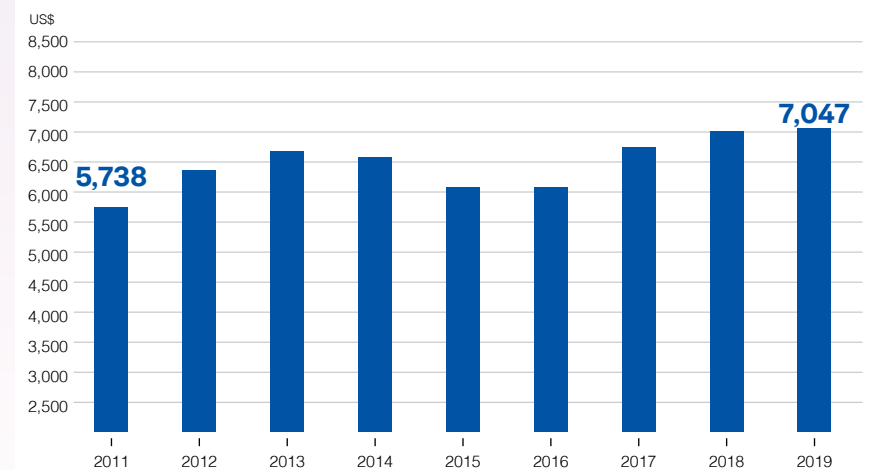
GDP GROWTH

Source: IMF



GDP PER CAPITA IN US DOLLAR VALUE

Source: IMF



Stimulating Peru's Project Pipeline

QUELLAVECO AND MINA JUSTA REMAIN ON COURSE, BUT PERMITTING MUST BE EXPEDITED TO INCREASE GREENFIELD DEVELOPMENT



Image courtesy of Anglo American

⇒ Project development was impacted significantly during the lockdown, as large construction workforces were forced to down their tools for months. However, since the sector has reopened, progress has been made at several key projects.

In an online Jueves Minero event in September, organized by the Peruvian Institute of Mining Engineers (IIMP), minister of Energy and Mines, Jaime Gálvez, announced that construction at Marcobre's US\$1.6 billion Mina Justa copper project advanced during the pandemic and is nearing completion. Furthermore, he revealed that all the permits for Newmont's US\$2.1 billion Yanacocha Sulfuros [Sulfides] project have now been granted and, pending board approval, the project could start in 2021. Gálvez also provided an update on the US\$431 million San Gabriel gold project, currently in pre-consultation stage, which is due to end this year, and Southern Copper's US\$2.8 billion Los Chancas copper-molybdenum project, which is progressing favorably and could present its environmental impact study (EIA) in 2021.

On the other hand, the approval of an EIA modification for Chinalco's US\$1.35 billion Tomorocho expansion remains

pending, and Anglo American's US\$5.3 billion Quellaveco project has suffered delays.

Tom McCulley, CEO of Anglo American Quellaveco, commented: "Unfortunately for us, the pandemic happened when we were at peak man-power and hitting top productivity levels, so it has had a significant impact on Quellaveco." McCulley highlighted that prior to Covid, the management team at Quellaveco had been looking for opportunities to speed up development, such as commissioning timeframe and ramp up, which helped offset some of the impact of the pandemic. Indeed, despite the delays, he confirmed the 2022 target remains intact: "In recent months we have been in a process of remobilization, and expect to get back to top performance levels by late 2020 or early 2021. Today, we do not know the full extent of Covid, but we still expect to finish in 2022 and we continue to look for ways to mitigate all the Covid impacts as best we can."

Peru's healthy near-term project pipeline should boost copper output in the

next two-to-three years, but beyond this, there are worries that thorny social issues and cumbersome bureaucracy are limiting large-scale development. "For a country to receive investment, a number of conditions need to be met," said Ricardo Labó, executive director of the Australia Peru Chamber of Commerce (APCCI), explaining that in addition to geological potential and technical proficiency, you need to have the right political and social conditions. "Projects like Quellaveco and Mina Justa have managed to solve these issues, now we need to see which projects come next," he added, noting that 2019 and 2020 have been disappointing from a greenfield development standpoint. With a lack of major greenfield projects on the horizon after Quellaveco, projects currently in the pipeline, such as Bear Creek Mining's Corani silver-lead-zinc deposit in Puno, have taken on elevated importance. Furthermore, in light of the need to revive the economy in a post-lockdown landscape, project development should become a priority.

On a micro level, for the regions that host the projects the importance of project development can be fundamental, a fact illustrated by the National Institute of Statistics (INE) declaring Puno as the poorest district in Peru. "Mining Canon (amounting to 50% of income tax, transferred to the regions and areas of influence of projects) has been decreasing in recent years, mainly due to the lower contributions from Minsur's San Rafael mine related to lower metal prices as well as production. The direct and indirect revenues to local communities from a project the size of Corani will have a transformational impact in the region," stated Elsiario Antúnez de Mayolo, Bear Creek's COO and general manager.

Anthony Hawkshaw, Bear Creek's president and CEO, elaborated on progress at Corani: "We managed to increase production at the plant by 20% on a daily basis, reduce operating costs, and increase the net return from around 15% to almost 23%. Furthermore, we reduced the payback period on initial capital from 3.6 years to 2.4 years." Bear Creek announced it had engaged BNP Paribas and Société Générale for a US\$400 million senior secured credit facility in March 2020.

The successful development of mining projects in Peru often depends on early-stage engagement with local communities. In 2012, Common Ground Consultants did a review of the Corani region and made recommendations to Bear Creek as to the type of social programs the company should implement. These recommendations were expanded upon by Andrés Franco, VP corporate development, who elaborated how Bear Creek is working towards the diffusion of information by educating the local population on the project's environmental impact: "Selected community representatives were enrolled in an intensive program that covers the Environmental and Social Impact Assessment, or 'ESIA'," he explained, with the training covering such topics as use of chemicals and the milling processes. Franco noted that such an initiative stimulates community engagement, provides a high level of transparency, and mitigates any risks that stem from a lack of knowledge.

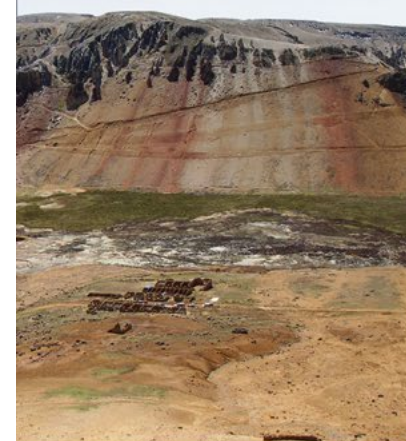
This subject of community engagement was touched upon by Ulises Solís, general manager of Macusani Yellowcake, the Peruvian subsidiary of Plateau Energy Metals, who spoke of the issues presented by the prior consultation process from an exploration standpoint: "The social permission of the communities can sometimes expire because one of the commitments is to give them work, which we cannot guarantee until we have the permit."

One of the causes of these delays, according to Jorge Chávez, general manager of mining consultancy EnvPhys, is that the number of regulations and agencies involved have increased over time. "A common problem is the different evaluation criteria and interpretations of the authorities regarding legislation and technical requirements for mining projects. The criteria can be different, not only between agencies, but also between the professionals in the same agency," he explained, suggesting that the evaluation criteria for permitting should be standardized and that the regulatory framework should be extensively simplified to achieve a more predictable permitting process. For Xenia Forno, partner at Peruvian law firm Estudio Rubio Abogados, simplifying the requirements should not be understood as a lack of concern for environmental and safety regulations. On a positive note, Forno has noticed acknowledgement by the authorities that the processes must be streamlined: "The most important thing now is that the government is aware that the delay in obtaining and granting permits is a barrier to mining investment, especially for exploration. It is clear that there is an urgent need to push exploration for new discoveries."

Indeed, this urgency has been compounded by the economic devastation caused by Covid-19. "I am hopeful that the coronavirus crisis and its dramatic impact on the economy will prompt the right reaction by the government so that the exaggerated approach towards prior consultation is changed," reflected Oscar Díaz, CEO of Viceversa Consulting, adding: "In this recessive scenario, we need the government to take bold, disruptive actions to facilitate investment." ■



DEVELOPING THE
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RESPECTFULLY



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Tom McCulley

CEO
ANGLO AMERICAN QUELLAVECO



What have been the main milestones achieved at Quellaveco in the last 12 months?

Before the Covid-19 outbreak, we were making great progress. We had started impounding water in the high mountain area, putting concrete on the primary crushing area, and progressing the steel and mechanical installation at the plant area. One of the biggest milestones was the earthworks, which was completed earlier in 2020. On the operational side, we had started initial pit works, as well as starting to run four of our 794 trucks. More importantly, we had started our operating training program, with local women running the trucks. I interviewed these women in July, and it was moving to see how proud they were to be operating some of the biggest and most modern mining trucks in the world. Overall, this is a ground breaking program for us and shows the commitment we not only have to the local community, but more importantly, our diversity measures being put into action.

How has the pandemic impacted the development timeline at Quellaveco?

Unfortunately for us, the pandemic happened when we were at peak man-power and hitting top productivity levels, so it has had a significant impact on Quellaveco. However, prior to Covid, we were looking for opportunities to exploit, which will now help offset some of the impact of the pandemic. In recent months we have been in a process of remobilization, and expect to get back to top performance levels by late 2020 or early 2021. Today, we don't know the full extent of COVID, but we still expect to finish in 2022 and we continue to look for ways to mitigate all the COVID impacts, as best we can.

Can you explain what the implementation of FutureSmart Mining will mean to the operation?

FutureSmart is a blend of technology and sustainability. If you go back to the vision and design of Quellaveco, it has really been focused on the long term sustainability of the mine, through effective use of things like water, energy and the environment. Quellaveco has been focused on technology such as automation, with digital and analytical tools all coming together with our operating model at Anglo American which is

at the forefront of technology and sustainability. We will be looking at future technologies to bolt on as we go, to ensure that we are optimizing the sustainable use of resources and remaining cost-effective.

I have heard from other companies that Covid has changed or expedited their technological path. The advantage we have at Quellaveco is that we started out on that path, and have not had to change anything from a technology standpoint. In time, we think that Quellaveco will be a catalyst for change in the mining industry, and FutureSmart is a big part of this.

The Global Tailings Standard was launched in August 2020. What role did Anglo American have in its development?

I am still Group Head of Projects for Anglo American, and the tailings group reports to me. Since 2014, we believe Anglo has been the global leader in tailings management. We are proud of our role in developing the new Global Tailings Standard, having spent a lot of time with the organizations involved to provide experience and input that went a long way to shape the Standard. Quellaveco will meet international standards from day one, and has had the benefit of having Anglo's global tailings head, Caius Priscu, as part of our team to ensure what we design, build and operate is world class.

In what ways has Anglo American helped local communities during this year of particular hardship?

Our foundation has always been the dialogue table, and the people who put the project together back in 2011/12 were groundbreaking from a community relations and sustainability standpoint. We follow that road map today by making sure we meet commitments. In 2020, health and wellbeing of the workforce and local community has been the main priority, providing test kits, oxygen and hospital beds from an early stage. We have also provided food and water for the needy, not only from a company standpoint, but a personal standpoint, with our leadership team and some of our vendors giving back to the community. We also tried to look for areas where there was real need, and came up with a financing plan to help support local agriculture, which must develop in harmony with the mining industry. ■

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UNA EMPRESA FERREYCORP

Anthony Hawkshaw, Elsiario Antúnez De Mayolo, Eric Caba & Andrés Franco

AH: President & CEO
EAM: COO & GM
EC: VP Project Development
AF: VP Corporate Development
BEAR CREEK MINING



AH



EAM



EC



AF



What were the key findings of the NI 43-101 Report published for the Corani project in December 2019?

EC: The 43-101 is an update to the technical report issued in 2017. Primarily we looked at addressing risks on construction design, trying to make a constructible plan and improve the economics of the project. During the process, we did materials testing, additional geotechnical studies, and contracted Ausenco to review the design of the process plant. The net result saw the capex come out basically the same as in 2017, but with significant changes within the capex regarding the distribution of capital.

AH: We managed to increase production at the plant by 20% on a daily basis, reduce operating costs, and increased the net return from around 15% to almost 23%. Furthermore, we reduced the payback period on initial capital from 3.6 years to 2.4 years. The capex is about US\$580 million, but the people that provide the financing will expect us to provide the capacity for potential delays and start-up cost overruns, which will push the number above US\$600.

In March 2020, Bear Creek Mining announced it had engaged BNP Paribas and Société Générale for a US\$400 million senior secured credit facility. Can you expand on this transaction?

AH: Both banks have substantial mining experience, financing projects such as Mina Justa in Peru and, in 2018, they provided approximately US\$13 billion of financing for mining projects around the world. Based on their desktop work, each of them offered indicative terms, and each proposed they would like to work with another bank for syndication.

We negotiated an engagement letter which sets out the due diligence process. Discussions with other sources of finance with respect to an inter-creditor arrangement, legal documentation, translation of documentation, and perfection of security in Peru, should take an additional three or four months. Sometime in Q3 2020, we hope to have put together an additional US\$250 million of financing that may include offtake arrangements with smelters and/or traders, possibly a base metals stream, subordinated debt, and a portion of equity to complement the debt facility.

How have Bear Creek's relationships with the Chacaconiza and Quelcaya communities evolved?

AF: We are completely transparent with the local communities; for example, the local population has been educated about the environmental impact of the project. Selected community representatives were enrolled in an intensive program that covers the Environmental and Social Impact Assessment, or "EISA" in detail, for example outlining the use of chemicals and explaining milling processes. These people now have extensive knowledge about the ESIA and are qualified to, and have been engaged to, explain environmental matters related to the Corani project to community members and visitors. This stimulates community engagement and provides a high level of transparency and, at the same time, mitigates any risks stemming from a lack of knowledge about the impacts of the project.

Bear Creek announced a CAD\$16.6 million bought deal financing in February 2020. Where will this money be invested?

EAM: In 2017 we started to build a substation near the town of Macusani to provide energy for the project but also to provide social benefits. In 2020, we will continue with the power line, which will also help the community. We want to integrate the project development and social support to solidify the good relationships we have with the communities and local authorities. We also intend to invest in the project access road, which has been a matter of contention for other mining projects in Peru.

What would the successful development of the Corani project mean for the Puno region?

EAM: The project is vitally important for the Corani district, which the National Institute of Statistics (INE) declared is the poorest district in Puno. Mining Canon has been decreasing in recent years, mainly due to the lower contributions from Minsur's San Rafael mine related to lower metal prices as well as production. The direct and indirect revenues to local communities from a project the size of Corani will have a transformational impact in the region. ■

Managing the Social Aspect

SOCIAL TENSIONS REPRESENT ONE OF THE BIGGEST BOTTLENECKS IN PERUVIAN MINING

⇒ On January 29th, President Martín Vizcarra announced that Southern Peru's Tía María mining project in Arequipa will not be carried out during his government. "In this government no, there is no way," he affirmed, declaring that granting a construction permit does not necessarily imply having a social license. Although Vizcarra mentioned that other mining projects were being successfully developed, the risk that a project as high-profile as Tía María becomes the poster child for resource development in Peru, at least in the eyes of the general public, is not something that should be taken lightly.

"If you look at the outcome of the congressional election that took place on January 26th, you will notice that politicians with anti-mining rhetoric won in regions where mining is prevalent," observed Claudia Cooper, president of the Lima Stock Exchange (BVL), ex-minister of the Economy, and president of PERUMIN, the country's main mining convention and exhibition, for 2021. "Despite the mining sector giving a lot of money to the regions it operates in, there is still a lot of anger," she added, advising companies to be proactive in their engagement with communities instead of leaving the relationship building to the state. Why does this anger exist? Augusto Cauti, former vice minister of Mines (until August 6th), spoke of the lack of trust that has grown in recent years from all parties in the mining sector, and the need to present appropriate, transparent and



Image courtesy of MMG Las Bambas

clear information. "The mining sector is complex and not always easy to comprehend and comprehensive to be explained, and the challenge is to show the benefits the industry can provide to improve the quality of life to the inhabitants with something tangible rather than just rhetoric," he said, continuing: "I believe that developing projects in a low-profile manner and/or just as a good neighbor should be things of the past – the sector has to have a more visible face and involve more in alliances with people and local activities from the surrounding areas."

For Jorge Chávez of EnvPhys, it is important that the industry and government work together to increase the acceptability of mining in Peru. "Normally a percentage of mining in the GDP or amount of taxes paid by the mining industry is used to explain the positive impacts of mining; nevertheless, the normal citizen perceives of these concepts as abstract and not related to their day to day activities," he said, suggesting that the positive impacts of mining should be reinforced and explained to the people in innovative ways: "More effective would be the contribution of mining in people's pension funds, salaries, or how much taxes would have to be increased if the mining industry stops."

The public perception of mining was also touched upon by Marcial García, partner

and mining lead at EY Peru, who believes that opposition to the mining sector is not solely driven by concern for the environment, but also for political reasons. "The public should also be aware that the mining industry pays more taxes than any other sector in Peru," said García. "Since 2011, mining companies pay an overall tax burden that goes from 42% to 52%, depending on the profitability level of the mine," he added.

The involvement of new stakeholders in the effort to build social relationships and tackle anti-mining stigma is being expanded beyond the traditional three-pronged axis of the mining company, government and community leaders, according to Gonzalo Covarrubias, general manager of WSP Peru. "Consulting firms can help from a technical approach, and can help engage NGOs, which is something WSP has been doing in Latin America," he elaborated, stressing the need for mining companies to consider how they can bring value to a community longer than the life of the project. "Mining companies cannot afford to only be experts at their core business, but must now consider the long-term social aspect from the very beginning of a project."

For Steven Botts, president of Santa Barbara Consultants, the social and environmental issues surrounding a project can actually benefit mining companies, as they offer the chance to show tangible

actions rather than the usual corporate rhetoric. "Although many mining companies look at this as a challenge, the conservation of biodiversity can represent a big opportunity, as it gives the company a chance to put their values into practice."

Considering the economic burden placed on the Peruvian economy by the pandemic, could the role mining companies have played in the emergency response help rejuvenate the sector's image? In July, the International Council on Mining & Metals (ICMM) held a meeting with mining industry leaders titled 'Covid-19: Communication and collaboration to tackle a common enemy'. Tom Butler, ICMM CEO, discussed how the sector's robust response was being noticed: "As pointed out by

Juan Luis Kruger of Minsur, this was an opportunity to reframe the discussion around mining with local governments and host communities, as people started to appreciate the delivery capacity of mining companies in remote areas."

In the case of Minsur, they had been struggling for many months to get permits to build a health clinic, but when the pandemic started, the authorities recognized the urgency and removed the red tape.

In parallel to the mining sector's emergency response measures, which included the delivery of oxygen, PPE and essential supplies to local communities, the new minister of Energy and Mines, Luis Miguel Incháustegui, has been proactive in debottlenecking social conflicts. In his first month as minister, Incháustegui con-

vinced Glencore to pay S/1,000 per elector to the Espinar province and helped settle a local dispute in Caylloma next to the Fortuna Silver mine. Furthermore, in an interview with La República in September, Incháustegui mentioned that the government has spoken to Las Bambas about the need for a concentrate pipeline or train to transport product. "I don't think anyone would like more than 300 trucks to pass by their community per day, even if the road has been paved," he said.

For Peru to successfully iron out the social tensions that surround its mining industry, a sustained collaborative effort between the private and public sector should be one of the top priorities for the Sagasti administration and whoever wins the election in April 2021. ■

INTERVIEW

Tom Butler

CEO
INTERNATIONAL COUNCIL ON
MINING AND METALS (ICMM)



In July, ICMM held a meeting with mining industry leaders titled COVID-19: Communication and collaboration to tackle a common enemy. What were the key takeaways from the discussion?

We talked about the response of the industry, which I think was very robust and effective. The industry has health and safety as a core value, and it is used to responding to all kinds of challenges. For example, there are many companies that have had to deal with malaria and Ebola, so they are used to dealing with epidemics. We brought all of the companies together, and those that were less experienced in dealing with infectious diseases were learning from those that have dealt with such issues on a more regular basis. The other topic that came up was the impact of closing operations down. In many jurisdictions, mining companies provide

health services, infrastructure support and even basic food and water supplies. At the start of the pandemic, there was an initial discussion as to whether the mining industry is essential, but this question is more than just the importance of the metals and minerals that are mined. If you shut an operation down there can be serious implications for host communities.

Furthermore, as pointed out by Juan Luis Kruger of Minsur, this was an opportunity to reframe the discussion around mining with local governments and host communities, as people started to appreciate the delivery capacity of mining companies in remote areas. In the case of Minsur, they had been struggling for many months to get permits to build a health clinic, but when the pandemic started the authorities recognized the urgency and removed the red tape.

The Global Industry Standard on Tailings was launched in August 2020. What were the contributing factors that led to its creation?

Everyone will have heard of the Brumadinho tragedy of January 2019. That was the second big tailings catastrophe in Brazil, after the Samarco disaster in November 2015. After Samarco we commissioned a technical review, involving ICMM and some engineering companies. However, after Brumadinho we decided it was necessary to conduct something that was much more holistic, to make sure we were doing everything we could to minimize the risk of that happening again. We proposed a multi-stakeholder review and, in parallel, the Church of England (C of E) and Swedish Council on Ethics (which represents the Swedish sovereign wealth fund) were thinking along the same lines on behalf of investors, so we teamed up with them, representing the Principles for Responsible Investment (PRI, a UN-supported international network of investors managing more than US\$100 trillion in assets). Together with the United Nations Environment Program (UNEP), who represents countries and implicitly their citizens, the multi-stakeholder approach was formed and terms of the review were agreed on. ■

Claudia Cooper

President
LIMA STOCK EXCHANGE (BVL)



⇒ **How important is the mining industry to the Peruvian economy?**

The mining sector contributes to between 10 and 15% of GDP, but its great importance is the macroeconomic stability it gives to the Peruvian economy. All of our external and fiscal accounts are heavily dependent on this. 60% of Peru's exports are from the mining industry, and it accounts for more than 50% of overall foreign investment. It is also important for income tax collection. Mining contributes to Peru having a stable exchange rate, stable prices and very low interest rates. Put simply, Peru is a mining economy, and a very large part of our growth depends on the sector.

We opened our economy to international markets in the 90's, so that foreign investment and local investment have exactly the same guarantees and procedures.

What are the strengths and weaknesses of Peruvian mining from an investment standpoint?

The geological endowment is the first thing, but Peru's economic model is also very attractive for foreign investment. We are better than our neighbor countries in this respect. The issue now is the relationship of the mine with its near environment. Despite the fact the mining sector is generating a lot of resources for the regions it operates in, there is still a lot of anger. A better coordination with the Government and an improving relationship must be forged with the neighboring communities. If you look at the outcome of the congressional election that took place on January 26th, you will notice that in mining regions the politicians with anti-mining rhetoric won, so this is something the industry has to work on.

We have many successful examples, such as Quellaveco, Antamina, Mina Justa and Cerro Lindo, where the mining sector works with the local communities. The problem is when this is left to the State, which is not efficient enough to deliver quick progress. Private companies must be proactive in this regard. ■

Jorge León Benavides

President
CHAMBER OF COMMERCE
CANADA PERU (CCCP)



⇒ **What do you think makes Peru attractive as a mining jurisdiction, and how could it be improved?**

Peru is an attractive country for investment because of these main points: First, internationally recognized macroeconomic soundness; second, a favorable climate for investment; finally, a policy of integration and trade openness sustained over time. Another element that undoubtedly increased mining investment in Peru has been the revision of environmental laws in such a way as to reduce socio-environmental conflicts to a minimum. The mining sector is of the utmost importance to the Peruvian economy, particularly with regard to exports and investment, that generate both direct and indirect employment increases.

Political stability is a fact of vital importance for the increase of investments, which in the long run will generate more jobs, greater benefits and development of a country. The confidence generated by the Peruvian government in the private sector will be essential to increase investment in the mining sector. President Francisco Sagasti in this transition period of his government must establish a policy of support for the mining sector: he knows he can take advantage of the increase in mineral prices.

What work does the CCCP do to promote business and investment in Peru?

The CCCP has solid business platforms, which help to boost supply and demand among the mining companies, large suppliers of the mining sector and global investors and entrepreneurs. This platform is hosted on the Chamber's website and in this way mining companies are able to consolidate their business requirements with the entire circle of interest. Likewise, our participation in international and national trade fairs help to manage business and investments in our country, such is the case of PDAC, Perumin and Expomina.

It is essential for us to be able to attract top-level representatives of the Canadian Government to Expomina Perú 2021, who will act as key players and who can forge truly meaningful links with their Peruvian counterparts. The only way to recover the economic growth of Peru is to work with other countries towards the same objective. We are also looking to attract senior representatives from leading Canadian mining companies, both producers and explorers. Likewise, we want to count on the participation of the most prominent mining suppliers. ■



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MINING PRODUCTION



"Since August the market has been very active. Mining companies are making new requests such as equipment additions to their fleets, with an emphasis on expanding brownfield operations. The pandemic caused clients to reduce sustaining capex as well as investment capex, but this will rebound in 2021. The message we are getting is that despite a 20% output reduction in 2020, mining companies expect an equal increase next year."

- Gonzalo Díaz Pró,
General Manager,
Ferreycor S.A.

Image courtesy of Southern Copper Corporation

Copper

THE RESTART OF OPERATIONS AND RISING COPPER PRICE OFFERS RENEWED OPTIMISM

➔ Before the Covid-19 pandemic ground the majority of Peruvian mines to a halt save for essential measures such as flotation, processing and environmental care and maintenance, Peru had experienced three years of stable copper production. In 2019, Peru's copper production stayed within a percentage point of the previous year's figure, reaching an annual total of 2.46 million tonnes (mt/y), a 0.8% year-on-year increase. Cerro Verde, the mine operated by Freeport McMoRan in Arequipa, remains the largest producer of copper in Peru, with 473,980 mt/y (2019 data), followed closely by Antamina (a BHP-Glencore-Teck-Mitsubishi joint venture)

with 459,219 mt/y, and Southern Peru in third place with 414,394 mt/y. Las Bambas, operated by MMG, was the fourth biggest copper producer with 382,500 mt/y, almost equaling its 2018 mark despite a series of blockades which prevented the transportation of concentrate from the site to the Matarani port. Having experienced sharp growth between 2014 and 2017, moving from an annual average of less than 1.5 million mt/y in the years previous, this period of stability preceding the new decade was expected to be followed by growth. However, the damage caused by the coronavirus will certainly see production decrease in 2020; the ministry of Energy and Mines (MINEM) announced in August that production of copper plunged 20.4% in the first half of 2020 compared to the same period in 2019. While the extent of production lost in H1 is alarming, more promising news came when minister of Energy and Mines, Jaime Gálvez, announced that copper production fell by only 2.2% in July compared with the same period a year earlier. Furthermore, the market revival of the red metal in H2 2020, despite a depressed world economy, is injecting much needed liquidity into producers looking to make up for time lost during lockdown. In March, copper traded below US\$2.00/lb, its lowest level since

the global financial crisis of 2008-2009, but in a remarkable turnaround, a recovery of over 50% saw spot prices break the US\$3.00/lb barrier in August, a level that increased to over US\$3.20/lb in November on the back of positive Covid vaccine news. High imports from China were the main catalyst for this rise, and government-backed infrastructure projects across the globe enhance the bullish sentiment. A robust near-term pipeline of expansion projects, anchored by two high-profile greenfield projects – Mina Justa and Quellaveco – gives Peru a solid platform for growth. In 2021, Southern Copper's Toquepala expansion will see its first full and uninterrupted year of production. Minsur's Mina Justa operation was expected to open by the end of 2020, but will now ramp-up in 2021, due to lockdown delays, and is expected to produce 100,000 mt/y of copper, including 58,000 mt of copper cathodes. Anglo American's Quellaveco will contribute a further 300,000 mt/y of copper starting in 2022. In February 2020, Hudbay Minerals secured a surface rights agreement with the community of Chilloroya for the Pampacancha satellite deposit located near the company's flagship Constancia copper-gold mine, the lowest cost open-pit sulphide copper mine in South America according to Hudbay, which announced it ex-

pects to be mining ore from the deposit in H1 2021. In the medium term, Peru's ambition to make substantial inroads into the production gap with Chile seem unlikely to be fulfilled. Although Chilean production fell by 0.8% in 2019 on the back of declining ore grades and financial issues at state giant Codelco, catching up to Chile's total of 5.78 million mt/y would require numerous district scale projects to move into production. Before the coronavirus outbreak, MINEM had predicted an increase in Peru's copper output of 27% by 2022, but progress will be partly dependent on the ironing out of social issues that have interrupted production at Las Bambas and delayed projects such as Southern Peru's Tía María. On the subject of the reoccurring blockades, Edgardo Orderique, Las Bambas' general manager of operations, commented that open dialogue with the local communities in Apurímac was ongoing to find a mutually beneficial solution. Furthermore, he noted that since Las Bambas started operations, Apurímac has been transformed from one of the poorest regions with the lowest development and growth rates, to having the leading regional growth rate. Orderique also elaborated on MMG's investment plans at Las Bambas, which include the upgrade of the molybde-

num plant to achieve 100% processing, and the production of the third ball mill, which should be completed by the end of 2020. Through these investments and the easing of social conflicts, the company's aim is to achieve sustainability in copper production. "Las Bambas hopes to achieve production of approximately 2 million mt of copper during the five year period of 2021 to 2025 – an average of 400,000 mt/y – an amount significantly above the levels forecast before production started," he said. When asked about the delayed development of Tía María, Oscar González Rocha, president and CEO of Southern Copper, suggested that doubt in the project had been spread by some members of the Peruvian government, and alleged that anti-mining activists have been using violence against the local population. "The Tía María project is one of the best mining projects in the world from an environmental standpoint; it has no tailings and there are no smelting fumes, so we hope authorities understand there is no possibility of contamination," reassured González Rocha, noting that Southern expects to develop Tía María project with an investment of US\$1.4 billion to produce 120,000 mt of copper cathodes annually. Another project to have been delayed is Southern Peaks Mining's Ariana, a

copper, zinc, gold and silver mine located in Junin. "Ariana is currently in a state of limbo and what is happening is not only a threat for the project, but for all new mining operations in Peru," stated Adolfo Vera, Southern Peaks' president and CEO, who clarified that, while there is no local opposition to Ariana, an NGO contesting the project caused Southern Peaks to reduce the rate of construction whilst awaiting a decision from the Constitutional Court. Underlining the role the mining industry plays in the country's economic development, Vera suggested that this source of income should be protected instead of fought against: "Once the nonsensical claim is rebuffed, the Ariana project is approximately 18 months away from being completed," he said. Vera went on to detail the progress made by Southern Peaks in 2019, including the geological reinterpretation of its Condestable flagship asset, increasing the life of mine significantly, and growing resources by a multiple of 2.4, a mark Vera expects to improve on again in 2020. "As soon as we obtain the permit, we will start to further expand the capacity at Condestable in light of the new size of the resource and reserve," he explained, adding that the company hopes to have completed a feasibility study on the expansion of Condestable by 2021. ■

WE MINE FOR PROGRESS

Being sustainable means creating value for all of our stakeholders, from residents of the neighbouring communities, our employees and contractors, to our shareholders. Our commitment to sustainability is embedded in everything we do, underpinned by MMG's policies, values, standards and operating model.

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MMG LAS BAMBAS

Resourceful Thinking

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- Mine Environmental
- Mine Water Management
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- Mineral Processing
- Mine Closure

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Edgardo Orderique

General Manager – Operations
MMG LAS BAMBAS



What were the highlights achieved by MMG Las Bambas in 2019?

Despite having social problems, we still managed to achieve strong production levels in 2019. We closed the year with 382,500 mt/y of copper concentrate. Thanks to several productivity efforts in mining and processing, negative effects were mitigated. We continue to make significant efforts to keep a strong dialogue with the surrounding communities and work towards sustainable development.

Las Bambas is the fourth-largest copper producer in Peru. Although we are slightly below our goal, we hold a strong national position. Our main investment projects are related to the upgrade of the molybdenum plant to achieve a 100% processing of this ore. Another large project we are working on is the construction of the third ball mill that began in mid-2019 and should be completed by the end of 2020. This will help achieve sustainability in copper production. On the other side, we have been purchasing mining equipment including a 75 cy (+100-short ton) electrical shovel, 13 400-short ton haul trucks and related auxiliary equipment since 2019. As a result, this year we will continue implementing our mining plan and start building our next pit.

What operational improvements have been made to optimize production?

Significant operational improvements were made in 2019. We managed to have a minimum of 35% of fine ore from the primary process of the mining operation, which allowed us to have a better milling throughput. We have also reduced the waiting time of the shovels when loading the trucks, enabling us to load approxi-

mately 5,500 mt/h. Furthermore, we have improved the weight, speed and tire lifespan of our trucks.

As for crushing, we have reduced the granulometric classification of the material so that we have more processing when grinding. We have also started using another type of liner in the grinding zone that allows us to process higher volumes of ore, as well as new reagents in the flotation area that allow a higher recovery of difficult-to-process minerals like clay, marble and talc. These reagents make materials float and stop them from being encapsulated in the tailings. We have changed and implemented an air-forced system in the first cells of the rougher-scavenger flotation system to improve the copper recovery.

Can you explain Las Bambas' approach to tailings management?

We now have a 95% water recovery and thus do not re-introduce much fresh water to the process since we can re-pump the same water. Las Bambas uses a lot of geotechnical and hydrogeological instrumentation that allows us to monitor the process in real time and avoid any issues. Independent auditing firms inspect our operations twice a year and keep us permanently informed in case of any potential situation. We have placed piezometers that monitor any filtrations around the dike, along with robotic radars and geotechnical monitors to detect any instability in or near the tailings storage facility.

What are the main goals and objectives of MMG Las Bambas in the coming years?

Las Bambas hopes to achieve production of approximately 2 million mt of copper

between 2021 and 2025 – an average of 400,000 mt/y – an amount significantly above the levels estimated before production started. Our primary goal is to have zero production incidents. Safety is the number one pillar of our company, so we are working on programs such as Safe Tasks, We Take Care of One Another, Stop and Think, the 3 Qs, and Behavior-based Safety to promote an interdependent culture of safety across the company.

Do you have a final message for the Peruvian mining community?

MMG and Las Bambas will continue betting on mining investment in Peru. Our focus relies on our operations area: process improvement and reservoir identification. We will continue working with the communities and contributing to the development of their regions. The company gives away 3% of its sales as royalties, which benefits the 84 municipalities of the Apurimac region, mainly the Cotabambas province where Las Bambas is located. Poverty reduction, improvement in nutrition and education are some of the proven positive impacts this province has had.

Before Las Bambas started its operations, Apurimac was one of the poorest regions and had the lowest development and growth rates. Currently, this region leads the regional growth rate. Mining promotes progress in remote places of the country and works as leverage to promote employment, entrepreneurship and other economic activities. The development and sustainability of Las Bambas will mean that other large mining projects located in Apurimac can be implemented to benefit the region and the country. ■

Oscar González Rocha

President & CEO
SOUTHERN COPPER CORPORATION



To what extent has Covid-19 impacted Southern Copper's operations?

We have continued operating our mines in Peru and Mexico, despite lockdowns in both countries, which has been achieved partly by imposing local quarantine measures at our projects that are far from large settlements. Copper production was down just 1.3% in Q2 at 253,097 mt, as lower output at Buenavista in Mexico was partly offset by an increase at Cuajone in Peru. Guidance for 2020 is 997,100 mt, a reduction of only 1,300 mt from original forecasts. On the positive side, the company's molybdenum production increased by 16.3% in Q2, with silver up by 13.5%. Southern Copper Corporation (SCC) is making every effort to keep production at satisfactory levels while achieving a competitive cash cost. This is reflected in our 2Q20 cash cost per pound of US\$0.67 net of by-product credits. We are operating in total compliance with local, regional and national emergency measures, and we have implemented rigorous hygiene, sanitation and safety protocols at all of our facilities.

What are Southern Copper's plans for investment in Peru in the next five years?

We expect to develop the Tía María project with an investment of US\$1.4 billion to produce 120,000 mt/y of copper cathodes. When Tía María starts its operation, Southern is also evaluating a new smelter with a capacity of 1 million mt/y to process copper concentrates and an expansion in our refinery to produce 280,000 mt/y of cathodes – this project represents an investment of approximately US\$1.3 billion. Los Chancas, another deposit located in

Apurimac region, will add 130,000 mt/y of copper contained in concentrates with an investment of US\$2.8 billion. We are about to finish the environmental impact assessment (EIA) to obtain the construction license at this project, which also contains molybdenum and gold reserves.

Michiquillay in Cajamarca will increase our copper production by 255,000 mt/y, with an investment of US\$2.5 billion. We have also increased reserves, achieved higher production and mined higher grades at Cuajone in 2020. SCC has the financial capacity to develop all of these projects at the same time with a total investment of US\$8 billion, which will increase our copper production by 575,000 mt/y.

What issues have caused the delay to the development of Tía María, and what actions is Southern Copper taking to resolve the situation?

There has been doubt placed by some members of the Peruvian government, and some anti-mining activists have been using violence against the local population. However, SSC has maintained a strong relationship with majority of stakeholders and has explained our project step by step, while at the same time developing social programs to increase wealth in the area. The Tía María project is one of the best mining projects in the world from an environmental standpoint; it has no tailings and there are no smelting fumes, so we hope authorities understand there is no possibility of contamination.

How have operational improvements and the introduction of new technology increased production capacity

and efficiency at Southern's Peruvian operations?

The new concentrator at Toquepala added 100,000 mt/y of copper contained in concentrates, which represents approximately an increase of 30% to our production capacity compared to previous production. We also have a desalination plant which processes seawater for our personnel residents of Ilo and for the metallurgical process. Regarding new technology, we foresee an increased in artificial intelligence (AI) in all of SCC's processes. All production areas are using or incorporating AI and digitalization in order to increase efficiency, safety and productivity.

Can you provide examples of Southern Copper's social initiatives in Peru and how the company has helped communities during this time of economic hardship?

We continue to fight the Covid-19 pandemic, prioritizing efforts to safeguard the health and wellbeing of our workforce, their families and nearby communities in Moquegua, Tacna, Arequipa, Apurimac and Cajamarca. In addition, in order to collaborate with the Ministry of Health, SCC is providing 30,000 liters of oxygen every week to regional hospitals in the Arequipa and Moquegua regions for Covid-19 patients. Furthermore, we have been delivering sanitation kits to the National Guard, police workers, health centers and local communities to prevent dissemination of the virus. Besides this, we continue our efforts to support vulnerable people, providing nutrition and sanitary kits. Due to social distancing measures, we have reinforced educational, health and economic initiatives through online programs. ■



Adolfo Vera

President & CEO
SOUTHERN PEAKS MINING



How was 2019 for Southern Peaks Mining?

From an operational perspective, Southern Peaks Mining experienced some challenges in 2019, one of which was the delay in obtaining a permit to expand capacity at Condestable. We have yet to obtain the permit, which we hope will be achieved in Q1 2020. In 2019, the company was focused on reinterpreting the entire geology of Condestable, and we have been able to increase the life of mine significantly. In 2019, we were able to multiple resources by 2.4 times and we are expecting to see an even larger multiplier in 2020. As soon as we obtain the permit, we will start to further expand the capacity at Condestable in light of the new size of the resource and reserve.

Can you elaborate on the financing strategy for the Condestable expansion?

We have recently agreed a loan contract of approximately US\$50 million with Scotiabank Peru. This raise was specifically for the expansion of Condestable and is currently the only debt the company has. We will not need any further funding for the expansion of Condestable. We are hoping to achieve 20% increase in capacity, which will translate into 20% increase in production and hopefully profit.

What is the timeline for the development of the Ariana project?

Ariana is suffering in the same way as Tia Maria, not in the sense that there is local opposition for the project, but there was an NGO that set up a battle against the project. Southern Peaks Mining thus chose to significantly reduce the rate at which we were building Ariana while waiting for the decision from the constitutional court. This approach is unique in that it is the first time it has been used for a project that had obtained all the required permits, licenses and authorizations. Ariana is currently in a state of limbo, and what is happening is not only a threat for the Ariana project, but for all new mining operations in Peru.

The country and all its inhabitants need to understand how important the mining industry is for the economy of Peru. This source of income should be protected instead of fought against. There is igno-

rance about what the mining industry is doing and I believe that the government should step up to educate and inform the country of the importance of mining. The mining sector should also be transparent and communicate what is going on in the industry.

Once the nonsensical claim is rebuffed, the Ariana project is approximately 18 months away from being completed. We have finalized most of the surface infrastructure and what remains is the heavy work of building up a processing plant and the mine development.

Despite experiencing a volatile couple of years, investors still seem quite bullish on copper. How do you view its fundamentals?

The fundamentals in terms of supply and demand have not changed and therefore we are expecting a deficit in copper to arise quite soon. However, the sudden ability of the market to find sizeable copper supplies in warehouses at short notice does raise an eyebrow. The impacts that events in China can have on the price is also a worry, as one country having such influence on the price of a commodity creates instability. The fundamentals are being measured in terms of what we know copper is being used for today, such as infrastructure development. The electric vehicle market is the factor that will significantly drive up the demand for copper.

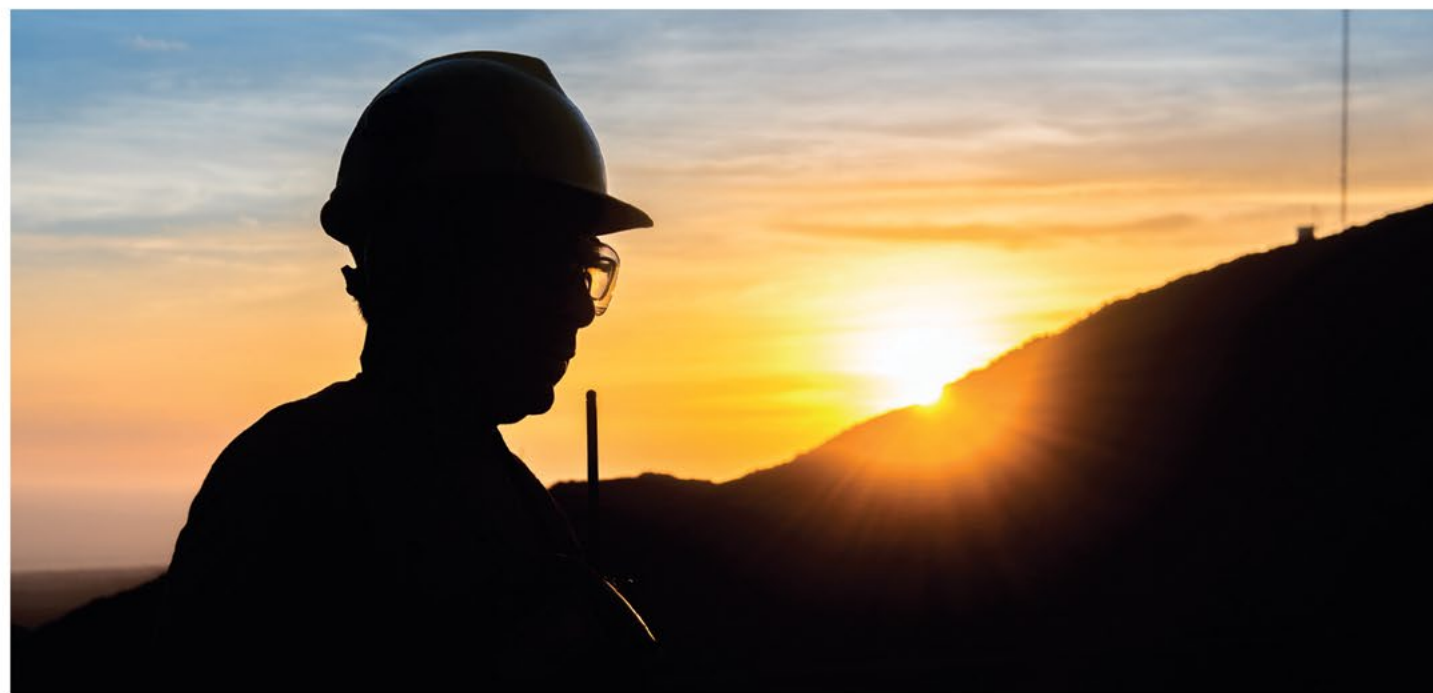
What are Southern Peaks Mining's principle objectives for 2020?

We aim to reinstate the Ariana project as soon as possible. The other key objective is to obtain the expansion permit for the Condestable project, and we hope to have completed a feasibility study on this expansion by early 2021. Southern Peaks Mining will also start looking for additional assets in Peru and Latin America, and we have set some goals for the corporate development of the company which we hope to achieve moving forward. Southern Peaks Mining is celebrating its 10th anniversary in 2020. The company has matured and has clearer goals for its way forward. We now know what drives value and we are concentrating on these drivers. Our focus is on delivering value and we will continue chasing cash generation from a business perspective. ■



Committed to the Sustainable Development of Our Country

www.southernpeaksmining.com

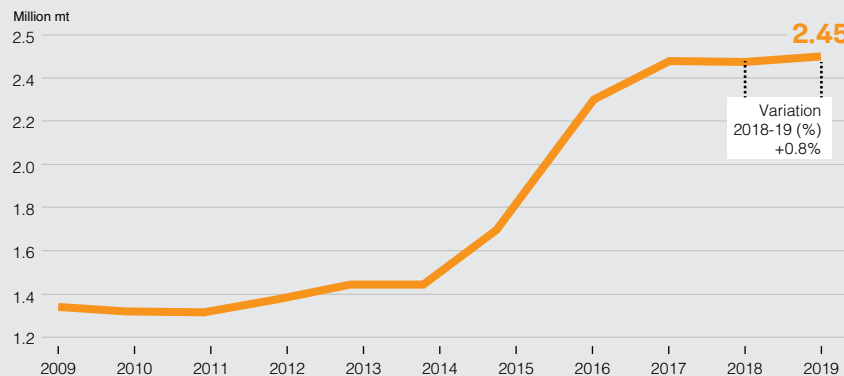


We hope to have completed a feasibility study on the Condestable expansion by early 2021. Southern Peaks Mining will also start looking for additional assets in Peru and Latin America.



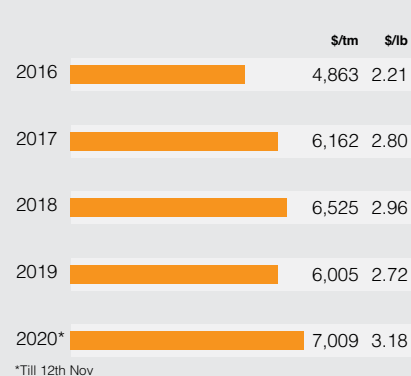
COPPER PRODUCTION IN PERU

Sources: MINEM / GBR



AVERAGE COPPER PRICE

Sources: LME / GBR



GLOBAL COPPER PRODUCTION (2019)

Sources: USGS / MINEM / GBR



GLOBAL COPPER RESERVES (2019)

Sources: USGS / MINEM / GBR



Precious Metals

THE BULL MARKET IS OFFSETTING DECLINING PRODUCTION

From a price standpoint, 2020 has been a year to remember for gold and silver producers, as the beginning of what many expect to be a secular bull market gathers pace. Although economies have opened up in recent months, the decision by central banks to print vast sums of money to revive economies, currency devaluation, inflation and a deep global recession have all created the perfect storm for precious metals to thrive.

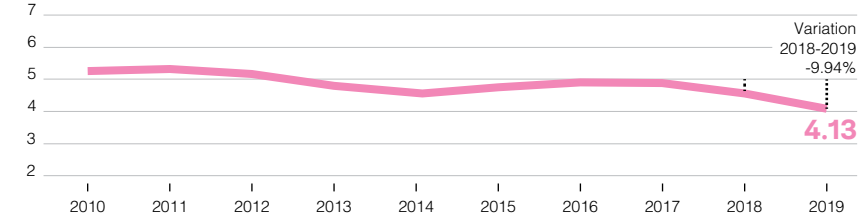
In Peru, gold production declined for the fourth consecutive year in 2019, with an annual output of 4.13 million ounces (oz/y), a 9.94% decline from 2018. Likewise, silver saw a 7.24% decrease from 133.8 million oz/y to 124.1 million oz/y, its third consecutive year on a downward trend.

Despite decreasing production, Peru remains the sixth biggest gold producer in the world and the second biggest silver producer. Declining output is being offset by surging prices, as gold reached an all-time high, breaking the US\$2,000/oz barrier for the first time ever in August. Silver suffered more than gold during the liquidity crunch and ensuing market sell-off in mid-March, but recovered to reach over US\$29/oz in August, its highest mark since 2013. Despite the prices of both metals dipping slightly in September, the cash flow produced from sales in Q3 2020 should show some eye-catching numbers.

Buenaventura is Peru's biggest precious metals producer, with a wide array of its own operations and a stake in Yanacocha (Peru's largest gold mine operated by Newmont). On September 1st, Leonardo García replaced Victor Gobitz as Buenaventura's new CEO after it was

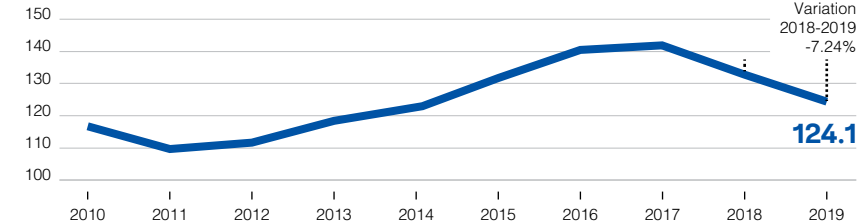
GOLD PRODUCTION IN PERU

Sources: MINEM / GBR



SILVER PRODUCTION IN PERU

Sources: MINEM / GBR



announced that Gobitz would move to Antamina. García revealed that due to the effect of Covid-19, Buenaventura's main focus has been on preserving cash, refinancing the company's syndicated loan, and obtaining a 30-month period of grace. "Also, we postponed our 2020 dividend payment until we have more visibility about the current situation, and now we are working on refinancing the US\$115 million balloon payment of Huanza's leasing that we expect to close in November," he explained.

García also acknowledged that the downward trend in gold production and diversification into base metals is being reflected in the company's portfolio, with production falling at Orcopampa and La Zanja, and Yanacocha's production currently stable at around 0.5 million oz/y, but expected to decrease in the coming years. "In the medium term, San Gabriel will be a key project for us as it will be a breaking point; while Yanacocha, Tantahuatay and La Zanja will become gold-copper producers and not just gold producers."

Buenaventura's debottlenecking process across its four main operations has continued in 2020; the simplification of the metallurgical process and optimization of mine preparation have seen positive results at Tambomayo, and improved efficiency in the underground mine at Uchucchacua resulted

in significant cost savings. "Orcopampa is a different case, because we have re-sized the operation, and a big focus now is on the exploration front in order to increase the LOM of the operation. Finally, at Marcapunta we should reap the benefits of the program by the end of 2020 and beginning of 2021," concluded García.

Meanwhile, Gold Fields continued its growth in South America in 2019 with the advancement of its Salares Norte project in Chile, as well as the completion of a feasibility study at its Cerro Corona mine in Cajamarca, where mine life has been extended to 2030 – an extension of seven years. With a scoping study set to be performed in 2020 aimed at further extending the LOM at Cerro Corona to 2034, Luis Rivera, Gold Fields' executive vice president of the Americas region, gave an overview of the milestones achieved by the company and its growth ambitions in Peru: "Gold Fields' South American operations have the company's lowest running costs in the world. The net profit coming out of Peru is 21% of the company's entire profits. Our Peru business contributes approximately 310,000 gold equivalent ounces per year (oz eq/y), and our objective is to acquire another asset to reach a 500,000 AuEq Oz/y target."

In December 2019, Gold Fields became the first open pit mining company in



Luis Rivera

Executive Vice President – Americas
GOLD FIELDS



Our Peru business contributes approximately 310,000 ounces equivalent per year (oz eq/y), and our objective is to acquire another asset to reach a 500,000 oz eq/y, target.



our waste dam, and we are now at a stage where we can start construction. We aim to extend Cerro Corona's mine life to 2034 and, in 2020, we will continue with a scoping study to achieve this goal.

In addition to our Cerro Corona project, we are exploring other areas in Southern and Central Peru. We have secured a 16% stake in Chakana Copper, but this project is operated by an independent management partner.

What engineering needs to be done at the Cerro Corona project to extend the mine life to 2034?

A substantial amount of innovation has been implemented in our proposal and we are looking towards new technologies and digitization to achieve the mine life extension goal. With regards to our tailing's facilities, a lot of detailed engineering is necessary. The tailings and waste management designs and engineering are being completed as part of a feasibility study.

How does Cerro Corona compare to Gold Fields' other global projects in terms of production, cost and profitability?

Gold Fields' South American operations have the company's lowest running costs in the world. The net profit coming out of Peru is 21% of the company's entire profits. Our Peru business contributes approximately 310,000 ounces equivalent per year (oz eq/y), and our objective is to acquire another asset to reach a 500,000 oz eq/y, target.

What potential do you see from Gold Fields' Salares Norte project in Chile?

Gold Fields has been fortunate with the current price of gold as well as foreign exchange rates improving in Chile. This means that the return on investment on the Salares Norte project is going to be shorter than the 2.5-year payback that was predicted with a gold price of US\$1,200 per ounce. With Salares Norte, Gold Fields has strategically secured a footprint in one of the best mining jurisdictions in the world. Chile is a copper producing country, but we are opening the gold market there again. We aim to continue our operations in Chile for at least another 20 years and

we are exploring throughout the country.

Considering the current strength of gold, will Gold Fields have a stronger focus on exploration, and which regions does the company see as having high potential for discovery?

Approximately four years ago, Gold Fields decided to reduce its exploration budget and we had no exploration activities in the Americas. In 2019, the company changed its strategy and allocated a budget for exploration and M&A in the Americas and appointed a new exploration manager. We have always been focused on gold, but are also starting to expand our interest into copper in the Americas, considering the geological potential.

Gold Fields is the first open pit mining company in Peru to receive the ISO 45001 certification for workplace safety. Can you elaborate on the company's focus on safety?

Safety is one of Gold Fields' core values and our motto is that, if it is not safe, we do not operate. Our safety index has improved significantly over the last five years, but we continuously strive to improve safety standards and measures even further. Gold Fields strives for zero harm at all of its operations worldwide and we aim to minimize occupational health and safety hazards. We want to encourage the entire mining industry to have a focus on health and safety before they start operating.

How is Gold Fields introducing sustainable initiatives into its operations?

Gold Fields is the first mining company in Peru to introduce electric vehicles to its operational and transportation fleet. We remain highly committed to the continual improvement of our environmental performance. Key areas of focus include water stewardship, mine closure and the reduction of our carbon emissions and energy usage. All of our operations are certified to the ISO 14001 standard and are fully compliant with the International Cyanide Management Code. For example, Gold Fields does not use mercury for the beneficiation of gold or in any of its processes. ■

Peru to obtain the ISO 45001:2018 certification for its Cerro Corona operation, awarded due to its emphasis on safety. Elaborating on Gold Fields' priorities moving forward, Rivera added that key areas of focus include water stewardship, mine closure and the reduction of carbon emissions and energy usage. "All of our operations are certified to the ISO 14001 standard and are fully compliant with the International Cyanide Management Code. For example, Gold Fields does not use mercury for the beneficiation of gold or in any of its processes."

Another of Peru's US\$1 billion+ market cap precious metals producers, Hochschild Mining, had to cut its 2020 production guidance to 280,000-290,000 gold equivalent ounces, with AISC raising slightly to US\$1,250-US\$1,290 AuEq Oz, due to lockdowns in Peru and Argentina. However, with operations now back to almost full capacity at its Pallancata and Inmaculada mines, president and CEO Ignacio Bustamante expects Hochschild to deliver a solid second half of production with strong cashflow generation.

Elaborating on measures taken to extend the mine life at Inmaculada, Bustamante highlighted drilling campaigns that discovered 50 million ounces of silver north of the Angela vein, with five main structures – Susana Beatriz, Salvador, Facundo, Noelia and Pilar. At Pallancata, Hochschild was waiting over three years to get the permits required for drilling, and then the pandemic hit. However, the company now intends to drill aggressively over the next 12 months to extend LOM.

Expanding on this theme, Bustamante affirmed that exploration is the top pillar in Hochschild's growth strategy. "Brownfield exploration is where we believe we can generate the most value, by increasing LOM, improving grades, and allowing us to put certain assets back into production, such as Arcata," he said, noting that Hochschild now has all of its permits to drill a wide range of targets including Crespo, Arcata, Corina, Cochaloma, Pablo Sur and Palca. "I do not recall having a more loaded second half of the year with so many meters to drill," he concluded. ■



GOLD FIELDS

At **Gold Fields** we maintain our commitment to improving the quality of life of all our stakeholders, with the arrival of COVID-19, we created a plan that sought to protect the health and emotional well-being of people, without neglecting the continuity of our operation.

Our strategy prioritized the care of our people and communities. Under our multi-stakeholder vision, we have worked with the authorities and institutions that are on the front lines of the fight against COVID-19 with the sole objective of saving the Peruvians lives.

TOGETHER, NOTHING STOPS US!

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Leandro García

CEO
BUENAVENTURA



Since taking over the position of Buenaventura CEO in September, what priorities have been set for the next 12 months?

First, in 2020 due to the effect of Covid-19, our main focus has been on preserving cash. We have refinanced our syndicated loan, obtaining a 30-month period of grace, and postponed our 2020 dividend payment until we have more visibility about the current situation. We are currently working on refinancing the US\$115 million balloon payment of Huanza's leasing that we expect to close in November.

Regarding our own operations, which are the locomotives of our company's development, the plan is to continue increasing efficiencies in order to continue generating value for our shareholders. Last but not least, as you know, the continuity of mining lies in exploration. For this reason, going forward we will continue to focus our efforts on the exploration and development of new mines. By doing this we can give sustainability to our company, always putting safety first, respecting the communities that host us and caring for the environment.

How is the debottlenecking program progressing at Buenaventura's main operations?

The program is moving along well. We have had very good results in Tambomayo, where we have simplified the metallurgical process while we have also optimized mine preparation. In Uchucchacua we have improved efficiency in the underground mine as well, and in both mines the program is resulting in significant cost savings. Orcopampa is a different case, because we have resized the operation, and a big focus now is on the exploration front in order to increase the LOM. Finally, at Marcapunta we should reap the benefits of the program by the end of 2020 and beginning of 2021.

To what extent is declining gold production being offset by higher gold prices?

Buenaventura's gold production profile follows the declining trend of the Peruvian gold segment. We are seeing production fall in Orcopampa and La Zanja. Yanacocha's production did not decrease in the past year but it will over the next years. So, in the medium term, San Gabriel will be a key project for us as it will be a breaking point, while Yanacocha, Tantahuatay and

La Zanja will become gold-copper producers and not just gold producers.

What is the current status of the San Gabriel gold project?

San Gabriel is in Moquegua, at the south of Peru. It is a project for an underground mine that belongs 100% to Buenaventura. The EIA is approved and we have the land agreements in place, however we are facing some delays due to the prior consultation process. We hope we can have this done by the end of 2020. During the last year, we solved the issues regarding rock quality, so we are ready to take an investment decision if the prior consultation process goes well.

What was the rationale behind your recent investment in Tinka Resources?

The company's vision is to have assets that can be in production for at least 10 years. Ayawilca is a high-grade zinc project, equidistantly located between El Brocal and Uchucchacua. In both plants we have the capacity to produce lead and zinc concentrates.

Therefore, it makes sense to think that Ayawilca, rather than being developed as a standalone project, could be developed as a satellite mine to feed those plants. El Brocal has a plant capacity between 18,000 and 20,000 mt/d, while Uchucchacua is a 4,000 mt/d plant with an EIA approved to go to 6,000 mt/d, although we are still at an engineering phase before we approve this expansion.

How are base metals playing an increasing role in Buenaventura's production profile?

Buenaventura has a 67-year history. It started in silver, with Julcani; then the focus was strongly on precious metals, with several mines across the country, and of course Yanacocha. Then the company invested in copper and base metals with Cerro Verde and El Brocal, so today's production profile is quite diversified. The idea is that Buenaventura should be a long-lasting investment vehicle with consistent financial results. In this respect, today our main focus is on gold and silver with an important contribution of copper, mainly due to Cerro Verde but in the future, we expect to have more contribution of copper than today, mainly due to our current pipeline of projects. ■



Ignacio Bustamante

President & CEO
HOCHSCHILD MINING



From a mining standpoint, how do you think the Peruvian government has dealt with the pandemic?

It was a very atypical situation, but the signals and messages we received from the government were not clear. Some companies interpreted that they could continue operating to some capacity, while others interpreted that they had to stop. Hochschild took a conservative approach, and put the health and safety of its people first, shutting down operations apart from essential care and maintenance, such as water treatment and ventilation. Then, the government took way too long to classify mining as a critical activity for the country. Argentina, where mining is not nearly as important to the economy as it is in Peru, decided to put the sector as a top priority and operations restarted after one month, compared to three in Peru.

What measures have been taken to extend the mine life and Pallancata and Inmaculada?

At Pallancata we were waiting over three years to get the permits that were required for drilling, and then the pandemic hit. However, we now have more drill targets than we have ever had, and intend to drill aggressively over the next 12 months to extend the life of mine (LOM). At Inmaculada, we began our first drilling campaign outside of the Angela vein in 2018, finding over 1 million ounces of gold, albeit at a lower grade than Angela. In 2019, the focus was on grade, and we found a new area north of Angela with five main structures – Susana Beatriz, Salvador, Facundo, Noelia and Pilar. With this discovery we were able to find another 50 million ounces of silver, as well as improving the average grade of our new resources. In 2020, we are focusing on finding additional potential areas, adding inferred resources and converting as many inferred resources as we can to measured and indicated resources and to reserves.

2020 has been a political rollercoaster for Peru, with numerous changes to the Ministry of Energy and Mines. What do you think are the main challenges facing the newly elected officials?

We have the highest respect for both Luis Miguel Incháustegui and Jaime Gálvez because of their history in the mining and public sector, and are enthusiastic about the positive attitude they have shown at the start of their new roles. The main challenge the government has is to accelerate the permitting times, particularly to clarify the issues surrounding the prior consultation, which is in dire need of fixing. The Ministry of Environment is also very important for the mining industry, and must work in unison with the Ministry of Energy and Mines and the private sector to help regain Peru's competitiveness.

I am convinced that the only way that you can ensure long-term sustainability between mining and local communities is through a long-term mutual agreement between them. It is a road to nowhere if government is trying to impose certain things when either of the parties is not in agreement. The government should play the role of facilitator when required, set the tone, and increase efficiency.

Looking ahead, what are Hochschild's priorities and what is the company's growth strategy?

Exploration is the top pillar in Hochschild's growth strategy, which also includes brownfield, greenfield, early stage projects and M&As or JVs. In the case of Brownfield exploration is where we believe we can generate the most value, by increasing LOM, improving grades and allowing us to put certain assets back into production, such as Arcata. I do not recall having a more loaded second half of the year with so many meters to drill.



Hochschild also plans to be active in M&A across the Americas in jurisdictions that have the right mix of geological potential plus a solid economic and political environment. This could be through a JV, like in the case of Snip, Pallancata and San Jose, but also through outright acquisition if the conditions allow a good return for our shareholders. ■



Brownfield exploration is where we believe we can generate the most value, by increasing LOM, improving grades and allowing us to put certain assets back into production, such as Arcata. I do not recall having a more loaded second half of the year with so many meters to drill.

Zinc

THE Q3 2020 REVIVAL HAS BROUGHT A TIMELY BOOST TO PRODUCERS

➤ The theme of base metal revival in the second half of 2020 continues with zinc, which descended to a 5-year low of US\$0.82/lb on March 25th, as the pandemic decimated demand, but then followed an upward trend to trade above US\$1.10/lb in August and September. Zinc production in Peru went down by 4.39% in 2019, and will certainly see a further decrease in 2020, as the primarily underground mines where it is extracted make remote work and social distancing more challenging than at open-pit operations. Indeed, Ricardo Porto, CEO of Nexa Resources, indicated that due to new health and safety protocols, returning to full capacity will probably require a vaccine. However, he did mention that after ramping up at the beginning of Q3, Nexa's Peruvian mines were back to approximately 90% production capacity. Porto related how Nexa maintained a level of production at Cajamarquilla with the smelter running during lockdown using the stock

of concentrate the company had during the care and maintenance period. Furthermore, he explained how the company's focus on innovation has helped it adapt to new working conditions, by utilizing its open innovation platform, Mining Lab, to look for the best ways to track and trace workers. "Nexa's innovations have been oriented to reduce the number of workers needed in an underground operation. By definition, underground mining has risks associated, and the move towards more automated, remote work has been developed long before the pandemic," said Porto, giving the example of digital temperature scanners with cameras as one of a number of new technologies implemented. Looking forward, Porto affirmed that Nexa's investment plans for Peru have not been impacted by the pandemic. The first project in the company's Peruvian development pipeline, Magistral, is in advanced pre-feasibility stage, which Nexa hopes will be finalized by the beginning of 2021 before taking a construction decision. "Peru is without doubt the main area of focus for Nexa moving forward as we view it as the mining jurisdiction of the future," revealed Porto. Another of Peru's zinc producers is diversified precious and base metals company Sierra Metals, with production from two mines in Mexico and its flagship Yauricocha underground mine

in Yauyos province, Peru. Igor Gonzales, Sierra Metals' former CEO (replaced by Luis Marchese on June 1st, 2020), elaborated on the operational improvements made at Yauricocha: "The Yauricocha mine is now fully mechanized. We also completed the Yauricocha tunnel, which connects all of our underground workings with the processing facility. We installed a welded rail line so that trains can travel at a higher speed and we are purchasing larger locomotives and haul cars to allow us to move waste and ore faster." Despite the impact of the pandemic, Sierra Metals reported an adjusted EBITDA of US\$12.6 million in Q2 2020 in-line with Q2 2019, as lower revenues due to Covid government mandated curtailments were partially offset by reduced operating costs. "Metals prices have strengthened at the start of the third quarter especially for copper and precious metals. We are optimistic that with improved operating efficiencies and potential higher metal prices we will see a stronger second half for 2020," said Luis Marchese, in a statement on August 13th. Furthermore, operational improvements at Yauricocha have been made in preparation for the company's flagship asset to increase capacity by 20% once permits for the expansion have been acquired, bringing the mine from 3,000 mt/d to 3,600 mt/d by 2021. ■



Ricardo Porto

President & CEO
NEXA RESOURCES PERÚ



By definition, underground mining has risks associated, and the move towards more automated, remote work has been developed long before the pandemic. When Covid-19 arrived, these technologies become even more important.



To what extent have Nexa Resources' Peruvian operations been impacted by the pandemic?

Now (September 2020) operations are stable, but we certainly suffered during the lockdown. We managed to maintain a level of production at Cajamarquilla with the smelter running, using the stock of concentrate we had during the care and maintenance period. Q2 was heavily impacted, but we have ramped up since the beginning of Q3, now

reaching a level of approximately 90% production capacity across our mines in Peru. As Nexa runs underground mining operations (where remote work is more complicated than at open-pit mines), the health and safety protocols that have been implemented mean production is likely to remain at 90-95% for the rest of 2020, as returning to full capacity will probably require a vaccine.

How has Nexa's focus on innovation helped the company adapt to new working conditions?

In general, Nexa's innovations have been oriented to reduce the number of workers needed in an underground operation. By definition, underground mining has risks associated, and the move towards more automated, remote work has been developed long before the pandemic. When Covid-19 arrived, these technologies become even more important. At the same time, we utilized our open innovation platform, Mining Lab, to look for the best ways to track and trace workers. Many providers approached us with interesting solutions, and we are implementing a number of new technologies including digital temperature scanners with cameras.

There has been some criticism of the Peruvian government with regard to the length of the lockdown for mining companies. Do you feel they should have allowed operations to restart more quickly?

I would say that hindsight is 20/20, and it is easy to look back and suggest what could have been done better. Nexa started holding daily crisis meetings on March 7th, and the global protocols and advice from leading health officials have changed dramatically since then. Furthermore, in a country where 70% of work is informal, maintaining a quarantine for a long period is a huge challenge. Perhaps the authorities might have done some things differently if they had hindsight, but in my opinion, by prioritizing the health of its citizens, the Peruvian government acted correctly. Covid-19 is certainly not just a little flu. From a health and safety standpoint, it was made clear what was required at an early stage.

What support has Nexa given to the communities surrounding its Peruvian operations during 2020?

Nexa operates all over Peru, and we are the main source of income for the communities in these areas. Since March, we have delivered over 400 oxygen cylinders, 12 respirators, and thousands of PPE to the communities and the health sector, as well as over 11,000 food parcels. It was due to the logistics supply chain set up for the mining industry that this emergency response was quick, and it has reinforced the importance of mining to the country. The pandemic has also reinforced the value of working in conjuncture with communities. For example, there are various communities near Nexa's Pasco mining complex and we worked with them to implement, train and support the new health protocols during the lockdown.

How do you view the current performance and fundamentals of zinc?

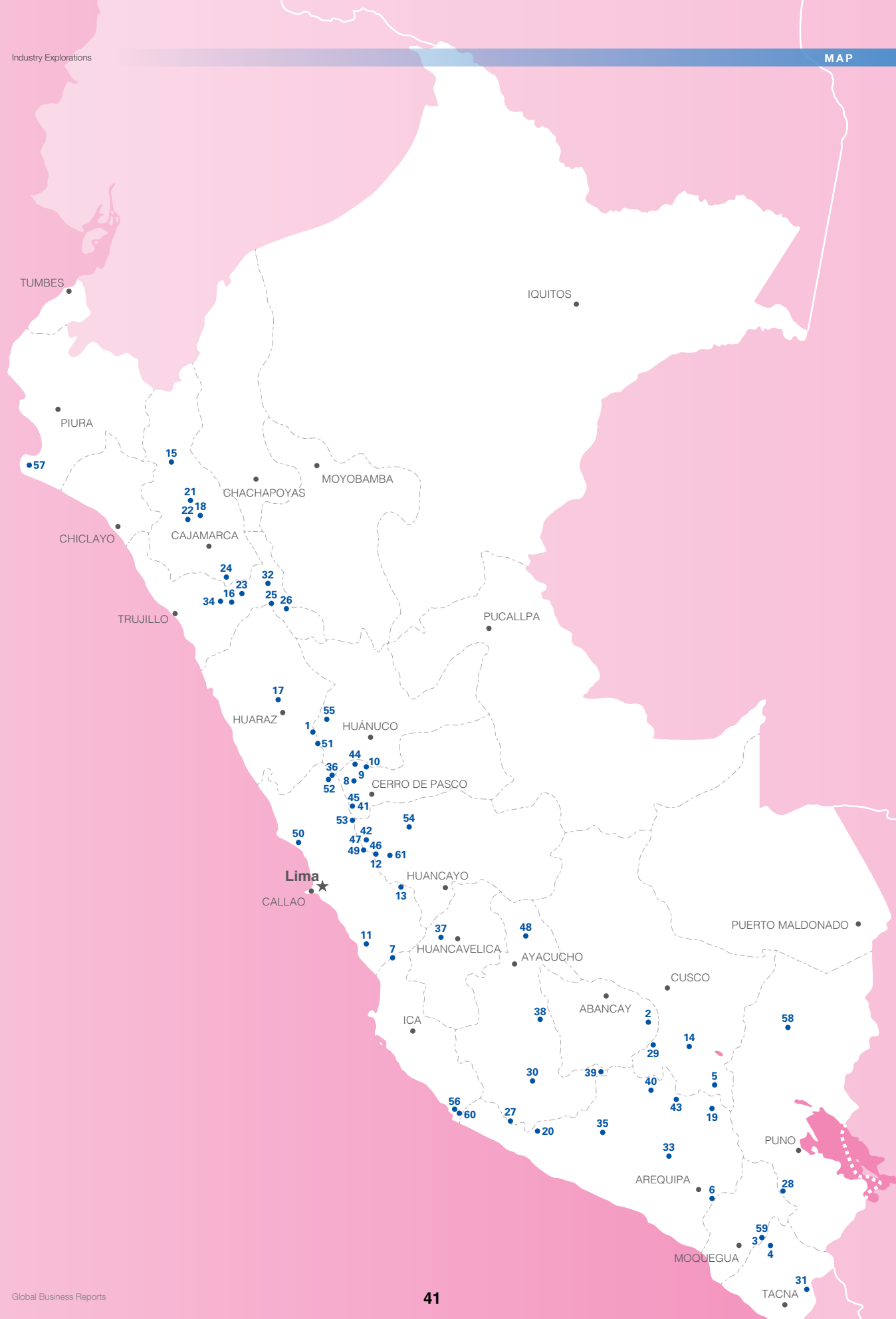
Since May, zinc has rebounded well and at this moment, is the best performing base metal. While there is a current surplus of zinc metal, the market has begun to understand that the supply of zinc concentrate is not as robust as previously thought. Surplus should remain throughout 2020 as smelters have been active even while some mines have been shut down. However, looking further ahead, infrastructure-based stimulus packages to help revive economies will push demand up and offset the reduction in demand from the automotive sector.

What is Nexa's vision in Peru for the coming years?

Peru is without doubt the main area of focus for Nexa moving forward, as we view Peru as the mining jurisdiction of the future. Our Aripuanã project in Brazil is currently under construction and is the immediate priority for Nexa, but despite delays, the company has not changed its investment plans in Peru. The first project in our Peruvian development pipeline is Magistral, which is in the advanced pre-feasibility stage that we hope to finalize by the beginning of 2021 and take a construction decision. ■

Peru's Main Producing Mines

NUMBER	MINERAL	COMPANY	MINE
1	Copper, Molybdenum, Silver, Lead, Zinc	Antamina (BHP-Glencore-Teck-Mitsubishi)	Antamina
2	Copper, Molybdenum, Gold, Silver	MMG-Guoxin-CITIC	Las Bambas
3	Copper, Molybdenum, Silver	Southern Copper	Cuajone
4	Copper, Molybdenum	Southern Copper	Toquepala
5	Copper, Gold, Silver	Glencore	Antapaccay
6	Copper, Molybdenum	Cerro Verde (Freeport-Sumitomo-Buenaventura)	Cerro Verde
7	Copper, Silver, Lead, Zinc	Nexa Resources	Cerro Lindo
8	Copper, Silver, Lead, Zinc	Nexa Resources	El Porvenir
9	Copper, Silver, Lead, Zinc	Nexa Resources	Atacocha
10	Copper, Silver, Lead, Zinc	El Brocal (Buenaventura)	Colquijirca
11	Copper, Gold, Silver	Southern Peaks Mining	Condestable
12	Copper, Molybdenum, Silver, Lead, Zinc	Chinalco	Toromocho
13	Copper, Silver, Lead, Zinc	Sierra Metals	Yauricocha
14	Copper, Silver, Molybdenum	Hudbay Minerals	Constancia
15	Gold, Silver	Yanacocha (Newmont-Buenaventura-Sumitomo)	Yanacocha
16	Gold	Barrick	Lagunas Norte
17	Gold, Silver	Barrick	Pierina
18	Gold, Copper	Gold Fields	Cerro Corona
19	Gold, Silver	Buenaventura	Orcopampa
20	Gold, Silver	Caraveli	Chacchuille
21	Gold, Silver	Coimolache (Buenaventura-Southern-Espro)	Tantahuatay
22	Gold, Silver	La Zanja (Buenaventura-Newmont)	La Zanja
23	Gold, Silver	Pan American Silver	La Arena
24	Gold, Silver	Pan American Silver	Shahuindo
25	Gold	C.M. Horizonte	Parcoy
26	Gold, Silver	Retamas	Retamas
27	Gold, Silver	Laytaruma	Laytaruma
28	Gold, Silver	Aruntani	Andrés
29	Gold, Silver	Anabi	Valeria
30	Gold, Silver	Apumayo	Apurimac
31	Gold, Silver	Minsur	Pucamarca
32	Gold, Silver	Poderosa	Poderosa
33	Gold, Silver	Buenaventura	Tambomayo
34	Gold	Los Andes Peru Gold	Isabelita (El Toro)
35	Gold	Yanaquihua	Alpacay
36	Silver, Zinc, Lead	Buenaventura	Uchucchacua
37	Silver, Gold	Buenaventura	Julcani
38	Silver, Gold	Hochschild	Inmaculada
39	Silver, Gold	Hochschild	Pallancata
40	Silver, Gold	Hochschild	Arcata
41	Silver, Lead, Zinc, Copper	Pan American Silver	Huarón
42	Silver, Zinc	Pan American Silver	Morococha
43	Silver, Lead, Zinc	Fortuna Silver	Caylloma
44	Silver, Lead, Zinc	Volcan (Glencore)	Cerro de Pasco
45	Silver, Lead, Zinc	Volcan (Glencore)	UAE Chungar
46	Silver, Lead, Zinc	Volcan (Glencore)	UAE Yauli
47	Lead, Zinc, Copper, Silver	Glencore	Yauliyacu
48	Zinc, Lead	Trafigura	Catalina Huanca
49	Silver, Lead, Zinc	Casapalca	Americana
50	Silver, Lead, Zinc	Colquisiri	María Teresa
51	Lead, Zinc	Mitsui	Santa Luisa
52	Lead, Zinc, Silver	Buenaventura	Mallay
53	Zinc, Lead, Silver	Trevali	Santander
54	Zinc	San Ignacio de Morococha	San Vicente
55	Copper, Silver, Lead, Zinc	Raura	Raura
56	Iron	Shougang	Marcona
57	Phosphate	Mosaic-Mitsui	Bayóvar
58	Tin	Minsur	San Rafael
59	Copper	Anglo American-Mitsubishi	Quellaveco (under construction)
60	Copper	Marcobre (Minsur-Alxar)	Mina Justa (under construction)
61	Copper, Silver, Zinc	Southern Peaks Mining	Ariana (under construction)





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JUNIOR EXPLORATION



"By 2021, we would like to see the downward trend in exploration investment reversed and hopefully new discoveries announced. There is a lot of interest in Peru due to its geological potential and economic stability, but we need to iron out the regulatory permitting challenges that remain as soon as possible."

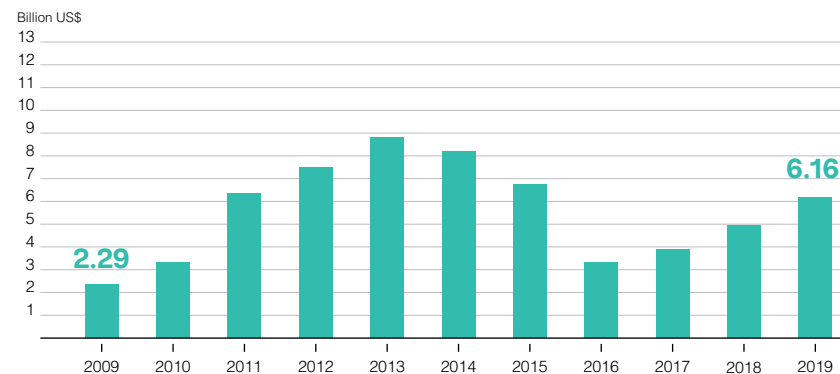
- Manuel Fumagalli,
President, National Society of Mining,
Petroleum and Energy (SNMPE)

Junior Exploration

CUMBERSOME PERMITTING IS HOLDING PERU BACK FROM FULFILLING ITS POTENTIAL

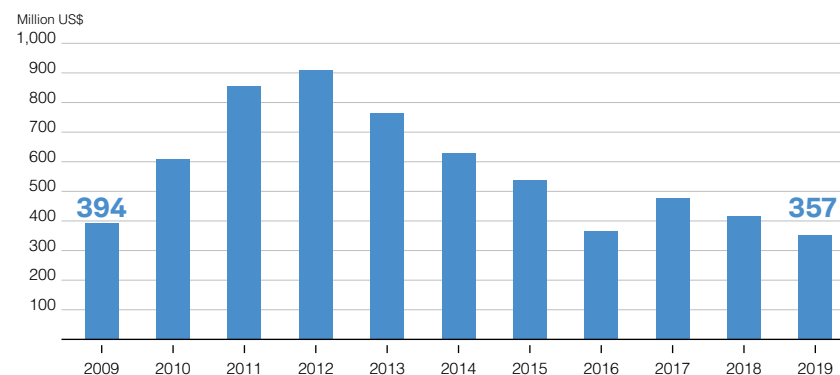
TOTAL MINING INVESTMENT IN PERU

Source: MINEM



EXPLORATION INVESTMENT IN PERU

Source: MINEM



be approved and with ongoing social challenges, this is testing the friendship between the jurisdiction and juniors," he said, adding that Peru has to be aggressive in combatting corruption to attract more investment into its exploration sector.

This has been reflected in the membership of the Canada Peru Chamber of Commerce (CCCCP), according to its general manager Carla Martínez, with the number of junior participants decreasing in recent years. "To reignite the interest of the junior mining community, permitting and authorization times must be reduced," she affirmed. Fernando Pickmann, partner at global law firm Dentons and president and COO for Regulus Resources, believes there is a double liability for why permits have been taking so long: "Some of the delays are due to a lack of capacity to grant permits, but some of the responsibility must also fall with the companies looking for permits who have not

been doing the proper work," he said, observing that instead of following the prior consultation process, companies have been looking for ways to avoid it.

"The government needs to see where there is potential and act quickly, because investors are tired of waiting two or three years to know if there really is potential and cannot continue to invest if they are uncertain there will be a sufficient or a timely ROI," stated Jorge Granda, general manager of AK Drilling, who remarked that, as Peru loses its competitiveness, funds go to other jurisdictions.

Even before the pandemic, the leading authorities in Peru's mining industry were vocal in their acknowledgment that the climate for exploration must become more attractive if Peru is to maintain a healthy project pipeline. Augusto Cauti, ex-Vice Minister of Mines (until August 6th), stated that stimulating exploration is a prime government objective in 2020. As evidence



In the next 50-100 years copper will play a role in global industrial and urban expansion like the oil and gas sector played for the last 100 years in terms of generating, storing and distributing power.

**- Luquman Shaheen,
President & CEO,
Panoro Minerals**



of the government's commitment, Cauti pointed to the decree of urgency enacted on December 27th, 2019, that grants the definitive rebate of VAT for the next three years. "Furthermore, we reinstated legislation that allows companies that invest large amounts in the country to perform accounting in US dollars," added Cauti.

Manuel Fumagalli, president of the National Society of Mining, Petroleum and Energy (SNMPE), was keen to emphasize the intention of the mining authorities to push for change, revealing that the SNMPE is working with the government to streamline the permitting process, as the discussion to move the ILO Convention 169's prior consultation (consulta previa) from the exploration stage to the feasibility mining project development stage gathers pace.

Drilling permits and exploration licenses mean little to juniors without access to capital, and in this respect, the Canadian money markets hold significant influence. In early 2019, the Toronto Stock Exchange (TSX) and TSX Venture Exchange (TSXV) made a strategic decision to establish a full time presence in Lima to explore new opportunities across South America. From a mining

standpoint, Latin America represents 23% of mining issuers on TSXV, second only to Canada with 45%. The man in charge of leading this growth is Guillaume Légaré, head of South America for the TSX and TSXV, who outlined the reasons for choosing Lima as a base: "We chose Peru as a base because it is the most important South American mining market for our exchanges. In Peru, there are 57 companies listed on TSX and TSXV that are active in South America with 135 mining properties." With a goal to support more local management teams access the Toronto exchanges' two-tiered ecosystem, Légaré noted that there are different channels available for accessing capital other than a traditional IPO. One option is the Capital Pool Company (CPC) program, which introduces experienced investors to entrepreneurs whose growth and development-stage companies require capital and public company management expertise. "There are a number of CPC founders looking for mining opportunities in the region; we want to bring investment opportunities from LatAm to these founders, and better communicate the different options for raising capital to potential issuers," he explained.

One such CPC is Magnitude Mining, which entered into an agreement for a qualifying transaction with gold-focused junior Pucara Resources in March 2020. Since they were already trading on the TSXV, an RTO was the most efficient and cost-effective way for Pucara to go public, according to Steve Zuker, president and CEO of the new entity – Pucara Gold – which went public in October 2020 under the ticker TORO. "We will focus our exploration efforts on high-sulphidation epithermal gold deposits, as this is our expertise and there are only a handful of companies in Peru focused on grassroots exploration," explained Zuker.

Rising base metals prices rejuvenate Peruvian exploration

Despite the bleak backdrop of a turbulent first half of the year, the summer of 2020 has breathed new life into Peru's junior community. For a start, metals



AntaKori Copper-Gold Project Peru



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prices have flourished since the mid-March liquidity crunch that saw investors sell stocks en masse. By September, copper had reached a two-year high of over US\$3.10/lb, silver a seven-year high of over US\$28/oz, and gold remained in the US\$1,900 range, just shy of its all-time high of US\$2,070 hit in August. Even zinc rebounded robustly, recovering from a low of US\$0.82/lb in March to reach US\$1.13/lb in September.

To illustrate how the tide has turned for the Peruvian junior community, we can examine the share price appreciation of three of the leading juniors in Peru from March 16th (the first day of lockdown in Peru) through to September 16th, exactly six months later. Regulus Resources moved from C\$0.55 to C\$1.62 (up 195%); Chakana Copper moved from C\$0.10 to C\$0.75 (up 650%); and Tinka Resources was up 122% during the same period. The profile of these three

companies is an indication of the direction Peruvian mining is headed, with base metals receiving greater interest from investors as precious metals production continues to decline.

Despite a booming gold market, the trend of precious metals producers investing in base metal juniors is evident in Peru. In January 2020, Tinka Resources raised C\$18.5 million through a strategic partnership with Buenaventura, which bought a 19.3% stake in the company at a remarkable 100% premium to the share price when it was announced. This was the second in a line of strategic financings by precious metals players in Peru following the May 2019 announcement that Gold Fields had completed a C\$8 million investment for a 16% stake in Chakana Copper. "We have always been focused on gold, but are also starting to expand our interest into copper in the Americas considering the geological potential," stated Luis Rive-

ra, Gold Fields' executive vice president for the Americas.

With gold-focused industry heavyweights such as Barrick CEO Mark Bristow declaring he believes copper will be "the most-strategic metal on this planet" in a decade, and a lack of undeveloped gold assets large enough to satisfy big producers, copper offers the upside linked to the impending electrification movement, as well as the type of assets that guarantee long-term production.

While the short term outlook for copper appears volatile, the bullish long term market consensus should hold Peru in good stead for years to come. "In the next 50-100 years copper will play a role in global industrial and urban expansion like the oil and gas sector played for the last 100 years in terms of generating, storing and distributing power," predicted Luquman Shaheen, president and CEO of Panoro Minerals. ■

INTERVIEW

Guillaume Légaré

Head – South America

TORONTO STOCK EXCHANGE (TSX)

TSX VENTURE EXCHANGE (TSXV)



Why was Lima chosen as TMX Group's South American base?

We chose Peru because it is the most important South American mining market for our Exchanges. There are 478 mining companies in Latin America listed on TSX and TSXV, with 1,045 mining properties. In Peru, there are 57 companies listed on TSX and TSXV with 135 mining properties. Latin America represents 19% of mining issuers on TSXV, second only to Canada with 48%. Our goal is to support more local management teams to access our unique two-tiered ecosystem.

TSX already has an agreement with the Santiago Stock Exchange (BCS). Is this a model you intend to mirror with other stock exchanges in the region?

Our main objective is to allow our listed clients to have access to new pools of capital, and to optimize access to capital. We are close to the local exchanges in the region and a number of companies have taken advantage of the dual-listing approach. We have a unique two-tiered ecosystem that utilizes the public venture capital model approach, which is something companies need right now. There is already the MILA (Latin American Integrated Market) exchange agreement, which allows investors access to companies should they come via Mexico, Peru, Colombia or Chile. We will be working with the local exchanges in the region to make sure this is made as efficient as possible.

What are some of the alternative ways to raise money besides an IPO?

Unique listing vehicles such as the Capital Pool Company (CPC) program give Venture companies greater access to capital. The CPC program introduces experienced investors to entrepreneurs whose growth and development-stage companies require capital and public company management expertise. There are a number of CPC founders looking for mining opportunities in the region. We want to bring investment opportunities from LatAm to these founders, and better communicate the different options for raising capital to potential issuers. ■

THE ISSUE OF PERMITTING



I am hopeful that the coronavirus crisis and its dramatic impact on the economy will prompt the right reaction by the government so that the exaggerated approach towards prior consultation is changed. In this recessive scenario, we need the government to take bold, disruptive actions to facilitate investment.

- Oscar Díaz, CEO, Viceversa Consulting



The government needs to see where there is potential and act quickly, because investors are tired of waiting two or three years to know if there really is potential and cannot continue to invest if they are uncertain there will be a sufficient or a timely ROI. By losing these opportunities, Peru loses its competitiveness and these funds go to other countries. Permitting must be sped up in order to recover opportunities for revenue and business that we are currently leaving on the table.

- Jorge Granda, General Manager, AK Drilling



I believe there is a double liability for why things have been taking so long. Some of the delays are due to a lack of capacity to grant permits, but some of the responsibility must also fall with the companies looking for permits that have not been doing the proper work. Instead of following the prior consultation process, companies have been looking for ways to avoid it.

- Fernando Pickmann, Partner, Dentons Gallo Barrios Pickmann



A common problem is the different evaluation criteria and interpretations of the authorities regarding legislation and technical requirements for mining projects. The criteria can be different, not only between agencies, but also between the professionals in the same agency. I believe that evaluation criteria for permitting has to be standardized and that the regulatory framework should be extensively simplified to achieve a more predictable permitting process.

- Jorge Chávez Blancas, General Manager, EnvPhys



There is interest from investors to finance projects, but the system is failing the mining industry with regards to excessive regulations, such as the requirement of prior consultation for an exploration project that makes minimal environmental impact. Peru is still the most stable country in Latin America, but the permitting times are causing investors and juniors to look elsewhere.

- Steve Zuker, President & CEO, Pucara Gold Ltd.

Copper

PERU HAS A NUMBER OF PROMISING PROJECTS LOOKING TO CAPITALIZE ON A REVITALIZED MARKET

⇒ Considering the scarcity of sizeable junior copper assets globally, a name frequently brought up as a buyout candidate is Regulus Resources, whose AntaKori project has produced five of the top 20 copper intercepts reported worldwide over the last two years with mineralization close to surface, according to John Black. Black provided an update on the company's phase II drill program, mentioning that the focus has been to extend the mineralization, mostly to the north of the project. He also noted that the resource already announced has given Regulus a strong foundation to build upon, with 250 million mt of 0.48% copper and 0.29 g/mt gold in the indicated category and 267 million mt of 0.41% copper and 0.26 g/mt gold in the inferred category.

The Regulus management team has already had success with Antares Minerals, which was sold to First Quantum for C\$460 million in 2010, and Black believes they have the same scale of project or better with AntaKori. "We have already demonstrated a sizeable resource with great opportunity for expansion. We have the security of a solid investment premise on the known deposit, but also the benefit of additional exploration upside," concluded Black.

Another of the Canadian juniors active in Peru, Chakana Copper, used the investment received from Gold Fields in May 2019 to start a 20,000 m drill program at its Soledad project in June 2019, with the aim of testing numerous targets and completing definition drilling on additional mineralized breccia pipes, according to president and CEO, David Kelley. After drilling 5,700 m of the program in 2019, Chakana made the decision to halt drilling and wait until an expansion of its drill permit had been granted to allow access to other parts of the property that have not been drilled yet. Kelley spoke of how Soledad is evolving from a mineralization standpoint: "Looking at the value of what we have drilled up to date, approximately 60% of the value sits in gold and silver and the remaining 40% sits in copper. I believe as we go deeper, copper will become more dominant."

When asked about the potential scale of the project, Kelley outlined Chakana's initial target for publishing a resource is 10 million mt, which will allow for investor confidence and put the company in a position to raise money to continue aggressive exploration. "There are approximately 40 to 50 breccia pipes. Each breccia pipe varies in size and we have confirmed that the breccias become bigger at depth. We have never seen the bottom of a breccia pipe, even though our deepest breccia intercept is over 700 m."

One of the previously active juniors that has returned with a makeover in 2020 is Camino Corporation (Camino), with new president and CEO Jay Chmelauskas appointed at the beginning of 2020. Chmelauskas has previous experience advancing projects through development, including Jinshan Gold Mines (now China Gold International), that developed one of China's largest gold mines in inner Mongolia, and Western Lithium (now Lithium Americas), advancing one of North America's largest lithium deposits. "Camino's previous drill results from 2017 indicated the potential scale and grade for a copper mine," said Chmelauskas, who had been looking for early-stage projects in good jurisdictions due to copper's role in the electrification transition and a lack of new discoveries in the copper space. "My business partner, Keith Peck, was involved with the development of the Franke copper mine at Chilean copper producer Centenario Copper, and we now believe the Los Chapitos could be similar," he stated, speaking of Camino's flagship asset in Arequipa.

Camino has identified up to four areas of copper, including copper/gold mineralization at Los Chapitos (a large land package of 220 km²) that the company intends to test this fall. Additionally, field work has already commenced at the company's high grade copper-silver project, Plata Dorada. "By August 2021, we aim to have a maiden resource for Los Chapitos and a larger portfolio of assets within Camino," said Chmelauskas, before declaring: "The projects I have worked

Images courtesy of Regulus Resources



on have turned into successful, long term companies, and we are looking to repeat this success in the copper sector at Camino."

One of the longest running juniors in Peru is Panoro Minerals, which follows a prospect generator model, preferring to advance its portfolio of projects with strategic partners rather than risk dilution from equity raises. "Through Panoro's partnerships with Wheaton Precious Metals (WPM), Jogmec, Hudbay and Mintania we receive approximately US\$5 million

per year, and this requires no capital raising or stock dilution," explained Luquman Shaheen, president and CEO.

Panoro has royalties in projects sold, such as a 2% royalty on the Kusiorcco project sold to Hudbay, located near their Constancia mine, and the Cochasyhuas project sold in June 2020 to Peruvian company Mintania In 2020, for which Panoro is due US\$2.5 million over the next two years while retaining a 5% royalty. Later this year, Panoro intends to drill the Chaupec and Guacile targets at its Cotabambas copper-gold project, revealed Shaheen.

GlobeTrotters Resource Group is another of the prospect generators active in Peru, and recently acquired the Candelaria brownfield project, located approximately 25 km southeast of Cerro Verde. Richard Osmond, GlobeTrotters' president, elaborated on the advantages of the company's business model: "In the past 5 years alone we have noticed a substantial turnover in the exploration teams for most of the major mining companies exploring in Peru. This makes it very difficult for the majors to compete with expert teams who have been focused on project generation in Peru for more than a decade."

A new copper-focused junior entered the Peruvian market on February 25th 2020, as C3 Metals (formally Carube Copper Corp) finalized the share-for-share acquisition of Latin America Resource Group (LARG) and its flagship Jasperoide copper-gold project. Jeff Ackert, C3's vice president of business development, highlighted Jasperoide's premium location in the Andahuaylas-Yauri belt, which hosts several large producing copper-gold-molybdenum deposits including Las Bambas (MMG), Antapaccay (Glencore) and Constancia (Hudbay). Regarding the focus of the Ontario-based junior, which also has projects in Jamaica, British Columbia and Nova Scotia, Ackert affirmed that the majority of exploration dollars will be directed towards Jasperoide in 2020: "The ability of exploration companies to make discoveries and put projects into production in Peru is testament to how the government and mining community has put the country on the map as a leading jurisdiction, especially for copper." ■


CAMINO

ON THE COAST.

Los Chapitos Copper Project, Chala, Arequipa, Peru

- **Discovery** – 1.31% Cu over 82.5 m, including 2.19% Cu over 31.7 m (DCM-024)
- **Power** – 500KV lines over the property, connecting to Peru's largest windfarm
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- **Access** – 40 minutes from Pan-American Highway

Exploration Drilling Restarts Q4 2020



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PDAC 2020

Booth #3325 in the Investors Exchange
Booth #3109B in the Core Shack

David Kelley

President & CEO
CHAKANA COPPER



Can you provide an update of Chakana Copper's phase III drill program at the Soledad project?

Chakana Copper started a 20,000 m drill program at the Soledad project in June 2019 with the aim to test numerous targets and complete definition drilling on additional mineralized breccia pipes. We drilled 5,700 m of the program in 2019 and then made the decision to halt the drilling and wait until we had an expansion of our drill permit approved to get us into other parts of the property that have not been drilled yet.

During drilling, we tested one of our high priority targets, breccia pipe 7, which had never been drilled before. It had both an excellent geophysical and surface geochemistry response. All four drill holes intersected significant mineralization, including 31 m of 0.68 g/mt Au, 205.9 g/mt Ag, and 0.23% Cu from 157 m in hole SDH19-111, and 35 m with 0.80 g/mt Au, 53.8 g/mt Ag, 0.35% Cu from surface in hole SDH19-114. We have a lot of enthusiasm and excitement for this particular target.

We also performed drilling at breccia pipe 6, which was necessary to get it to a point where the mineralization could be included in an initial resource. We then moved

on to breccia pipe 5 where we had a target set out on the east side, which achieved some of the highest grades we have seen in this pipe. We were able to extend the mineralization to depth which gives us more volume and significantly improved the copper grades. All of the breccia pipes we have drilled thus far are open at depth.

In 2019, Gold Fields invested C\$8 million in Chakana Copper. Can you explain how the relationship has developed?

In our initial two years of drilling, we saw some spectacular results which attracted the attention of several large mining companies. Gold Fields was the most aggressive in terms of wanting to learn about our project and was very thorough in their due diligence, which culminated in an investment in the company.

We are increasingly seeing large precious metals producers investing in copper projects. One of the reasons for this is that it is becoming increasingly difficult to replace reserves in the gold industry and there are obvious benefits in diversifying your portfolio. Furthermore, mining producers are looking at ways in which they can extend life of mine, which makes copper projects favorable.

Jay Chmelauskas

President & CEO
CAMINO CORPORATION



Can you explain how your previous experience in gold and lithium development led you to become president and CEO of copper junior, Camino Corporation (Camino), in January 2020?

I had been viewing copper projects for a couple of years, and came across Camino Corp. at the beginning of 2020, as an early stage project in a good jurisdiction. There is a lack of new discoveries in the copper space and Camino's previous drill results from 2017 indicated the potential scale and grade for a copper mine.

What progress has been made at Camino Corp. in 2020?

During the pandemic, we completed a 100% acquisition of the Los Chapitos project, and we have been advancing Los Chapitos by analyzing our database in a comprehensive manner to plan for the next stage of exploration and drilling. We also engaged with the local community near Los Chapitos to provide food and assistance during the COVID-19 shutdown.

From a regulatory standpoint, in July we received all permits and approvals to drill Los Chapitos, which will start this fall. On July 14th, we closed a private placement of C\$3 million to fund exploration activities. The first exploration results should be out by the beginning of December, and the plan is to drill the project targeting the delineation of a mineable resource.

What potential do you see in the Los Chapitos deposit?

Los Chapitos is envisioned as a medium to large-size IOCG (iron oxide copper-gold) discovery. IOCG deposits exist up the coast of Chile and Peru and are typically not as large as major porphyry deposits, but tend to carry higher grade and other metal credits. At Los Chapitos, the intercepts have been copper with only trace amounts of silver based on the 17,500 meters that were drilled in 2017/18. Our initial exploration target is to get to about 20 to 30 million mt of resource. At that size, we believe that the capex to develop

John Black



CEO
REGULUS RESOURCES



Can you provide an update on the progress on the phase II drill program at the AntaKori copper-gold project?

The phase I drilling program was completed in late 2018, which allowed us to put out a resource published in March 2019. We moved directly from phase I into phase II, which ran throughout 2019. We have completed approximately 16,000 m of what we anticipate will be a 25,000 m phase II program. The focus has been to extend the mineralization, mostly to the north of the project. The resource already announced gave us a great start with 250 million mt of 0.48% copper and 0.29 g/mt gold in the indicated category and 267 million mt of 0.41% copper and 0.26 g/mt gold in the inferred category.

We have had some very eye-catching results on some of our drill holes, for example, drill hole 31 hit 610 m of 0.84% copper with 1.02 g/mt gold, a 1.66% copper equivalent. The AntaKori project has produced five of the top 20 copper intercepts that have been reported worldwide over the last two years, and with mineralization close to surface. It is producing very lengthy intercepts that are high grade and indicative of a very robust system.

What are Regulus' plans to drill the newly permitted Anta Norte portion of the AntaKori project?

The area we refer to as Anta Norte is outside of the immediate agreement that we have with Coimolache, the neighboring operating mine. Regulus thus required a separate drilling permit and the related initiation of activity authorization, which we obtained in late November 2019 and March 2020 respectively. Operations were put on hold due to Covid-19, however, we recommenced drilling in October 2020, and expect to complete the phase II drill program in the first half of 2021, which will then provide data for an updated resource estimate. Drilling will most likely continue directly into a phase III program to complete definition of new mineralization.

How is Regulus planning to deal with the arsenic content found in some of the deposit?

Currently, approximately 40% of our resource is high arsenic material and about half of the project is skarn mineralization with lower arsenic contents. The portion with high arsenic will require additional treatment to be properly processed. We are currently investigating a number of techniques that are applied to other projects, including partial roasting and pressure oxidation or autoclave processing.

How do you think AntaKori compares to other junior projects?

Regulus specializes in acquiring opportunities to drill out and demonstrate very large copper or copper-gold deposits. We had success with Antares Minerals, which we sold to First Quantum and we think we have the same scale of project or better with AntaKori. There are very few copper or copper-gold resources the size of AntaKori that are in the hands of junior companies and therefore potentially available for acquisition. As copper demand increases in the next few years, we anticipate that major companies will be motivated to acquire an interest in projects like AntaKori.

Regulus offers one of the more exciting copper-gold projects available worldwide. We have already demonstrated a sizeable resource with great opportunity for expansion. We have the security of a solid investment premise on the known deposit, but also the benefit of additional exploration upside. ■

How is Soledad evolving from a mineralization standpoint?

The commodity mix at Soledad is really interesting as we have copper grades up to 10%, gold grades over an oz/mt, and silver grades up to 5 kg/mt. This gives an indication of the grade potential of the nature of the mineralization, being a mix between precious and base metals. Looking at the value of what we have drilled up to date, approximately 60% of the value sits in gold and silver and the remaining 40% sits in copper. This may change over time as we are drilling numerous breccia pipes, which have varied commodity ratios. I believe as we go deeper, copper will become more dominant.

What do you envision for the Soledad project moving forward?

There are potentially 40 to 50 breccia pipes on the project and we have never seen the bottom of a breccia pipe, even though our deepest breccia intercept is over 700m. Chakana Copper's initial target for putting a resource out is 10 million mt, which will put the company in a position to raise money to continue aggressive exploration. ■

a copper mine is possible to finance as a junior company. However, the upside potential for these IOCG systems is up to 500 million mt, with the best comparison being Mina Justa in Peru, which is about a 400 million mt IOCG deposit and is located about 100km north of Los Chapitos.

Do you have a final message for the audience of Global Business Reports?

We re-capitalized Camino to restart exploration at our Los Chapitos copper discovery and to develop a platform to build a copper company. We have identified up to four areas of copper, including copper/gold mineralization at Los Chapitos, which is a large land package of 220 km². As well as developing the Los Chapitos project, we are assessing other opportunities to grow the company. Our second copper project, Plata Dorada, is a high-grade copper and silver project located 158 km east of Cuzco. By August 2021, we aim to have a maiden resource for Los Chapitos and a larger portfolio of assets within Camino. ■



Graham Carman

CEO
TINKA RESOURCES



What were the main milestones achieved by Tinka Resources in 2019?

Tinka Resources was able to put out a PEA for the company's Ayawilca Zinc Zone project in mid-2019, based on the resources at the end of 2018 containing ~7 billion pounds of zinc, one of the largest undeveloped zinc deposits in Latin America. We were able to show a robust underground mining project with a 21 year mine life producing both zinc and silver-lead concentrates, with good infrastructure (power, water, roads) and strong community relationships. We also had a successful year in our exploration programs at Ayawilca with the discovery of a new silver zone, and we believe that there is a lot more potential to further grow the zinc and silver resources as well as further optimize the project in 2020 and beyond.

Another big milestone late in 2019 was Tinka Resources' strategic investment with Buenaventura. This is a big step forward for the company as it gives a stamp of approval from the biggest mining company in Peru and should provide confidence for our investors. It was also great that our largest shareholder, Sentient, continued to support the company in the private placement.

How will the Tinka Resources and Buenaventura partnership work moving forward?

Buenaventura has a breadth of mining experience in Peru and in our region of central Peru in particular - they have two mines within a 50 km radius, Uchucchacua and Brocal, so can provide expert advice and project synergies as well. Buenaventura will be a strong partner for Tinka given their local knowledge and mining experience. Buenaventura bought a 19.3% stake in Tinka Resources at a price of C\$0.243 per share, which was a 100% premium to the share price when it was announced. The net proceeds from the investment with Buenaventura and Sentient (C\$18.5 million), which was closed in January 2020, will be used to advance the Ayawilca project through further exploration and development over the next two to three years. There is still an opportunity for other strategic investors to get involved in the company's success. From Tinka's perspective, to get one or two additional companies interested in the project is ideal for existing shareholders and my role as CEO is to maximize this value and continue to attract new investors including other large corporates.

To what extent has volatility in 2020 impacted Tinka Resources' project timeline?

The timeline for work at Ayawilca in 2020 has been impacted due to coronavirus, as our drill programs were delayed during the lockdown in Peru. However, we recommenced drilling at Ayawilca in October 2020. Tinka is actually in a very good place as we are fully funded for the next two years and therefore do not need to raise additional capital to complete our programs. We have 6,000 to 10,000 metres of high priority drill metres to complete in 2020 and, as long as this program can be completed this year, our time line remains on track. We expect to have an expanded and improved zinc resource late 2020, and then be able to commence a PFS during 2021-2022. As long as permitting can be completed on time, first production at Ayawilca could be in 2024.

Do you also have a final message for the audience of Global Business Reports?

Tinka Resources shares are attractively priced (TSXV:TK), considering we have invested ~C\$30 million on the Ayawilca project in drilling over the last five years, while the company is well funded and now has Buenaventura as a strategic investor. Once zinc prices rebound, and leading up to that time, Tinka should be the go-to zinc project on the horizon for investors to consider. Today, in Peru, if you have a project with permits in hand and you have strong financial backing, you are in a premium position. The best way to create real shareholder value is by expanding our resources through exploration discovery, as well as advancing and de-risking the project towards development, and this is Tinka Resources' combined strategy moving forward. ■



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Zinc

ZINC HAS REBOUNDED WELL AFTER A TORRID START TO THE YEAR

⇒ The dire performance of zinc in the first half of 2020 left some producers operating at a loss, and zinc-focused juniors looking to raise money were at the risk of severe dilution as share prices fell in tandem with a demand decimated by Covid-19. However, an impressive rebound in Q3 has injected optimism in the sector, and Peru, as the world's second biggest producer, should benefit from zinc's improved outlook. "While there is a current surplus of zinc metal, the market has begun to understand that the supply of zinc concentrate is not as robust as previously thought," observed Ricardo Porto, president and CEO of Nexa Resources Perú, who added that infrastructure-based stimulus packages to help revive economies will push demand up and offset the reduction in demand from the automotive sector.

Peru's biggest precious metals producer, Buenaventura, became a strategic investor in zinc-silver junior Tinka Resources in January, which is in the rare position (for a junior in Peru) of having the cash and permits in hand to progress exploration work through to 2021, according to CEO Graham Carman. "Today, in Peru, if you have a project with permits in hand and you have strong financial backing - you are in a premium position," he said.

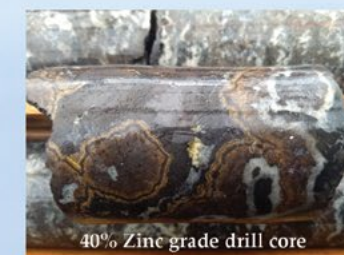
In September 2020, the company announced preparations were underway for a ~7,000 meter drill program consisting of approximately 20 diamond drill holes, most of which lie adjacent to the Colquipucro Fault. It is anticipated that the drill program will be completed in early 2021, subject to potential delays

as a result of the Covid-19 pandemic. "Ayawilca should be the next large zinc development project in the pipeline in Latin America," remarked Carman, who indicated that a PFS could be complete by 2022, and, as long as permitting can be completed on time, first production at Ayawilca could be in 2024.

Another junior with a path to produce zinc concentrates, as well as lead, silver and gold, is Cerro de Pasco Resources (CDPR), which in November 2019 announced it would acquire Volcan Compañía Minera's Oxidos de Pasco asset for US\$30 million. Steven Zadka, CDPR's executive chairman, suggested that CDPR is treading on different territory to most juniors as it is acquiring a producing company: "As we are going to be producing revenue, we now have the ability to tap into non-dilutive capital sources such as streaming and debt," he said, noting that there is also a lot of equity upside for investors considering the 140 million mt of material inside the mine in addition to exploration potential. "When an equity IRR is supplemented against a non-dilutive capital, you are looking at a really high return on investment," stated Zadka.

The city of Cerro de Pasco has had a contentious relationship with mining, with the entire city polluted and the community living on a mine. Zadka revealed that the ultimate goal is the relocation of the entire city to Ninacaca in Pasco. "We can offer the Peruvian government a way to resolve a very bad situation they have on their hands. We are the only solution for Cerro de Pasco and our property and operations hold great potential for the region," concluded Zadka. ■

TINKA
Resources
TSXV & BVL: TK



40% Zinc grade drill core

AYAWILCA

a world class
zinc-silver exploration
and development project



Tinka owns a large, high grade
ZINC and SILVER project in Peru
with huge upside

New zinc and silver targets to be
drill tested in 2020 and 2021

ZINC in resources: 1.8 billion
pounds (Ind) and 5.6 billion
pounds (Inf)

SILVER in resources: 20 Moz (Ind)
and 38 Moz (Inf) at Ayawilca and
Colquipucro

Strategic investment by
Buenaventura, Peru's largest
mining co., early in 2020

Fully funded for resource
expansion/conversion drill
program in Q3-Q4 2020



Ayawilca camp site & infrastructure

Email: info@tinkaresources.com
Website: www.tinkaresources.com

Precious Metals

IN AN IDEAL MARKET FOR PRECIOUS METALS, PERU HAS A LACK OF ADVANCED STAGE GOLD JUNIORS

⇒ Gold output fell for a fourth consecutive year in Peru, largely due to crackdowns on illegal mining operations in the La Pampa region and lower grades at existing projects. While Peru remained the sixth biggest producer of gold in the world in 2019 (143.3 tonnes, according to World Gold Council figures), it risks being overtaken by the rising star of West Africa, Ghana, which produced 142.4 tonnes in 2019.

Other factors contributing to the decline in Peruvian gold production are the lack of junior projects to have gone into production in recent years, and a lack of well-funded, advanced stage juniors to boost a development pipeline that is dominated by brownfield expansions from current producers. "If you look at Peru, there are no new gold projects coming up, and at the global scale these projects are very scarce. This scarcity, coupled with the uncertainty surrounding the world economy, will continue to push the gold price upwards," commented Yuri Valdivieso, geologist for Palamina. While the market conditions are favorable for gold, Peru needs to take advantage. However, there is a risk that juniors will migrate to more exploration-friendly jurisdictions. One of the issues since the decentralization process that transferred more power to regional authorities in Peru is the risk of individuals with an anti-mining stance opposing permits. This was the case for Eoro Resources, whose La Victoria gold and silver asset is located in the San Markito area close to the Pallasca community. Awaiting a maiden drilling campaign in 2018, the permission to attain surface rights was not granted by the Pallasca community president at the time, despite receiving the backing of the majority of the community, according to CEO Tom Larsen. This led to Eoro stopping activities at La Victoria in December 2018 and turning its attention to the Iska Iska project in Bolivia.

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Being able to advance its Bolivian project caused Eoro's share price to appreciate over 300% in 2020, from under C\$0.30 in January to over C\$1.30 in September. When questioned, Larsen reinforced Eoro's commitment to Peru, revealing that a new mining-friendly president and committee in Pallasca were elected in December 2019. Although Eoro's intention to develop its Peruvian asset is encouraging, the positive market reaction it received acquiring a project in a

different jurisdiction is an illustration that Peru cannot rest on its laurels; geological potential must be backed up by streamlined permitting.

Another precious metals junior to have experienced Peru's cumbersome permitting procedures is Pucara Gold (formerly Pucara Resources), the gold-focused company with a portfolio of 10 projects across Peru. "There is interest from investors to finance projects, but the system is failing the

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David Stein



President
KUYA SILVER



What were the circumstances surrounding the creation of Kuya Silver and how you came to take control of the Bethania silver mine?

I was looking at a variety of projects for potential investment around 2016/17, and Bethania stood out as having the most outstanding potential. We created Kuya Silver in late 2017 to acquire the Bethania mine. The short term goal is to expand and restart the mine, which was put into care and maintenance in 2016. We saw the opportunity to put our own plant at site, which will greatly lower the costs and increase production, which makes it a very exciting silver project.

It is hard to get exposure to pure silver plays, as so much of the metal is mined as a by-product, and even companies that specialize in silver often have gold assets. This is why true primary silver companies trade at very nice premiums.

What are the reasons behind taking the company public in October 2020?

When I first struck the deal to acquire Bethania in 2017, we were in a bear market. We thought that staying private until production we could go public as a junior producer, something like Excellon Resources, which would be much more attractive for our investors. We were able to raise US\$4 million privately over several tranches over the past two-and-a-half-years, attracting Eric Sprott and a number of other mining-savvy investors. In early 2020, we started looking more aggressively at go-public options for the company and settled on a transaction with Miramont Resources that we announced in June. It has been a great fit. Once we announced our plans to go public, we were able to raise C\$12 million in June and we went public in October 2020 on the Canadian Securities Exchange (CSE), under the ticker KUYA.

Kuya's website mentions the Bethania silver mine and always been small, until now... Can you elaborate on this statement?

On a tonnage basis we are planning to expand production by 3.5 times, and will be producing the concentrate on site, instead of toll milling like before. By doing so, we eliminate the long haul trucking costs of the ore, and reduce the milling costs because we won't have to pay other mills a premium to use their facilities. We also expect to get better recoveries for the metals by designing a process specifically for our ore. In addition to the expansion, we have the funds for a significant drill program, which will be important to future growth.

What are the next steps for Kuya Silver and what does the future hold for the company?

In August we received approval for the EIA for the new plant that we are looking to build at site. If the market remains strong we could be in the position to start construction early next year and could have production by the end of 2021. We are fortunate that the area we are in in Central Peru is used to mining and the mine is near a small community that has had a positive experience with the mine.

I see Kuya in the longer term being a consolidator in silver-focused projects. Building on the success of Bethania we will be looking to do further projects here, as Peru is stable, has huge exploration potential, and we are positive about the future of mining here. ■



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mining industry with regards to excessive regulations, such as the requirement of prior consultation for an exploration project which makes minimal environmental impact," said Steve Zuker, Pucara's president and CEO.

However, better news came when Pucara finally went public on October 6th, 2020, with its share price shooting up to C\$1.50 on the same day it opened trading at C\$0.40. Zuker affirmed that Pucara Gold will focus its efforts on advancing exploration at its flagship Lourdes and Pacaska gold projects: "These are high sulfidation epithermal gold targets, exhibiting similar geologic characteristics to other large HS gold deposits like Yanacocha in northern Peru and Mulatos in Mexico."

A new public silver company hopes to restart Bethania in 2021

Kuya Silver acquired the past-producing Bethania silver mine in 2017, and has since received investment from the likes of Eric Sprott in an effort to get the mine up and running by the end of 2021. David Stein, president of Kuya Silver, elabo-

rated on how his company's strategy evolved due to the improving market conditions: "In early 2020 we started looking more aggressively at go-public options for the company and settled on a transaction with Miramont Resources that we announced in June."

Once Kuya announced it would go public, it subsequently raised C\$12 million in June, before going public on the Canadian Securities Exchange (CSE) in October 2020, trading over C\$1.40 under ticker KUYA. Stein revealed that Kuya is planning to expand production by 3.5 times at Bethania, and will be producing the concentrate on site, instead of toll milling like before. "By doing so, we eliminate the long haul trucking costs of the ore and reduce the milling costs because we won't have to pay other mills a premium to use their facilities," he explained, adding that Kuya also expects to get better recoveries for the metals by designing a process specifically for the ore.

In August, Kuya received approval for the EIA for the new plant that it plans to build at site, and has the funds for a significant drill program to grow the resource, affirmed Stein. "If the market remains strong we could be in the position to start construction early next year," he remarked. ■

INTERVIEW

Steven Zadka

Executive Chairman
CERRO DE PASCO RESOURCES



➔ What were factors behind Cerro De Pasco Resources' (CDPR) decision to acquire Volcan's Oxidos de Pasco asset in November 2019?

CDPR will acquire all of the issued shares as well as permits, licenses and concessions of Volcan's Oxidos de Pasco asset for US\$30 million. As we already had the tailings and the stockpile at Cerro de Pasco, we were looking to conglomerate everything into one company. Originally we were interested in the sulphide concentrators as they were not producing to their full capacity, but we realized that the oxides were also related as they are in the same area and use the same tailings dam. Therefore, we saw the opportunity to also include the oxides as part of the acquisition. Volcan spent a significant amount to build the oxide plant and has identified a seven-year mine life that will generate approximately 200,000 ounces of gold and 18 million ounces of silver.

We are fortunate to be acquiring in situ resources – there is 140 million mt of material that is still in the mine, which is very high grade with good recoveries. In addition, the approximate 11,000 hectares of concessions have not been fully ex-

plored and we see a significant amount of blue sky potential. There is also an underground mine, which we will look to reactivate in 2020.

How do you plan to increase processing capacity at the plant?

The sulphide concentrators are running at 7,000 mt/d, but are permitted for up to 19,300 mt/d. The plan is to bring the production back to its permitted capacity.

What is CDPR's strategy for raising capital?

CDPR is treading on different territory to most juniors as we are acquiring a producing company and essentially we are becoming a producer. As we are going to be producing revenue, we now have the ability to tap into non-dilutive capital sources such as streaming and debt. If you look at the amount of resources we have combined, there is still a lot of equity upside for someone to get in at this level. When an equity IRR is supplemented against a non-dilutive capital, you are looking at a really high return on investment. ■

Lithium and Uranium

➔ On September 10th, 2020, Peruvian Congress received an initiative for the exploitation of lithium and its derivatives by the State from the deputy Jesús Arapa of the Popular Action Party. If the project is approved, the different phases of the mining activity related to lithium will be declared of public necessity and of national interest. The initiative also includes the creation of the National Lithium Regulation Council, which will be in charge of regulating the activity. Alex Holmes, president and CEO of Plateau Energy Metals, was keen to elaborate on the misconception surrounding such legislation: "I often read about uranium-lithium legislation, which is funny because they are totally different metals/minerals," he observed, explaining that in the general mining law in

Peru there is an allowance for radioactive mineral mining and processing.

What does not currently exist is the regulation regarding the safe handling and transport of uranium from the site to the port, and the port to the enrichment facilities. "Peru is a founding member of the International Atomic Energy Agency, and the Peru government is working on regulations and targeting completion for the end of 2020. Lithium, on the other hand, is a non-metallic mineral and non-radioactive. It is already in the mining law and regulations are not required."

In February 2020, Plateau Energy Metals announced a positive PEA for its Falchani deposit in Puno. The PEA indicates a scalable, long mine life battery-grade lithium chemical project which Benchmark Mineral Intelligence (BMI) rates in the low second quartile of operating costs. Holmes explained how a phased expansion approach will give Falchani the scalability to be able to adapt to the market: "Through three phases we ultimately ramp up to 85,000 mt/y of lithium chemical, with an aver-

age of 63,000 mt/y and a 33 year mine life," he said, observing that 85,000 mt/y would put Falchani as today's single largest lithium chemical project in the world. "As an example, SQM produces 70,000 mt/y," he added.

Before the Falchani lithium discovery altered the company's focus, Plateau Energy Metals (previously Plateau Uranium) had worked on the consolidation of extensive uranium resources in the Macusani district in Puno, south-eastern Peru. While the uranium industry had been in the doldrums since the 2011 Fukushima disaster in Japan, the radioactive metal used in nuclear fuel is another of the commodities to make a remarkable comeback in 2020, with renewed interest in the segment. Holmes summarized uranium's market dynamics: "The outlook for uranium has improved significantly as a result of supply disruptions due to Covid-19. We believe it has opened up weaknesses in the spot market and it is a matter of time before utilities are forced to go back to the contract market to cover their fuel needs for the next few years." ■

Alex Holmes

CEO and Director
PLATEAU ENERGY METALS



➔ What were the highlights from the PEA for the Falchani lithium project in February 2020?

Through three phases we will ramp up to 85,000 mt/y of a battery quality lithium chemical, with an average of 63,000 mt/y and a 33-year mine life. That would put Falchani as today's single largest lithium chemical project in the world.

From a cost perspective, how does Falchani compare with other stand-out lithium projects globally?

Because Falchani is not a spodumene project, the way the lithium is hosted allows us to rapidly extract it within 24 hours through a tank leaching process. Downstream of this, the chemical crystallizer component of the plant is identical to what Tianqi and Albemarle use in Australia as we bring lithium into sulphate solution, approximately 24 hours later the plant precipitates a low impurity, battery quality lithium chemical. This is important because lithium into sulphate solution gives us end-product flexibility, as lithium-ion battery chem-

istry is evolving, the lithium chemicals demanded also changes.

What do the existence of by-products hosted at Falchani, such as potassium, mean for the potential of the project?

As we leach the lithium out of the host rock, potassium (also in the host rock) comes into our lithium sulphate solution, and we have the ability to precipitate the potassium using conventional technology into an SOP fertilizer. Domestic use is huge in Peru and there are currently no domestic sources in the country.

We have also identified cesium and rubidium chemical production potential. Cesium is on the US critical minerals list, and China controls the only three sources. It is a high-value market with use in air-traffic monitoring, night vision applications, medical devices and lubricants. None of these by-products were included in the economics today, but have the potential to reduce the net operating costs of Falchani from its already low 2nd quartile benchmark. ■



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ENGINEERING, CONSTRUCTION AND CONSULTANCIES



"Covid-19 is causing a significant and permanent impact on the mining industry. It is changing the way we operate and interact. It is changing current health and safety protocols in order to preserve social distancing, and it is changing the way we staff operations. This said, it is also presenting opportunities to introduce change at a faster pace as it has brought down paradigms such as remote work and use of technology."

- Gianflavio Carozzi,
CEO,
AESA

Image courtesy of INCIIMET

Engineering, Construction & Consultancies



Mining companies have accelerated their digital transformation initiatives... Our team was able to adapt and work remotely by using digital real-time tools to work online, including tools for augmented reality, connecting our subject matter experts abroad with our local teams and clients.



**- Alfredo Remy,
General Manager,
Hatch Peru**



While a certain amount of engineering and consultation can be performed remotely, field work and environmental studies were two of the main areas restricted by the lockdown, according to Antonio Samaniego, director of SRK Consulting. Since these restrictions have been lifted, where has demand been coming from? "Now that mines have reopened, the demand is coming mainly from reserve verification and due diligence for capital investments, so a lot of work on the economic aspect," related Samaniego, specifying that SRK has performed a lot of due diligence for the new S-K 1300 standard from the U.S.' Securities and Exchange commission (SEC), that companies trading in the American market will have to present in 2022.

For other consulting firms, particularly those that work in strategic advisory, business has been stimulated by the pandemic. FTI Consulting, an independent global advisory firm dedicated to helping organizations manage change, mitigate risk and resolve disputes, has been busy helping mining clients navigate the evolving set of challenges Covid-19 has presented, according to Michael Cullen, FTI's managing director for forensic and litigation consulting. When asked about the advice FTI gives to clients regarding their approach to stakeholder engagement in times of crisis, Cullen suggested to confront the facts and balance optimism with pragmatism. "I use the example of the Stockdale Paradox, a term coined by Stanford professor Jim Collins in his book *Good to Great*," said Cullen, continuing: "Collins references Admiral Jim Stockdale, the highest ranking military officer held in Hôa Lò Prison (the infamous "Hanoi Hilton"), who relates that the optimistic captives were often the first to perish because of unrealistic expectations. Stockdale never gave up hope, but also realized he could be in there for a long time, and prepared accordingly." ■

ADJUSTING TO THE NEW NORMAL

⇒ Mining industry headlines in 2020 have focused on the impact Covid-19 has had on production levels, commodity prices and volatile share performance. Perhaps the most profound impact, however, has been on those at the front line and behind the scenes at the operations: engineers, construction workers, contractors and consultants – those who design, build and run the mines. With infection rates still high in Peru, industry workers have had to adjust to the "new normal". "It is changing the way we operate and interact; it is changing current health and safety protocols in order to preserve social distancing, and it is changing the way we staff operations," observed Gianflavio Carozzi, general manager of mining contractor AESA. The impact of the pandemic is also presenting opportunities to introduce change at a faster pace, he related, bringing down paradigms such as remote work and use of technology in order to cope with the crisis: "Changes that had been set aside or rejected in the past will find significant tail wind to be revisited and implemented."

Alfredo Remy, general manager of Hatch Peru, explained how his team leveraged technology to adapt to remote work with clients: "We used digital real-time tools to work online, including tools for augmented reality, connecting our subject matter experts abroad, with our local team and our clients." He added that mining companies have accelerated their digital transformation initiatives, working on technological roadmaps to advance through the implementation process at mine sites. This sentiment was echoed by Florencio Castro, vice president for Peru at multinational EPCM Ausenco: "We are experiencing technology at a much faster rate than normal," he said, commenting that Ausenco has noticed clients have become more open to embrace new ideas since the start of the pandemic. "We see greater levels of experimentation and testing, which has been an opportunity to think differently about our operations."

Castro mentioned that Ausenco's Peru team has adapted to remote work, including the continuation of work at Mina Justa, currently at a critical part of its construction. "We expect to have the mechanical completion at Mina Justa by the beginning of next year. This is proof that even under these difficult circumstances projects can still be delivered successfully."

Growth through consolidation and innovation


⇒ Consolidation has not been confined to mining companies in recent years, as some of the largest EPCM and consulting houses ramped up M&A activities to bolster their service offerings with clients increasingly looking for a one-stop-shop instead of outsourcing to multiple suppliers – a trend that should be accelerated in a post-pandemic landscape as mining companies look to reduce the number of service providers in and around their sites.

In April 2019, Australian EPCM giant WorleyParsons announced the completion of the US\$3.2 billion acquisition of Jacobs' ECR (Energy, Chemicals and Resources) division, re-branding to "Worley" in the wake of the transaction. On the consulting side, ERM (Environmental Resources Management) acquired CSA Global in July, a coming together of mining and environmental expertise – another of the prevalent themes in recent years – as environmental social governance (ESG) has moved quickly to the forefront of strategy for mining companies. In February 2020, ERM acquired Critical Resource Strategy & Analysis – a specialist sustainability advisory company. Canadian engineering and consultancy firm WSP was particularly active in the M&A space in 2019, completing nine acquisitions to diversify its service portfolio. "You need to be ubiquitous, have a global footprint and a wide range of expertise to follow the biggest clients," explained Gonzalo Covarrubias, general manager of WSP Peru, who underlined the importance of having local knowledge but being able to call on specific global expertise. "In Peru we are running several projects which have an active presence of our colleagues from the UK, Canada, Australia, Colombia and Chile," he said.

Covarrubias also emphasized the importance of the environmental segment to WSP's long-term strategy, noting that acquisitions such as that of the US-based company Ecology and Environment in December 2019 were evidence of the growing demand for environment services. "Environmental also brings to the table the social aspect, not just the permitting. It is more holistic and comprehensive, addressing topics such as climate change, sustainable economic development and community engagement," he said, listing multi-disciplinary services such as mine closure as a focus area where WSP's broad offering can add value.

One of the major international engineering firms to have strengthened through acquisitions in recent years is SNC-Lavalin, which, strengthened its consulting services in innovation and new technologies through the 2017 acquisition of WS Atkins. In addition to its EPCM and consultancy services, SNC-Lavalin now offers laser scanning for brownfield projects, drones for surveillance and monitoring, 3D, 4D and up to 7D modeling for engineering designs, as well as the implementation of technological road maps.

Innovation has also been a growth driver for Wood, since the US\$2.2 billion merger of Wood Group and Amec Foster Wheeler, according to former operations manager for mining and minerals at Wood's Peruvian office, Franco Pedraz. "We believe that if a company and its operations are digitized the initial capex investment will decrease the opex significantly. I think as soon as people have enough examples of projects where technology impacted the opex savings, they will place a bigger emphasis on the implementation of innovation." Franco Pedraz is now country manager for Worley's Peru office. Patrick Smith, managing director and CEO of AMC Consultants, commented that the ability to start a mine with new innovations is more feasible for those with bigger budgets and large-scale, long-life mines, such as open-pit iron ore operations, for example. "However, it is more common for companies to evaluate their projects on the basis of tried and tested technologies and then, after they have built the mine, implement extra technologies to improve the operation," he explained. ■



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Gonzalo Covarrubias

General Manager – Peru
WSP



Part of WSP's consulting service is focused on how to make a long-term relationship between a project, the community and the operation. Tied to this is, for instance, mine closure, which is a multidisciplinary service in its essence that involves the environment, water management, decommissioning, community management, and general infrastructure.



How did the five acquisitions made by WSP in 2019 impact its business in Peru?

WSP has acquired nine companies in 2019. However, the Louis Berger acquisition, that happened towards the end of 2018, was the one that impacted the company's Peruvian business the most. Louis Berger had been active in the country for 24 years, and its portfolio of projects that includes infrastructure, and the design and supervision of airports and ports, has really strengthened the diversity of our business in Peru.

The industry has been undergoing a wave of consolidation through M&A, as you need to be ubiquitous, have a global footprint and a wide range of expertise to follow the biggest clients. For instance, in Peru we are running several projects that have an active presence of our colleagues from the UK, Canada, Australia, Colombia and Chile.

What type of work has WSP been doing from its environmental and water segments?

The environmental segment is a key part of WSP's long-term strategy, and some of the company's recent investments have been directed here, such as the acquisition of the US-based company Ecology and Environment in December 2019. In Latin America, WSP is the number one consulting firm in environmental services and water, with over 1,000 employees dedicated to this. Environmental also brings to the table the social aspect, not just the permitting. It is more holistic and comprehensive, addressing topics such as climate change, sustainable economic development and community engagement. Part of WSP's consulting service is focused on how to make a long-term relationship between a project, the community and the operation. Tied to this is, for instance, mine closure, which is a multidisciplinary service in its essence that involves the environment, water management, decommissioning, community management, and general infrastructure.

How could social tensions between the industry and regional communities be alleviated?

There is not a recipe for success for this, but you have to have a deep understanding of what the communities want. There

has been a lack of trust in the promises being made by part of the new developments. Society has lost faith in the establishment, which has created a bridge for more stakeholders to come to the table. Consulting firms can help from a technical approach and can help engage NGOs, which is something WSP has been doing in Latin America. This is linked with innovation – how can you bring value to a project long than its life of mine? Mining companies cannot afford to only be experts at their core business but must now consider the social aspect from the very beginning of a project.

Have you noticed an increase in the demand for tailings services in the wake of incidents such as Brumadinho?

Absolutely. We have noticed a rise in the demand for our tailing services in recent years, with a more proactive approach from mining companies to invest in technology and new ways that mitigate the environmental liabilities posed by tailings. We are just starting these services in Peru, but always in collaboration with our experts abroad. An example of this is the work WSP is doing with Glencore at Antapaccay, performing an EoR (Engineer of Register) for the three tailing dams. Safety is in the core of the mining sector and every incident is considered seriously.

Can you elaborate on WSP's "Future Ready" slogan?

"Future Ready" demands WSP to design today considering the problems of the future. In a 30-year project, what issues could be faced down the line, and how can we address them now? Three of the fundamental key trends to consider for this are climate change, society and technology. We believe this approach is what differentiates WSP, and what helps us retain the best experts. In order to follow this approach, having global expertise is important, but you also need to question yourself. We analyze the development of resources, economies and technology to predict how things could be in the future. It is important to have clients with a similar mindset and we have started to see this from the biggest clients, as this is being driven by shareholders and consumers. In Peru this used to be a back-office issue, but is moving to the front of corporate strategy. ■

Florencio Castro

Vice President – Peru
AUSENCO



Which projects and services have been driving business growth at Ausenco?

Ausenco sees the current market conditions for copper and other metals involved in the electrification of transport, along with gold, as robust, and expect strong global interest in these metals to drive our business. We recently completed Carrapateena – a copper-gold mine in South Australia, for OZ Minerals. The project was ramped-up to nameplate capacity in under one month after commissioning completion and continues to achieve excellent recoveries. At Mina Justa we have provided a complete mine-to-port solution. This is a flagship project for us, we are very proud of the work done there despite a small stop due to Covid-19. We are now continuing the construction and we expect to have the mechanical completion by the beginning of next year. This is proof that even under these difficult circumstances, projects can still be delivered successfully.

What are some of the engineering challenges specific to Peru when doing early-stage study work?

The recognition of local characteristics is very important especially in the early phases of project development. Peru's altitude and the remoteness of its mine sites are well-known challenges, but equally challenging is that Peru requires very detailed planning for permitting and particularly, for achieving social licenses, and many projects failed in the past due to these aspects more than technical or economic factors. These considerations need to be incorporated

early on, in the planning and design phases, to find ways to develop projects sustainably. Due to these complexities that are specific to Peru, it is crucial for engineering firms to have enough local experience and knowledge.

What have you noted to be the main areas of focus for your clients?

Restoring production under Covid-19 has been a key priority and companies are also reviewing their short-term capital expenditure plans in light of the new cost variables introduced by Covid-19. I believe there has also been more openness to the use of new technologies and novel approaches. We are experiencing the use of technology at a much faster rate than before in the industry. In the past, we noticed many mining clients were reluctant to embrace new technologies, but under this situation we see greater levels of experimentation and testing, which has been an opportunity to think differently about mining projects including its construction and operation.

Could you elaborate on the expertise that Ausenco holds in the areas of tailings management?

Ausenco covers every aspect of a project from pit to port, including tailings. It is important to think of tailings in a different way to minimize this long-term industry liability. More than looking at the existing technologies to reduce tailings impacts per se, we also need to think of other ways to improve how minerals are processed, and ultimately reduce not only tailings volumes but also water and energy usage. Ausenco takes a very

holistic approach to tailings, and our tailings experts evaluate both how to minimize the risks associated with tailings, as well as the overall management during its life cycle.

How do you see the health of the Peruvian mining industry, and where do you situate it in the cycle?

It is always difficult to know where metal prices will be heading, never mind under so much uncertainty. Prices have been going up recently, and the expectation is that, as the economies recover from Covid-19, demand will gradually pick up and drive prices further. History shows that great crises have been followed by expansion periods in the mining industry. We are optimistic there will be an upward trend in demand for metals beyond the current difficulties for which Peru is well positioned to take advantage of.

What differentiates Ausenco from its competitors in the mining engineering services space?

Ausenco has a great track record of completing complex projects in Peru; Constancia and Mina Justa both exemplify our project delivery capabilities. The second differentiating point is that we go across the full value chain in Peru, providing a complete range of services from permitting to engineering, construction, and sustaining capital. Thirdly, Ausenco always looks at a mining project differently, starting from the project balance sheet and always looking for better ways of designing a financially viable, technically sound and environmentally conscious mining project. ■

Local Players in the Market



In the future, miners will need less people to be monitoring the operation, but they will need more people to solve all the problems that big data throws.

⇒ 2019 was a successful year for Peru's local engineering firms, as brownfields expansion projects for medium-sized operations, rather than the big EPCM jobs suited to the international heavyweights, offered opportunities for growth. This was the case for BISA Ingeniería de Proyectos, which enjoyed its first full year of independence from Buenaventura in 2019, and has worked with Yanacocha, Antamina, Nexa Resources, Buenaventura and Chinalco in recent years. Federico Schwalb, BISA's CEO, explained that the company was restructured in 2016 to focus on its core business – engineering, consulting and construction management – leading BISA to break even in 2017, followed by revenue increases of 25% in 2018 and 21% in 2019.



**- Renzo Ayala,
Geotechnical Manager,
Anddes**



Of the services offered by BISA, Schwalb has seen a growing demand for the PMO (Project Management Office) service, where a third party company can be the eyes and ears of an operation, showing the mining company how to execute a project properly. "BISA has realized that a good way to take on projects is by integrating a PMO which can plan, execute and control," he said, adding: "We expect this area of business to grow in 2020 and I think that we will become the PMO partner for many more projects."

Multidisciplinary engineering company Anddes is headquartered in Lima and has further offices in Chile and Argentina. Renzo Ayala, Anddes' geotechnical manager, expanded on the company's research department created in 2013: "During these years, most of our research projects have been financed by Peruvian government funding," he said, continuing: "We are very oriented to mining trends such as risk management and security, which have become especially important due to a large number of failures that have occurred in mines worldwide."

Ayala also spoke on the role of technology in automated monitoring, analyzing results and ensuring decision making becomes easier, and how this will impact the local workforce: "In the future, miners will need less people to be monitoring the operation, but they will need more people to solve all the problems that big data throws." He gave the example of an application Anddes introduced that automates seismic recordings in a few minutes to alert mining companies when an earthquake occurs.

Anddes has adopted standards set by the International Council of Metals and Mining (ICMM) that make mining processes and the design of mining more rigorous, in line with the company's policy of replicating the ideas and guidelines that have been implemented in other mining countries to strive for constant improvement. ■

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Federico Schwalb

General Manager – Peru
BISA INGENIERÍA DE PROYECTOS



BISA has realized that a good way to take on projects is by integrating a PMO (Project Management Office) that can plan, execute and control. BISA is currently the PMO for two very important clients – we help them manage, are their eyes and ears, and show them how to execute projects successfully.



Can you explain how BISA has evolved since becoming independent from Buenaventura?

2019 was BISA's first complete year of independence from Buenaventura. The company has had the same management team for the last four years, and generally we have been very happy with the development. In 2015, the company experienced an approximate US\$3 million loss, so in 2016, we decided to reshape and refocus our efforts on our core business – engineering, consulting and construction management, leading the company to break even in 2017. Revenues were then increased by 25% in 2018 and 21% 2019; EBITDA turned positive in 2018 and more than doubled in 2019. At the beginning of the year, we aimed to see another 10% growth in revenues in 2020; however, due to restrictions caused by the worldwide sanitary issues, we estimate similar results to those of 2019.

Where is most of this business demand coming from?

BISA's niche is in brownfield projects, and by focusing on our core strengths we have been growing well in this market. In the future, we would like to take part in greenfield work, but after the two big projects finish – Mina Justa and Quellaveco – there is a dearth of greenfield projects in Peru, so in the short term, growing through our niche is the best strategy. BISA's key clients in the mining sector include Buenaventura, Yanacocha, Antamina, Nexa Resources, and Chinalco.

As well as working directly with mining companies, BISA also has formal collaborations with other engineering companies in Peru to collaborate on projects. As the company tries to expand geographically, we would like to increase our presence in other countries through partnerships.

What would you say are currently the biggest challenges facing the Peruvian mining industry?

Attaining community acceptance is still a big challenge in the Peruvian mining industry. Creating the appropriate climate to successfully develop operations requires collaboration from all stakeholders from the earliest stages of a project. As an industry we have to work on better communicating the work that we do and the benefits this work holds for the entire country. There

is still a significant amount of ignorance that leads to a lack of trust.

The importance the government places on the mining sector is also relevant. I believe that currently, their focus is not on promoting the industry, but rather on managing it. What drives the mining industry further is the capacity and willingness of the government to promote the sector and more effort is needed with this in mind.

Which area of Peru's mining sector would you like to see improve in the coming years?

The government should work on creating favorable conditions for exploration companies. New exploration and greenfield projects will have to start soon as it can take a long time to move from exploration to development and production. Although production is currently strong, ore grades are declining and new projects need to be developed as we can not rely on brownfield projects forever – resources need to be replaced and new projects to be developed.

Do you think the mining companies have more disciplined cost structures these days?

After the mining boom in 2012, when the tide started to go down, it became evident that some mining operations were not profitable. There was less investment entering the industry and many mining operations had to focus on cutting costs. Besides prices now starting to increase again, we can see that there is more discipline and control over costs in the mining industry. Having discipline and control allows for mining companies to develop strong projects that would survive a downturn in the mining cycle, and in that sense, Peru's mining industry is in a better position than it used to be.

Can you elaborate on BISA's service as a PMO (Project Management Office)?

BISA has realized that a good way to take on projects is by integrating a PMO (Project Management Office) that can plan, execute and control. BISA is currently the PMO for two very important clients – we help them manage, are their eyes and ears, and show them how to execute projects successfully. We expect this area of business to grow in 2020 and think that we will become the PMO partner for many more projects. ■

CONSULTANTS HAVE THEIR SAY

You need to confront the facts and balance optimism with pragmatism when engaging stakeholders. I use the example of the Stockdale Paradox, a term coined by Stanford professor Jim Collins in his book *Good to Great*. Collins references Admiral Jim Stockdale, the highest ranking military officer held in Hanoi Hilton (the infamous "Hanoi Hilton"), who relates that the optimistic captives were often the first to perish because of unrealistic expectations. Stockdale never gave up hope, but also realized he could be in there for a long time, and prepared accordingly.



- Michael Cullen, Managing Director – Forensic & Litigation Consulting, FTI Consulting

It is not about giving your workforce a handbook of rules, and then following them around to ensure they comply, but instead, creating a culture where the workers themselves are involved in the safety program through workshops, inspections, and safety activities so that they have a sense of accountability and ownership in the company's safety performance.



- Steven Botts, President, Santa Barbara Consultants

I believe that opposition to the mining sector is not solely driven by concern for the environment, but also for political reasons. There is strong evidence that community groups are manipulated by politicians and other groups with political agendas. By managing an effective communication process and highlighting the benefits the industry holds for the country, the industry can show the government and other stakeholders how mining can create positive social and economic contributions.



- Marcial García, Partner and Mining Lead, EY Peru

Every organization has challenges, and often these are broader than the initial problem may seem. Sometimes clients approach a consultancy looking for a particular service, but our goal is to identify more broadly what needs to be done to get the very best result from the evaluation of the deposit, all the way up to the processing and recovery of the metal.



- Patrick Smith, Managing Director and CEO, AMC Consultants

Antonio Samaniego



Director
SRK CONSULTING



What have been the main areas of work for SRK in Peru during the pandemic?

The main effect of the pandemic has been the restrictions on field work. We were only able to go back to the mines and projects in late June, and in a very limited way. We have all been working from home for the most part. We have had to work a lot with information provided directly by mining companies with our remote guidance. Besides this, there has been a lot of optimization work to reduce costs.

Now that mines have reopened, demand is coming mainly from mineral resource and reserve verification and due diligence for capital investments. We have requests of due diligence for the new S-K 1300 standard from the US Securities and Exchange Commission (SEC) for the few companies trading in the American market that will have to present these reports in 2022. We did a very thorough SEC-compliant report for Nexa Resource, for instance. We have also done NI 43-101 PEA reports for Canadian-based juniors that work in Peru, as well as due diligence independent reports for banks and M&A for credit institutions.

Could you provide examples of some of the interesting projects you have been working on?

An important project has been an evaluation of all reserves and resources for Buenaventura's mines, which required sharp analysis to define the cutoff grades because of the high volatility of metal prices. We also undertook mining optimization work for Hochschild and have worked on an ore sorting project with them. Overall, the crisis has put many new projects on hold and most projects are related to operational optimization and expansions of tailings dams for current operations.

What advice would you give to mine operators to make the most of the current high prices?

Peruvian mines use quite a lot of technology, but sometimes they could benefit from an additional step toward automation and machine learning with the use of big data. There is a lot of information that could be used, and with this crisis there are personnel available to work on data analysis that could identify high potential areas within the operations for additional pro-

duction. This way they could benefit from the current cycle, because any new projects will require lengthy permitting and they will not be in production during this cycle.

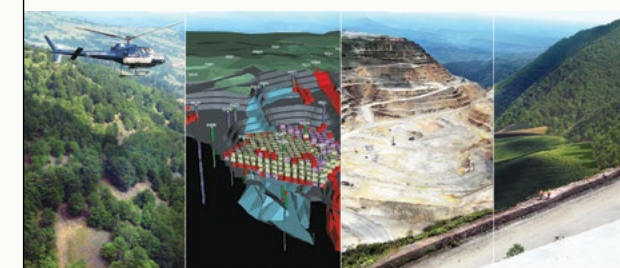
How are industry standards evolving with regards to tailings management?

All associations and professional bodies are releasing their tailings management reviews and guidelines, such as the ICM. As former president of the Peruvian Institute on Mining Engineers (IIMP), I have been participating in the Global Mining Professionals Association (GMPA), a group including SME, CIM, AusIMM, SAIMM, IOM3, IIMCh and IIMP, which are the leading mining professional institutions worldwide that got together to improve visibility of the mining industry.

How is the future shaping up for SRK in Peru and globally?

In Peru, we have a team of more than 100 professionals, and our main objective is to maintain the team during these challenging times, while we also prepare the next generation of company leaders. Globally, SRK employs 1,400 people and we are trying to work as "one SRK", to identify the best people for each area of practice and better serve our clients. Finally, we are working a lot on innovation. Our Vancouver and South Africa offices, for instance, are developing rock mapping methods using satellite images and photographs, which is very valuable today, as we are unable to send geologists on site. ■

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Paul Murphy

Manager – South America
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⇒ When do you expect to see more mines moving underground in Peru?

Peru will move in the same direction Chile has, where we are seeing that for the older pits, an open cut / underground trade off study clearly shows that it is more favorable to extract the material under the pit via an underground mining method (often a caving method) rather than continue mining via an open cut method. Peru is at a stage where there are mature open cut mines, and we will see mines such as Antamina going underground in the future. There are also of course those projects that are underground projects from the beginning with no open cut component at all. The region is full of them, be they narrow vein mines or large porphyries.

How is the size and design of an underground mine established?

A critical step in any mining study is “right sizing” the mine. With respect to how “big” a mine will be, that is derived from the optimization process, which determines how much mineralized material can be extracted at a profit.

With respect to the rate at which the mine will produce, you first need to understand what the deposit naturally wants to do, which will then drive the size of the infrastructure such as the processing plant. Grade of course plays a part (high grade mines can be small and still be profitable where as a low grade mine generally need the economy of scale to keep the costs low). With a block cave, for example, it is the horizontal surface area of the cave that dictates how much the mine can deliver; with a smaller scale stope mine it will be how many operational areas you can have running at the same time and how much each can produce. ■

Alberto Coya

General Manager – Peru
Regional Manager – LatAm
STANTEC



⇒ How are Stantec’s business units divided in Peru, and which have been driving growth?

In Peru, Stantec offers services in six different service areas. We have environmental, which is primarily permitting and community services for mining operations, two business units dedicated to water: the water resources business unit covers water management for the entire water cycle of a mine and the water business unit encompasses water treatment services for both mining and non-mining clients. Our tailings and waste unit provides all phases of design and implementation for tailings storage facilities. The Construction Quality Assurance (CQA) is a service we offer for the infrastructure that we design. We also have an underground mining business unit, established three years ago.

In 2019, Stantec had very positive business results in all six areas. Our projects come from Stantec’s key clients, including companies like Cerro Verde and Cerro Corona where we have been working for many years. We also work for other large mining companies in Peru, including Antamina, Las Bambas, Yanacocha, Buenaventura and Hochschild.

How can Peru’s mining industry stimulate its exploration industry and get projects developed?

Social issues are the biggest challenge for the Peruvian mining industry, however, there are options for mining companies to overcome this challenge. One option is to invest in creating mining corridors where the government and the community can jointly work out social issues up front. Having the State take the role of promoting mining in certain areas would smooth the way for a good working relationship between communities and mining companies. This approach could also assist in establishing shared infrastructure needed for mines in the vicinity of the corridor. In terms of greenfield projects, the Peruvian mining industry is still benefitting from two projects that are under construction, but when these projects go into production in 2020-2021, there will be no new greenfield projects in Peru. ■

Environment & Tailings Management

THE BRUMADINHO TRAGEDY HAS BEEN A CATALYST FOR CHANGE

⇒ On January 25th, 2019, three years on from the Mariana tragedy in Brazil, disaster struck again, as the tailings dam at Vale’s Brumadinho mine in Minas Gerais burst, killing 293 people and causing extensive environmental damage in the region. At Expositram in Belo Horizonte, August 2019, photos of all 293 victims were placed around Vale’s stand in the exhibition hall. Before the first presentation at the tailings management round table, the lawyer representing the victims and their families described in detail how the chemical waste that had descended upon the town had killed them. If ever the industry needed to be shocked into action, it was at this moment.

Indeed, Brumadinho was the catalyst to accelerate change, as a multi-stakeholder review involving industry, investors and authorities led to the Global Industry Standard on Tailings being launched in August 2020. Industry was represented by the International Council on Mining and Metals (ICMM), investors were represented by the Church of England Pensions Fund and Swedish Council on Ethics, who teamed up with the Principles for Responsible Investment (a UN-supported international network of investors managing more than US\$100 trillion in assets), and finally the United Nations Environment Programme (UNEP) represented countries.

“Comprising six topic areas, 15 principles and 77 auditable requirements, the Standard will ultimately be supported by implementation protocols that will provide detailed guidance for certification or assurance as applicable, and for equivalence with other standards,” explained Tom Butler, CEO of the ICMM. Butler went on to warn: “The writing is on the wall for anyone who thinks that

they can get by without paying proper attention to the standard.”

This sentiment was echoed by Adam Matthews, investment team director for the Church of England Pensions Board, and co-chair of the Investor Mining and Tailings Safety Initiative: “We intend to make a clear requirement to companies that, if they wish to retain continued investment and support of banking facilities and insurance, they must show compliance... There is an inevitability here, but also an opportunity to work

collaboratively to drive the change that is needed.”

The industry response to Brumadinho, including the Global Tailings Standard, will hopefully prevent such tragic events in the future. However, it is important to examine how a catastrophe on this scale, at a facility owned by one of the five biggest mining companies in the world, could happen again after a similar failure in 2015. Furthermore, as industry-wide compliance will not happen overnight, could this happen again?

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Image courtesy of Gold Fields

A lack of high-level expertise could be one factor contributing to the risk. “There are a huge number of tailings dams in the world. Klohn Crippen Berger (KCB) has nearly 600 employees who are constantly fully booked on tailings projects and we probably serve only 5% of the market,” related Dan Etheredge, KCB’s general manager for South America.

KCB had its best year ever in 2019, with the majority of the demand stemming from tailings and water management services, according to Etheredge, who commented that, while the industry on the whole has become more diligent with regard to tailings management, there are still cases of neglect. Citing the case of an unnamed client where a dam safety review was performed and a liquefaction assessment was recommended, Etheredge related how the client’s local consultant advised against the investment. “There is a lack of knowledge and comprehension about tailings management and, even after the world has seen many disasters, there are still some companies trying to cut corners,” he reflected, adding: “We have also recently seen a tailings facility under construction with no technical specifications or detailed design. The dam was being built from feasibility level drawings.” Eduardo Ruiz, general manager of Am-

phos21, emphasized the relevance of tailings facilities in the overall site-wide water balance of a mine, due to water being a destabilizing element. “The trend is to design and operate facilities that have a lower amount of water,” he said, noting that while new technologies are being applied in new projects, there are also a lot of older, conventional mines where the risks and long-term conditions need to be better understood. “Standards are definitely improving with more automatization, control and monitoring, so this is a segment where we are going to see a lot of work in the future.” As a diversified mining country with long mining heritage, Peru has developed a lot of tailings experience. Antonio Samaniego, director of SRK Consulting and former president of IIMP, described the progress made on the topic of tailings management in Peru, including his work with the Global Mining Professionals Association (GMPA), a group including ICM, SME, IIMP, and other institutions worldwide. “Last year we had a meeting in Arequipa where we created the Global Action on Tailings (GAT) working group. We have meetings every three months and we are working on several initiatives related to this field,” he added.

Considering the complexity and the variety of tailings dams, as well as the

environmental and human liabilities surrounding the subject, mining companies are looking for the best expertise on the market. Alberto Coya, Stantec’s general manager for Peru and regional manager for LatAm, underlined his company’s reputation in tailings built through its global network of expertise: “Currently mining companies are demanding ‘grey hair,’ by this I mean they are putting a premium on individuals with many years of experience,” observed Coya, elaborating: “Given recent failures, the industry demands more hands and eyes than ever to look after tailings structures.” The importance of being able to draw upon global expertise to provide tailored tailings solutions was also highlighted by Everaldo Abegg, country manager – separation for Andritz Peru, who mentioned that dams are still the dominant medium but there is a lot of interest in dry discharge. “Companies are conscious of the issue of becoming dependent or liable to a tailings pond and they are seeking preventive technologies,” said Abegg, noting that most new projects are mindful of how to incorporate technologies to insure safe dry stacking, increased product recovery and lower environmental risks. “Tailings de-watering is, without a doubt, becoming the preferred management strategy for discharges,” he added. ■



Eduardo Ruiz

General Manager
AMPHOS21



The relevance of tailings facilities in the overall site-wide water balance is crucial and it is well-known that water is a destabilizing element for this, so the trend is to design and operate facilities that have a lower amount of water.



How did the COVID-19 pandemic affect Amphos21’s operations?

The pandemic impacted those projects where we had people at the operations, which had to stop between March and May. We are a highly diversified company, and while we had a certain reduction of activity, we have recovered quite rapidly and we expect to have reasonable results this year, considering that 2019 was a record year for Amphos21 globally. The market has recovered, also driven by good metal prices.

In general terms, Covid-19 is going to accelerate the process of digital transformation. We need to see how new technologies like the internet of things, machine learning and artificial intelligence can be linked to the day-by-day tools and instruments used in water management. Achieving this will require strong capital investment by miners, but at the end of the day it will allow for more efficient and safer operations. Only the bigger miners will be able to invest heavily on this in the near-term – it will take longer for medium-sized mines.

Could you describe some of the projects you are working on?

We cover the full water cycle, including engineering and implementation of our solutions, and we apply all that at the early stages of engineering, during operations and when we do process optimization or in the valorization of environmental liabilities and closure activities. A challenging project we are working on is the reprocessing of tailings in Minsur’s B2 project. This is a very interesting case from the point of view of waste management and the circular economy. We are also doing several research projects for Buenaventura Group’s focus on mine closure for different components. Support on mine dewatering for Antamina is another example of essential operational activities where we are involved.

To what extent is water management at the core of mining operations, especially when it comes to tailings management?

The relevance of tailings facilities in the overall site-wide water balance is crucial and it is well-known that water is a destabilizing element for this, so the trend is to design and operate facilities that have a lower amount of water. Of course, new

technologies may be applied in new projects, but there are also a lot of conventional mines out there where we need to understand the risks and long-term conditions. Standards are definitely improving with more automatization, control and monitoring, so this is a segment where we are going to see a lot of work in the future.

What differences do you see between the countries where Amphos21 operates?

All the countries where we work present a very strict regulatory framework. In Spain, and generally in Europe, mining used to be a strong industry, but this is no longer the case, so our services there usually focus on expert advisory and R&D activities. Latin-America, and particularly Chile and Peru, are the strongest mining countries for us, where mining has an enormous weight in the economy and strong support from the government. They both have similar environmental frameworks where water is always controversial but present a different context. Major projects where we are involved in Chile are placed in arid conditions where water resources are scarce, while Peru is a bit more diverse. If water is scarce, as in the south of Peru, it may be difficult to fulfil operational water demands and to obtain water rights, and you may need to look to groundwater - if it is possible - or non-conventional resources such as desalination and wastewater treatment. If there is too much water, like in central Peru, you need to manage that water surplus, which is particularly complex for underground mining operations. And of course, both countries will have to pay close attention in the coming years to climate change and the impacts on operations.

What are your goals for the medium term?

Amphos21 has always been a very innovative company, so we want to be pioneers of new technologies and make sure that our team exploits its full potential. We have experts across the whole water cycle, and what we need to do now is to adapt new technologies and process the vast amount of data generated by the operations to improve our solutions and make our work more efficient. For this, we have a strong R&D arm that works together with academia and technical centers. ■

Dan Etheredge

General Manager – South America
KLOHN CRIPPEN BERGER



➤ **Is the lack of high-level expertise about tailings a reason why there have been so many major tailings disasters in the last five years?**

Not necessarily. There are a huge number of tailings dams in the world. Klohn Crippen Berger has nearly 600 employees who are constantly fully booked on tailings projects and we probably serve only 5% of the market.

We are currently dealing with a situation with an unnamed client where we did the dam safety review and recommended a liquefaction assessment. The client's local consultant advised the client that the liquefaction assessment was not necessary, and they decided against the investment. There is a lack of knowledge and comprehension about tailings management and, even after the world has seen many disasters, there are still some companies trying to cut corners. We have also recently seen a tailings facility under construction with no technical specifications or detailed design. The dam was being built from feasibility level drawings.

Does Klohn Crippen Berger get involved in early stage work?

Klohn Crippen Berger is involved in projects in the early stages and assists clients in site selection studies for tailings facilities. For example, the company was involved in identifying the original tailings location for the Antamina mine in Peru in the 1990's. In collaboration with the client, a decision matrix will be developed to establish what is important for the client and what will then be the best decision moving forward.

Are companies changing their approach towards tailings?

Dry stack tailings are becoming more prominent. Klohn Crippen Berger is currently developing dry stack tailings designs for several clients and we have done dry stack pilot studies for Vale in Brazil. The use of new and innovative tailings technologies is becoming more common, but it is still quite expensive and many companies prefer traditional methods. ■

Adam Matthews

Investment Team Director
CHURCH OF ENGLAND PENSIONS BOARD
Co-Chair
INVESTOR MINING & TAILINGS SAFETY INITIATIVE



➤ **What led to the creation of the Investor Mining & Tailings Safety Initiative?**

A few years ago, we developed our ethical policy for investing in the mining sector to identify how we can responsibly engage and invest. One of the issues highlighted was an ongoing concern around tailings dams, prior to Brumadinho but following the Mariana disaster, where we felt that the companies (BHP and Vale) had been engaged by investors, but the sector-wide issue still remained. A sector-wide approach was needed, and we started to put that in place. Then Brumadinho happened. This was the moment we felt we simply had to mobilize other investors that share the same concern, and that investors had to take a very different approach. These disasters were clearly not black swan events, but a recurring set of disasters, and there was a disconnect between the continued growth in waste and the way it was being managed and the risk, both ethical and financial that investors faced.

How much have you seen investor's attitudes change towards environmental standards in the mining industry in recent years?

Investors do not invest in a vacuum. Asset owners and pensions funds invest on behalf of a large part of society. Regulators now have very clear expectations on how pension funds operate on issues like ESG, and we have to actively demonstrate to our beneficiaries how we understand these financial risks and the action we take. This influences the companies we invest in, and it is a trend that is growing rapidly in one direction.

The recent outcry over what happened in Australia at the Juukan caves with Rio Tinto raises a broad concern about whether standards are being respected, and that investors have really understood what they are being told. It underlines the importance of investors being at the table and driving best practice. ■

Construction, Installation and General Contractors

INFRASTRUCTURE-BASED STIMULUS PACKAGES AND HIGH METALS PRICES POINT TO A BETTER 2021

➤ Construction sites and assembly works were some of the first to shut down after lockdown was announced by President Vizcarra on March 16th, impacting construction projects such as the 15,000-person workforce sent home from Quellaveco. As quarantine restrictions have loosened and projects have started to ramp up, the sector is recovering, but new health and safety regulations make pre-Covid levels of capacity unlikely in the near-term.

One of the largest South American construction firms, Ingeniería y Construcción Sigdo Koppers (ICSK), has managed to maintain the 28 projects it has in execution, according to CEO, Sandro Tavonatti: "The sanitary measures in place have forced the different parts of the value chain to work together in unison, rather than as separate entities," he explained, adding that because ICSK works in various countries, it has received daily feedback regarding the best sanitary practices from different jurisdictions, allowing the company to adopt international best standards quickly and mitigate risk.

In Peru, ICSK has been working on projects that include Tomocho for Chinalco, and the sulfides area at Mina Justa for Marcobre. Tavonatti confirmed that rising metals prices in Q3 have certainly increased the appetite for project development, but warned against companies rushing into construction without the requisite preparations. "Our experience has taught us that it is wise to thoroughly plan all aspects of a construction project, in terms of cost, optimization, incorporation of technology, engineering and due diligence," he said, noting that metals prices are cyclical and have many variabilities, but correct construction planning can help guarantee success in the short, medium and long term.

Larger companies that offer a multitude of integrated services stand to benefit from the post-lockdown landscape, with mining producers looking to reduce the number of different service providers at sites. "I think we will see a consolidation period whereby mining operators will try to work with less contractors," reflected Víctor Gobitz, president of the Peruvian Institute of Mining Engineers (IIMP) and newly appointed CEO of Antamina.

One of the major mining contractors in the Americas, STRACON, has seen a lot of business in the last couple of years from construction services, including the expansion of mine infrastructure, tailings dams and leach pads, according to CEO Steve Dixon. Dixon gave the examples of Quellaveco, for which STRACON did the earthworks for the plant site at the project, and is now working with Anglo American to prepare the mine for operation; and the Cobre Panama project, which has now been commissioned and moved into production, where STRACON provided a broad spread of construction services.

Dixon revealed that STRACON felt a significant impact from when the state of emergency was declared in mid-March, through until late May. "Throughout this period, our operating rate was reduced to around 20% of pre-Covid levels," said Dixon, revealing that STRACON had increased to 75% capacity by September. "We had to work closely with clients to put into place appropriate protocols, first and foremost to protect employees as we move forward."

Pevoex has been working for Nexa Resources, providing a full mining service at Atacocha, and working on the tailings dam at Cerro Lindo. Furthermore, the company provided services at La Arena (Pan American Silver), performed pre-strip drilling at Cuajone, and worked as a subcontractor for other companies in the construction of the tailings dam at Quellaveco. ■

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Sandro Tavonatti

CEO
INGENIERÍA Y CONSTRUCCIÓN
SIGDO KOPPERS



How has Ingeniería y Construcción Sigdo Koppers (ICSK) dealt with the challenge of Covid-19?

Covid-19 has been a test of ICSK's capacity to adapt, to be more agile and forge closer relationships with our clients and collaborators. The sanitary measures in place have forced the different parts of the value chain to work together in unison, rather than as separate entities. Some contracts were impacted, but the main investments have been maintained. Today, we have 28 projects in execution, and we have worked hard to maintain these contracts for the benefit of our workers and their families, which equal thousands of people. Because Sigdo Koppers works in various countries, we have received daily feedback regarding the best sanitary practices from different jurisdictions, and this constant sharing of knowledge has allowed us to adopt international best standards.

Can you give examples of some of the standout mining projects ICSK has worked on in recent years?

In Peru, we have worked on the Toromocho project for Chinalco, a client that ICSK has been working with for almost 20 years. The other standout project in Peru has been the sulfides area at Mina Justa for Marcobre. These clients have recognized us for our standards of technical proficiency, security and occupational health.

In Chile, we have been focused on underground mining, doing structural work for Codelco at Chuquicamata, and the new ore transporting system for Codelco's Andina division. We have also

been working on the Valdivia cellulose plant for Arauco, which has been technically demanding and requires many workers. By August, we had already returned to pre-Covid levels of capacity at these projects.

What would you say to mining companies looking to take advantage of rising metals prices by fast-tracking construction?

Rising metals prices have certainly increased the appetite for project development. However, our experience has taught us that it is wise to thoroughly plan all aspects of a construction project, in terms of cost, optimization, incorporation of technology, engineering and due diligence. This is key to the success of a project and any company trying to rush this process could encounter problems. Metals prices are cyclical and have much variability, but correct construction planning can help guarantee success in the short, medium and long term. Today, ICSK likes to offer a complete package of engineering, construction and assembly, and work together with clients from an early stage of their projects through to the end to ensure a seamless project development process.

How is ICSK incorporating new technology in its processes and projects?

With regard to innovation, two years ago ICSK revised its processes to give the company more flexibility to deal with market variables such as the price of copper, changes to the environment, and stricter health and safety regulations. We have focused on challenging traditional paradigms, including a con-

stant search for new collaborators, including technology providers and niche engineering firms. Within the Sigdo Koppers' group, a company called Godelius supports and implements technological developments in the mining and natural resources market, offering solutions for mine safety, monitoring centers (NOC), content distribution, IP productivity, IT infrastructure and IT/industrial convergence.

The construction industry is behind other sectors from an innovation standpoint and needs to reduce the technology gap that exists. ICSK wants to push these boundaries and not just accept that, because things have been done a certain way for many years, they should continue in that manner.

As governments look to revive economies with infrastructure-based stimulus packages, what role can the construction industry play in generating wealth and employment?

The key point is that construction and assembly companies work directly with local communities. Our industry has an intensive use of resources, and because of the scale of projects companies like ICSK work on, we bring a level of training and expertise that helps elevate working standards and professional experience for communities. Over time, this reduces the need for a foreign workforce and makes communities self-sufficient to take on complicated projects. In the 22 years ICSK has worked in Peru, we have witnessed the development of an extremely talented and capable local workforce. This in-country capacity will be the engine for economic revival. ■

Steve Dixon

CEO
STRACON



Which of STRACON's services have been in high demand in the last two years?

STRACON's services have been focused on the construction side, including the expansion of mine infrastructure, tailings dams and leach pads. There has been a lack of new greenfield projects kicking off in 2019 and 2020, but since 2018 we have been working on Quellaveco. STRACON did the earthworks for the plant site at the project, and we are now working with Anglo American to prepare the mine for operation.

Dumas, STRACON's underground mining services provider based out of Canada, now represents around 25% of our overall business. We have also continued to provide a broad spread of construction services on the Cobre Panama project, which has now been commissioned and is producing. We are looking to build upon this capability in Peru in the coming years.

After the Brumadinho tragedy, have you noticed the industry paying more

attention to tailings management?

There is definitely a heightened focus within the industry regarding tailings management. STRACON is a tailings dam builder: we have built several facilities, having had an involvement with the majority of large-scale tailings dam projects in Peru during the past 10 years. Additionally, we recently completed the construction of the tailings management facility for Cobre Panama. It is important that no corners are cut when undertaking the preparatory investigation work and initial engineering work, then coming up with an appropriate design that addresses the criteria of each specific facility. Each project is different, with its own geotechnical and hydrologic conditions, and access to suitable materials available for construction. All these factors along with several others must be taken into consideration when developing the design. The construction must follow design and be controlled with strict quality control process. Maintenance of these facilities during their life is also a critical factor. ■

Rómulo Mucho

General Manager
PEVOEX



What are the main projects Pevoex is involved in?

We currently have a three-year contract to provide the full mining service at the Atacocha mine. We have a very good relationship with Nexa Resources, and we are also doing another job at Cerro Lindo's tailings dam. We are also working at La Arena (Pan American Silver), and we are also doing pre-split drilling at Cuajone. At Quellaveco. Our main goal is to continue consolidating the company's growth. This year we are lining up US\$4 million to invest in new equipment, including two or three large drill rigs to increase our pre-splitting work, an area where we are bidding for additional projects.

How could mining investment push economic recovery in Peru?

The government has not managed this crisis adequately, and with regards to mining it lacks a long-term vision for the industry. The anti-mining sentiment in Peru is preventing the sector from developing and a government that does

not speak up about the importance of mining is putting off investors. Today, there is US\$3.5 billion worth of investment that could be unlocked, including Tía María, Corani, Corocochuayco and San Gabriel, if the government had the political will to do so. But Tía María is still stuck, and without Tía María perhaps we will never have Zafranal moving into construction either. The government has also postponed the prior consultation process at San Gabriel to next year. To put it simply, the country cannot afford for these delays to continue. Other promising projects are Yanacocha sulphides (US\$2.1 billion), Pampa de Pongo (US\$2.2 billion) and Río Blanco (US\$2.5 billion). This year some of the largest mines are investing in new equipment and modernization: Antamina and Cerro Verde are spending US\$400 million each. With the country producing 2.5 million mt of copper annually, every cent the copper price goes up represents an additional US\$50 million in revenue. It is an opportunity the country cannot miss. ■

Underground Mining Contractors

THE TRANSITION TO LARGER UNDERGROUND OPERATIONS GATHERS PACE

⇒ The global mining industry is migrating underground as ore grades decline and the incremental extraction of earth's finite resources continues. In some countries, such as Canada and South Africa, underground mining is the norm, with operating depths more than 3 km below the surface. In neighboring Chile, Codelco's Chuquicamata, at one point the largest open pit copper mine in the

world by excavated volume, opened its underground operation in August 2019, allowing the state copper giant to exploit the remaining resources located below the current ore deposit until 2058.

While there are currently no large scale underground mines in Peru, there has already been growth in this segment with medium to small scale operations, and the myriad of mining contractors active in Peru are preparing for the impending growth opportunities in the years to come, with the likes of Yanacocha underground, Corocochuayco and Antamina all expected to transition underground in the new decade.

In 2017, a joint venture agreement was signed between underground Australian contractor Byrncut Offshore (Byrncut) and local Peruvian firm San Martín with the transition to large-scale underground mines in mind. The move to the type of underground mining Byrncut specializes in – large open stopes, sub level caves and block caves using bulk mining methods with large tonnage – has yet to gather pace in Peru, as projects such as

Yanacocha underground have suffered delays due to metallurgical issues moving from an oxide ore body to a sulphide ore body. However, Byrncut remains committed to South America in the long run, according to managing director Greg Jackson, as the company sees the move to large-scale underground mining as inevitable.

Jackson explained how Byrncut works directly in the R&D phase with OEMs, providing feedback on how equipment can be developed to suit the specifics of different mines. "As Peru does not yet have experience in large-scale underground operations, when the transition happens Byrncut will be well placed to suggest the most suitable mining methods and technology to implement," he said.

Many projects also begin as underground operations with no open cut component at all, such as Nexa Resources' Cerro Lindo polymetallic mine in Chíncha, one of the world's 15 largest zinc mines. INCIMMET is one of the contractors working at Cerro Lindo and Eduardo Cossio Chiri-



We still see many mining operators that have different contractors, and typically small contractors for each of the processes in underground mining – but that is migrating towards a model of having one single contractor doing the whole process. This allows the client to have better control over the operation.



- Diego Morales, General Manager – Peru, Mas Errázuriz



nos, INCIMMET's CEO, spoke of the new technology being introduced to the operation to boost productivity and cut operational costs: "Within the new fleet we will have at Cerro Lindo we purchased a machine that performs the cable bolting service and requires only one operator, compared to the old machines that require seven for the whole process." Another of the major players in Peru's underground mining value chain is AESA, which achieved record sales in 2019 due to a combination of new projects as well as ramp ups on existing projects, according to Gianflavio Carozzi, CEO. Detailing how a sharpened focus on safety has been key to AESA's growth, Carozzi explained how the company reshaped its policies, standards and procedures in order to address a reality in Peru: low reading comprehension rates: "You cannot just assume that your policies, procedures and training material are going to be well understood. We thus decided to use alternative methods of delivery, particularly a bigger use of visual aids. As such, we started the use of comics and

animated videos to inform on critical aspects of safety."

As larger underground operations become commonplace in Peru, will they follow the model of using integrated contractors? This was the question posed to Diego Morales, general manager for Peru at Mas Errázuriz, which has been working on the Asana river diversion tunnel at Quellaveco. "You will have one single contractor or, if the mine is too large, several contractors in different areas who take care of everything in those specific areas," responded Morales, referencing El Teniente, one of the world's largest underground mines, which employs five contractors including Mas Errázuriz. "In older mines, it is not so simple, as absorbing smaller contractors to integrate the operation presents social issues to the mining operator," he added.

Underground mining also has the challenge of adapting to remote work requirements while below the surface in a confined space. "As Nexa runs underground mining operations (where remote work is more complicated than

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Gianflavio Carozzi

CEO
AES A



We envision that there will be a transition from open pit to underground as it becomes much more expensive to extend the mine life on these operations as open pit. We are seeing some migration already, for example at Yanacocha where we have completed our fourth underground exploration project.



How was business in 2019 for AESA and where are you seeing demand coming from?

2019 was a very good year for AESA as we reached record sales, started new projects as well as important ramp ups on existing projects. We have primarily been working with mid-sized and large underground mining operations, but two years ago the company started working with open pit operations as they were beginning to transition to underground. We envision that there will be a transition from open pit to underground as it becomes much more expensive to extend the mine life on these operations as open pit. We are seeing some migration already, for example at Yanacocha where we have completed our fourth underground exploration project, which should migrate into production in the short term.

Can you explain how AESA's innovative approach to training helps increase and develop talent?

In 2019, AESA started a journey to re-structure the way we train our employees in terms of safety and hard and soft skills. We focused on the delivery of our policies and standards, the training experience of the employee and developing training solutions that are unavailable in the market. We took a new look at safety and decided to reshape our policies, standards and procedures in order to address a reality in Peru: low reading comprehension rates, as a result of which you cannot just assume that your policies, procedures and training material are going to be well understood. We thus decided to use alternative methods of delivery, particularly a bigger use of visual aids. We started using comics and animated videos to inform on critical aspects of safety.

How did AESA manage to influence a change in legislation to create the Dual Formation program?

Changing legislation was a two-year process and we had to work closely with the Ministry of Education. The aim was to generate conditions that would allow us to create a program that combines on-the-field training with traditional training in classroom. This type of program develops employable skills in communities that have very few opportunities. This program is an important tool for upskilling and empow-

ering communities. The Dual Formation program is a 1-year program consisting of both theoretical and practical training, and after graduation the students are incorporated into AESA's staff. The first program was launched in 2019 and we have very high expectations moving forward.

How can technologies in an underground mine setting help mitigate safety risks?

Some of the main risks in underground mining where technologies can be of help are falling rock events, gasses, interaction between machines and people, flooding and those associated with the use of explosives. The adoption rate of embracing new technologies is still slow in underground mining in Peru, but is definitely increasing.

In order to implement technologies, a certain level of infrastructure is needed in the mine. It is also important to pay attention to the skills required for operators to be able to work with the technology. To this end, we are seeing customers starting to make important moves in the direction of infrastructure development and change management to create the right climate for innovative technologies to be incorporated into mines.

How do you think the Covid-19 pandemic will impact the mining industry as a whole?

The pandemic is causing a significant and permanent impact on the mining industry. It is changing the way we operate and interact; it is changing current health and safety protocols in order to preserve social distancing, and it is changing the way we staff operations. But it is also presenting opportunities to introduce change at a faster pace as it has brought down paradigms such as remote work and the use of technology in order to cope with the crisis. As social distancing becomes a necessity, we will see a bigger push for automation and tele-remote operation.

All these immediate changes generate additional cost at first, which generates a need to increase productivity to mitigate it. Therefore, changes that had been set aside or rejected in the past will find significant tail wind to be revisited and implemented. We are working on changes required in order to emerge strengthened from this crisis and benefit our customers. ■



Greg Jackson

Managing Director
BYRNECUT OFFSHORE



Technologies like remote loading, autonomous driving and increased mechanization all help by taking operators out of the line of fire. Equipment is often operated remotely now – that could be in a small room underground in the mine, on the surface of the mine, in an office in a city or even another country.



What progress has been made since the JV was signed between Byrnegcut and San Martin in 2017?

When the JV was signed, we agreed to look for a particular style of work where we can add value. We cannot compete with local Peruvian contractors for the smaller jobs that only last one year and want you to start tomorrow. Instead, we have been focusing on the larger scale underground projects, some of which have been slow moving forward, such as the Yanacocha transition, which is taking longer than expected due to metallurgical issues moving from an oxide ore body to a sulphide ore body. The sort of mining methods that Byrnegcut supports globally tend to be large open stopes, sub level caves and block caves – bulk mining methods with large tonnage. Rather than using 30-ton trucks we predominantly use 60-ton trucks.

Byrnegcut remains committed to South America as we see the move to large scale underground mining as inevitable.

How can a large-scale underground operation benefit from Byrnegcut's expertise?

Byrnegcut has developed expertise over a long period of time, and we have become very good at managing mobile equipment fleets due to strong relationships with suppliers such as Sandvik, who we work in close collaboration with to develop and improve equipment. We are used to managing and maintaining fleets to get the most out of the machinery. We also have the mining skills in terms of being productive and getting second-to-none rates of advances. Byrnegcut is large enough to provide the best safety systems, operating systems and training, which has been a big part of our business for a long time. Byrnegcut is a registered training organization in Australia, and we train our workforce all over the globe to the same standard, regardless of the location.

Can you elaborate on the company's focus on innovation?

We are always looking for a better way to mine more efficiently and cost effectively for the client. Byrnegcut works directly in the R&D phase with OEM's, providing feedback on how equipment can be developed to suit the specifics of different mines. We are cognizant that not every mining company needs a lot of new technology, but we believe that the number of mines Byrnegcut works at gives us a unique ability to know what works in different settings, and this knowledge can help guide our clients. As Peru does not yet have experience in large-scale underground operations, when the transition happens Byrnegcut will be well placed to suggest the most suitable mining methods and technology to implement.

To what extent can technology mitigate the risks associated with underground mining?

Technologies like remote loading, autonomous driving and increased mechanization all help by taking operators out of the line of fire. Equipment is often operated remotely now – that could be in a small room underground in the mine, on the surface of the mine, in an office in a city or even another country. It is not just safety that is improved, productivity is also increased with greater uptime. With the money companies have tied up in equipment, you want to be using it as much as possible. Regarding the changing nature of mining jobs, we find that most people can adapt to technology fairly quickly. As the skillsets required for different job functions evolves, there may be slightly less people working in total, but I do not believe it will have a major impact. Furthermore, automation does not make sense for everybody. If you have labor that is fairly cheap, it becomes an economic decision.

Where we you like to see the company in Peru in five years time?

In five years time we are targeting having two operating contracts in Peru and a couple outside of Peru in South America. San Martin's extensive presence in the region gives us an established base in the countries we intend to operate in. We have been in Peru for almost three years, and we are playing the long game. We took time to find the right partner with similar views to us as a business and as people. Now we are working with that partner to find the right job to add value. We know in South America relationships are important and you do not develop a relationship in one day. ■

at open-pit mines), the health and safety protocols that have been implemented mean production is likely to remain at 90-95% for the rest of 2020," elaborated Ricardo Porto, president and CEO of Nexa Resources Perú, who mentioned that returning to full capacity will probably require a vaccine. INCIMMET's Eduardo Cossio Chirinos detailed how underground contractors are responding to this challenge: "A few years ago we began the process of implementing digital transformation into our operations, and we have seen the results of this during the pandemic," he said, explaining that powerful IT infrastructure allows INCIMMET to operate remotely indefinitely, both in its central office and in its projects, helping avoid contagion and unnecessary travel. This sentiment was echoed by AESA's Gianflavio Carozzi: "As social distancing becomes a necessity, we will see a bigger push for automation and tele-remote operation."

Technological Advancements in Shotcrete

Extracting ore at depth can be a complicated, costly and dangerous business, and a worrying rise in the number of fatalities at Peru's mine sites in 2019 (40 deaths, versus 27 deaths in 2018) heightened the need to remove workers from areas of risk. This urgency to remove workers from risk was then compounded

as the pandemic ensured health and safety would be the fundamental priority of 2020. One of the ways this risk is being mitigated is through technology and, in particular, the mechanization of services. From the side of the contractor, Diego Morales stated that Mas Errázuriz now only works with semi-automatic equipment. Furthermore, the company is testing the use of remote control electric equipment in Chile. Peruvian company Robocon is the only shotcrete contractor in the world to be affiliated with EFNARC (European Federation for Specialist Construction Chemicals and Concrete Systems), and has been mechanizing underground processes with the likes of Buenaventura and Pan American Silver. Furthermore, Robocon has been integrating with contractors to work on tenders for small mines that are transitioning from dry to wet shotcrete, according to CEO Enrique Sattler. Discussing Robocon's latest technologies, Sattler explained how the company tailors its solutions depending on the context of the mine: "Our solutions will transform narrow vein mining, as tasks that used to take 1.5 days (or three shifts) can now be completed in 30 minutes in a secure operation," he said, adding: "The objective is to mechanize the shotcrete solutions, rather than use a larger workforce." One of the innovations being used in Volcan's Chungar mine in Peru by Robocon

is the slick line shotcrete transportation method – a vertical pipe that takes shotcrete from the surface to depth through gravity. Working in collaboration with Tumi Raise Boring and Robocon's sister company Tecnomecánica, Robocon can ensure the tunnel has the correct proportions so the shotcrete is transported downwards efficiently. "This saves mining companies time and has significant cost benefits – the investment is paid off in only 12 months and increases the productivity of the mine," affirmed Sattler. Another of the companies that works with Robocon is Metal Técnica, the Peruvian distributor of Putzmeister equipment, including robots for the projection of concrete and concrete transport equipment in narrow-vein mining. José Midzuaray, Metal Técnica's general manager, pointed to the underground segment as the business line that fueled growth for the company in 2019, with 90% of its work coming from contractors rather than directly with the mines. Elaborating on Putzmeister's latest technology, Midzuaray highlighted Geokret 2.0, a complete solution for smart shotcrete application that incorporates laser technology. "The solution is based on the 3D high-resolution scanning of the underground galleries before and after each shotcrete application, comparing results and optimizing the applications," he explained, noting that Geokret 2.0 runs through a digital app designed to help the operator work more remotely and enhance safety. ■



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Eduardo Cossio Chirinos

CEO
INCIMMET



Currently, we have a total of seven open-pit mining projects. We do not work on the blasting or hauling of mineral ore yet, but focus more on infrastructure projects, earth movement, civil and concrete works – facilities that go hand in hand with the direct operations of the mine.



How was business in 2019 for INCIMMET and how has the company expanded internationally?

2019 was a very good year for INCIMMET. For instance, in Colombia we constructed a 4.1-meter diameter, 310-meter-deep mine bore for Continental Gold, the first of its kind in Colombia, and one of very few in Latin America. We also won the mine development contract with Tambomayo – Buenaventura and we had the renewal of our contract with Cerro Lindo – Nexa with a bigger scope, both contracts in Peru. We recently worked for two years with Hochschild Mining in Argentina operating a project for Minera Santa Cruz training workers on mine backfill. We are exploring opportunities for our complete portfolio of solutions in the region.

Although INCIMMET is known for underground mining, the company has been diversifying to work with open pit operations. Can you expand on this?

INCIMMET is one of the few mining contractors who work on both open pit and underground mining. Our first experience in open pit mining was with Anglo American at Quellaveco in 2011, where we carried out early earth moving work, platform construction, concrete and civil works. This side of the business really took-off for the company in 2017 when we started working with Barrick Gold, Freeport, Southern Copper and Chinalco. Currently, we have a total of seven open-pit mining projects. We do not work on the blasting or hauling of mineral ore yet, but focus more on infrastructure projects, earth movement, civil and concrete works – facilities that go hand in hand with the direct operations of the mine.

Can you elaborate on the collaboration between INCIMMET and Du Pont?

We wanted to strengthen our safety culture and working with Du Pont was a very powerful and transformational experience. We thought that we were adhering to the best practices but when we began working with Du Pont, we realized there were many areas we could improve in. 2020 is INCIMMET's third year working according to what we learned with Du Pont. They have helped to shift our entire business approach to safety. We are working on seven safety aspects – mostly incorporating observation of em-

ployees to determine how they are behaving in the field and ensuring we give powerful feedback. Operational discipline outlines, protocols and procedures are updated and communicated to the staff. One of the important aspects is visible leadership; not only stating you are a leader but by showing your colleagues that you are a strong leader by setting an example.

Can you provide an example of how new technology is increasing productivity and reducing costs at underground mining operations?

Within the new fleet we will have at Cerro Lindo we purchased a machine that performs the cable bolting service and requires only one operator, compared to the old machines that require seven for the whole process. As well as boosting productivity, the operational cost savings are significant. When introducing new machinery, INCIMMET's operators undergo a rigorous training program. The operators need to feel comfortable and understand how to operate the machinery properly in order for the mines to see the increase in production these machines can provide.

How much of an impact do you feel political turbulence in Peru has had on its mining industry?

We have an ancient culture of mining in Peru with abundant resources and all stakeholders have to figure out how to create value with these resources. The people involved in the mining industry are very conscious of the weight of mining in the economy. We see INCIMMET's employees are very proud of what they do and where they work as they see the opportunities the sector provides them and their families. On the other hand, social issues still remain. In my opinion, sceptics do not know how the mining industry works and can be influenced negatively by people who have no knowledge of the industry. Over the last 10 years, Peru has established a middle class which did not exist 20 years ago. There are very few other industries that can improve people's lives in such a short time. To further develop this, mining needs to consider all stakeholders and be an industry that is conscious of its impact on the environment so projects can be developed a sustainable way. ■

Enrique Sattler

CEO
ROBOCON



the air compressor, with different components and booms according to the size and particularities of the mine. We are on the way to consolidate the market for small tunnels in Perú, working in Panamerican Silver mines Huarón and Moroccan, and developing projects with Buenaventura for mechanization of shotcrete in small tunnels, merging from dry to wet shotcrete. We are also participating in several tenders for small mines that are merging from dry to wet shotcrete. Most of the mining companies are focused on their core business – production – and prefer to outsource all their concrete requirements to one specialized contractor.

Can you provide an example of how Robocon tailors its equipment depending on the particularities of the mine?

An example of how specialized Robocon has become and how we tailor to the needs of the client is the small 1.6m by 2m electric operation equipment TecnoShot 1.6E, and a small 1m3 Mixer TDMix1, that were designed, manufactured and developed with our technical partner Tecnomecánica.

This solution will transform narrow vein mining, as tasks that used to take 1.5 days (or three shifts) can now be completed in 30 minutes in a secure operation. The objective is to mechanize the shotcrete solutions, rather than use a larger insecure workforce. This provides a wet shotcrete solution where only 8% of the material applied falls to the floor when applied, rather than traditional dry shotcrete where 40% falls to the floor.

What is the slick line shotcrete transportation method and what are its benefits?

The slick line is a vertical pipe that takes shotcrete from the surface to depth through gravity. Working in collaboration with Tumi, we assure a perfect vertical Raise Boring to install the pipe and components of the Slick Lines. This saves mining companies time and has significant cost benefits – the investment is paid off in only 12 months and increases the productivity of the mine.

How has Robocon evolved to offer more of an integrated solution?

We are integrating the business vertically to include materials. The production of concrete related to plants is tailored for several concrete uses and configurations. We have integrated laboratories for concrete tests to make sure the quality control is ensured. Now we are integrating a laser control to determine the correct quantity of shotcrete and control of the thickness.

What opportunities do you see for the business to grow as mines increasingly move underground in Peru?

I believe there is a lot of opportunity and we are already seeing more operations in Peru such as Antamina and Yanacocha making the transition from open pit to underground. Underground mines dominate the market in jurisdictions such as Canada and South Africa, and even in countries where open pit has traditionally been dominant such as Chile, where vast underground operations such as Chuquibambilla are starting. As Robocon consolidates its position in Peru, we would be interested in expanding to neighboring countries such as Brazil, Chile, Colombia and Ecuador. ■



How do Robocon's shotcrete solutions cater to Peru's diverse mining market?

Robocon has a complete range of services for the mining market, this includes design, manufacture and operation of batching plants (for surface and inside the mines), manufacture and operation of Slick Lines, shotcrete materials (cement, additives, fibers), quality controls, shotcrete transportation and application. The range of equipment therefore also must be diverse, ranging from electric to diesel, large to small, equipped with

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EQUIPMENT & TECHNOLOGY



"The pandemic has accelerated remote work and remote processes in terms of operations management, including fleet management. I have spoken to many clients, including Antamina, Las Bambas and Chinalco, regarding remote control centers away from the mine site. Even with manually operated trucks, these days there are fewer workers required at site."

- Tomás Martínez,
CEO,
Komatsu - Mitsui Maquinarias del Peru (KMMP)

Mining Equipment

THE OEMS LEADING TECHNOLOGICAL ADVANCEMENTS



Image courtesy of Ferreyros

Equipment manufacturers were hit heavily during the lockdown, with the dual blow of operations shutting down and new projects being put on hold. However, for the largest OEMs, this impact was mitigated by the support of long term contracts with mining producers and developers that have provided ample opportunity for growth in recent years and offer a platform for recovery in the aftermath of the pandemic.

Caterpillar distributor Ferreyros S.A. (Ferreyros) was awarded the two largest mining fleet tenders that have taken place in Peru in recent years, with Mina Justa and Quellaveco combining for a total of around US\$400 million in new equipment, according to Ferreyros' general manager, Gonzalo Díaz Pró. Providing an update on equipment delivery for the projects, Díaz Pró commented that by September the fleet for Mina Justa was almost fully delivered, on time, with only four trucks left to arrive. Regarding Quellaveco, 30% of the mining fleet had been delivered, with the expectation to reach 50% by the end of 2020.

"From a technology standpoint, both mines will feature leading-edge innovation," said Díaz Pró, noting that Marcobre is considering using alternative fuels to power its Caterpillar trucks at Mina Justa in the future, which can switch to operate with locally-sourced liquefied natural gas (LNG).

The move towards electric vehicles is also gathering pace, with Díaz Pró citing Caterpillar's new 400-ton electric drive trucks that have been recently introduced to Peru as an example: "The CAT 798 truck provides customers with the option to choose between electric drive and mechanical drive trucks, both in 400-ton payload capacity."

Díaz Pró noted that these new trucks are joining 120 CAT 797 mechanical drive trucks in the same class size, already running in Peruvian mines, which represent a market share of more than 75%.

Tomás Martínez, CEO of Komatsu - Mitsui Maquinarias del Peru (KMMP), commented that the pandemic has accelerated remote work and remote processes in terms of operations management, including fleet management. "I have spoken to many clients, including Antamina, Las Bambas and Chinalco, regarding remote control centers away from the mine site," said Martínez, observing that even with manually operated trucks, these days there are fewer workers required at site.

Providing examples of Komatsu's latest innovations, Martínez mentioned the FrontRunner Autonomous Haulage System (AHS), which enables manually operated equipment (such as loaders, dozers, graders, and light vehicles) to safely interact in an AHS haul truck (AHT) environment, optimizing the mining operation. "Today in Peru, we are exploring the introduction of a fully autonomous 240-tonne truck, which is currently at the prototype stage," he added.

Looking at performance from 2019 to 2020, KMMP had 71% of its sales in Peru from ultra-class trucks, according to Martínez, including 55 of Komatsu's 320-ton capacity 930 trucks delivered to Cerro Verde, as well as the introduction

of Komatsu's 400-ton 980 truck to several high-profile mines in Peru.

One of the more recent entrants to the mining OEM market in Peru, Liebherr, also echoed the sentiment of Ferreyros and Komatsu with regard to the significance of 400-ton capacity trucks. "The most important product for us is the 400 ton truck. Almost all new mines and projects in Peru are requesting this size," stated Ricardo Ishida, Liebherr's general manager in Peru, highlighting the company's main project – a truck test with two 400-ton Liebherr T284 trucks.

Liebherr has had a representative office in Peru since 2014, but started a fully-fledged operation at the beginning of 2019. Ishida spoke of Liebherr's mining portfolio that includes a range of trucks with electrical drive systems from 100 to 400 tons, and hydraulic shovels ranging from 100 tons of operation weight to 800 tons. "The latest trend in the market is autonomous technology," he said, suggesting that Liebherr's difference is that it offers an open autonomous system that allows greater flexibility because it can integrate other autonomous systems. "If the mine has an autonomous system 'X', our trucks can be integrated into that system without having to change the whole package for the entire mine," he explained.

Several years ago, Epiroc identified three main technological trends as game changers in the mining industry: automa-

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Gonzalo Díaz Pró

General Manager
FERREYROS S.A.



Have you noticed optimism returning to the market in the last couple of months?

Since August in particular, the market has been very active. Mining companies are asking for new requests for proposals, such as equipment additions to their fleets, with an emphasis on expanding brownfield operations. The pandemic caused clients to reduce sustaining capex as well as investment capex, but this will rebound in 2021. The message we are getting is that despite a 20% output reduction in 2020, mining companies expect an equal increase next year. It is true that, until we have a vaccine, it will be difficult to return to a normal course of business. However, things are in good progress.

We had just introduced our new 400-ton electric drive trucks in Peru. The CAT 798 truck enhances our portfolio, providing customers with the option to choose between electric drive and mechanical drive trucks, both in the 400-ton payload capacity. These new trucks are joining 120 CAT 797 mechanical drive trucks in the same class size successfully running in Peruvian mines, which represent a population market share of more than 75%.

What progress has Ferreyros made at Mina Justa and Quellaveco?

In recent years, Ferreyros was awarded with the two large mining fleet tenders that took place in the country – Mina Justa and Quellaveco, with a total combine of around US\$400 million in new equipment. Mina Justa's fleet is almost fully delivered, on time, with only four trucks left to arrive. Regarding Quellaveco, we

have delivered about 30% of the mining fleet, and expect to reach 50% by the end of 2020.

From a technology standpoint, both mines will feature leading-edge innovation. Marcobre for Mina Justa is considering using, in the future, alternative fuels with our trucks, which can switch to operate with liquefied natural gas (LNG), an economic and locally available resource. Quellaveco is considering many technology upgrades to their fleet, such as autonomy packages. It will be a state-of-the-art mine in terms of technology, and we will be there with them.

How has Ferreyros' service center in La Joya impacted local employment since opening?

Ferreyros directly employs more than 3,500 people in the country. More than 1,000 people work and live in customers' isolated mine site operations. Among our main workshops, we invested US\$40 million five years ago in a world-class Customer Rebuild Center in La Joya, located one hour drive from Arequipa. We aim to promote a sustainable development hub in this mining area, providing fair and top-class employment opportunities for future generations. Today, La Joya employs 350 people, 70% of them from the city of Arequipa.

What underground mining equipment does Caterpillar provide, and how do you view the transition to underground projects in Peru?

Around 20 years ago, Caterpillar adapted its strategy with a view that the natural trend for mining is to eventually go

underground, and bought Tasmanian equipment manufacturer Elphinstone. Today, Caterpillar has a growing portfolio of underground equipment, such as a full size range of loaders and haulers. In Peru, we have around 80% of the market share for load haul dump (LHD) equipment. Cat's R1700 LHD is the future of underground mining equipment, producing 40% more than the R1600, while using 34% less fuel per ton. In 2021, we will start a project for automation and remote operation from the surface for a R1700 unit.

Many mining companies here still use all-highway haulers for underground mines, but this will change and evolve to proper underground haulers in time. In particular, the large underground projects are of great interest to us. In Peru, Yanacocha's Chaquicocha deposit transitioning underground will be a big step in this direction.

Do you have a final message for the Peruvian mining industry?

I would like to see a country proud and in-love with mining, understanding that this industry is about progress for everyone. Peru has a complex geography, with huge highlands that complicate logistics and transport of goods. However, these same highlands have a lot of value within them, and this value needs to find its way to the people. We need to collaborate all together to achieve long-term economic progress and eradicate poverty, looking for the greater good and working in a harmonious coexistence between mining, population and authorities. Tangible economic development is the real engine for growth. ■

Tomás Martínez

CEO

KOMATSU - MITSUI MAQUINARIAS DEL PERU (KMMP)



What steps did Komatsu - Mitsui Maquinarias del Peru (KMMP) take to deal with the Covid-19 outbreak?

KMMP quickly established a crisis committee to carefully develop protocols and ensure the health and safety of our workers as our main priority, as well as implemented an action plan to re-activate operations after the first months of the lockdown. Parallel to this, in April, we had meetings with leaders of KMMP's main customers to understand their expectations, safety protocol measures and in conjunction, look for improvement opportunities from all standpoints: health, safety, production efficiency and forward planning. We also reviewed our organization and looked at which KMMP teams could perform remotely and which teams were essential to maintain on-site work. As a result, by August 2020 we had 55% of our workforce working at site or in an office, 33% working remotely, and only 12% on leave. This situation has made the company more agile and creative, as well as bringing us closer to clients due to frequent technical webinars that KMMP is hosting.

Which Komatsu machinery has been in high demand in the Peruvian mining market?

The trend has been that clients are demanding reliability, efficiency (better uptime) and productivity, rather than trying to save capex. Looking at performance from 2019 to 2020, KMMP has had 71% of its sales in Peru from ultra-class trucks. In the last two years, we have delivered 55 of Komatsu's 320-tonne capacity 930 trucks to Cerro Verde, one of KMMP's most important projects. We have also introduced the

400-tonne Komatsu 980 truck to several high profile mines in Peru. Komatsu's line of high-efficiency engines that use less fuel has also been popular. The Common Rail fuel injection system for the QSK 60 MCRS and QSK 78 engines improves engine life, as well as provides a greener, more environmental solution for mining customers.

Can you provide an overview of some of the latest Komatsu technologies?

One of the interesting innovations of recent years is Komatsu's SMARTCONSTRUCTION integrated autonomous Unmanned Aerial Vehicles (UAVs) – drones that survey a site for project management needs. Another innovation is Komatsu's FrontRunner Autonomous Haulage System (AHS), which enables manually operated equipment (such as loaders, dozers, graders and light vehicles) to safely interact in an AHS haul truck (AHT) environment. Regarding autonomous trucks, Komatsu now has 13 years of experience, with an active fleet of 240 autonomous trucks globally. In Peru we are exploring the introduction of a fully autonomous 240-tonne truck, which is currently at the prototype stage.

Which working practices do you think the pandemic has accelerated?

The pandemic has accelerated remote work and remote processes, in terms of operations management, including fleet management. I have spoken to many clients, including Antamina, Las Bambas and Chinalco, regarding remote control centers away from the mine site. Even with manually operated trucks, these days there are fewer workers required at site. For projects currently under cons-

truction, such as Quellaveco, and new projects to start development in the coming years, the introduction of autonomous technology and remote work will become commonplace.

Can you elaborate on the community and employee-focused programs that KMMP has initiated in 2020?

KMMP has been working with the Operators Club initiative to improve the employability of heavy machinery operators in Peru. We have also implemented virtual conferences for the Technical Education for Communities program, to promote and facilitate careers in our field of business. In 2020 more than ever, we have reinforced the importance of health and safety in the workplace, which has been key to maintaining strong, long-term relationships with clients, employees and local communities.

What is KMMP's vision for the next 12 months, and do you have a final message for the Peruvian mining community?

The company's growth strategy is based around the pillars of safety, technical competence, higher productivity, reliability and service. We intend to increase the incorporation of new technologies to mining operations in Peru, including digital solutions such as remote fleet management and the introduction of autonomous trucks. Peru has been one of the countries that has suffered most during the pandemic, but we hope this experience can make us stronger. Challenging times also bring opportunity and as an industry we must use the tremendous potential of Peruvian mining to generate jobs and revive the economy. ■

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tion, digitalization and electrification, according to Ángel Tobar, Epiroc's general manager for the Andean region. When asked about the receptiveness of the Peruvian market to new technologies, Tobar commented that at first it was multinational operators who started to adopt these changes, but nowadays the local operators are realizing that these trends are irreversible and do not want to be left behind in the effort to maintain productivity rates at competitive levels. "Although not all companies evolve at the same speed, we are convinced that Peru will be, in just a few years, at par with the other large mining countries in terms of technology development," he said.

Observing that Covid-19 has accelerated the implementation of digitalization and automation, Tobar highlighted that Epiroc designs its solutions with its customers' key issues in mind, including: "Requirements to reduce operating costs, increase productivity, increase utilization of equipment, reduce environmental impact, and especially nowadays: to enhance health and safety conditions."

Giving examples of Epiroc's electric technology that has been implemented at Peruvian operations in recent years, Tobar cited the Scooptram ST7 operating at an altitude of 3,800 meters above sea level, and the company's second generation of battery-powered equipment such as the 14-ton Scooptram, drilling equipment including the Boomer, and the 42-ton Minetruck.

Despite advances in recent years, the transition towards widespread electrification at Peruvian mine sites will not happen overnight, and for Giorgio Mosoni, general manager at John Deere distributor Ipsa, it is dependent on the type of equipment used: "It makes perfect sense for equipment such as the excavator, which works from a stationary position but has the rotational movement which creates the energy to be able to charge itself," he explained.

"I do not think we are moving quickly towards a fully electric machine, as you are dealing with hydraulics and the power needed to move large amounts of earth, so the battery technology must mature," continued Mosoni, noting that hybrid equipment is becoming a lot more popular and allows significant savings when it comes to fuel consumption. ■

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Ricardo Ishida

General Manager – Perú
LIEBHERR



The latest trend in the market is autonomous technology. Liebherr's difference is that it offers an open autonomous system that allows greater flexibility, because it can integrate with other autonomous systems. If the mine has an autonomous system 'X', our trucks can be integrated into that system without having to change the whole package for the entire mine.



Can you provide an overview of Liebherr's activities and growth in Peru in the past two years?

Liebherr Peru started operations at the beginning of 2019; before that there was a representative office since 2014. Currently our main project is a truck test with the first two T284 model of 400-ton capacity. At this moment the majority of our resources are focused on the assembly so as to start the test in the following weeks. This test will be performed in one of the most important operations in the market and will serve as a showcase of Liebherr's product and the quality of our technical support. Our mining product range is trucks from 100 tons to 400 tons with electrical drive systems. We also have hydraulic shovels ranging from 100 tons of operation weight to 800 tons. The most important product for us is the 400 ton truck. Almost all new mines and projects in Peru are requesting this size. In the medium term, our focus will be on after-sales with the construction and implementation of workshops and warehouses to be able to provide support according to the fleet that we have in the country.

How did the pandemic affect Liebherr's operations and how has the company adapted?

It had an important impact because it paralyzed the entire operation in Peru when we were starting to assemble the first trucks in the country and we had to evacuate our team from the mine site. This situation affected us a lot, but we managed to keep all the employees without any work suspension or limitation. We established a work plan during the quarantine and, in the case of technical personnel, we trained them virtually in conjunction with the factory. The virtual platform that Liebherr has is particularly good in the technical training part. We have already restarted activities but, as far as possible, everything is handled virtually. The people operating in the mine work with all the sanitary protocol and distancing measures.

In terms of innovation, what new smart technologies and solutions from Liebherr do you think have good potential? Do you think we are far from automated digital mining in Peru?

The latest trend in the market is autonomous technology. Liebherr's difference is that it offers an open autonomous system that allows greater flexibility, because it can integrate with other autonomous systems. If the mine has an autonomous system 'X', our trucks can be integrated into that system without having to change the whole package for the entire mine.

Compared to Chile, Peru is a few years behind in automation. Chile already has at least one project with autonomous trucks. There is a lot of interest from some mining companies in Peru, but we are still beginning to study these alternatives. There is currently a mine under construction in Peru that is bringing a fleet that is going to be autonomous.

The mining truck market in Peru is very competitive. What is Liebherr's strategy to penetrate this market?

I think after-sales and product support is very important, because in the end the trucks have the same load capacity as the rest of the brands, but the quality of support that you can provide is key for the customer. Without this, you can sell a product, but you cannot have a long-term relationship and, in the mining industry, having a long-term relationship is fundamental. We have a very good product and we have to show the quality of support that we can provide in the country.

What are the safety features of Liebherr's T284 truck, and how important is health and safety to the company?

The issue of security is extremely important to us. In our mining division we have six pillars: safety, productivity, efficiency, reliability, customer support and environmental care. In these times of pandemic, safety has been one of the points to which we have given more emphasis, especially with the people we have in the mine. The T284 truck has many protection systems; a dynamic braking system, good ergonomics to facilitate the operator's work and the option of anti-fatigue camera and other systems that mines may have. ■

Ángel Tobar

General Manager Andean Region
EPIROC



Could you provide an overview for Epiroc's performance in 2019 in terms of projects and new technologies introduced?

2019 was a very significant year for Epiroc, as some mining projects involving high lev-

els of automation, especially in surface mining, started to take off; this included both pre-stripping activities and production drilling. As an example, we implemented the Bench Remote System in some of Peru's open pit mines using our SmartROC D65 drill rigs, and we consider this to be an excellent first step towards automation in Peruvian mining. We also participated in the country's large greenfield projects, Marcobre and Quellaveco, so we are very optimistic about the future. With regards to underground mining, for a few years now we have integrated our Certiq and Mobilaris systems into our clients' operations. The complexity of underground mining presents many challenges for optimization, as shown by the fact that operating uptime can be up to 25% lower underground than in surface mining. Epiroc's technologies help increase uptime and deliver a lower cost per tonne via mine digitalization. As part of this offering, it is important to mention that this office covers the whole Andean Region that includes Peru, Bolivia and Ecuador, and in the latter country we have participated in Fruta del Norte, an emblematic underground project

that has recently started operations where we have cutting-edge Epiroc equipment dedicated to drilling activities and rock support.

How is electric technology being implemented in Peruvian operations?

Over the last two years our battery-powered Scooptram ST7 has already been working successfully at an altitude of 3,800 meters above sea level. This piece of equipment is a good example of Epiroc's commitment towards a safer and environmentally friendly operation. In parallel to this, the Epiroc Group has developed the second generation of battery-powered equipment, providing a wider choice for clients and allowing for a significant reduction of diesel utilization and related costs, all of which while having zero emissions. Today, our second generation of battery-powered equipment includes the 14-ton Scooptram, the drilling equipment (Boomer) and the 42-ton Minetruck. At Epiroc, we are fast to recognize new trends and discover new ideas. We quickly get new solutions to market and adapt to changes in customers' needs. ■

Giorgio Mosoni

General Manager
IPESA



What do you think clients require most from OEM's and distributors at the moment?

Machine uptime is by far the most important metric when it comes to client satisfaction. The investment that was made into the logistics center was particularly focused on this. IPESA has reached spare parts availability close to 94%, which is the bet we are placing on the industry to be able to differentiate ourselves from competitors. While the biggest players may be focused on giant mining trucks or shovels, IPESA's focus is directed towards the mining contractor. In the space of auxiliary equipment for the maintenance of the mines, the roads, and the earth movement that is done in the early stages of mine development, that is where we believe we are particularly strong. Our proximity to our clients is what differentiates us.

Which of IPESA's products have been in high demand?

On the John Deere side, the 35-ton excavator has been IPESA's greatest success story in the last 12 months, growing from

a market share of high single digits to high double digits. On the Wirtgen side, HAMM rollers (compacting equipment) have been popular for road and maintenance work within the mine. Having superior compacting ability plays an important role from a safety standpoint.

What are your views on the social tensions that exist between the mining industry and rural communities?

Education is of paramount importance when it comes to knowing what are the different stages of mining, and knowing exactly how that is going to impact communities in terms of agriculture, whether that be land availability, water quality or access to labor.

It is important for mining companies to get directly involved by creating training and job opportunities. This can create a sense of ownership and pride. Communities may see a road being built, and think that this should have been built regardless of whether the mine was developed. Local towns need to see the benefits in terms of employment and income firsthand. ■

Construction and Auxiliary Equipment

MINING PRODUCERS ARE PRIORITIZING UPTIME, BUT LONGER SHIFT CYCLES HAVE IMPACTED DEMAND



Image courtesy of Scania

⇒ Mining investment to the tune of US\$6.15 billion in 2019, anchored by Quellaveco, Mina Justa, and a diverse portfolio of active mining operations, offered a wealth of opportunities for manufacturers specialized in construction equipment and auxiliary mining trucks. However, Covid-19 disrupted these opportunities in a multitude of ways, not only due to the operational paralysis, but also in the way mines operate in the new normal. “In 2020 it is like we have had four months of activity taken away, principally because of the impact the pandemic has had on various business sectors,” reflected José Antonio Heredia, trucks division manager at Mercedes-Benz distributor, Divemotor. “In the mining industry, companies have preferred workers to move around less, creating longer shift cycles and therefore lowering the demand for transportation to and from the mine sites,” he explained. On a more positive note, Heredia observed that the pandemic has accelerated digitalization, especially for smaller vehicles, as clients demand a lot of information and data to help them make decisions. Moreover, Heredia believes that Peru is now in a position to supply the latest mining trucks to the market, citing the 6x4 dump truck segment (41 tons gross vehicle weight) and 8x4 segment (50 tons) as being in particular demand for new projects. “In the 30 years

I have worked in this industry, it is the first time I have seen the Peruvian market being able to offer solutions which are as technologically advanced as anywhere in the world,” he stated. For Jörgen Sjöstedt, VP Peru and Region North at Volvo, innovation has helped truck manufacturers guarantee uptime, the key client consideration for 2020. “Being able to assure availability to clients starts from the design phase,” explained Sjöstedt. “From a technological standpoint, we have implemented connectivity solutions in our equipment and vehicles to be able to monitor uptime and prevent breakdowns,” he continued, pointing to automation as a way in which Volvo is improving productivity, safety and availability. Regarding the source of equipment demand, Sjöstedt revealed that small and medium sized mining operations are the sweet spot for Volvo Peru and its area of focus for the coming years. He added that Volvo’s main work comes in the construction phase of the mine, followed by logistics – transporting minerals from the mine to the port as well as fuel to the mines – and providing bus-

ses to transport mine employees to and from the workplace. The need to maximize uptime was also reinforced by Oscar Jaern, CEO at Scania Peru, who mentioned how the configuration of a product is important when it comes to availability. “Scania’s Heavy Tipper has a reinforced high line, suspension, breaks and various components which are specifically dimensioned for mining environments,” he said, commenting that details of a customer’s operations can make a huge difference in terms of component durability, and therefore Scania works closely with clients to design suitable equipment. “For preventative maintenance is also very important to analyze data which helps avoid breakdowns and reduce downtime,” he added. Scania made the news in October 2020 due to the announcement that it had delivered the largest single fleet of mining trucks in 2020. The order was for 77 units to three underground mines in the center and south of the country, through an operating lease with Dinnet, a contractor working for Nexa Resources at its Cerro Lindo mine. ■

Oscar Jaern

Director General
SCANIA PERU



Which factors must be considered to ensure a high rate of product availability?

The configuration of the product is important when it comes to availability. Details of the customer’s operations can make a huge difference in terms of component durability, and Scania works closely with clients to design suitable equipment. Preventative maintenance is also very important to analyze data that helps avoid breakdowns and reduce downtime.

How is Scania Peru working to mitigate environmental impacts?

Sustainability is the highest point on Scania’s agenda, and we work within a three pillar framework – energy efficiency, alternative fuels and electrification, and intelligent and safe transport. We are trying to reduce the CO2 impact of Scania’s vehicles. We also offer many solutions with alternative fuels, and have gas solutions on all Scania trucks. Tailoring vehicle dimensions to the client’s operations and needs and avoiding accidents through safety features allows for our vehicles to have less impact on the environment. Furthermore, Scania has signed a UN global contract which consolidates all of the company’s sustainability initiatives. The company has a clear objective to reduce its CO2 impact in half by 2025. ■

Jörgen Sjöstedt

VP Volvo Peru and Region North
VOLVO



Which consideration is high on the agenda for Volvo’s mining clients in 2020?

There is an increased focus on the importance of uptime. We want to offer a premium solution to our customers and therefore we must guarantee premium uptime. Being able to assure availability to clients starts from the design phase and

having good hardware. Furthermore, this is backed up by skilled technicians and after-sales support. From a technological standpoint, we have implemented connectivity solutions in our equipment and vehicles to be able to monitor uptime and prevent breakdowns. Automation is also a way in which we are improving productivity, safety and uptime.

Can you expand on Volvo’s ‘Iron Women’ program?

Volvo started the Iron Women initiative to promote the development of female truck drivers. To become qualified truck drivers, the women that are part of the program will have practice, theory and training in simulators. The training program allows students to acquire the skills and knowledge necessary to drive heavy-duty trucks and obtain a license to drive vehicles of more than 12 tons. As well as increasing diversity in the Peruvian transport industry, Iron Women also increases the number of professional and responsible drivers to recruit for our customers. We have had a great throughput with this program, and what is even more rewarding is that some of our clients have hired women graduated from this programs. ■

José Antonio Heredia

Trucks Division Manager
DIVEMOTOR



What solutions have been in high demand from Divemotor’s mining division?

In the last two years, the new technologies available in our portfolio have significantly reduced fuel consumption.

This is due to compliance with more demanding environmental regulations, which in the case of our vehicles, comply with the EURO 5 standard and the Emissions Regulation 025-2017-EM, which regulates the reduction of the sulphur content below 50 ppm. Fuel accounts for approximately 40% of the operating costs associated with hauling materials in a mining project, and Divemotor’s new range of vehicles can reduce this cost by 5%.

The applications most demanded by the mining sector are the tractors, which move the mineral concentrate to the ports. Our Freightliner 114SD Tractor is designed to ensure maximum reliability even in the most severe conditions. The new Mercedes Benz Dump, our “Arocs Minero” 8x4 configuration, which incorporates hydraulic components in its transmission, is a unique innovation in the sector. The Arocs Minero 8x4 has levels of reliability, safety and productivity not previously achieved by a conventional dumper. ■

Underground Equipment

THE PUSH FOR MECHANIZATION AND AUTOMATION IS ACCELERATING

While the underground market in Peru currently lacks large-scale mines such as Codelco's El Teniente or Chuquicamata in Chile, a variety of small to medium sized operations offer the chance for both national and international players to establish a foothold before the impending transition to depth. One of the global leaders in underground mining equipment is Finnish company Normet, which has a fleet of 270 machines in Peru. Franklin Pease, general manager at the company's Peruvian branch, has noticed an increasing industry push for mechanization and automation in the last 12 months, but noted such changes take time: "Mechanization requires a cultural change and modifications to the planning processes of mining companies, so change does not happen overnight. You also need better training; people need to be prepared to make sure that the operation reaps the right benefits." One of the processes that is becoming mechanized is the charging of explosives for blasting, either ANFO charging or emulsion charging. "We are working very closely with some of our clients in

this respect and this shows that the industry is transforming," said Pease, explaining that with a mechanized approach the efficiency of the blasting process can be improved, risks and costs can be reduced, and safety levels increased.

Competing against the global dominance of international OEMs is a daunting prospect, but Peruvian underground mining equipment manufacturer Resemin has carved out a niche for itself and sold machines in five continents. Resemin's Muki equipment, suited for smaller tunnels of 3x3 meters, and with four applications (drilling, scaling, roof bolting and cut-and-fill mining) continues to be a standout product for the company, but in recent years Resemin has expanded into the utility vehicle space as well. James Valenzuela, Resemin's founder and CEO, spoke of his company's evolution: "Approximately two years ago, Resemin started to produce utility vehicles, challenging Normet who are the leaders in the market. Today we produce scissor lifts, personal carriers, scalers, and emulsion and ANFO chargers."

DSI Underground supplies innovative technologies for underground mining and tunneling, and has been in Peru since 2008, moving to a new plant in Callao in 2018. Carlos Leigh, DSI's CEO for Latin America, mentioned that the company, which has been working at Chuquicamata in Chile for over 13 years, already produces most of its underground products in Peru. Leigh highlighted temporary products such as friction bolts as being popular in the Peruvian market, including DSI's OMEGA-BOLT – high pressure inflatable bolts used to secure a variety of ground conditions.

On September 1st, 2020, a JV was signed between DSI Underground and ventilation firm, ABC Technology Group, to launch DSI Underground Ventilation Systems. The JV will offer a portfolio of products including FlexLine and semi-rigid HardLine ducting for positive and negative airflow, high-efficiency Toughvent fans which increase pressure with lower diameters and decreased energy consumption, as well as a range of accessories. Discussing the motivation behind the JV, Leigh underlined the importance of ventilation to underground mining operations from a production cycle and cost standpoint: "The time it takes to remove the dust in the mine so work can commence makes a big difference to operational efficiency, and the costs of ventilation are also important from an energy standpoint, especially those in high altitudes such as most of the mines in Peru."

Austin (previously Austin Engineering) supplies customized equipment to large global mining clients, mining contractors and OEMs. In 2019, the company was recognized by the Australian Financial Review (AFR) as one of Australia and New Zealand's most innovative companies of the year for its two-piece excavator bucket. Building upon the success of its open pit equipment, the company has adopted a strategy to customize equipment for underground operations, according to Luis Flores, general manager of Austin Peru. "Austin's JEC underground body features a lightweight, curved design to reduce material hang-up and overall operating costs," he explained, mentioning business partnerships with underground contractors such as AESA as key entry points into the market.

The growing trend for mechanization in underground mining is nothing new for US-based manufacturer J.H. Fletcher & Co, according to Alonso Echevarría, J.H. Fletcher's executive director for Latam, who remarked that the company has been designing mechanized products for decades. These include automated mecha-

nized rock bolters that utilize J.H. Fletcher's HV32 (hydraulic valve) rockdrill, at a total height of 0.5 meters. "This minimal rock-drill height allows JH Fletcher the ability to offer the shortest mechanized remote (automated) roof bolt modules in the market." On the subject of trends in underground mining innovation, Echevarría pointed to data transformation as being more relevant than before, with analytics necessary to manage customers' organizational operational data flows more effectively. "The application of data analytics is at the forefront of creating real time value across the productive supply chain for underground mining clients." In the underground mining space, the range of equipment, infrastructure and software necessary to operate can drive up both capex and opex. With that in mind, Guido Perez, Latam and US regional director at Micromine, spoke of the latest technology the mining software company is currently developing that can lower costs as well as improving operational performance: "We are working on innovations that combine machine vision and deep neural networks, similar to technology seen at airports where a camera recognizes your face through signals painted on the walls. This negates the need for extensive and costly underground network infrastructure." ■



Today we are seeing data transformation as more relevant than before, and our equipment is built to provide such analytics necessary to manage customers' organizational operational data flows more effectively. The application of data analytics is at the forefront of creating real time value across the productive supply chain for underground mining clients.



- Alonso Echevarría,
Executive Director –
Latam,
JH Fletcher
and Co.



DEFINING THE FUTURE UNDERGROUND

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James Valenzuela

CEO
RESEMIN



➔ **Resemin made a US\$10 million investment into the company's production plant in 2019. What were the reasons behind this investment?**

From 2016 to 2018, Resemin increased production volumes by 50% per year. In 2018, the company produced 120 machines, but due to challenges experienced, we produced approximately 100 machines in 2019. We saw that we needed to bring about change in our business and in order to increase production capacity we decided to make this investment in a new facility. Currently only assembly is done at the new facility, but we plan to move all of Resemin's operations there by the end of 2020.

Which of Resemin's machines have been in high demand over the last 12 months?

Resemin's MUKI range of equipment is a game changer in the underground mining space and is still the product that is most in demand. The MUKI equipment is a standout in the market and Resemin's competitors do not have an equivalent to these machines. The machines are small

and compact, which makes them ideal for narrow vein underground operations. Resemin's roof bolter equipment is also in high demand, and we truly believe that we offer the best bolting turret on the market.

How has Resemin's product offering evolved in recent years, and what new technologies do you have for the market?

In underground mining, there are three kinds of machines – jumbos, loaders and utility vehicles. Approximately two years ago, Resemin started to produce utility vehicles, challenging Normet who are the leaders in the market. Today we produce scissor lifts, personal carriers, scalers and emulsion and ANFO chargers. Resemin is doing well in the utility vehicle space, but we are still in the development stages.

An important developed we have made in recent years is incorporating air-conditioned cabs on all of our machines. Resemin is also launching the first battery powered front-face drilling rig in the Peruvian market in February 2020. These rigs will have an initial cost of approximately

Carlos Leigh

CEO – Latin America
DSI UNDERGROUND



➔ **In Chile there has already been a transition to large underground mines, such as Chuquicamata. Do you expect to see a similar transition in Peru in the coming years?**

At the moment, we are seeing some iconic mining projects in Peru that are currently unable to be developed because of social issues. In the short term, we do not envisage a prompt change to this dynamic, but nonetheless we are already prepared for any transition underground. DSI Underground already produces most of its underground products in Peru, being a country that uses an important number of temporary products, such as friction bolts. These include OMEGA-BOLT® – high pressure inflatable bolts used to secure a great variety of ground conditions.

How has Covid-19 impacted the company's operations in Latin America?

Latin America is an important region of production for our company and the sudden lockdowns in Peru and Argentina affected this side of our business. Peru has recovered well since lockdown restrictions

were lifted, and August was a very good month despite some of the mines remaining closed. In Chile, the lockdown started later, but recovery in September has been positive. Interestingly, Brazil and Mexico, which have had important infection rates, have not been impacted much from a mining standpoint.

On September 1st 2020, a JV was signed between DSI Underground and ventilation firm, ABC Technology Group, to launch DSI Underground Ventilation Systems. Can you elaborate on this venture?

Ventilation is fundamental to underground mining. When we talk about underground support to improve the production cycles, this is particularly key. The time it takes to remove the dust in the mine so work can commence makes a big difference to operational efficiency, and the costs of ventilation are also important from an energy standpoint, especially those in high altitudes such as most of the mines in Peru. The product portfolio of the new joint venture will include FlexLine™ and semi-rigid HardLine™ ducting for positive and

40% more than the current machine due to the sodium nickel battery being used.

How does Resemin's equipment improve safety?

Resemin's scalers and roof bolters reduces the risk of falling rocks in an underground mine as rock anchors can be installed to keep the roof of the tunnel stable. There is no equipment in the market better suited for smaller tunnels of 3 meters by 3 meters than Resemin's products, which as well as being the most productive in this space, also have the highest safety standard.

What are Resemin's principal objectives for 2020?

Resemin's main objective for 2020 is to increase production capacity to again be able to produce approximately 120 machines a year. Our vision moving forward is to be a leading corporation in the national and international mining industry, with a complete product range of innovative, easy to use and specially designed high-quality equipment to solve different needs in underground mining operations. ■

negative airflow, high-efficiency Toughvent fans, made in South Africa, which increases pressure with lower diameters, decreasing energy consumption, and other ventilation accessories: curtains and coverings, emergency shelters, inflatable AirStop and repair kits. DSI Underground Ventilation Systems will count with a full engineering and design services, supported with our partners of ABC in Canada.

How is DSI Underground incorporating digitalization into its processes and products?

Since the beginning, we have been focused on mechanizing our products and systems to support safety and improve production cycles. In recent years, we have also been embracing the rise of digitalization, for both internal processes and customer support. We have started testing new digital innovations internally and in the field, which offers clients full traceability. This helps customers administrate DSI Underground's underground support products, allowing them a new scale of management in the full process. ■

Franklin Pease



General Manager
NORMET



Please provide some insights about Normet's business in Peru in 2019?

2019 was a good year in spite of the political issues that have been a bit of a distraction. The mining industry has continued to evolve toward more sophistication, with a stronger push for mechanization and automation. Today, we have a fleet of around 270 machines in Peru and this figure is quite stable – there are no new projects at the moment, so most of the sales come from fleet renewal.

What underground processes are being mechanized at the moment?

For example, the charging of explosives for blasting processes, either ANFO charging or emulsion charging. We are working very closely with some of our clients in this respect, and this shows that the industry is transforming. With a mechanized approach, you improve the efficiency of the blasting process, while you reduce risks and costs. In Peru, we are already working with Exsa, a blasting solutions provider, in the mechanization of blasting processes in several units of Nexa Resources.

Do Peruvian mining operators have the right mindset to introduce mechanization?

Mechanization requires a cultural change and modifications to the planning processes of mining companies, so change does not happen overnight. You also need better training: people need to be prepared to make sure that the operation reaps the right benefits. An important aspect of this evolution is that, when you include mechanization, you can collect plenty of data that can be analyzed and applied in future automation processes.

How is technology changing, overall in the industry and particularly in

Normet's line of equipment for underground mining?

Mechanization involves incorporating a stronger technology base. For instance, the industry is increasingly aware of shotcrete waste in the operation, which represents very important costs. In order to control the shotcrete rebound, you need to provide more training and also to collect real-time data. Also, the industry is asking for machines with compressors on-board and power packs to connect to the mine's grid, so they do not need to use diesel. This is in line with the trend to reduce emissions and pollution. At Normet, we have several models to spray the shotcrete, including the Alpha 20 and the Alpha 30. In Peru, the Alpha 20 is our best-selling unit, but as mines become bigger we will see a transition towards the Alpha 30 in the years to come.

Do you think the electrification process will also result in more autonomous battery-powered equipment, rather than machines that plug in to the grid?

We already have battery-powered equipment in several mines abroad, including shotcrete sprayers and mixers. We do not have any units locally yet, but they would be highly appropriate in a country like Peru, where diesel engines are significantly affected by the altitude.

Beyond underground equipment, how are Normet's other businesses doing?

We are steadily increasing our sales of additives for shotcrete production. Today, the trend is that it is the contractors who manufacture the shotcrete onsite – it is no longer a cement company taking care of that. The industry is increasingly looking for integrated contractors that can offer all the required services, from mine development to rock support, so there are different ways in which we can support them. ■

Equipment Components

THE BENEFIT OF DATA-DRIVEN SOLUTIONS

Far from being the sole domain of the largest OEMs, innovation is also influencing the product offerings of companies further down the value chain, such as providers of equipment components. Rexroth, a German hydraulic drive specialist that forms part of the Bosch group, has been expanding in Peru in recent years, opening a new service center in Arequipa to mitigate logistical challenges and help with aftersales, according to general manager, Kai Rothgiesser. Rothgiesser revealed that 80% of all hydraulics in Peruvian mines are Rexroth products, and this level of penetration has opened the door to service opportunities: "Traditionally, Rexroth has been offering repair and aftersales services to the market, but in recent times we have experienced a very high demand for condition monitoring." Rothgiesser claims that Rexroth's condition monitoring solutions are unique in the Peruvian market, detailing how condition monitoring constantly measures

wear and reports the need for replacement when critical limits are reached. "Scheduled, on-time replacement reduces the risk of machine stoppages and thus increases machine availability. At the same time, this approach lowers maintenance costs since only actually worn components are replaced," he explained. Data-driven solutions are also driving business growth for another German company active in Peru – compressed air specialists Kaeser Compresores. Marco Vásquez, general manager of Kaeser Compresores Peru, explained how the company's air-on-demand product works: "The Sigma Air Manager (SAM) 4.0 acts as the central head that controls the individual equipment with maximum efficiency while adjusting the flow capacity according to the demand," he said, elaborating that predictive maintenance capabilities activate an automatic service response. This way, if there is a problem with any of the components of the compressed air station, the system will identify the unit and what parts have to be changed,

and will create a service order. Vásquez added: "A technician will be sent onsite even before the client finds out that there is a problem." One of the industry leaders in compressor technology, Atlas Copco, offers a remote monitoring solution called *Smartlink*, a device that sends data to a central server. Vicente Trenado, general manager of Atlas Copco Andean Region, described how the data is displayed in a website which is accessible by the end-user, so they can access real-time information on their computer or cell phone from any location. "This can be for any equipment, and gives maintenance teams the relevant readings where they can see working conditions, temperature and pressure-drops, among other things. From Atlas Copco's side, we can do data-mining; in other words we can contact the customers proactively when we see there is an irregularity or a risk," said Trenado, adding that Atlas Copco uses this data-mining to research and develop the next generation of products it will produce. ■

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Kai Rothgiesser

General Manager – Peru
REXROTH



Condition monitoring constantly measures wear and reports the need for replacement when critical limits are reached. Scheduled, on-time replacement reduces the risk of machine stoppages and thus increases machine availability. At the same time, this approach lowers maintenance costs since only actually worn components are replaced.



How has the opening of Rexroth's new service center in Arequipa improved the company's offering?

Since its foundation in 2017, Rexroth had planned to establish a service center in Arequipa with the goal of giving our business a boost. Having a service center in Arequipa means that we are closer to customers and can mitigate some of the logistical difficulties in the southern region of Peru. We were in the process of refurbishing before the Covid-19 quarantine and plan to officially open the center in Q4 2020.

We are confident that we will gain a significant amount of service business in the Southern part of Peru. The company has good relationships with the mines in the region, but our main business in that part of the country has been in components and sales. We will now be able to provide high quality services to clients operating in the South.

Can you highlight some of the projects Rexroth is involved in?

Rexroth is involved with almost all the mines in Peru in terms of components and sales, and 80% of all hydraulics in the mines in Peru are Rexroth products. This level of penetration opens the door for us to service the mines. The company does not only work with mines directly, but also has very good relationships with the mining contractors and OEMs.

Which of Rexroth's technologies have been in high demand recently?

We have experienced a very high demand for condition monitoring. We have identified this as a high growth business area for us and in 2019, we presented new monitoring solutions to the market. Rexroth's condition monitoring solutions are unique in Peru. Condition monitoring constantly measures wear and reports the need for replacement when critical limits are reached. Scheduled, on-time replacement reduces the risk of machine stoppages and thus increases machine availability. At the same time, this approach lowers maintenance costs since only actually worn components are replaced. As with any data-driven service, condition monitoring is only attractive if it offers both security and value. But the real value is created when condition monitoring becomes predictive maintenance.

In simple condition monitoring, sensors are used to watch over equipment and alert the owner to any changes in operating parameters, such as RPMs, temperature and pressure. A solution can be created with relatively few sensors and a minimal amount of standalone hardware, at a cost far less than that of a production stop. The data from the sensors can be used for monitoring much more than alerts. Analyzed properly, it can help determine when a machine is at risk of breaking down – so that corrective maintenance can be planned in advance. Predictive maintenance has many advantages: reduced need for on-site spare parts, fewer demands on service personnel, lower energy consumption and more reliable production.

How do you view the current health of the Peruvian mining industry?

Peru has many advantages – production costs, energy costs and labor costs are relatively low. There is also still a lot of opportunity in the country as many mining sites have already been identified, but not yet developed. I believe that the Peruvian mining industry is on the right path and the industry is continuously improving. There is a willingness to adopt new technologies to increase efficiency and productivity.

What are Rexroth's main objectives for 2020 and outlook for 2021?

Rexroth saw high growth rates in 2019 and we aimed to continue on this path in 2020. The Covid-19 pandemic, however, greatly affected the Peruvian market and the operations of our customers. We had some very difficult months, but now see a solid recovery. In August we reached the level of 2019 again and expect 2021 to exceed the growth planned for 2020. We are optimizing the business and expect to grow very quickly in the areas of sales and services. The company also wants to be known for its capabilities in interconnectivity and providing top quality industry 4.0 solutions. Additionally, we see opportunities for growth as the Peruvian mining industry starts more underground operations. The underground mining environment is tougher on components, which is advantageous for Rexroth as there are then more service opportunities. ■

Comminution and Material Handling

Like the rest of the mining value chain, companies involved in the technology for mineral handling and processing facilities were impacted by the sharp reduction of operational capacity in March. However, as the companies providing solutions for services deemed “essential”, such as flotation, heap-leaching and tailings management, this sub-segment of the industry has been able to weather the storm better than others. Furthermore, with mining producers looking to make up for lost time and take advantage of high metals prices, there should be a greater appetite for technologies that increase the volume and efficiency of processing. “When things restart and ramp up, there could be a lot of opportunities as mining producers look to compensate for lost production by increasing throughput,” reflected Fernando Samanez, vice president of mining equipment and sales for the Pacific Rim at Metso, speaking in April. “When plants are restarted and looking for 5% more throughput, for example, new technology will have to be implemented,” he added. Samanez remarked that the majority of new Metso products coming out, such as primary gyratory crushers, filters and the latest mining crushing solutions, consider two things: “Modularization, in other words transporting modules fully assembled to site; and secondly optimizing the design and engineering of next-generation equipment that has already been developed by adding automation and e-controls.” The development of smart equipment was also touched upon by Javier Schmal, vice president for Latin America at Martin Engineering, who elaborated on his company’s N2 Position Indicator – a sensor for belt cleaners which allows for remote monitoring of the belt cleaner blade: “This senses how the cleaner is working, its tension and position, it has an alarm equipped if there is an accident such as a fire, and lets the customer know the wear-life of the pieces.” Schmal went on to explain that the sensor sends data to a gateway which analyzes it and sends information to the customer through an app or computer. “This is real time information delivered remotely, that includes

locations, condition reports, and predictions of when blades have to be replaced.” Martin Engineering serves clients including Southern Copper, Cerro Verde, Las Bambas and Miski Mayo, and has adapted to the strict travel restrictions during the pandemic by putting on technical webinars to give support to customers, something that has been particularly popular in Peru, according to Schmal. “The idea is to train local teams to be safer, cleaner and more productive, and we have now taught thousands of customers throughout the Americas since lockdown began.” One of the Peruvian players in the segment, Tecnomina, celebrated its 50th anniversary in 2020, and has gone through a modernization process in recent years, according to general manager, Fernando Barrio. Tecnomina represents Rema Tip Top, providing assembly and splicing services for steel and canvas-cable conveyor belts for clients such as Southern Peru, Antamina, Cerro Verde, Las Bambas and Antapaccay, and Barrio revealed how the company has adapted to sell complete solutions instead of products: “These days, customers want to reduce their

workload and need the product provider to offer the installation service,” he related, adding: “To help with this we created the Luis Barrio Samanez Training Center (Centro de Capacitación Luis Barrio Samanez) in 2019, responsible for training the qualified personnel we need to provide conveyor belt maintenance and tire repair.” Karina Zevallos, managing director of Weir Minerals Peru, who remarked that a significant portion of the company’s revenue comes from aftermarket sales and services, also highlighted the importance of providing a complete solution. Zevallos listed mill liners, valves and comminution as the products that have been the biggest drivers of growth for Weir Minerals, and spoke of the importance of training, particularly from a diversification standpoint: “Considering that our customer base is very diverse, our employees also have to be,” she said, citing Weir Minerals’ collaboration with Yanacocha to attract new talent. “We have offered a training course for students where they can see how we operate on site and in practice to encourage them to further their studies in a mining industry direction.” ■

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Javier Schmal

Vice President – Latin American
MARTIN ENGINEERING



Martin Engineering’s N2 Position Indicator is a sensor for belt cleaners that allows for remote monitoring of the belt cleaner blade. This senses how the cleaner is working, its tension and position; it has an alarm equipped if there is an accident such as a fire, and lets the customer know the wear-life of the pieces.



How has the pandemic impacted Martin Engineering’s Latin American operations?

The mining industry in Latin America has been heavily affected, with some operations reduced to 50% or stopped completely. In Brazil and Chile the mines remained more active, but in Mexico, Peru and Colombia the lockdowns were stricter. From a business standpoint, the pandemic has emphasized the importance of remote access to operations and remote monitoring of equipment, products and facilities.

What new technologies and processes has the company been developing in line with the new working conditions?

We have been working on technology for remote monitoring, involving electronics, sensors, analytics and also the mechanical side, so it will be safer to service our products with less frequency. Something else we have been doing a lot of, in Peru especially, is technical webinars to give support to Martin Engineering’s customers. The idea is to train local teams to be safer, cleaner and more productive, and we have now taught thousands of customers throughout the Americas since lockdown began.

Can you elaborate on the features of Martin Engineering’s N2 Position Indicator for belt cleaners?

Martin Engineering’s N2 Position Indicator is a sensor for belt cleaners that allows for remote monitoring of the belt cleaner blade. This senses how the cleaner is working, its tension and position; it has an alarm equipped if there is an accident such as a fire, and lets the customer know the wear-life of the pieces. The sensor sends all the data to a gateway that analyzes it to provide important information for the customer through an app or computer, and also for Martin Engineering to continuously develop and improve our products. This is real time information delivered remotely, that includes locations, condition reports, and predictions of when blades have to be replaced.

What are some of the standout mining projects Martin Engineering has been working on in recent years?

We work with the main players across Latin America, having specialized technicians close to the projects of our key clients. Martin Engineering’s Peru HQ is in Lima, but

we also have a really strong team in Arequipa, and have expanded our footprint to the north of the country as well. We serve clients including Southern Copper, Cerro Verde, Las Bambas and Miski Mayo, to name a few. In Peru, we are implementing a stand-alone pneumatic tension system for our cleaners that will keep the tension to the required level (whether it is for primary, secondary or tertiary cleaners) all the time, until the blade runs out. This saves time and money, as well as reducing risk.

Do you think mining companies are more willing to adopt new innovation these days?

This differs depending on the country and depending on the company, but certainly people are asking more about innovation and new technologies these days. Industry leaders such as Vale, Newmont and Southern Copper are some of the most active in these conversations around Industry 4.0. In the past, we used to deal with the mechanical and engineering departments, but now we are dealing with the IT departments.

How do you view Peru as a mining jurisdiction compared to other Latin American nations?

When Peru really realizes and accepts it is a mining country, it will do even better than it currently is. For instance, Chile and Brazil really believe that they are mining countries and support the mining industry much more than in Peru. While Peru is not yet one of the largest markets for Martin Engineering, it does hold huge potential for growth, much more than in Chile. Despite the challenges in the country, we grew by double digits in Peru in 2019, and have high expectations for a strong rebound in 2021 after the disturbance of the pandemic.

What is Martin Engineering’s vision for the future?

Martin Engineering wants to be recognized as a global leader in mining technology and strengthen our presence in Latin America. Importantly, we want to work closely with our customers, communities and our families. The industry needs to be more responsible with the environment, and Martin Engineering is focused on preventing waste with its products. We offer solutions that will give long-term benefits to clients, and we are open to work together on this innovation process. ■

Fernando Samanez

VP Mining Equipment & Sales PACRIM
METSO



Does Metso design tailor made equipment or opt for a more standardized approach?

Certain types of equipment should be made to order, but Metso is trying to increase the production of standardized equipment. For example, apron feeders are sized based on width, length and power, and can provide optimal results with standard units. The engineering can be modified slightly, but the design remains the same for different sizes. The majority of new products coming out, such as primary gyratory crushers, filters and the latest mining crushing solutions, consider two things: transporting modules fully assembled to site; and secondly optimizing the design and engineering of next-generation equipment that has already been developed by adding automation and e-controls

How does Metso's acquisition of Outotec change the company?

The merger should achieve extraordinary results in the short run, as it creates an industry-leader in supplying mining and process equipment globally. Mixing the different technical expertise will create a tier-one company. Both companies are Finnish, so potential cultural challenges that happen during a merger are minimal. ■

Karina Zevallos

Managing Director
WEIR MINERALS PERU



Where is the most demand coming from for Weir Minerals' products and services?

In Peru, there is a lot of demand for rubber linings, hoses, pumps, mill liners, cyclones, valves and comminution. In 2014, Weir Minerals acquired the American comminution company, Trio, which has

strengthened our presence in this market through products such as washers, screens, crushers, and scalpers.

Can you elaborate on Weir Minerals' focus on diversity?

Considering that our customer base is very diverse, our employees also have to be. We are in contact with academic institutions in the areas we operate to attract the diverse talent we require. In collaboration with Yanacocha, we have offered a training course for students where they can see how we operate on-site to encourage them to further their studies in a mining direction.

We are also trying to encourage more women to enter the mining industry, something I am passionate about as a director of Women in Mining Peru. I believe that there is still not enough female representation in the industry due to a lack of proactive measures from mining companies. People tend to talk a lot, but unfortunately there has been more noise than action. However, we are starting to see companies increase and promote diversity in their work forces, but I believe there is still a long way to go. ■

Fernando Barrio

General Manager
TECNOMINA



Tecnomina celebrates its 50th anniversary in 2020. How has the company evolved in recent years?

Tecnomina is a 100% Peruvian company that has been managed by the Barrio family since 1984. However, the

company is in a transformation process, moving from a family culture to a corporate culture. For instance, we are implementing ERP (Enterprise Resource Planning) and SAP systems to be able to have greater control over the costs of operations.

Today, we not only have first level products as representatives of Rema Tip Top, but we provide all the assembly and splicing services for steel and canvas-cable conveyor belts, as well as our own equipment. Since 2018, we have expanded our portfolio of services to include hot coating works and shot blasting works for metal surfaces. Tecnomina offers a wide range of solutions, but we have identified approximately 10 to 15 star products: natural rubber coatings, synthetic rubber coatings, cold vulcanized glue, tools, pulley lagging, belt cleaning systems, scrapers and everything related to the conveyor belts. ■

The Digital Mine

INNOVATION HAS BEEN FAST-TRACKED AS REMOTE WORK BECOMES COMMONPLACE

⇒ The term disruption, at least in the context of innovation, has positive connotations indicative of progression. On the other hand, the definition of disruption – disturbance or problems that interrupt an event, activity, or process – is rarely seen as a good thing, particularly for profitable operations in an industry that has been averse to change. Nothing breeds innovation like neces-

sity, and Covid-19 has caused a level of disruption not seen since the Second World War, accelerating the development and implementation of a number of new technologies.

From a safety standpoint, the mining industry has had to mitigate the risk of the virus spreading, a particular challenge as operations ramped up while infection rates remained high. "Covid-19 is accelerating the adoption of certain technology-based solutions in order to be more efficient and more secure," said Marcos Wieland, general manager of digital transformation company Sitech, part of the Ferrycorp group that includes Caterpillar distributor Ferreyros. "For instance, the vision of having a paperless mine through digitalization is becoming a must," affirmed Wieland, explaining that the use of digital tablets negates the need for workers to pass paper to each other, helping to minimize person-to-person contact.

To respond to the need for mining companies to ensure the health of mine workers and their families, Canadian

startup Minetell created an enterprise SaaS (software as a service) platform that measures and monitors Covid-19 risk exposure and control performance, offering a 60-day free trial of this solution to help essential service workers during the height of the pandemic. "Our platform delivers actionable and reliable information into the hands of decision-makers so they can ensure their workplaces are safe for their employees and their families, contractors and community partners," explained Michael Hartley, CEO and founder of Minetell, who added that the remote deployment model the company has been using since its inception two years ago means it does not have to adjust to the current context.

Another company to have helped mining companies during the lockdown is Micromine, which offered free licenses to its software for the month of April, as well as free online training. "In one day, we had 1,500 requests for licenses globally," said Guido Perez, Micromine's Latam and US regional director,

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The final target for companies is to have autonomous operations, and ABB has a clear road map for that. The first of the steps necessary to define this roadmap is a customer value workshop where we help identify the key points related to the specifics of a mine. This is followed by a digital maturity assessment.

**- Wilson Monteiro,
Country Manager –
Peru,
ABB**



remarking that the company had developed a strategy to implement its Pitram solution remotely without having to go to site.

Interestingly, when it comes to their core business, miners are not risk-averse. Mining is an inherently risky business, from the junior community raising millions of dollars to explore land that is statistically unlikely to be developed, through to the processes involved with extracting ore at altitude, depth, or both. However, by the time a mine is ready to go into production, traditional methods are often preferred as operators look to guarantee output for management and shareholders. For mining companies, deciding which of the myriad of technologies available on the market they should use is not straightforward, and that is where specialized digital transformation companies, such as Sitech, come into play. "The digital gap is constantly growing, so our job is to try to close that gap and prevent it from expanding," stated Marcos Wieland, Sitech's general manager, relating that the competitive labor costs in Peru mean local mining companies often do not feel the same incentive to

innovate compared to markets such as Australia or Canada.

Sitech sees the migration of information to an industrial cloud and the ability to capture data and transform it into information for decision making as the direction the industry is headed. However, while the industry goes through the maturing process, Wieland mentioned that solutions related to safety and security, such as proximity detection, collision avoidance sensors, and fatigue monitoring tools will be easier to introduce. When envisaging the digital mine, the move to cloud based solutions seems inevitable, but the path and timeline to achieve this depends on variables such as the size of the company, specifics of each operation, and market conditions. The disruption caused by Covid-19 has shown the industry the benefits of autonomous operations that can be operated remotely. "The final target for companies is to have autonomous operations, and ABB has a clear road map for that," stated Wilson Monteiro, country manager for Peru at ABB, observing that many clients are willing to adopt digitalization, but do not know how or where to start. "The first of the steps necessary to define this roadmap is a customer value workshop where we help identify the key points related to the specifics of a mine. This is followed by a digital maturity assessment," he explained, noting that factors such as life of mine can greatly impact the digital strategy that should be put into place.

Juan Parra, general manager of Emerson Automation Solutions' Peru branch, has noticed an encouraging change in business mentality in recent years: "The industry is increasingly interested in value added technology and especially in the opportunities for digital transformation," observed Parra, continuing: "Instead of integrating technology at an operational level, Peruvian mining is ensuring optimization is integrated from the project planning stage," he said, suggesting that operational efficiencies and better up time are replacing cost as the main consideration.

One of the global leaders in automation and digitalization is German multinational conglomerate, Siemens, which is currently working on the development

of the first digital mine in the world, located in Moquegua, Peru, according to Carlos Travezaño, CEO of Siemens Peru. "We are not talking about digitized processes working in silos, we are talking about total integration," he stated, affirming that digital solutions are being implemented from the engineering conception to operation and maintenance in all processes and disciplines. "It will allow our customers to improve productivity, efficiency, reliability and secure the operations in real time based on the fundamentals of data analytics, machine learning, IoT and Artificial Intelligence (AI)," he added.

"The pandemic represents a digital opportunity for mining operations," reflected Franco Bulnes, country manager for Peru and Bolivia at Eaton Electrical Group, a global company specialized in energy management. "Many clients in Peru are asking how to move to remote operations and what the digital future will look like more proactively than before."

Bulnes explained that digital changes in the energy space are related to generation, transmission and distribution. For example, the implementation of renewable energy on a mine site, such as solar power, requires an energy storage system that can be controlled and monitored digitally.

To enable a successful transition to the digital mine, the requisite infrastructure must be developed to support an integrated grid, elaborated Bulnes, concluding: "Mining requires many different digital solutions, which must be supported by software. For this software to function in unison efficiently, countries must invest in grids that bolster connectivity, as this is the direction the industry is headed."

Luis Palenque, president and director general for the Andean Region at 3M, spoke of the popularity of the company's electrical products, as all the processes and infrastructure to do with automation have been introduced to mine sites and plants. "Every project has its own issues, and we bring those issues to 3M's innovation hubs around the world so we can create new solutions for the market, or adapt our current solutions to fit the specific needs of a mine," he said. ■

Marcos Wieland Conroy

General Manager
SITECH



How is Sitech working on the adoption of new technologies in the mining sector?

Mining companies' core business is to produce commodities, not to try to figure out which technologies they could be using – that is where companies like Sitech fit in. The digital gap is constantly growing, so our job is to try to close that gap and prevent it from expanding. In banking, retail or finance, companies are aware that, if they do not go digital right away, they are going to be left behind. In mining, it is different; companies do not feel so strongly that way. Also, labor costs are competitive here in comparison to other mining countries like Australia, so the incentive to automatize operations is not so strong. Thus, our strategy has been to go step by step, educating customers, finding quick win opportunities, and promoting the right leadership initiatives to generate an increasing sense of urgency that will lead to higher adoption rates. Now, we all know that the digital transformation of mines will take place anyways, so we are also working on establishing roadmaps for the digitalization and automation journey

What are customers expecting from new technology?

Some leaders in mining consider that the rate of technology adoption should be much faster, but it is important to manage expectations, considering these efforts take time and require patience so they can become sustainable. So, the rhythm of adoption varies depending on the industry sub-segments: adoption in underground mining is

slower than in open pit mining, where mines are larger and global, and operators have bigger budgets. On the other hand, there are some factors, like the political issues (both internal and external), that are slowing down investment. Finally, the economy downturns that drive the mining cycles make it tricky defining when to invest: when the metals prices are high, some companies think they do not need the technology as they are doing well. When the prices are low, you need the technology but you do not have the money to invest in it. The truth is, the investment is necessary in both cases.

How has Sitech grown and evolved over the past years?

In 2018 we doubled the size of the company, but growth slowed down in 2019. Of course, we have reached a certain size by now, so growth cannot be explosive. On the other hand, our focus has been adjusting to changing market conditions and new challenges we see: as a solution provider and integrator, we started as a VAR (Value Added Reseller), however, in the last year, we have been investing and focusing on building the right capabilities in order to provide information based services. We have been building an industrial cloud; we believe the market is going on that direction and we believe it is all about information: capturing data and transforming it into information for decision making. Of course, this involves a certain cultural change in the industry, and will take some time. So, we are offering other solutions as well.

Could you provide more details on the other technology solutions you offer?

We offer more tangible solutions to issues related to safety and security, and we are working to package all this into a whole solution including items such as cameras, proximity detection and collision avoidance sensors, fatigue monitoring tools and others. In this area, there is a fine line between security and productivity, so the idea is to convey a message that a more secure operation means higher returns.

The big challenge for us is to integrate the whole solution and manage real-time data capturing. If your operators suffer from fatigue and are getting sleepy while working, there is a piece of data there. If you do not do anything about it, that data is lost. So, one thing is capturing data, and another is converting it in information for better decision making.

Do you expect more technology in the underground space as underground mining receives larger investment?

In Peru, the underground miners are typically the local, smaller operators that do not have the exposure to technology and best practices that the larger and global open pit companies do have. As Peru receives more investment for the underground space from large players, we will see more technology coming; we are already seeing that to an extent with the expansion of Glencore in Peru's underground segment through acquisitions. ■

Carlos Travezaño

CEO
SIEMENS PERÚ



⇒ **Can you provide an overview of Siemens' range of solutions for the Peruvian mining industry?**

Our solutions go from complete electrical engineering, automatization and services. We have drives for regular and Gearless Conveyors and Mills, automation with total digital integration with COMOS, advanced virtualization and data analytics with Mindsphere, Cybersecurity solutions, and all ranges of smart solutions for medium and low voltage switchgears, switchboards and E-houses.

What are some of the standout mining projects Siemens is working on in Peru?

We are presently working on the development of the first digital mine in the world located in Moquegua, Peru. Siemens has also been a part of developing Las Bambas where we supplied the complete engineering. We also manufactured, delivered and assembled the gearless drive stations and the four gearless mill drives. We have executed the project and installed our products in Toromocho (Chinalco), Antapaccay (Glencore), Antamina and Constancia (Hudbay Minerals). We were responsible for the design, supply of electrical equipment and construction of medium and low voltage energy distribution into the sites by supplying electrical rooms. In addition to that, we developed and provided eight medium voltage mobile substations at Cerro Verde. Ampliación Toquepala (Southern Cooper Cooperation) was one of the last projects we worked for, with more than 2,500 square meters of electrical rooms of medium and low voltage equipment. We recently provided an electrical room with main medium voltage switchgear in the mine for Quellaveco project.

To what extent is digitalization becoming a reality at mine sites in Peru?

Peru is a world leader in digital mining since it will have the first digital mine in the world. We are not talking about digitized processes working in silos, we are talking about total integration from the engineering conception to operation and maintenance in all processes and disciplines. It will allow our customers to improve productivity, efficiency, reliability and secure the operations in real time based on the fundamentals of Data Analytics, Machine Learning, IoT and Artificial Intelligence. ■

Juan Parra

General Manager – Peru
EMERSON AUTOMATION
SOLUTIONS



⇒ **What optimization solutions does Emerson offer to Peruvian producers?**

Emerson's Plan Web Digital Ecosystem is a package that maximizes industrial efficiencies at various levels of production and can securely implement the Industrial Internet of Things. On a base level, it improves control systems and data collection. DeltaV is our signature Distributed Control System in this segment and it is present on most of Peru's high-profile operations. Further up, we offer solutions for management and optimization. We contribute to higher reliability and safety in operations through the use of big data analytics and machine learning. The idea is for technology to be prescriptive rather than predictive.

Emerson Innovation Center in Santiago is a key element to the company's business strategy and is part of our commitment to collaborative partnerships. Emerson's role is to identify the technology that can solve a client's specific challenges, which is a joint effort and requires an open dialogue.

In your view, what is the priority for operators when it comes to technology services?

We are seeing that operational efficiencies and better uptime are replacing cost as the main consideration. This is an encouraging change. The industry is increasingly interested in the value added of technology and especially in the opportunities for digital transformation. Instead of integrating technology at an operational level, Peruvian mining is ensuring optimization is integrated from the project planning stage.

How can Emerson contribute to mines already in production?

We go beyond monitoring solutions to ensure efficiency. An operation's energy balance is crucial and our product line covers aspects of water and electricity as well mineral handling. We perform energy auditing and have processes to improve water consumption in operations. Legislation has become very strict in terms of water management, and we can contribute to a company's compliance needs and prevent business from being interrupted. ■

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"The mining industry cannot operate as a fully isolated entity. On top of energy supply, it needs cement, chemical reagents, explosives and many other elements; while the final product, be it concentrate or cathodes, needs to be sent out to the markets. I think we will see a consolidation period whereby mining operators will try to work with less contractors."

- Víctor Gobitz,
President,
Peruvian Institute of Mining Engineers (IIMP)

Drilling Services

PRODUCERS AND JUNIORS LOOK TO REBOUND VIA THE DRILLBIT

By the beginning of 2020, the downturn seemed to be in the mining industry's rear-view mirror and the focus had shifted from cost-cutting exercises to increasing productivity. Producers were looking to increase reserves through the drillbit and juniors were gearing up for exploration campaigns. Then Covid-19 struck and drilling services were not deemed essential by the Peruvian government – a blow for miners looking to create shareholder value, but an even more severe impact for the companies providing the services.

The disruption caused in Q2 2020 has, however, been mitigated by the sharp rebound in metals prices from Q3 onwards. Initially led by gold and silver, base metals recovered with copper trading over US\$3/lb and zinc over US\$1.10/lb. By October, juniors such as Regulus Resources, Chakana Copper and Tinka Resources had the drills turning, and this was mirrored by the producers looking to increase mine life on brownfield sites. "I do not recall having a more loaded second half of the year with so many meters to drill," stated Ignacio Bustamante, president and CEO of Hochschild Mining. In August, Barrick Gold announced the appointment of geologists Leandro



Image courtesy of AK Drilling

Sastre and Aoife McGrath in the newly created positions of vice president exploration for Latin America and Asia Pacific, and Africa and Middle East, respectively. Barrick boss Mark Bristow said the appointments reflect Barrick's commitment to what it regards as its main growth driver, another positive sign for the drilling segment. AK Drilling works with producers (70% of its business) at brownfield mines and with junior explorers (30%), according to general manager Jorge Granda, who spoke of the differences between the two segments: "We appreciate working with junior clients because of their agility, and with majors for how they support capacitation and safety standards."

The push for automation throughout the mining services sector has been accelerated by the pandemic, but for the drilling industry, Granda believes technology should be used to improve machine efficiency, rather than to remove human operators. Underlining the importance of human interaction for matters of safety and quality, he said: "Drilling is an artisanal practice where the human factor goes hand in hand, and therefore we do not believe that 100% automation will be achieved or is recommended."

On the topic of how to price services, Granda mentioned it would be ambitious to claim that drilling clients are all willing to pay for quality, but the importance is starting to be understood after

some of the majors suffered poor results attributed to cheap drilling. "Our challenge for 2020 is to provide a sophisticated product with frontline technology and highly-trained personnel at low prices," he reflected, mentioning the new technologies AK Drilling is developing in liaison with IDS, such as horizontal drilling, deep-pit drilling and automated diamond drilling.

"The price is still very important for many customers, however, more automated services with higher safety standards are becoming increasingly popular," observed Miguel Ángel Arenas, general manager of Peruvian drilling contractor Geotec, who has also noticed customers becoming more sophisticated in their requests for new technologies. "An example of this is the directional drilling service Geotec implemented in Peru along with our partner in the US," he said.

Automated drilling equipment is becoming more commonplace in Peru, particularly with the biggest players in the industry, such as at the Newmont-operated Yanacocha mine where Geotec has been using the Epiroc Smart rod handling machines. "Although this represents a bigger upfront investment, they increase safety and productivity significantly," stated Arenas, who explained that the capital investment is paid back as the machines can drill during downtime. Expanding on this theme, Arenas commented that Geotec is working on an artificial intelligence (AI) project to increase production and remove drilling workers from the firing line, a key focus area for 2020.

Environmental concerns are also high on the agenda for mining companies as public scrutiny and stricter regulations require operations to have smaller footprints, which has led Geotec to bring more compact and automated drilling rigs to the market, according to Arenas. Explaining how Geotec has developed smaller equipment that cuts water usage and reduces footprint as part of the company's three-year contract with Las Bambas, he added: "Since Las Bambas has a commitment with the local communities, we had to develop new working strategies to reach the high standard of service that they have set for their project." ■

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General Manager
GEOTEC



What are customers currently asking for from drilling companies?

Customers are becoming more sophisticated and are requesting new technologies. An example of this is the directional drilling service Geotec implemented in Peru along with our partner in the US. These days, customers are more focused on the quality of the products instead of the price. Price is still very important for many customers, however more automated services with higher safety standards are increasingly popular. There is a need for a smaller footprint in mining projects, which has led Geotec to bring more compact and automated drilling rigs to the market. For example, as part of Geotec's three-year contract with Las Bambas, we have developed smaller equipment that cuts water usage and reduces footprint.

Peru currently has more open pit operations, but mines are starting the transition underground. Have you seen a greater demand for underground equipment?

Definitely. Geotec has the Yanacocha contract with the highest security and innovation standards in the world. Representatives from Newmont Goldcorp came to see Geotec's drilling standards, using the Epiroc Smart Rod handling machines, and stated that it is the highest standard they have audited in recent years. These are smart and fully automated equipment for drilling. Conventional mine equipment costs around US\$350,000 and smart equipment costs around US\$620,000. Although this represents a bigger upfront investment, they increase safety and productivity significantly. One of the benefits is that the machines can gain time by drilling during downtime. Peruvian mining is not yet prepared to embrace the machines to work automatically inside the mines. Geotec is going to implement approach and instrumentation sensors that allow us to operate in those conditions in 2020. The device automatically shuts off when the laser barrier is cut.

What is Geotec's safety record and how has technology improved security for mining companies?

Geotec's safety indexes are excellent and have been improving with a frequency index (FI) of 0.67, a severity index (SI) of 2.01, and an accident rate (AR) of 0.001. These numbers have been achieved by implementing hands-free technology. Geotec will be the first company in Peru and Chile to implement

hands free technology in water wells, having bought equipment manufactured by Canadian company Foremost. There is currently no rod handler that manipulates the pipe, but we are going to buy a drill that guarantees that the pipe is handled hands-free. These machines have very high prices, but we are willing to make the investment ourselves rather than passing it on to our clients, because we are committed to constantly improving safety.

Does Geotec also work with junior mining companies?

We work with Regulus Resources, performing the drilling process of deep wells to help them reach their exploration targets. We have a very close relationship with Regulus' CEO, John Black, who invited Geotec to Coimolache because no company has been able to drill as deeply as we do. Although our work with Regulus has been successful for both parties, they are the only junior we currently work with. Geotec has strict financial policies, and with many junior companies payment can be an issue due to a lack of liquidity and cash flow.

Geotec recently signed a contract to work on the Lima Metro. Can you explain the importance of this project to the company?

This project is important because we are going to diversify operations to infrastructure even though we have only focused on mining. The Lima Metro has 17 stations located underwater, and Geotec has been hired to do the de-watering process, which is the same as we do for open pit mining. We drill water wells to dry the mine before the drill starts working. We have already drilled some pilot wells. Amphos 21 is the company working directly with Lima Metro and Amphos 21 subcontracted us, a company we have a very strong relationship with.

In which areas is Geotec investing in 2020?

Geotec is investing in technologies that increase productivity and safety. We seek to target increased production during downtime through automation and artificial intelligence (AI), and we are currently working on some AI projects to remove drilling workers from the firing line. We are aware that these investments are not going to have an immediate return of investment, but they will allow us to differentiate ourselves from other companies as leaders in the market. ■

Jorge Granda

General Manager
AK DRILLING



What do you think should be done to stimulate exploration in Peru?

These days, the government and the industry are focused on net profit and total revenue, but do not focus on the money left on the table. Investing in exploration generates a project pipeline, which in turn generates revenue to be used in education and social projects. The government needs to see where there is potential and act quickly, because investors are tired of waiting two or three years to know if there really is potential and cannot continue to invest if they are uncertain there will be a sufficient or a timely ROI. By losing these opportunities, Peru loses its competitiveness and these funds go to other countries.

Permitting must be sped up in order to recover opportunities for revenue and business that we are currently leaving on the table. Additionally, the investment climate for exploration must be incentivized to maintain Peru's dynamism as a jurisdiction.

How would you characterize the Peruvian mining market in 2020?

Investment during the last three years in Peru has been in brownfields rather than exploration. This can be attributed to two reasons: permitting and communities.

The importance of mining for GDP growth has always been recognized, however it is fitting to point out that the regions that receive cash flow are those with exploration projects. In the 1990s with the exploration boom, cash reached small provinces and stimulated domestic economies. It demonstrated how exploration can result in a positive chain of development where increased earnings translate to better living standards and upward mobility. The focus for a country to grow and prosper should be exploration, more so for Peru given its resources.

What is the split between AK Drilling's work with juniors compared to producers?

70% of AK Drilling's operations are at brownfield mines and 30% are for junior exploration. In comparison to other drilling companies, we have a greater share of business with juniors. Being a drilling company that works with both is interesting because it allows for synergies – what you learn from one can be shared with the other. We appreciate working with junior

clients because of their agility, and with majors for how they supports capacitation and safety standards.

Can you elaborate on AK Drilling's focus on innovation?

In 2019, we opened IDS in Chile, AK Drilling's technology branch that specializes in drill design. In liaison with IDS, AK Drilling is developing new technologies such as horizontal drilling, deep-pit drilling and automated diamond drilling. The goal is to improve machine efficiency, whilst being conscious of the importance of human operators for matters of safety and quality. Drilling is an artisanal practice where the human factor goes hand in hand, and therefore we do not believe that 100% automation will be achieved or is recommended.

From the client perspective, are you currently seeing a bigger focus on quality or price?

Our challenge for 2020 is to provide a sophisticated product with frontline technology and highly-trained personnel at low prices. It would be ambitious to claim that drilling clients are all willing to pay for quality. Nevertheless, the importance is starting to be understood, especially after some majors suffered poor results attributed to cheap drilling.

Companies hire AK Drilling for its quality, high safety standards with no accidents and production efficiency. We have to look for new ways to ensure efficiency and safety. That starts from the hiring of suitable personnel and machines with the latest technology.

Which areas do you view as having high potential moving forward?

AK drilling's operations extend across the continent, covering five Latin American countries. There are very interesting regional opportunities but the company's strategy begins in-house by strengthening its services. We measure success not by how quickly we can grow but by ensuring excellence of service and by providing positive results. AK Drilling's upmost priority is repeat business and ensuring that clients feel they are being served to the best of our capacity. The company's motto is to explore the resources of tomorrow to improve the quality of life today, a philosophy we would like to see adopted by all mining stakeholders. At the end of the day, Peruvians are the ones who will benefit the most from the influx of capital. ■

Blasting Technologies

M&A AND INNOVATION TO HELP STAND OUT FROM THE CROWD



Image courtesy of Gold Fields

➤ The competitive market for blasting services in Peru is served by both international and local explosive companies, including large players such as Orica, Famesa, Enaex and Maxam. So how does a company differentiate itself from the competition? One way is to buy the competition. On February 18th 2020, Orica announced it would acquire Exsa, Peru's largest manufacturer and distributor of industrial explosives, which Orica's managing director and CEO Alberto Calderon stated will immediately establish Orica as the number one player in Peru. Alejandro Caicedo, Orica's general manager in Peru, called the Exsa acquisition an "extraordinary opportunity" that reinforces its industrial capabilities, supply chain and market share in Latin America. "The merger of both companies generates a solid and talented team, a high range of products, top-quality solutions, cutting-edge technology and excellent service," he stated.

Caicedo went on to say that the winning players in the medium and long term will be those who can provide value and technology, rather than those that offer the lowest price. Giving the example of Orica's introduction of the Bulkmaster 7 Mobile Manufacturing Unit to a Peruvian mine, Caicedo added: "We are developing a fully automated blasting process, which considers innovations like WebGen, the world's first wireless initiating system that operates remotely, and BlastIQ, a cloud-based digital platform designed specifically to enable continuous improvement of blasting outcomes." Discussing how products are developed in the blasting industry, Caicedo was keen to stress that Orica looks for an integrated solution rather than simply a product, citing the company's acquisition of GroundProbe as evidence of

Orica's commitment to offer an 'end-to-end' approach. To emphasize Orica's focus on R&D, Caicedo continued: "We have more than 200 technologists and more than 40 software developers dedicated solely to our digital solutions to optimize the blasting process itself and the whole process downstream." While Orica is mostly present in open pit operations in Peru, the company sees the underground mining segment as a potential area of growth, and Caicedo mentioned that new blasting technologies can help support safer and more efficient operations. "Underground mining is still done very much in an old-fashioned manner, so there is an opportunity to change that without sacrificing margins," he said, before concluding: "Indeed, technology improves productivity and margins." ■



Alejandro Caicedo

General Manager - Peru
ORICA



When you do not do things manually, you generate an enormous amount of data with priceless information in real time, which will allow you to improve every single process. What is going to transform the business is having the tools and the ability to analyze all that data.



What have been the main developments for Orica globally?

Orica's focus is to have a real customer-centric organization, which is also what we are promoting in Peru. With over 140 years of experience and 1,500 blasts per day, today we continue to be the leaders in mining and civil blasting. Locally, we are the number one seller of cyanide, as this is a strong market for precious metals, and we have a big market share in the blasting business as well. From a financial and organizational standpoint, this is a good split; both businesses are good and they offer some synergies for the Peruvian market.

The Peruvian market is served by large international and local explosive companies. What is your positioning in this competitive scenario?

The market is very competitive and we need to offer good rates; however, in the medium and long term those that prevail will be who the ones that can provide value-added propositions and technology to its customers, rather than those that offer the lowest prices. For example, at Orica, we are already introducing the latest technology in Mobile Manufacturing Units, Bulkmaster™ 7, to an important customer in Peru, the first advanced truck in Latin America, that had only been used in Australia. In the same way, we are developing a fully automated blasting process, which considers innovations like WebGen™, the world's first wireless initiating system that operates remotely and BlastIQ™, a cloud-based digital platform designed specifically to enable continuous improvement of blasting outcomes by integrating data and insights from digitally connected technologies across the drill and blast process.

Could you comment on the acquisition of Exsa in February?

This operation represents an extraordinary opportunity for Orica as it reinforces our industrial capabilities, our supply chain and our position in the Latin American market - a region with good growth prospects. Although we already had a strong presence, this will be increased thanks to Exsa's broad customer base, which is of great interest to us. The merger of both companies generates a solid and talented team, a high range of

products, top-quality solutions, cutting-edge technology and excellent service, allowing us to add more value to our customers.

With Exsa we share values and principles such as commitment to the safety and sustainability of our operations, so our focus continues to be on working safely, responsibly and sustainably, ensuring the well-being of our people and the communities where we operate, and consolidating our position as the strategic partner of choice for our customers.

How important is it to look at the blasting process with an 'end-to-end' approach?

Energy is just one factor; sometimes you do not want so much energy because you want to control slope stability; sometimes you want stronger fragmentation, but you need to control dilution. What I want to say is that we look for an integrated solution, not simply a product. At Orica, we have an investment that is three times greater than that of our competitors in R&D. At the same time, we have more than 200 technologists and more than 40 software developers dedicated solely to our digital solutions to optimize the blasting process itself and the whole process downstream. We are competing with our technological solutions and not only with market-leading commercial explosives. Recently we acquired GroundProbe®, whose technologies are used to detect instabilities in real time and predict when collapse of mines and dams will occur.

Blasting presents safety risks. What can be done to remove operators from the line of fire?

You can remove operators from the line of fire by having connectivity and reducing human interactions to the minimum. We already have a wireless initiating system in Australia with BHP Billiton, for instance. When you do not do things manually, you generate an enormous amount of data with priceless information in real time, which will allow you to improve every single process. What is going to transform the business is having the tools and the ability to analyze all that data. With our tools in BlastIQ™ we will address this challenge and allow our customers to monitor from their desks how benches are progressing, hole by hole. ■

Laboratories & Chemicals

R&D INVESTMENT TO IMPROVE HEALTH, SAFETY AND SUSTAINABILITY

Laboratories

Laboratories in charge of geochemical analysis consist of larger bases, usually company headquarters located in the capital, as well as smaller mine site laboratories. In the case of Certimin, the former had to close briefly during lockdown, but the onsite labs remained active, according to general manager and director, Miguel Caillaux, who remarked that the company had already recovered to healthy levels of operation and turnover by July. Jonathan Campbell, Certimin's deputy general manager, explained how the company's geo-metallurgical approach is structured to provide solutions for different types of minerals. "The success of metallurgical tests depends on your capacity to look for new processes and be creative," he said, noting that after a process has been designed initially, it must be adapted to the mineralogy of the ore. "You need to run some simulations and change some parameters in order to improve the results, and then you can scale that up to an industrial volume." To enable this adaptability, Campbell noted that Certimin has expanded its automated flotation plant and today has 24 flotation cells, two vertical regrinding mills, two flotation columns and other complementary equipment. Between its central laboratory in Lima and preparation facilities in Arequipa, Puno and Cajamarca, Certimin can process 2,000 samples daily, with three current business divisions: geochemistry, metallurgy, and environmental. Caillaux revealed that Certimin is now opening a fourth division for operation support, including new technologies that do not necessarily involve laboratory tests: "One of our partners has developed a series of technologies to measure parameters continuously on-line, among these there is a software for tracing Covid-19 within the workforce."

Chemicals

In 2019, Melbourne based chemical distributor IXOM began a transformation strategy to focus on its strongest sectors and segments, according to César Castillo, general manager of IXOM Peru. In Peru, this process involved expansion of some of IXOM's business lines, such as mining, which represents 50% of the company's business activity (a figure IXOM envisions will grow to around 70%). Discussing how IXOM involves its mining clients in the R&D process when developing its products, Castillo explained that the company tests product performance in terms of a site's particular geology. "Minerals vary greatly, not only among projects, but often within the same operation," he said, noting that efficiency improvements rather than price has been the most important metric for clients. Regarding the type of mining clients IXOM works with, Castillo suggested the company was looking to expand its scope: "IXOM's mining business partnerships are currently with producers directly, but we want to increase our outreach to EPC companies and contractors too. Partnering with EPC companies brings advantages such as the integration of technology to mine design directly." The mining industry makes up around 30% of Quimtia's revenue, according to sales manager Eduardo Galdo, who related that Quimtia's mining business had been impacted more heavily than other sectors it works in, such as food, livestock and animal feed, but by August was back to 90% capacity. One of Quimtia's key products and technologies for mining is hydrogen peroxide to eliminate cyanide, and Galdo commented that the company has accounts with almost all the precious metals mining companies in Peru, but is now trying to expand into other metals. "We want to go into base metals too - in the pre-oxidation of the mineral in the slurry, once it goes into flotation. We have one or two trials going on using this technology, to help the client either recover more product, or to use less cyanide, which is more expensive than hydrogen peroxide," he said. Cyanide is one of the main costs for gold producers, and controlling the levels used can help lower costs and also reduce environmental liability. Swiss company CyanoGuard has developed technology that reduces toxic reagent usage and improves precious metal recoveries, focusing on cyanide detection, monitoring and optimization. "We basically help gold mines improve recoveries and reduce cyanide usage, saving them money and reducing their environmental footprint," summarized CyanoGuard CEO, Benedikt Kirchgässler. In April 2020, CyanoGuard raised US\$3 million from a seed round led by Wingman Ventures to help initiate pilot projects and expand the digital and artificial intelligence based aspects of its technology, according to Kirchgässler. Regarding the type of savings a gold mining company could expect to make using CyanoGuard technology, he replied: "The use of CyanoGuard's technology allows gold mines to reduce their cyanide consumption by 15-20%. As well as reducing cyanide under-delivery, by minimizing these times, we can increase gold recovery by about 2%." ■



Miguel Caillaux, Jonathan Campbell & Luz Blancas

MC: General Manager & Director
 JC: Deputy General Manager
 LB: Commercial Manager
CERTIMIN S.A.



MC



LB



JC



Can you summarize the main aspects of the geo-metallurgical approach at Certimin?

MC: In exploration, you typically take small samples from many targets and then you need to project the metallurgical parameters, but the scarcity of core samples makes it difficult to run the metallurgical tests. Together with an important mining company, we worked on a project to introduce a technology that uses an automated pilot plant that handles small amounts of sample and offers the same quality results, or even better quality results than a large pilot plant because of its sophistication in the measurements of all the parameters.

JC: In order to provide solutions for different types of mineral, we expanded our automated flotation plant and today we have 24 flotation cells, two vertical regrinding mills, two flotation columns and other complementary equipment. The success of metallurgical tests depends on your capacity to look for new processes and be creative. You design a process first, but then this has to change to adapt to the mineralogy of the ore. You need to run some simulations and change some parameters in order to improve the results, and then you can scale that up to an industrial volume.

LB: We were the first company in Peru to integrate metallurgical tests with geochemical analysis. The geo-metallurgical approach also requires that you have a strict sample management from the beginning, so these samples can be conserved and used in metallurgical tests - sometimes several years after drilling. In Certimin we have developed special procedures for the storage of these samples. In this field we have developed some of the most emblematic projects of the country.

Which contracts have helped mitigate the effects of the pandemic?

LB: There were two factors that helped mitigate the effects of the pandemic. First, in February we won an important contract for mine site laboratories in the gold mines: La Arena and Shahuindo, which is a great validation of our work because since 2010 we have won the bidding processes with three different operators: Rio Alto, Tahoe, and now Pan-American Silver. Whenever you have new

owners coming in, companies always revise their contracts and quality services of their suppliers, and we were happy that we continued to be the best option for them. At Certimin we have as mission to engage in long-term business relationships, and this is a good example. Additionally, in the second semester of the year we received the trust to manage the laboratory of the polymetallic mining unit of Cerro Lindo from Nexa Resources. The second factor is related to junior companies. Some of them are reactivating exploration, thanks to high gold and copper prices, and the granting of some important drill permits by the Ministry of Mines this year.

What is Certimin's current capacity, and how is the company incorporating new technologies and solutions?

MC: Putting together Certimin's Lima laboratory and the capacity of our preparation facilities in Arequipa, Puno and Cajamarca, we can process 2,000 samples daily in Lima. In terms of new technologies, Certimin currently has three divisions: geochemistry, metallurgy, and environmental, and now we are opening a fourth division for operation support, where we are including new technologies that do not necessarily involve laboratory tests. One of our partners has developed a series of technologies to measure parameters continuously online, among these there is a software for tracing Covid-19 within the workforce. As part of our long-standing relationships with Chilean partners, we are also offering automation and robotic systems for fuel handling to mining trucks. Finally, we have partnered up with Glencore Technology Australia and BGRIMM Technology from China who have an active role in scientific research and technology development in the field of comprehensive utilization of mineral resources.

JC: In Peru, we are the official laboratory for Glencore's Technology tests with Isamill and Jameson Cells. There are four large mining companies that already use these technologies, and as these penetrate the market, we expect an increasing demand for our services. In addition, the partnership with BGRIMM Technology will give access to our clients to technological innovations and a wide and diverse experience in mineral processing. ■

Eduardo Galdo

Sales Manager
QUIMTIA



⇒ **Quimtia works with hydrogen peroxide to eliminate cyanide. Considering the rising price of metals, is this an area that the company is trying to grow?**

This is one of Quimtia's most important products and technologies. Today, we have accounts with almost all the precious metals mining companies in Peru, and we want to maintain this market share. To build upon this, we want to go into base metals too, in the pre-oxidation of the mineral in the slurry once it goes into flotation. We have one or two trials going on using this technology to help the client either recover more product, or to use less cyanide, which is more expensive than hydrogen peroxide.

Can you describe the products Quimtia has that relate to tailings, including WaterShed?

Quimtia sells chemicals that are used in solid liquid separation, which help the tailings separate much faster from water, which helps utilize the tailings volume better. Quimtia has worked with Ecolab - Nalco to develop their WaterShed business in Peru. WaterShed is a technology that increases water recovery while improving deposits and increasing the life of a tailings dam.

How competitive is the chemicals industry from a mining standpoint?

It is a very competitive market. There are two sides to the business – the commodity side, where we try to offer the best price and leverage Quimtia's strong logistics chain to ensure the products are delivered on time and form. We have partnerships with logistics agencies to assist with this both on the purchasing side and the delivery side. The second side is the specialty business, where we try to sell technology rather than products. For this, we offer the client tailor-made solutions that are designed and tested with the mining companies, working closely together. We review the application of these chemicals to see how we can continuously improve, working as a consultant rather than a sales person. ■

César Castillo

General Manager – Peru
IXOM



⇒ **How important is the mining market for IXOM in Peru?**

Mining makes up 50% of our business activity and we envision this share to grow to around 70%. The pipeline for new projects in Peru amounts to more than US\$50 billion, which speaks to the immense potential for development in the country. We operate at all levels and have partnerships with small, medium and large-sized operations. Our clients include Hudbay, Gold Fields, MMG Las Bambas, Cerro Verde, Barrick and Antamina, as well as BHP-Escondida, Anglo American, Vale Brasil and Codelco Chile.

Can you elaborate on the company's focus on innovation?

Product innovation is IXOM's priority because it ensures we remain competitive, particularly with regard to constantly improving the operational efficiency for our mining clients. We have a reliable and proven range of reagents; our offer covers from bulk, solid, packaged, specialized and customized liquids to improve the recovery of mineralogical species. Thus, we improve productivity in oxide in copper, zinc and precious metals; we have unique products for the extraction of solvents and we also have custom collectors according to the mineral for the concentration of copper. In flotation, we have dispersants, primary and secondary collectors. In water treatment we have flocculants and antifoams, with unique customized products manufactured at our plant in Chile. We are also in the maintenance line with refrigerant gases and coolants. Finally, we also have emulsifiers for explosives.

We have a team of engineers dedicated to the development of new operational solutions for the mining industry. A recent and important innovation from our team in Peru has been the redesign of a froth flotation reagent, and our mining partner in this endeavor will facilitate the technological diffusion. This will be launched in Peru in 2020, but will be adaptable to operations worldwide and will be testament to the Peruvian mining industry's global influence. ■

Outsourcing, Transportation & Logistics

⇒ The success of any large industrial operation relies on knowing where to invest a company's human resources and knowing which 'non-core' activities can be outsourced to third party specialists. In the mining industry, finding mineral reserves and extracting them safely, sustainably and efficiently is the core business, but the list of processes associated with a successful mining operation is long. This is where third-party contractors come in.

One of the larger players in this sector is Confipetrol, a company of Colombian origin, but with a large presence in Peru as well as offices in Bolivia and Argentina, and the intention to expand into Chile. With more than 20 years of experience in South America and over 4,500 certified employees, Confipetrol offers a comprehensive range of services that include maintenance for the mining sector. "We usually help clients during opex rather than during construction, because we take care of their repair and maintenance services while an operation is in progress," explained Wilson Miranda, general manager of Confipetrol Andina (Confipetrol's Peruvian subsidiary), which has grown 20% annually in operation and maintenance (O&M) services.

Having worked with some of the largest players in Peru's mining industry, including Nexa Resources, Yanacocha, Minsur and Barrick Gold, Miranda suggested that the maintenance of equipment, plants, indoor mine equipment and open pit mine equipment is best left to specialized companies which measure their services through key performance indicators: "That is the best way to focus on finding reserves, exploring and processing them," he concluded.

"The trend for outsourcing and renting is evident across all business sectors, as companies continually search to reduce capex

and liabilities," said Fernando Martínez Cáceda, general manager of Avis Perú, who gave the example of companies preferring to rent computers rather than buy new, and the increase in shared office space, as widespread global trends. "The same trend is evident in the vehicle leasing market," he added.

Cáceda mentioned that Avis generally works with mining service companies, OEMs and contractors, such as SGS, Metso, Epiroc and Komatsu, and in recent years this side of the business has evolved substantially and now involves more than simply leasing a vehicle. "Today important information and data about the vehicle is available, including driving habits of the operator, how to reduce fuel use, reduce the need for maintenance, and minimize the risk of accidents."

Air travel costs for mining players in Peru are also being reduced, as companies can now share air-services, in part due to the development of clusters in the south of the country, according to Luis Fontenoy, general manager of Servicios Aéreos de los Andes (Los Andes). "Clusters allow companies to have capabilities that they would not have on their own. There are companies that need some services, but not in the necessary volume to justify chartering a flight themselves," he said, adding that sharing services can also dramatically reduce travel time. "Instead of taking up to 10 hours to reach the mines, travelling by road, we can help them cut that time to less than one hour."

One of the main logistical challenges in Peru is the location of the mines. The majority are at altitude, in the middle of the mountains, or in areas that often lack infrastructure. "These challenges represent opportunities for logistics providers, because companies need help in navigating and dealing with their peculiarities," observed Juan Alonso Checa, Latam director of Noatum Logistics, who cited Quellaveco and Toromocho as examples of complicated projects from a logistical standpoint due to their location in Ilo. As well as work on the development of Quellaveco and expansion of Toromocho, Noatum (which acquired MIQ Logistics in 2019), Noatum Logistics has been working on an expansion project at Las Bambas and the implementation of the copper concentrate transportation system for Mina Justa. ■

Wilson Miranda

General Manager
CONFIPETROL ANDINA



What has been the progress of Confipetrol Andina in the mining industry in the last year?

Confipetrol Andina (Confipetrol's Peruvian subsidiary) has grown 20% annually in operation and maintenance services. We do maintenance services for the mining sector, but also for the oil, gas and energy sector. The mining industry represents 60% of overall sales annually.

Among our main clients, we have participated in Nexa Resources' projects such as Pasco Mining complex, Atacocha, El Porvenir and Cerro Lindo, where we provide service and maintenance for their equipment. We are also working with Yamacocha in the maintenance of its plants, with Minsur in equipment maintenance, and with Barrick Gold at Lagunas Norte, among others.

How does Confipetrol maintain high safety standards?

Safety is at the core of Confipetrol's business. We have developed a behavior-based management system to make sure that employees have a proactive attitude with regard to safety, take care of themselves, and carry out thorough risk assessments and identification of hazards. Confipetrol's workers use all the necessary management tools so that they can work safely and minimize the risks of an accident. These management systems have allowed Confipetrol to sharpen its focus on safety and security, our main operational priority. Furthermore, Confipetrol has received the ISO 9001 certificate for quality, ISO 14001 for environment and ISO/IEC 18001 for safety.

How can third party service providers help companies focus on their core business?

Companies are looking for specialists that allow them to solve their main problems so they can focus on their core business – finding reserves and extracting them safely, sustainably and properly. Maintenance of equipment, plants, indoor mine equipment and open pit mine equipment is left to specialized companies that measure the service they are having through KPIs. That is the best way to focus on finding reserves, exploring and processing them. We usually help them during opex rather than during construction, because we take care of their repair and maintenance services while an operation is in progress.

Which of Confipetrol's services are helping the business grow in Peru and Latin America?

Third party services in operation and maintenance of concentrator plants, open pit equipment, fleet maintenance and underground mine equipment are all driving growth for the company. Confipetrol is looking to expand its services. We have opened offices in Chile and have participated in several tenders because we conducted a commercial survey to identify business opportunities. Customers verified that we have the requisite skills to be able to participate in large tenders, and we are eager to be involved in more projects in 2020 throughout Latin America. We are currently working on an important project in Chile that we are handling from Peru due to the expertise we have here. Chileans and Argentines value Peruvian mining expertise highly, which makes Confipetrol very competitive in the market. Further north, there is a lot of potential in Ecuador, and we will participate in Ecuador's Mining Summit in 2020 to identify business opportunities in this region.

What can mining companies do to change the negative public perception of the mining sector?

Large mining companies work hard at looking after the communities where they operate. Receiving permits in Peru can be a lengthy process, but the government is already working on trying to reduce those times. I was in a meeting with the Minister of Economy recently, and the government appears keen to help resource development in the country. Regarding social issues, the negative outlook is a global phenomenon. There must be a joint effort between the State, the private companies and the affected communities to solve the problems. Proactive measures should be taken instead of reactive ones.

What are Confipetrol's main goals and objectives in the mining sector for the next two years?

Confipetrol wants to be the first choice for customers in operation and maintenance services. We want mining companies to see us as the main operation and maintenance contractor that will solve your problems with high quality standards, safety and environmentally friendly actions. We always ensure high reliability of equipment and availability at a fair cost with the highest possible standards. ■



Image courtesy of Certimin

THE BENEFITS OF OUTSOURCING

The trend for outsourcing and renting is evident across all business sectors, as companies continually search to reduce capex and liabilities. For instance, these days companies do not buy new computers, and office space is also frequently rented or shared. The same trend is evident in the vehicle leasing market. Being able to monitor vehicle condition is particularly important for those working in the Peruvian mining industry, as sites are usually set in rugged terrain.

- **Fernando Martínez Cáceda,**
General Manager,
Avis Perú



Mining clusters allow companies to have capabilities that they would not have on their own. There are companies that need some services, but not in the necessary volume to justify chartering a flight themselves. Los Andes sharing services can dramatically reduce travel time. Instead of taking up to 10 hours to reach the mines, travelling by road, we can help them cut that time sometimes to less than one hour.

- **Luis Fontenoy,**
General Manager,
Servicios Aéreos de los Andes



The main logistical challenge in Peru is the location of the mines. The majority are at altitude, in the middle of the mountains, or in areas with complicated access, often in places lacking infrastructure. Toromocho and Quellaveco are a particular challenge since they are located in Ilo, which is not one of the most developed ports in Peru. These challenges represent opportunities for logistics providers, because companies need help in navigating and dealing with their peculiarities.

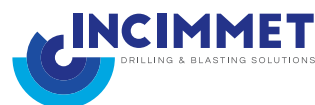
- **Juan Alonso Checa,**
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