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Peru's mining industry

Battling commodity cycles and social issues

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Cover photo: Cerro Corona gold-copper operation, courtesy of Gold Fields.

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Peru's bipolarity towards mining

The Tía María conflict demonstrates the need for careful planning

At the start of 2015, Southern Copper's Tía María copper project, a $1.4 billion venture, appeared at the top of the list of the next-to-be-built copper mines in Peru. The mobilization of anti-mining protestors in Arequipa's Tambo Valley, however, resulted in weeks of turmoil which saw the death of four people. The series of events included a weird announcement by a company spokesman on March 27th, according to which Southern was cancelling the project, only to be denied by his superiors a few hours later. This was swiftly followed by the publication of a recording where the main activist opposing the project is heard negotiating to stop the violence in exchange of a $1.5 million bribe.

As this report goes to print, the Tía María project is yet again on hold and the authorities have declared a State of Emergency in the province of Islay for 60 days, starting May 25th. The government has been sending mixed messages throughout the conflict, and while there is the impression that Southern Copper's communication strategies have been questionable, there is a general feeling that the President Ollanta Humala's administration has not provided enough support to the mining industry.

Peru's GDP only expanded by 2.35% in 2014, the lowest rate since 2009, and the depression in demand and decline in prices for mineral commodities are dragging down growth. The performance for 2015 still remains a question mark, but will probably be in the 2%-4% growth range. As the economy cools down after years of impressive performance, Peru cannot afford the luxury of letting multi-billion dollar mining investments go to other countries.

Mining investments over the first quarter of 2015 amounted to $1.7 billion, a 14% decrease year-on-year. One could argue that this figure is still healthy considering the global commodity-pricing scenario. However, the reality is that a big portion of this investment comes from the inertia of past decisions, and does not take into consideration the high opportunity cost of having large ventures at a standstill, such as Yanacocha's Conga project, and now Tía María.

Carlos Gálvez, president of the main industry association, the National Society of Mining, Petroleum and Energy (SNMPE), is not very optimistic for the coming years: "We had forecasted investments of $10 billion annually. In 2016, we will go down to levels below $5 billion, and in 2017, we will be at $2 billion. For 2018, if Quellaveco does not go ahead, we will be at zero. Something needs to be done," he said.

With uncertainty about future demand trends, as well as concerning the results of the 2016 presidential elections, and with some anti-mining leaders comfortably installed in several regional governments, the prospects for 2017 onwards do not look buoyant from the perspective of new project development. The government contends that it is aware of the problem and is trying to expedite the bureaucracy for exploration projects, but it still remains to be seen if this will have a positive effect in the short term.

Actually, what is keeping projects on the shelves is not that much the bureaucracy, but the social conflicts and the uncertainty about commodity prices. AngloAmerican's Quellaveco, another key project for the country, is still awaiting a production decision. On a positive note, Hudbay Minerals' Constancia, a $1.7 billion project, reached commercial production earlier this year. Also on the copper spectrum, construction at the huge Las Bambas project is close to completion, while the trebling of the processing capacity at Cerro Verde is also underway.

Other projects worth mentioning are Southern Copper's expansions at Toquepala and Cuajone; Buenaventura's Tambomayo gold project - a $200 million venture expected to be commissioned in 2016; Tahoe Resources' Shahuindo gold project, whose phase I will involve a $70 million investment; Hochschild Mining's Inmaculada, which just started production for an annual output of 6 to 7 million oz of silver equivalent; and Jinzhao Mining's Pampa de Pongo, a $1.5 billion iron ore operation plus $340 million port, which has been quietly advancing and has already received its environmental impact assessment approval.

All this shows that, while particular conflicts steal the headlines from time to time (from Río Blanco to Conga to now Tía María), the mining industry keeps investing in Peru. The mood might not be the best, due to the global commodities market, but every country with mining potential offers its own challenges. With outstanding geology, competitive power and labor costs and a great pool of providers in place, Peru will not cease being a top mining destination in the years to come. Operators and developers, though, will need to do a great job identifying and addressing social issues before conflicts come up, or they could see their projects endangered.

Production and development

Large investments in copper mines are finally starting to bear fruit

Hudbay Minerals' Constancia reached commercial production in Q2 2015. Photo courtesy of Stracon GyM.

Peru is the third largest copper producer worldwide, after Chile and China. In 2014, the country's copper output stayed practically flat at 1.38 million metric tons per year (mt/y). Since 2007, production has been pretty stable around the 1.2/1.3 million mt/y range. Now, however, copper production is expected to increase dramatically, with the commissioning of several large projects that will add around 1 million mt/y between this year and next.

The main recent producer is Hudbay Minerals' Constancia operation, which started production in December. The mine, a $1.7 billion venture, should yield between 100,000 and 125,000 mt/y of copper this year and average production will be 85,000 mt/y over a 22-year mine life. "The next big milestone will be to meet the design parameters in terms of steady throughput and metallurgical recoveries before the end of the year, so that we reach the nominal 89% recovery," explained Cashel Meagher, vice-president of Hudbay's South American business unit.

The company has moved its project team to Arizona to work on the Rosemont asset, but Constancia could open the door to further opportunities in the Andean region. "We have a project in Ancash that could be a grassroots discovery, into which we have only put $250,000 so far. Peru is so attractive because discoveries can still be made at the surface. Having said that, market valuations are so low that there is real interest in what the juniors may have. The problem is that many of these deposits are in places that are not favorable to mining," Meagher said.

Meanwhile, the gigantic expansion at Freeport-McMoRan's Cerro Verde mine from 120,000 mt per day (mt/d) to 360,000 mt/d should be ready by early 2016, pushing copper production from this operation to around 600,000 mt/y, as compared to 235,000 mt/y last year. Chinalco is expected to invest $1.5 billion to expand Toromocho, which produced a lower than expected 70,000 mt/y of copper last year, yet by March 2015 it ranked as Peru's third largest copper operation with 15,500 mt Cu produced during that month.

In Apurimac, former Glencore Xstrata project Las Bambas, now $62.5%-owned by MMG Ltd., will be a key addition to the country's copper production, with 2 million mt of copper during its first five years of operation, starting in 2016. Construction was 90% complete by Q1 2015. The operating consortium is investing around $3 billion to put the project into production, on top of the nearly $7 billion acquisition cost last year, a figure that includes the $1.2 billion that was spent beforehand by Glencore Xstrata.

"The acquisition of Las Bambas is a true transformational milestone for MMG. While we expect the mine to be in operation for over 20 years, we believe there is potential to extend the mine life through exploration, as only 10% of the total concession area has been explored. Having Las Bambas will also help us establish a solid platform for our growth in the South American region," said Gustavo Gomes, president of Minera Las Bambas.

Cashel Meagher, vice president South America business unit, Hudbay Minerals.

Gustavo Gomes, president, Minera Las Bambas (MMG).

With regard to metals other than copper, gold output fell from 4.87 million oz in 2013 to 4.54 million oz last year; zinc production also decreased, from 1.35 million mt to 1.32 million mt; and both silver and lead saw increasing production to reach 123.8 million oz/y and 278,500 mt/y, respectively.

Peru's great cost position

Being able to produce profitably despite defensive prices is a key advantage for many Peruvian operations. Barrick's Lagunas Norte, for instance, yielded 582,000 oz of gold in 2014 at all-in sustaining costs of $543/oz, the lowest cost of all of the corporation's mines.

This enviable cost position allows for new capital investments to continue pushing for


Lagunas Norte was Barrick's lowest cost operation worldwide in 2014. Photo courtesy of Barrick.


Manuel Fumagalli, executive director, Barrick.

efficiency and extending mine-life. Manuel Fumagalli, executive director of Barrick in Peru, gave some operational details: "This year we expect to finish building the Phase 6 of the new leach pad with an investment of approximately $60 million. We also expect to begin the construction of a waste dump expansion, at a cost of approximately $17 million. We currently have 2.8 million oz in reserves, which means, at current prices, a life of mine that can last until approximately 2018. We are evaluating options to capitalize on the refractive material lying beneath the current ore deposit. This could extend the life of the mine."

North from Barrick's operation in the region of La Libertad is Cajamarca, the geology-rich but conflictive region where the Minas Conga project is on hold, and where Gold Fields operates its Cerro Corona gold and copper mine. The South African-based company managed a 35% free cash flow margin from this mine in 2014 despite the low cycle. Ernesto Balarezo, executive vice president for the Americas at Gold Fields, described some of the cost-saving efforts that were behind this financial performance: "Fuel and power are key components of our costs. In 2014, we replaced our 70 to 100 mt trucks with a fleet of 30 mt trucks, reducing fuel consumption by 6%. We had 12% savings in power consumption thanks to an easier-to-process ore from the mine, and to the fact that we switched to polymer mill liners instead of iron liners. We also incorporated an additional crusher between the SAG mill and the ball mill, increasing productivity; finally we invested $7 million in two mobile crushers."

Optimizing this operation is key for Gold Fields, considering that the social environment in Cajamarca makes it impossible for the company to expand the mine: "For us, the most efficient growth would be via

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Ernesto Balarezo, executive vice president Americas, Gold Fields.

Santander Zinc Mine located in the Central Peruvian Polymetallic Belt. Photo courtesy of Trevali Mining Corp.

brownfield exploration around Cerro Corona, but we cannot apply this strategy. This situation goes against the best interests of the region and the country," Balarezo said.

The company has cut all its exploration programs worldwide with the exception of its Salares Norte project in Chile, and plans to keep growing in the Americas through acquisitions. Last year, Gold Fields decided to sell its controlling interest in the Chucapaca property to Buenaventura, Peru's largest precious metals player, that is currently reworking the project as an underground operation, named San Gabriel.

Buenaventura produced 422,000 oz of gold in 2014 from its direct operations (a 6% decrease year-on-year; and all-in sustaining costs were $843/oz Au), while it also controls 43.65% of Minera Yanacocha, which yielded a total of 970,000 oz of gold in 2014. The company is in the process of divesting four mines that it shut down last year. The main project in the company's pipeline is Tambomayo, which will produce 110,000 oz/y of gold and 3 million oz/y of silver starting next year. The company was anticipating a 25% increase in silver production at its Uchuchaccua mine this year, but it has been suffering from strikes.

Medium-sized producers

Peru presents very good opportunities for mid-tier players, as portrayed by companies such as Trevali Mining and Southern Peaks Mining. The former started commercial production at the Santander polymetallic mine last year, and the results for 2014 exceeded the company's guidance, as explained by Mark Cruise, president and CEO of Trevali: "Mine production has been improving consistently quarter after quarter, and the mill is performing exceptionally. By the end of Q4 2014, we had recoveries of 88% for zinc and lead, and 80% for silver, so we are already approaching our theoretical limits for recovery rates. By Q4 2014, our all-in operating costs were approximately $0.40 per pound of zinc equivalent."

With Santander now in production, Trevali is developing its second project in New Brunswick, Canada. Cruise, who pointed out that Santander is the first new zinc operation in Peru since 2005, affirmed that the company's bet on zinc is going to pay off as the market fundamentals shift over the next months: "2014 was the first year that there was a zinc deficit since 2008 and, in 2015, zinc is the only metal so far where global supplies have dropped. Besides, there are two large marquee mines that are going to close down this year: the Century mine in Australia and the Lisheen mine in Ireland. Therefore, the outlook is for stronger zinc prices in the second half of 2015."

With regard to Southern Peaks Mining, the company operates Quiruvilca, a base metals asset acquired from Pan American Silver, and Condestable, an underground copper mine bought from Trafigura. With those two mines as its foundations, Southern Peaks is looking at potential acquisitions and is also moving forwards at Ariana, a 70%-owned project in partnership with Pan American Silver, where a feasibility study has been completed. Quiruvilca and Condestable are mines that have been in operation for decades. Thinking outside the box is essential for achieving efficiencies, said Adolfo Vera, Southern Peaks' president and CEO: "Condestable is the second-largest underground mine in Peru, yet 70% of its production came from labor-intensive conventional mining (miners drilling with a jack-leg). We are trying to get 40% of our production through sub-level stoping with long-holes, which requires far less people. So far the results have been exceptional."

Finally, another low-cost producer that is well adapted to the low cycle is Sierra Metals, a company that acquired the Yauricocha mine in Peru in 2011. In 2014, it had all-in sustaining cash costs of less than $12/oz of silver. Yauricocha is an underground polymetallic mine that has been in operation for over 60 years. Last year it produced over 2.1 million oz of silver, on top of some gold, copper, lead and zinc. Moving forwards, the company plans to continue growth, both internally and through further acquisitions, taking advantage of the synergies created by the mines' cashflow and the operating teams in place in Peru and Mexico. "We primarily look at low-cost opportunities in precious metals. It is definitely a good time to go shopping," pointed out J. Alberto Arias, chairman of Sierra Metals.

Further down the pipeline

With Constancia already in operation, and with Las Bambas and the Cerro Verde expansion moving towards completion, the sector is realizing that there are no new large copper projects going towards construction phase anytime soon. Both Tía María (Southern) and Quellaveco (AngloAmerican) remain a question mark for different reasons; the latter should probably see a clearer path towards production if copper fundamentals strengthen over the next months.

Besides those, another important project in Peru's portfolio is First Quantum Minerals' Haquira, which is expected to be the company's second mine in Latin America after Cobre Panama, a $6 billion project currently under construction. The company also acquired the Taca Taca deposit in Argentina last year. Haquira is located in Apurimac, very close to Las Bambas, and is expected to yield 230,000 mt/y Cu. Mike Parker, general manager of First Quantum in Peru, explained how the region is going to change with the startup of these two operations: "Between Las Bambas and us we may get to a combined production of more than 600,000 mt/y from the region. It will be a major copper center. Mining is going to positively change the whole setup in Apurimac: it is

Andrew Swarthout, president and CEO, Bear Creek Mining.

Haquira is one of the main copper projects to be developed in the medium term. Photo courtesy of First Quantum Minerals.

currently one of the poorest regions in Peru, and social change needs to be managed."

Cobre Panama will not be commissioned before 2017, therefore the company has some time to build strong community ties before moving into production at Haquira. The company will need to relocate about 1,000 people, and currently half of its Peru staff is dedicated to social issues, although the company is also working around the project's technical aspects. Jorge Benavides Kolind-Hansen, corporate affairs manager at First Quantum, said:"The EIA will probably take us two years. We are also making good progress with the engineering studies for the mine and the different facilities. We are conducting archeological work as well and have acquired more mining rights to consolidate the area around the project."

With regard to projects in the precious metals spectrum, Minera IRL is looking for financing for its flagship Ollachea gold project, which has the necessary permits in place. The mine should yield around 930,000 oz of gold over nine years. In April, the company suffered the loss of its founding director, Courtney Chamberlain, who had led the company from its early days to position it as a medium-sized gold producer in Peru.

In silver, Bear Creek Mining has cut its generative exploration to focus on its Corani asset, a very large Ag/Pb/Zn project, while the company continues its work to recuperate its Santa Ana project as well, currently in dispute with the Peruvian government.

At Corani, the company recently published an updated feasibility study. The company's president and CEO, Andrew Swarthout, summarized the main highlights: "Our mine plan envisions an 18 year mine life. The payback period is very short: 3.6 years. The required capital upfront is $625 million and the sustaining capital has been reduced to $39 million; the overall capital has been reduced by about $54 million. We have been able to increase the silver recoveries to 72% and zinc recoveries to 60%: lead recoveries have fallen a bit, but of course the driver of the project is silver.

Unlike most other silver and base metals mines in Peru, which are underground small or medium type operations, Corani will be a large open-pit expected to produce 13 million oz/y of silver, as well of several hundred thousand mt of zinc and lead. This, said Swarthout, positions Corani in an advantageous position in the current environment of depressed silver prices: "With very few exceptions, silver producers worldwide are struggling to make money, with costs between $18 and $22 per oz."

"In this context, we can be opportunistic on an asset like Corani. We do not have to build it now and finance it under egregious conditions; we can wait for the right timing. All-in cash costs at Corani for the first five years will be $8.50 per oz, so the project is very well positioned," Swarthout concluded.

Cerro Corona is expected to be in production until 2023. Photo courtesy of Gold Fields.

Exploration

Creative business models provide some light at the end of the tunnel

Aruntani and Indico Resources have signed a joint venture for the development of the Ocaña project. Photo courtesy of Indico Resources.

Mirroring what has happened globally in the industry, overall exploration expenditures in Peru decreased by 50% between 2012 and 2014. Access to funds has become much more difficult, and in this context, junior companies are implementing a wide variety of strategies to survive, including signing joint ventures, divesting non-core assets, investing in feasibility studies rather than drilling, and shifting the business focus towards a cash flow-creating model.

"This is my fourth bear market, and I have learned that in different market environments you need to do different things. When it is easy to get money and properties are expensive, we have tended to focus on early-stage exploration work. Now that properties are worth nothing and money is hard to find, we are looking at acquiring projects already found by others," said Miles Thompson, president and CEO of Lara Exploration.

Lara, a company focused on project generation, has managed to survive market volatility thanks to the income generated by joint ventures and project transactions. Other companies are trying to follow the same model, for instance the newly formed Alianza Resources, coming from the merger of Estrella Gold and Tarsis Resources.

In addition to the global exploration crisis, Peru managed to make things worse for explorers at the beginning of the current administration, with increased layers of bureaucracy. Alex Aquino, country manager of Iamgold, referred to the cumbersome process: "Last year we needed 10 months to obtain the permits to drill 1,500 meters, and we had to go through five different ministries: Environment, Energy and Mines, Culture, Health and Agriculture. If there were just one governmental authority dealing with all these permits, the process would be much faster."

During the latest PDAC Convention, government officials assured that efforts are being made to simplify the permitting process, but this will not solve per se the problem of dry markets for exploration. Bearing this in mind, many juniors are starting to think as mining companies rather than explorers.

Get me some production

One of the key paradigm changes of the current market is that investors want to perceive that a project can be put into production rapidly and efficiently. In this respect, companies are making the most of their outlined resources to assess if that is possible, through feasibility and engineering studies.

In the words of Bob Baxter, president and CEO of Indico Resources: "There is a certain apathy today in the investors community, which does not want to consider anything that is not at a fairly advanced stage. The way we can add value to our shareholders is moving the project towards production." Indico's main asset is Ocaña, where there

Alex Aquino, country manager, Iamgold.

is an inferred resource of 50 million mt of soluble supergene copper. "We believe that we have potential for a 25,000 mt/y operation for 10 years," said Baxter.

The capital expenditure to put Ocaña into production is estimated at $100 million. In order to finance that, Indico has recently signed a joint venture with local Peruvian company Aruntani, whereby the latter can acquire 70% of the project by spending $18.6 million.

In the precious metals segment, Andean Gold is focused on moving towards production at its 100%-owned Urumalqui gold-silver project. With a 43-101 resource estimate of nearly 2 million mt, which does not include further exploration campaigns since 2012, Urumalqui could be put into production at a cost of just $10 million, said Alexander Peña, president and CEO, Andean Gold: "Although the grade is not extraordinary, we expect the mining to be cheap, since all the resource is contained within a package of 1,500 meters long and 200 meters deep. We are very confident with the resource that we already have and our strategy is to move towards production, not to do more exploration."

Other gold-focused companies moving towards production are Lupaka Gold, which has already started underground mining activities at Invicta's Atenea vein; and Peruvian Precious Metals, that has recently signed joint ventures with Peruvian partners to get mining going at their Igor project.

One of the classic names in Peru's junior segment, Vena Resources, is also focusing on advancing its Esquilache silver project towards a cash flow scenario. Esquilache is a former mining site from the 1950s and 1960s. Juan Vegarra, chairman and CEO of Vena, provided more information: "There is a 900 meter hill at Esquilache; Hochschild mined the first 200-300 meters, so the rest is still virgin. We need to go after the remaining mineralization. Before we do that though, we need to drill to measure the resource. We are evaluating the amount of oxide ore needed to put the mill into production."

Juniors keep adding value

One of the key junior players in the copper segment, Panoro Minerals, has recently published a positive preliminary economic assessment for its Cotabambas Cu-Au-Ag project, as Luquman Shaheen, president and CEO, explained: "The main conclusion from the PEA is that the resource, the mining plan, the metallurgy and the infrastructure are all good. Secondly, the project has strong economic parameters: a very strong after-tax net present value (NPV)

Luquman Shaheen, president and CEO, Panoro Minerals.

of $627.5 million, a very quick payback of four years, and a significant amount of payable gold and silver, with average direct cash costs (C1) of $1.26 per pound of copper, which place it in the lower quartile of costs worldwide."

Cotabambas has a resource of 117 million mt (indicated) and 605 million mt (inferred). Panoro is undergoing a feasibility study at the project, with the idea of completing it in about two years, while it is also undertaking a PEA at its main other project, Antilla, which has 338 million mt of mineralization between the indicated and inferred categories. Both Cotabambas and Antilla are in Apurimac, host to Peru's emerging copper district.

Meanwhile, AQM Copper, which holds 30% of the Zafranal copper deposit in Arequipa together with Teck and Mitsubishi Materials Corp., is advancing a pre-feasibility drilling program at the project. The company has a total PFS budget of $30 million and expects to release this study in early 2016. "Our in-pit sulphide resource is about 353 million mt grading 0.41% Cu and 0.08 g/mt Au. The idea is to come up with a mine-life of around 20 years, with the lowest capex possible. One of the big drivers for the capex is water solution. We are making good progress in finding the right solution for water supply," said Bruce Turner, president and CEO of AQM Copper.

In Cajamarca, a project that should see a new dynamic over the next couple of years is Antakori, following the merger of Regulus Resources with Southern Legacy Minerals. Led by John Black, who successfully sold Antares Minerals to First Quantum in 2010, Regulus is strengthening its social team in Peru. "The priorities now are to complete the consolidation of the mineral concessions, build a strong community relations team and establish a good relationship with stakeholders in the project area. We are looking at mid 2016, realistically, before we can drill; but we like this pace. If we were in a hot market, we might be tempted to cut corners both technically and socially," said John Black, CEO, Regulus Resources.

John Black, CEO, Regulus Resources.

Antakori already has a 43-101 inferred resource of 294.8 million mt at 0.48% Cu, 0.36 g/mt Au and 10.2 g/mt Ag. "The combined grade is very attractive, between 0.7% and 0.8% Cu equivalent depending on your parameters. This is a higher grade than many bulk copper opportunities around, with a very nice gold component and, the mineralization is open. We see potential for those numbers to substantially increase," said Black.

Besides Antakori, Regulus has a number of other projects, including Rio Grande in Salta, Argentina; Puchuldiza, in northern Chile; and Golden Brew in Nevada, which the company plans to drill this year.

Also in northern Peru, in the region of Lambayeque, Candente Copper has its Cañariaco copper-gold-silver project, which suffered anti-mining opposition in the last years. The company is currently looking at financing options to move forward with the project, which has a measured and indicated resource of 7.5 billion lb Cu, 1.6 million oz Au and 45.2 million oz Ag at a 0.30% Cu cut-off grade, plus additional inferred resources. "We are approximately 50% complete on a definitive feasibility study. We still have to conduct more geotechnical drilling for the design of the pit and tailings dam, and more metallurgical test work for the design of the plant. Although we stopped the engineering work, we continued building social relations," said Sean Waller, president of Candente Copper.

Beyond copper and precious metals

Two of the most active juniors in 2015 are not focused on precious metals or copper. After switching to phosphates a couple of years ago, Focus Ventures is advancing its Bayóvar 12 project very quickly in northern Peru. Meanwhile, Tinka Resources is focusing on its Ayawilca project, where earlier this year it released its first zinc resource of 13.3 million mt grading 7.7% zinc equivalent.

"Zinc has been the ugly duckling for a long time, yet the fundamentals of zinc are very good," affirmed Graham Carman, president and CEO of Tinka Resources. "Over the last few months we have also found tin and copper below the silver and zinc. We want to drill at least 10,000 additional meters at Ayawilca to grow our resource as fast as we can, and to do some exploration on the tin and the copper."

Besides Ayawilca, the company also holds a silver resource at its neighboring property, Colquipucro, for a total of 32 million oz (inferred). The plan is to do a PEA on this project. "The silver is important to us because it gives us the possibility of early cash-flow. The zinc would be an underground, higher-capital cost, longer-term operation, where at some point we may need a partner. The market is starting to perceive us more as a zinc company than a silver company. We like to point out that we have different options to add value," emphasized Carman.

With regard to Focus Ventures' phosphate endeavor, the company has reinforced its ownership position, recently

Graham Carman, president and CEO, Tinka Resources.

David Cass, president, Focus Ventures.

acquiring 70% of Bayóvar 12 after a renegotiation with the local partners. The idea is to be in a better position to raise funds for the project, said David Cass, president of Focus Ventures: "Despite the encouraging results, the markets have been unforgiving. One of the issues we faced was that without an actual interest owned in the property it was difficult to attract funding through an industry partner or equity financing."

Focus managed to put together a phosphate resource in a matter of months, currently standing at 115 million mt (indicated) and 73 million mt (inferred), both grading approximately 12.4% P_2O_5. With this in hand, the company is undertaking an additional drilling campaign this year. "We are confident that the additional 40 holes that are planned will help us nearly double this resource, and allow us to upgrade roughly 100 million mt to 150 million mt to the measured category," said Cass.

In parallel to the resource definition, the company has already made metallurgical tests with Jacobs in Florida: "Our PEA, currently underway, will look at production scenarios from 300,000 mt/y to 1 million mt/y. We are also looking at a near-term smaller scale operation to produce direct application phosphate rock. This sells for a much higher margin as an organic fertilizer product to local markets in South America," Cass concluded.

Northern Peru is positioning itself as a world-class phosphate district. Barclay Hambrook, president and CEO of GrowMax Agri Corp., another company exploring in the area, gave some insights about its history: "Initial exploration and development work in the Bayóvar region in Peru's Sechura desert stretches as far back as the 1960s. However, up until a decade or so ago, minimal work had been executed in this region."

Today, Brazilian miner Vale already has an enormous phosphate operation in the area, in partnership with Mosaic and Mitsui; while the Hochschild Group is also developing an phosphate project there, through its Fosfatos del Pacífico subsidiary, in partnership with Mitsubishi and Zuari Industries of India. With regard to GrowMax Agri Corp., a subsidiary of Americas Petrogas, the company counts IFFCO of India as a partner and it already has a 43-101 compliant resource estimate at its Bayóvar project. All signs indicate that, even if Peru will be mostly known for its metallic richness, non-metallic mining will also see some dramatic developments in the years to come.

Northern Peru is emerging as a world-class phosphate district. Photo courtesy of Focus Ventures.

Gold processing

The tolling business is gaining traction in the investors community

Dynacor was the first Canadian-listed company to enter the gold tolling business in Peru. Photo: panoramic view of the Huanca mill, courtesy of Dynacor.

Peru's gold processing business has been around for decades, yet it is the subject of fresh international attention. Companies listed on the Toronto Stock Exchange are increasingly investing in the segment, following the success of Dynacor Gold Mines, a company whose stock price went up through the downturn while most other exploration-focused juniors struggled to raise funds or even survive. Dynacor has demonstrated that investing in a processing facility can pay attractive dividends, which can then be used to support exploration activities without having to raise more equity. Over time, what started as a supporting revenue generator became a core income for the company, thanks to higher gold prices and to the Peruvian government's effort to formalize the artisanal gold mining segment. "In 2013, 22% of Peru's gold exports came from small mining operations, including formal, artisanal and illegal mines," said Jean Martineau, president and CEO of Dynacor Gold Mines.

The company is expanding its Huanca mill to reach a capacity of 300 mt/d, and has recently received the construction permit for its second gold processing unit, Chala, which will also process 300 mt/d. Dynacor was one of the first juniors to invest in the tolling business in Peru but is no longer the only player in this segment. Inca One, Standard Tolling, Montan Mining and Anthem United are all investing in their own plants around the country. "When we began, we had low recoveries, but today we have almost a 95% recovery rate, which is one of the highest in the country. Now, many other companies are coming to replicate our business model, but you cannot achieve that overnight," said Martineau. "When you build your mill, you design it according to your ore. In our case, we buy ore from 200-250 different miners. On the other hand, you need to build a network to source the ore, and that takes time."

Martineau assured that only a portion of the aforementioned 22% of gold production will manage to successfully formalize, leaving the rest of the ore in a limbo where formal mills would not be able to purchase it.

Yet, gold processors are not only looking for artisanal miners' ore. Len Clough, president and CEO of Standard Tolling, explained that formal mining companies offer significant business opportunities as well: "We have just signed a contract with a formal mining company: the beauty of which is that, being a larger contract, we can fill our initial capacity quickly. Once you reach capacity, you push grade and additional volume for expansion. We want to have a diversified portfolio. Ultimately, if we find a production-ready mining project, we could build a plant there easily."

In December, Standard Tolling completed the acquisition of the Huamachuco plant in northern Peru for $1.8 million, and

Jean Martineau, president and CEO, Dynacor Gold Mines.

Mark Wright, vice president for operations and new projects, Inca One Gold.

Standard Tolling's initial focus is on northern Peru. Photo: Huamachuco mill, courtesy of Standard Tolling.

is commissioning it with an initial capacity of 100 mt/d, expandable to 350 mt/d over the next months. Clough assures that the market offers great opportunities for newcomers, even if he recognizes that in Peru there is already a battleground for 1 oz per metric ton (oz/mt) material: "When they source material in the north, operators in the south like Dynacor set a very high cut-off grade, for instance 1 oz/mt. In these mines, there is a lot of 15 g/mt material that the other operators do not even touch. We are volume-focused, whereas our competitors are more grade-focused. We could comfortably have three to five plants north of Ancash, which would create a capacity of over 1,000 mt/d, but still not saturate the market."

While Dynacor also has an exploration project, Tumipampa, on which it will spend $5 million this year, the rest of the players are focusing solely on the processing business. Standard Tolling owns the Río Tabaconas project in Cajamarca (a former Grosso discovery) but it is looking at strategic options for it.

Meanwhile, Inca One Gold is also concentrating on developing a network of processing plants in Peru, as explained by Mark Wright, its vice president for operations and new projects: "The junior resource space has been pretty tough for a while. We were an exploration company, but as with everybody else, we could not raise the necessary capital to continue exploring. The gold milling business is a cash flow business, much less risky than punching holes."

Inca One Gold acquired the Chala One gold plant in the region of Arequipa and obtained debt financing to scale up the facility to 100 mt/d. In March, the company announced that Chala One is already in commercial production. According to Jaime Polar, vice president of operations and development at Inca One Gold: "The company's aim is to have properties up and down the coast to be able to service effectively the Peruvian market."

Another newcomer in the gold processing business is Montan Mining, a company that acquired the Mollehuaca 150 mt/d mill at the Chala valley and the Eladium mine, where the company is investing $150,000 in order to get production to 15 mt/d of 30 g/mt gold mineral. Besides the small mining segment around the plant, the company sees great opportunity to source high-grade material from the north of the country as well. "Apart from the typical carbon-in-pulp and crushing circuit, we also have a flotation circuit onsite. Peru is a very poly-metallic country, and there is only one other flotation circuit in the Chala region, so this gives us a competitive advantage to maybe process some mineral that other toll millers cannot handle," said Luis Zapata, executive chairman of Montan Mining.

Finally, Anthem United is taking a different approach than its peers. Rather than acquiring existing infrastructure, it is building a whole new mill from scratch in Arequipa, in partnership with EMC Green Group, a Peruvian company. The mill, called Koricancha, is a $10 million investment and will have a capacity of 350 mt/d. The company is also investing $2 million in the initial ore acquisition. "Anthem strategically chose the Koricancha mill's location to ensure that it has easy access to roads, with no communities in the vicinity. The mill has been designed in such a way that its infrastructure is purpose built to suit small-scale miners," said Greg Smith, CEO, Anthem United.

Zapata from Montan Mining, an investment banker by background, says that the gold processing segment should partially help improve the performance of mining stocks: "Investors regionally and internationally have suffered four years of a bear market. Bay Street has shied away from mining stocks over the last two years, but Canada is historically a key source of funds for mining projects worldwide. The market will come back," he assured.

Engineering and construction

The need for strong and reliable partners

The completion of Constancia, Las Bambas and Cerro Verde may open a period lacking new large construction projects in Peru's mining industry. Photo: Las Bambas concentrating plant under construction, courtesy of MMG.

Engineering and construction companies do not escape the general downturn and are trying to bring efficiencies to mining clients. A few years ago pretty much any levels of capex could be justified, but today this is no longer the case. New projects need to be reengineered in order to accommodate lower metal price projections, or risk being discarded for economic reasons.

In order to reduce costs, mining companies are strengthening their own procurement offices, increasing control over purchasing decisions and even questioning the previously dominant EPCM model for large projects. According to Óscar Scarpari, managing director for the Andean area at Techint Engineering & Construction: "The EPCM model generates a double layer of management in many areas. There is a trend amongst big mining projects to try to optimize the process, with more integrated EPC contracts."

Although oil and gas has traditionally been the company's core, Techint E&C had already developed some significant projects in mining in Argentina and Chile, before being awarded some contracts by Jacobs and Chinalco for the Toromocho copper project in Peru. Another company present in Toromocho was HV Contratistas, a Peruvian contractor now controlled by SalfaCorp of Chile, that had some civil works contracts and also participated in the plant's dry area. The company also built the truck shop for Glencore's Antapaccay and has had a significant involvement in Antamina over the years. One of HV Contratistas' recent projects was Impala's new minerals terminal at the port of Callao, where the company undertook the civil works and the mechanical installation. "For Impala we installed South America's largest side discharge wagon tippler and the conveyor belt system. It was a complicated project; we had to pump 10,000 cubic meters of water daily for 18 months," explained Antonio Ferreccio del Río, general manager of HV Contratistas.

Now, the company wants to expand its service offering to the mining industry to engage in longer-term relationships that go beyond the construction of new projects. "We want to obtain operation and maintenance contracts (O&M). It is an area where we have good experience, understanding the needs of the client and expanding our service offering from civil works and industrial installation to areas such as tunneling, blasting and others," said Ferreccio del Río.

Working hand in hand with the client

The increased interest in mining services responds to several factors, including the construction groups' need for more stable


Antonio Ferreccio del Río, general manager, HV Contratistas.


Pedro Romero, director, OHL Construcción.

cash flows and the mining companies' will to outsource non-core activities.

"The advantage of having a services company such as Stracon GyM is that it provides us with long-term contracts," said Juan Manuel Lambarri, general manager of the engineering and construction business for the Graña y Montero group, Peru's largest conglomerate in this segment.

Graña y Montero is executing the construction of Las Bambas and the expansion of Cerro Verde, as well as of Inmaculada, Hochschild Mining's new silver mine. Over the years, the group has participated in the construction of 50 concentrating plants in the region and has established a presence in Chile and Colombia through acquisitions. Stracon GyM is its Peru-based mining contractor; it is doing work in Panama for First Quantum's Cobre Panama mine, while in Peru it has two key clients; Tahoe Resources (previously Rio Alto) and Hudbay Minerals, under 'alliance contracts.'

Steve Dixon, CEO of Stracon GyM, explained this concept: "Traditionally, contracting is a fairly hard-nosed industry, often resulting in the client and contractor not successfully delivering the best outcome for the project. Alliance contracts, on the other hand, are quite flexible and can provide a platform from which to work together, to put the interests of the project first."

In other words, contractors need to tick a number of boxes, including having strong engineering departments, great safety records, strong financial shoulders, and the will to assume important responsibilities for the success of the project.

Pedro Romero, director of OHL Construcción, part of a large international group based in Spain, spoke about the need for long-term commitments with their clients: "In this slower period, we are taking advantage of one of our virtues: our capacity to add value when clients are trying to lower their costs. We are ready to reduce costs thanks to our engineering capacity, without lowering quality. The fact that Peru is a home market for OHL helps us promote our business in mining, which is a strategic sector."

OHL completed two large projects with major mining companies in Ancash and Apurimac last year, and expects to be awarded more work as soon as new projects receive the green light in the country. "Last year was not a good year overall, yet we had a significant presence in the mining sector. We completed 15 million man-hours with no lost-time incidents at our project in Apurimac; we also had an award for our environmental performance," Romero concluded.

Engineering and environmental consultancies

The most recent addition to Peru's open-pit copper portfolio has been Hudbay Minerals' Constancia. The project was handled by Ausenco under an EPCM model. This was a great milestone for the Australian company that had not completed a $1-billion plus EPCM project before.

"When you start the engineering, you need to have as few fixed variables as possible, because those limit the feasibility of the project," said Alberto Coya, general manager of Ausenco in Peru. "It is at the beginning when you can introduce big cost-saving modifications. We are known for doing 'fit for purpose' engineering, according to the size and complexity of the project and to the client's needs in its cost structure."

Marcelo Martínez, business development leader at Golder Associates Peru, agreed that every project requires a tailor-made strategy: "In Peru there are very large projects impacted by climate-altitude conditions, topography, seismic tectonic scenarios or seismogenic faults, landslide risks, etc., so you need to manage carefully the geological and geotechnical hazards in the area. Every project is different, there is not a copy-paste approach."

Golder Associates has had an office in Peru for 18 years, where it offers the company's core service areas, including ground engineering and water and environmental work, and has its own laboratory in Lima. Country manager Brian Griffin said that the company is diversifying to adapt to the mining downturn, yet "even if mining investments are reduced, mining will continue to be our main market sector."

The challenge for consultants is how to maintain a top-class service when mining companies want the same standards for less money. According to Lionel Ciampi, country manager of MWH, a global consultancy with a team of 300 people in Peru: "Mining clients always want to optimize their investment projects; over the last couple of years, they have increasingly targeted cost reductions and their hiring processes have changed. The market has become much more competitive."

MWH's clients in Peru include Cerro Verde, Gold Fields and Las Bambas. Ciampi explained that mining companies do not want to reduce the quality of service obtained from consultants, because that would endanger the sustainability of their projects. "We cannot reduce quality to be competitive; our future in Peru relies on the quality we have shown over the last

Lionel Ciampi, country manager, MWH.

20 years in the country. What we do is making the most of our global experience to complete the jobs in less time, without compromising quality."

Engineering consultancies typically grow and downsize easily according to project requirements. For Ausenco, for instance, a key challenge post-Constancia is to get new projects that will maintain the high levels of work of the last couple of years. Projects notwithstanding, it is important for consultancies to keep a minimum structure, below which it would be difficult to serve a market as large and diversified as Peru's mining industry.

Carlos Soldi, general manager of SVS Ingenieros, part of SRK, explained that their Lima office counts 100 professionals. "It is a similar size to SRK's Chile office. We do not intend to grow much more because with this number we can run the company efficiently and we can provide all the services we offer. This is one of our competitive advantages: not many consultancy firms operating in Peru have all their staff in-country. They are forced to bring expats, which increases costs."

The global village

The globalized economy and the enhanced connectivity of the digital age are also allowing for increased participation of foreign consultants in Peru's mining industry, even without a Peru office; in the same way as Peruvian engineers are working on projects worldwide from their Lima branch.

AMC Consultants, an international company headquartered in Melbourne, is increasingly working on Peruvian projects from its Vancouver office. Dedicated to different practice areas along the value chain, from resource evaluation to mine design and business improvement, the company is now evaluating opening an office in Peru. "The downturn in the market over the last few years has reinforced the need for mining consulting companies to work in a variety of jurisdictions around the globe. With 17% of the AMC Vancouver office revenues having been generated from Peruvian projects since the start of 2013, Peru is seen as an ever-more important jurisdiction within the company's portfolio," said Bert Smith, the general manager and principal mining engineer of AMC Mining Consultants (Canada) Ltd Vancouver. Smith assured that AMC is navigating the low cycle thanks to high levels of repeat business (more than 85%), and the fact that the company has managed to retain its core staff as well as open a new office.

EPCM Experts, a Peruvian consultancy that positions itself as a project integrator, intends to expand overseas after several years working in Peru on projects such as Shougang's Marcona, Barrick's Lagunas Norte and Hochschild's Inmaculada. According to its general manager Víctor Anyosa: "There is a need in the market for project integrators that think like their clients. As a general rule, each contractor only discusses its own specialty. Our strength is to integrate all segments."

Anyosa explained that the company, which also has a construction arm, can handle projects between $50 and $800 million and that there is a space in the market for companies in that niche, as long as growth is not limited to local projects: "To stay small and local is dangerous. Local consultancies charge between $35 and $50 per hour, while at the other extreme multinational companies are not flexible with the client, with rates between $75 and $100 per hour. There is a space in between for new multinationals that align with their clients' expectations."

Underground contractors

Lower metal prices have especially damaged underground operations, and silver has been one of the most heavily affected commodities in this cycle. In this context, contractors need to be very flexible to work together with the mining client for proper extraction planning and cost management.

Wayne Levert, Peru general manager of Dumas, described the local market: "Local companies in the underground segment grow very slowly and seem hesitant to make investments in expansions; they only do extensions using the company's cash flow, rather than investing new money. Silver miners are having a tough time."

Originally from Canada, Dumas is now present in several countries including Mexico and Guatemala, as well as Peru. Levert explained that a local office is crucial in order to understand the market's particularities: "We are the only specialized modern shaft contractor in Peru. Some international contractors are bidding on projects from the outside, but Peru has unique laws, rules, altitude and culture, and no one wants a contractor that would have to learn these things while executing a contract."

Wayne Levert, general manager, Dumas.

Wilder Ruiz Conejo, president, JRC.

Dumas has been in Peru for five years and has already worked with companies including Glencore at Yauliyacu; Pan American Silver at Morococha for shaft rehabilitation; Marsa for an 800-meter brand new shaft; and Milpo.

JRC Ingeniería y Construcción, a Peruvian underground contractor, has been expanding its offering in order to provide an integrated contract mining service. According to Wilder Ruiz Conejo, president of JRC: "We virtually operate 100% of the mine, delivering the ore at the processing plant. This integrated approach allows for better operational planning, a more efficient assignment of resources, higher productivity and lower costs overall."

One of JRC's key contracts is with Minera El Brocal at their Marcapunta Norte underground mine. As part of the company's corporate strategy, JRC is in the process of obtaining the triple certification, which is another example that shows how the mining industry is driving the development of stronger providers across the whole value chain.

The integration of services also applies to the different segments of underground contracting. Robocon, a specialized provider of shotcrete ground support services, is in the process of implementing cemented fill production plants in some of its operations in six Peruvian underground mines. The company also designs and produces its own equipment to support the company's services offering.

"Thanks to vertical integration, we have increased our production volumes from 2,000 to 10,000 cubic meters of material monthly. We have also integrated the provision of additives and fibers for shotcrete," said Enrique Sattler, general manager of Robocon, who pointed out that the process has provided interesting synergies and cost savings for clients.

Sattler commented on the trend in Peru's underground segment towards having less but stronger contractors: "Shotcrete machines are very different from other underground types of equipment, so for the client it makes sense to have one single contractor to take care of all their shotcrete needs. We can work on 18 fronts simultaneously with our specialized equipment," he concluded.

Equipment

Covering the whole range from open pit to underground

Peru's large fleet of equipment in remote locations demands a strong after-sales effort by providers. Photo courtesy of Ferreyros.

2014 was a slower year for equipment providers in the mining and construction businesses in Peru; new mining and infrastructure projects were delayed and the economy did not expand as much as had been anticipated. According to Divemotor, which represents Mercedes Benz in Peru and is particularly strong in mining with the Actros truck model, the sale of mining-oriented vehicles decreased by 40% last year. "We see great opportunities in medium-sized mining because mines are trying to lower operational costs. Many mine operators supply the fuel to their different contractors, and they are seeing that they can reduce costs by selecting the equipment brands that their contractors use," said José Antonio Heredia, manager of Divemotor's trucks division.

Thus, efficiency-related projects can lead to new equipment purchases, as portrayed by Gold Fields, which achieved fuel cost savings of 6% by replacing its truck fleet. Meanwhile, some service providers are also investing in new equipment, getting ready for when the market picks up. Explomin, a drilling contractor, has recently incorporated two Schramm reverse circulation drilling rigs worth $1.5 million each. Explomin's general manager, Noé Vilcas, explained the rationale behind this move: "We believe that this is the right time to increase our fleet and be ready for the market's turnaround. Right now the equipment is available, and availability is a key issue in this business."

Stronger dealers

The continued growth of Peru's economy has not gone unnoticed by the world's largest equipment manufacturers, who are increasingly targeting the market with the support of strong dealers that can afford enough stocks locally and deploy a good network of service personnel nationwide.

For instance, Zapler, a dealer of Palfinger and Link-Belt cranes, now also sells Kobelco excavators from Japan. Meanwhile Ipesa, which handles John Deere (including some Hitachi excavators), has now incorporated the representation of the Wirtgen Group brands.

Ipesa also has a rental company, CGM Rental, which has been instrumental to grow the John Deere business in the country. In the words of Javier Ugaz, commercial manager, Ipesa: "These machines represent sizeable investments. Having a rental company allows the client to test the product and our technical service. CGM has established a fleet of $50 million worth of equipment in less than three years."

SKC Maquinarias, part of Chilean group Sigdo Koppers, is the exclusive dealer of Volvo Construction Equipment in Peru. After

José Tomás Hevia, general manager, SKC Maquinarias.

a difficult 2014, the company perceives an improved business environment for 2015. "We have entered Constancia and other mining operations in their production processes. Once you enter a mining project, it is easier to grow the business in operation and maintenance works, which are always needed by mining operators," said José Tomás Hevia, general manager of SKC Maquinarias.

Besides Volvo, the company also represents other brands including SDLG, part of the Volvo Group, and Manitou, for the telehandlers. Like Ipesa, Sigdo Koppers also has an affiliated company dedicated to rental, SK Rental.

For equipment dealers, years of high levels of mining investment have meant strong sales growth, but miners are not only very demanding with the quality and performance of the machines; they also want the best after-sales service. "We are reinforcing the after-sales service across all our lines. You do not sell just the machine, you need to constantly monitor it to provide an added value to the client. One of the things we are going to do is to establish a service support base in the large projects," said Hevia of SKC Maquinarias.

Gonzalo Díaz Pró, COO of Ferreyros, Peru's Caterpillar dealer, explained: "Since the low cycle started, mining companies have been very careful with their investments in new assets, but production has continued. For this reason, it has been important to provide a high quality after-sales service to the operating fleets. In Ferreyros alone, we have 2,000 technicians and service engineers all around the country. Half of them are in the mines, so this is a great labor and logistics challenge."

Ferreyros' focus this year is the continued push for the introduction of Caterpillar's largest truck, the 797F, which arrived in Peru in 2011 and is already working in Toromocho, Toquepala, Cuajone, Antapaccay and Antamina.

Gonzalo Díaz Pró, COO, Ferreyros.

From the largest to the smallest

Being one of the main underground mining countries worldwide, over the years Peru has developed extensive expertise in this field. As a result of its innovation efforts, local equipment manufacturer Resemin has just introduced a new micro-jumbo, the Muki, designed to work in extreme narrow-vein operations, which allows for mechanization in tunnels where traditional methods were the only option. This has important implications safety-wise, but it also increases productivity, as explained by Resemin's managing director James Valenzuela: "The Muki can radically change mining in extremely-narrow veins worldwide. There was not a machine with these features in the market. It is a micro-jumbo with a width of 1.05 meters. It can drill a 2.4 meter hole in 40 seconds, as opposed to seven minutes with traditional methods."

The Muki is already operating in one of Castrovirreyna's mines in Peru, and Valenzuela expects to sell it worldwide. Resemin exported 43% of the machines it produced last year.

Meanwhile, global manufacturer Atlas Copco is introducing the Simba S7 C long-hole drill, which incorporates a computerized system and a new hand-held hydraulic rock drill. Atlas Copco's general manager in Peru, Brian Doffing, provided more insights about the latter: "Peru is one of the two countries that we have selected to do the trials for this product. It can drive efficiencies up by at least 25% over traditional pneumatic drills in hard rock applications."

From open pit to underground; from 400 ton trucks to 1 meter mini jumbos, Peru is a great testing ground for new equipment. Notwithstanding the deceleration of the country in terms of new mining projects, the country will continue being a key market for mining technology developers.

Service providers: the innovation push

Companies need to invest some time and money to think outside the box

Mining companies are increasingly pursuing operational efficiencies. Photo courtesy of Antamina.

Faced by challenging economic scenarios, companies have a dilemma to solve: Should they carry on as before while lowering some targets and trying to decrease costs in the hope that the storm will pass, or should they ponder on how to be efficient and profitable even if the storm becomes permanent?

The second option requires more time, more creativity and, initially, more money in most instances, but it is the long-term results that will prove the adequacy of this strategy. For miners who look at a 20-, 30- or 50-year horizon, constantly rethinking processes will certainly pay off.

The research and development (R&D) support that providers can bring to the industry is invaluable. Certimin, a large laboratory, has created a new position exclusively dedicated to new technologies. After investing in a mini flotation pilot plant last year, the company is introducing aero-photogrammetry services with drones that add to its previous offer in geochemical, metallurgical and environmental analysis. "Innovation is key for us. At a time where the priority is cost reduction, we bet on increasing productivity with new technologies. Analytical services are becoming a commodity, so we need to differentiate ourselves in other segments. Exploration activity has contracted significantly, so we are focusing on expansions and efficiency projects. We cannot start a price war, because that would not be sustainable," commented Álvaro Salazar, general manager, Certimin.

Álvaro Salazar, general manager, Certimin.

Another laboratory that works hand in hand with mining companies trying to optimize processes is Laboratorio Plenge. Over the years, the company has strengthened its profile as a niche provider in metallurgical testing. Especially over the last couple of years, most of its business has come from ongoing mining operations rather than exploration projects. "Bearing in mind that many mines in Peru are poly-metallic, companies look at optimizing the operation favoring the best-performing metal, like silver, and minimizing the amounts of those

Peru presents significant challenges for the transportation of large equipment. Photo courtesy of Stiglich.

elements that cause penalties such as arsenic. Generally, these changes in the process involve very low costs, and have great economic impacts," explained Gustavo Plenge, general manager of Laboratorio Plenge.

Depending on the case, said Plenge, companies may decide to sacrifice recoveries in order to increase volumes or focus on process efficiency: "For one particular client, we recommended changing the process and as a result the recovery rate went up from 84% to 90%. The return on investment for this modification was less than one year."

Besides the local players, international companies such as Bureau Veritas and SGS have a strong presence in the country to provide not only testing, but also inspection and certification services for minerals trading at the ports. Bureau Veritas has been strengthening its metals and minerals division through the acquisitions of Inspectorate and AcmeLabs, while SGS has been promoting its metallurgical testing business over the last couple of years.

Ernesto Labarthe, manager of mineral services at SGS, explained that there is a lot of space for the metallurgical business to grow in Peru: "In Chile, the majority of the market consists of major mining operations, where metallurgical tests are very important to optimize the concentration levels. Here in Peru there are a lot of small and medium-sized mines. The market is very different."

Labarthe affirmed that SGS' key advantage is the wide array of services offered to mining companies: "Some companies will only do metallurgical tests, or will only do geochemical analysis, or will only provide port supervision services. We offer all those lines, so we work in one way or another with pretty much all companies in the sector."

Blasting solutions

Exsa, a blasting solutions company, is reaping the fruits of its R&D activities by introducing a new explosive technology to the market this year called Quantex. It uses high-density ammonium nitrate, which is easier to source if compared to the traditional porous ammonium nitrate. Gustavo Gómez Sánchez, general manager of Exsa, gave more details: "The main use of this technology is rock fragmentation in surface mining. The product offers cost savings of 15% to 20% and further significant savings on the operational aspects, as well as up to an 18% reduction in greenhouse emissions. In Peru, both Southern Copper in Toquepala and Cuajone, and Newmont in Yanacocha are already using this product."

Exsa is expanding its scope, opening up operations in Chile and increasing its service offering beyond the mere provision of explosives, with activities such as secondary drilling or the design


Gustavo Gómez Sánchez, general manager, Exsa.


José Miguel Ríos, commercial lead Peru and Bolivia, Orica.

and construction of explosives warehouses within projects such as Minsur's Mina Justa and MMG's Las Bambas. Product-wise, the company's R&D department is working to improve its underground explosives offering, with a focus on dynamite.

Another big blasting solutions player, Orica, is mostly focused on open pit mining operations in Peru, where clients include Barrick, Glencore, Freeport-McMoRan, Chinalco and MMG. José Miguel Ríos, commercial lead for Peru and Bolivia at Orica, developed on the company's offering: "We are very focused on high-energy explosives, variable density explosives and the electronic initiating systems. In high-energy explosives we have the Fortis Extra and the Vistan/Vistis lines that are designed to make the link between the mine and the plant and to optimize the process where energy is more expensive. The cheapest energy is the chemical energy, the energy of the explosive. There, you can achieve enormous cost savings."

Despite the crisis, Ríos anticipated solid growth in the open pit spectrum, with operations such as Cerro Verde increasing its explosives needs from 3,500 mt/m to 5,000 mt/m, and new high-volume operations coming up such as Las Bambas. "The open pit segment is in a better condition to handle lower copper prices. Besides, operations in Peru must be in the lower quartile of costs if compared to other mines around the world," he said.

Transport and logistics

The need for innovation is not just a result of worse market conditions in the mining sector. Peru offers other challenges in terms of social relations, for instance, that push providers to source locally and provide business opportunities for the communities. Serious infrastructure shortages also affect the economic indicators of projects before and during the operation.

Bad infrastructure becomes a headache for transportation companies, which see their safety and timely deliveries compromised. Moving the necessary parts and equipment to the mining operations in very remote areas requires a whole engineering job, said Carlos Roldán, general manager of Stiglich Transportes: "Taking a big cargo from Callao to the south can take us five days. We need to move by night, remove traffic lights and pedestrian bridges, and put them back on immediately after. Sometimes our work starts one year before."

In this context, all providers, from food catering companies to fuel suppliers, need to plan well in advance to always have product in stock. Eduardo Paredes, sales manager B2B at Nexo Lubricantes, a Shell distributor, elaborated on this: "The reliability of supplies is critical for the mining client. A mining operation cannot stop. We always have high levels of stock, with storage houses in Chimbote, Trujillo, Piura and Arequipa, as well as our main stockhouse in Callao."

Transportation and logistics companies also need to be extremely careful with the capital equipment used by mining operators. "Every complex piece of equipment, such as a mining truck, arrives with boxes of spare parts. Sometimes mining companies may buy the same spare parts twice because they cannot locate the cargo that was already sent. It is a great challenge," said Armando Vidal, manager for the mining, energy and oil businesses at Ransa, a large logistics company.

The mining industry will never stop facing challenges, from lower grades to water management, all the way through to logistics and community relations. In this environment, providers play a key role in supporting the miners with new ideas, as long as mining companies themselves also dedicate some people to listen and evaluate these new ideas as well.

Mining safety

Zero is more than a simple number

Peru's mining industry has seen a great reduction of accident rates over the last years. Photo: workers at Constancia, courtesy of Stracon GyM.

Peru's mining industry suffered 32 fatalities in 2014, a 32% reduction year-on-year. The downward trend seems positive, but surely the relatives of those who died on mining duty will not care about that. Indeed, human safety is that particular parameter where numbers never add up, hence, the need remains for the industry to keep working on how to eliminate fatalities. Already in Q1 2015, eight people have lost their lives in Peru's mining industry.

The safety challenge involves a multi-disciplinary approach, from continuous innovation in new, safer technologies, to intensive education and training to ensure that all workers not only understand how to follow the right procedures, but also are dedicated, 100% of the time, to their own safety and to the safety of those around them.

Looking at the cold numbers from 2014, rockfall accidents accounted for 28% of deaths, followed by traffic crashes, which were 25%. While accident rates have consistently declined in recent years, Peru's Institute of Mining Safety (ISEM) is implementing a program with associated companies that aims to have zero fatalities by 2021.

Innovation and awareness

Creativity is a key ingredient in the industry's drive for lower production costs. The good news about this compulsory bias towards innovations is that better technology and processes have a positive impact on safety. Bearing in mind that a majority of deaths in Peru happen in underground mining environments, mechanization is a key aspect. "In Peru's underground segment, there are a lot of workers. When you have people with no experience going underground, they can be fine doing the normal work. It is when something else happens that workers experience difficulty. Most workers get hurt while they are going to work, going out of work, or in an emergency, because they do not know how to react," affirmed Wayne Levert, general manager of Dumas, a shaft contractor.

As previously mentioned, local manufacturer Resemin has come up with a small jumbo, the Muki, for very narrow vein operations. According to James Valenzuela, managing director of Resemin: "Old mining was built on rails and wooden frames; many mines are going back to that standard, which poses high risks for operators. It is inconsistent with modernity, but the problem is that until now there was no equipment in the market for these types of veins."

As underground operations go deeper, Peru can learn from the experience of other mining countries, namely South Africa. International engineering firm WorleyParsons, for instance, acquired TWP of South Africa in 2012, and incorporated important expertise designing shafts and introducing mechanized mining models. The company has been lately developing two shafts for Peruvian clients. "In Peru there are not many underground miners that have mechanized and modernized their operations. Traditional methods are still very much in use. We are trying to introduce new models for underground extraction," said Néstor Chacón, business development manager at WorleyParsons.

Another South African player heavily involved in underground safety is New Concept Mining, a ground support specialist. Over its first years in Peru, the country grew mainly through the sales of its jackpot and hydrabolt products, but is now trying to go a step further with the introduction of other solutions, such as the synthetic mesh and the thin spray-on liner (TSL), which could replace shotcrete in certain environments. Roberto Torres, technical manager of New Concept Mining in Peru, explained how the TSL works: "TSL is a polymer that hardens quicker and requires less volumes than shotcrete: 8 millimeters of TSL replace 50 mm of shotcrete. Besides, the TSL penetrates the cracks and acts as a glue, preventing them from expanding. Over the last five years, TSL has been widely used in mines in South Africa and it is also being used in Australia, Zambia and India."

James Valenzuela, managing director, Resemin.

Focus on people

Peru has been a mining country for centuries, yet the experience of such a long history of extracting metals does not negate the need for intensive training in this matter. In the words of Steve Dixon, CEO of mining contractor Stracon GyM: "The mining industry in Peru has experienced very strong growth over the last years and it will grow again after the current slowdown. This means that a lot of inexperienced, young people will enter the industry and keeping these people safe will be a huge challenge." Humans are not robots, so they are sensitive to external factors when it comes to safety: fatigue, heat, personnel problems… all these need to be taken into consideration. According to Frank Vasquez, sales manager of New Concept Mining: "We minimize the human factor risk. In the aggressive and exhausting environment of underground mining, people are prone to distractions and mistakes. For this reason, our products include color indicators which ensure that they are installed correctly."

Besides technology, the people factor is related to training, education, awareness and a safety culture across the organization. Gustavo Gómez Sánchez, general manager at blasting solutions company Exsa, said: "By nature, we need to carry safety in our DNA because we handle highly dangerous products. In my opinion, we already are at a very high level in products and processes. Therefore, the next big step is working on the behavioral side of things."

According to ISEM figures, last year the mortality rate per 10,000 workers was the lowest on record at 1.6; nothing to do with the horrendous figures of the past (23.4 in 1996), but still there is a way to go towards the goal of reaching zero fatalities in Peru's mining industry.