



SPECIAL REPORT ON TAIWAN

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Down the Stream from China

This research has been conducted by Pavlina Pavlova and Amelia Salutz of Global Business Reports. For more information, contact info@gbreports.com. Cover photos courtesy of CCSB, ScinoPharm and Sino Japan.

INTRODUCTION

Taiwan is known the world over for its technologically advanced electronics industry, but the island's \$146 billion chemical sector is also worthy of attention. Boasting one of the region's oldest chemical complexes, Taiwan is host to a behemoth petrochemical sector ranking 11th in the world in ethylene production capacity.

Over recent years, however, Taiwan's chemical industry has found itself constrained by rising regional petrochemical producers and overshadowed by other innovation-driven economies. Pressed by these market dynamics and propelled by government policies, the industry's time to make its mark is now.

Helped in no part by the global economy, Taiwan's industry is highly susceptible to lagging international demand. For a market with an exports-to-GDP ratio of 74%, and an industry as integral as the chemical sector, the global economic crisis has not been forgiving. After slow years in 2008 and 2009, with economic growth rates of 0.7% and -1.8% respectively, Taiwan's GDP growth jumped to 10.7% in 2010, only to drop to 4% in 2011 and fall further to 1.25% in 2012. After a challenging 2012, an uptick in the year's last quarter has led analysts to estimate GDP growth for 2013 will be close to 3.5%.

The outlook for 2013 is a welcome relief for the island's chemical producers. Softening global demand, coupled with rising competition coming from mainland China, Southeast Asia and the Middle East, as well as increasing regulations on the home front, have thrown many challenges in the way of their develop-

ment. Yet the island's chemical industry remains resilient. Reaching an output of \$146 billion in 2011 and accounting for roughly 29.81% of the country's overall manufacturing sector, the industry is a key economic driver for the island; the private sector and government alike are keen to ensure its continued success.

Surveying the changing dynamics of the national and global landscape, government in Taipei has formed a strategy. Environmental opposition to cracker capacity expansion has mounted in recent years, culminating in a decisive blow to the island's petrochemical players, coming in the form of President Ma Ying-jeou's decision in April 2011 to cancel the \$21.3 billion KuoKuang Petrochemical Technology Co. investment project planned in Changhua County.

The government is now pushing the industry towards an area where the island has already proved competitive: high-tech, high value-added products. For a country endowed with a strong electronics industry and highly skilled workforce, the industry's focus on upgrading its value-added rate does not seem like much of a gamble. However, when it comes to playing the innovation game, Taiwan lacks the attractive R&D incentives of neighboring countries like Singapore and high R&D investment to sales ratio of Japan. In order to compete, Taiwan's chemical sector will have to adjust rapidly in order to complete its transition into a regional hub of high-value chemical production.

In spite of these challenges, Taiwan has a solid foundation upon which to advance its chemical sector. With the island's giants of the petrochemical sector—state-owned CPC Corporation and private conglomerate Formosa Plastics Group—providing upstream processing, Taiwan's downstream industries can flourish along with the tremendous growth seen in the island's specialty chemicals and pharmaceuticals sectors.

PETROCHEMICALS

A TURNING POINT FOR THE SECTOR

With little hope of realizing its investment in Taiwan, the KuoKuang Petrochemical Technology Co., a joint venture between CPC and private sector producers, is eyeing a site location in Pengerang, Malaysia. The group's investment in Changhua was expected to increase Taiwan's ethylene capacity by more than a quarter, adding 1.2 million mt/y overall capacity at the cost of \$21.3 billion. Although the project would have helped Taiwan to meet the Ministry of Economic Affairs (MOEA)'s goal of achieving a national ethylene self-sufficiency rate of 90%, President Ma cancelled the project before the completion of the environmental impact assessment (EIA).

The government's decision came not only in an election year, but closely following a particularly accident-ridden year for the sector. In 2010, Formosa Plastics recorded four major fires, three of which at its Mailiao complex and the fourth lasting for two days at a nearby desulfurization unit. Environmental groups have been fighting fiercely to limit cracker expansion, citing not only these accidents but an increase in cancer mortality in the area around the Mailiao complex.

In the wake of industry disappointment over Kuokuang, the government has used the end of the Changhua project as an impetus for change, urging the national chemical industry to embrace fine chemical production. Accounting for almost 30% of the island's total manufacturing, the industry's survival is crucial to the health of the overall economy, yet the government has made it clear that a future for chemical commodities is simply not possible.

CPC, for its part, has formed strategic alliances with both domestic and foreign petrochemical companies in order to develop production of specialty chemical materials that can replace current imports. While giants like CPC and Formosa Plastics Group have the resources to invest outside of the island for its basic chemical needs and forge specialty partnerships, the government's new action plan is a challenge for the small and medium chemical players that have long operated on the island with little oversight or opposition.

The way forward has been dictated by the government; therefore the question remains how far the administration is willing to go to support one of its largest industries in a costly and technologically-demanding transition. Amongst Taiwan's petrochemical players, there is no sign of a great uptake of this agenda or any significant reallocation of resources in favor of R&D and fine chemicals.

To promote its new plan, the MOEA convened a Strategic Planning Meeting

for Taiwan's High Value-Added (HVA) Petrochemical Industry in June 2011, inviting domestic and foreign experts, scholars, as well as petrochemical industry business representatives to devise HVA development strategies. In conclusion, the group identified six major emerging industries for which the industry should develop specialty materials: biotechnology, medicine and health care, culture and creation, tourism, green energy and high-end agriculture.

As part of this initiative, the MOEA established the High Value Petrochemical Industry Promotion Office in 2012, to implement the promotion of the HVA development policy and assist in the formation of upstream-downstream R&D alliances for joint product development.

In the coming decade, the MOEA has announced plans to invest in the R&D of 43 HVA product items in order to stimulate the HVA portfolios of local producers. Additionally, the government is looking to attract overseas manufacturers to invest in local production and



Yen-Shiang Shih, Former Minister of Economic Affairs

enhance Taiwan's petrochemical output. "For the next five to ten years, Taiwan's petrochemical industry policy will push the industry towards HVA product development," says outgoing Minister of Economic Affairs Yen-Shiang Shih. "We hope Taiwan will become an important focus in the Asia-Pacific region in terms of HVA petrochemical product development and logistics."



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Interview with Dr. Eugene Lin,

Executive Director, Petrochemical Industrial Promotion Office, MOEA

What is PIPO's mission and what goals do you hope to achieve in its second year?

PIPO's mission is to promote R&D in the sector. Taiwan has welcomed foreign companies in setting up R&D centers in Taiwan, which a number of companies, such as Dow Chemical and Evonik, have already done.

We also work to create alliances connecting the upstream and downstream sectors to promote R&D, develop their markets and build plants. Another goal is to eliminate problems related to investing in Taiwan, through collaboration with the Executive Yuan's organization InvesTaiwan.

How has the cancellation of the Kuokuang project impacted the industry's willingness to invest?

Since we cannot increase the quantity of raw materials in Taiwan, we are focusing on increasing the value of our products. If the private sector wants to invest outside of Taiwan, the government also requests them to invest the same amount into increasing the value of Taiwan's sector. EPA regulations are getting tougher and regulations are increasing cost to the industry, but it is a turning point that will push companies to focus more on R&D and



invest in more advanced technology to minimize waste and pollution.

In what ways does the US shale gas boom stand to benefit or disadvantage Taiwan's chemical sector?

US shale gas may be a threat to certain products in the Taiwan industry

because they build up cracker capacity. Taiwan has to cope by focusing on high value-added products and considering investments in the United States. Formosa Plastics Group has already announced they are going to build an 800,000 mt/y ethylene cracker and a propane dehydrogenation plant in Texas. Other companies are also planning investments and we are waiting to see what progress will be made.

What key advantages does Taiwan have in the global market place?

Taiwan's chemical sector benefits from the integration of its infrastructure. The industry also excels in its ability to cut manufacturing costs to a minimum. Because we frequently use technology purchased from Europe or the United States and we do not have the advantage of raw materials, manufacturing cost is a key area where Taiwan's producers gain a competitive edge.

GREATER HOPES FOR 2013

In light of its recent political and regulatory challenges, the petrochemical sector's performance remains impressively modest. Softened demand from mainland China, which consumes about 60% of Taiwan's petrochemical output, has weakened the island's performance, but 2011 was nonetheless a record year of \$65.2 billion in output. A slight decrease in 2012 ended the year at \$64.4 billion.

According to Petrochemical Industry Association of Taiwan, ethylene produced in Taiwan in 2011 totaled 3.52 million mt, a dip of 10.36% from 2010. Total demand for ethylene in Taiwan was also down 7.71% and total demand for all petrochemical materials was 6.26% below 2010, coming in at 24.83 million mt. To match lower demand, output of petrochemical intermediates decreased by 5 to 10% for monomers and 10 to 15% for polymers.

For the coming year, Formosa and CPC are expanding their refinery capacities and pushing the development of C4, C5 and C9 petrochemicals. Formosa's Mailiao complex recently amended its 6th phase of expansion to focus on producing synthetic rubbers and high value-added petrochemicals. CPC is moving along with its renovation of the No. 3 Naphtha Cracker, which is expected to boost ethylene capacity between 230,000 mt/y to 600,000 mt/y.

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petrochemical industry to remain strong, we must narrow the gap in the supply of raw materials, while also expanding the scale of petrochemical production and enhancing the quality of industrial safety and environmental protection,” says CPC’s chairman Sheng-Chung Lin. “For CPC’s part, we have initiated a renovation and expansion project for our No. 3 Naphtha Cracker at the Linyuan petrochemical complex. The cost of the project is estimated at \$1.6 billion and will increase the cracker’s capacity substantially. After its completion in 2013, the project will generate an annual production value of \$2 billion and will stimulate further investment in the downstream petrochemical industry.”

The increase in ethylene coming on-line in June 2013 is expected to boost the performance of downstream producers. “The No. 6 Cracker is very close to mechanical completion, after which we will hand it over to CPC for commissioning and start-up,” says John Yu, chairman of CTCI Corporation, the EPC firm handling the project. “Many downstream manufacturers are simultaneously expanding their facilities to utilize the ethylene produced by the cracker.”

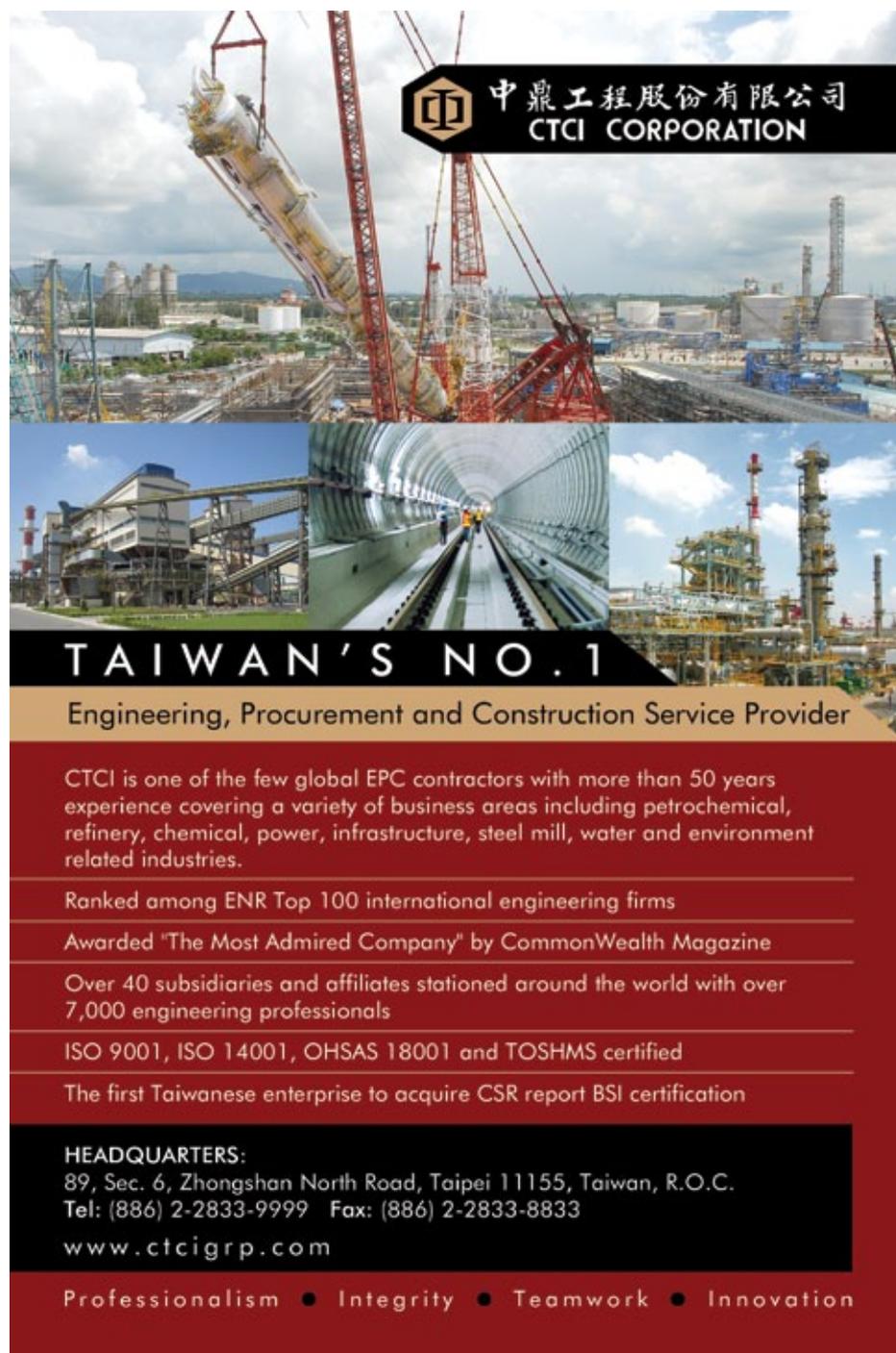
As the industry looks to the future, worries about the political climate and government support for the sector pervade. “It should be possible to attract more foreign investment in Taiwan, but environmental problems may stop this. The government says it is trying to promote high value-added production, but the EPA has rejected a Formosa Plastics hydrogenated hydrocarbon resins joint venture,” observes Steven Chen, chairman of alkyl benzene producer Formosan Union Chemical Corporation.

In hopes of improving the investment climate for local expansion, industry leaders like Formosa are leading the charge to increase local benefits for chemical complexes. Because the central government collects almost all tax revenue, local governments have no incentives to support investment, which has created further concerns about the industry’s ability to sustain its future.

“The changing environmental legislation in Taiwan is because of political problems, not environmental problems. Local government here receives very little

tax benefits from chemical complexes, because the majority of taxes go to the central government,” says C.T. Lee, chairman of Formosa Plastics Corporation. “The local government cooperates with environmental groups against the central government and the industry ends up in between. We are trying to work with the government to increase tax benefits for the local government to incentivize the approval of our investment plans.”

Though challenges persist, government voices remain optimistic that high value-added goals are achievable. “The world’s biggest market, China, is in our backyard, and we have trade agreements with some Southeast Asian countries. In five years, we will have more foreign and local companies investing in Taiwan,” predicts Eric Kuo, section chief of the Industrial Development Bureau’s Chemical Industries division.



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INNOVATION

MAKING THE SWITCH

Without a precedent for high levels of R&D in the petrochemical industry, meeting higher value-added rate goals will require a shift in strategy for the sector. “Taiwan has not been very successful in R&D up until now, because most companies did not allocate enough of their budgets to R&D efforts. In Taiwan, the percentage of revenues invested in R&D is about 1%, compared to 3 to 5% in the United States,” explains J.H. Shieh, executive manager of PIAT.

“Most of the high value-added fine chemicals are still in the hands of other industrialized places like the US, Europe or Japan. We cannot easily get production technology in Taiwan because we need to license it and other countries are reluctant to issue it. When it comes to selling fine chemicals in the global market, there is already competition from other countries. Countries that produce their own fine chemicals, such as South Korea, prefer to use their own materials for their application production,” says Shieh.

Taiwan’s largest solvent manufacturer LCY Corporation, which invests 2% of its revenues into R&D on an annual basis, recognizes that licensing technology no longer guarantees any competitive edge in the global market. “We have just announced an \$81 million investment in an R&D center in Kaohsiung and we have just launched a thermoplastic elastomer, Styrene-Ethylene-Butylene-Styrene (SEBS), which is the result of a totally homegrown process,” says Bowei Lee, chairman of LCY Corporation. “A lot of companies in Taiwan use the old strategy of licensing technology and scaling it up for commercialization. This does not work today, because companies in India and China can do exactly the same thing.”

Faced with more immediate market constraints, focusing on R&D is not a top priority. “The industry sees increasing our high value-added as a long-term target. Today, we are facing very short-term difficulties,” explains C.H. Hwang, vice president of

Tasco Chemical Corporation, citing the scarcity of raw materials and difficulties with local government.

Rather than develop advanced technology for current product portfolios, other companies are simply expanding into new business areas. “A great deal of our producers has diversified their businesses into electronics, telecommunications, and biotechnology, which consume many petrochemical materials. This helps provide petrochemical products with new outlets and applications,” says PIAT’s Shieh.

“The way forward is to diversify into new products,” agrees Chen of FUCC. “We are trying to understand what our customers need, and developing products to meet their demands. Our focus is on new specifications for existing products, as well as completely new products. The low-volume hydrogenated hydrocarbon resins we make are manufactured by only one other company in Asia. Many Chinese companies are producing yellow resin, but they do not yet have the technology to jump to high value-added hydrogenation.”

Through the operations of its subsidiary United Performance Materials, FUCC is able to locally produce aromatic petroleum resins, while also conducting customer-driven R&D and production process improvement. Four years ago, FUCC also merged with an agrochemical company and is exploring market opportunities in insecticides.

Given the growing demand for specialty chemicals in the Greater China region, and the vast potential for pharmaceuticals, this move on the part of petrochemical players is astute. If homegrown innovation is proving hard to flourish, R&D is a choice area where international companies who are looking for entry points into this attractive region can step in.

IMPORTING INNOVATION

Indeed, one of the government’s key strategies in advancing sector innovation is attracting R&D resources from abroad. Only six months after Taiwan’s signing of the historic Economic Cooperation Framework Agreement (ECFA) with China, 15 foreign enterprises had filed applications to establish R&D centers in



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The results show, with the number of overall patents granted by the United States in Taiwan increasing to 8,238 in 2010 after four years in the 6,000s range.

Ranking 13th on the World Economic Forum's Global Competitiveness Index, Taiwan enjoys the world's highest rate of US-granted patents per capita. Yet while the majority of these patents and R&D centers are coming from the electronics sector—Hon Hai alone was granted 2,013 patents by the United States Patent and Trademark Office in 2012—they are nonetheless deepening the local R&D resource pool for the chemical industry.

Compared to its fellow Tigers Taiwan has the least favorable R&D incentives, yet it is international chemical innovation centers with the prospect of developing materials for the electronics sector. In early 2011, Evonik Industries opened its first R&D center outside of Germany in Taiwan to explore the role that a chemical company can play within the electronics industry.

"Establishing Evonik's 'Light & Electronics' Advanced Project House in Taiwan will help consolidate our leading position in the world and bring Evonik closer to one of the most important electronics markets, while also developing greater opportunities for growth in Asia," says Gerard Berote, president of Evonik Industries Taiwan.

Merck, in turn, has announced plans to set up an R&D center close to Taiwanese panel makers to develop materials for Organic Light-Emitting Diode panels, lighting and solar power technologies. The company's new center will be in addition to their LCD R&D center, established in 2005. "We see Taiwan as one of the few places in the world where you can not only develop new technology, but you have the opportunity get it into a world class manufacturing facility and complete the product development process locally," says Karl Skjonnemand, R&D director at Merck Display Technologies Taiwan.

DEEPENING THE TALENT POOL

While the electronics industry has R&D benefits to share with the island's chemical sector, it also monopolizes Taiwan's talent. Taiwan has one of the highest densities of universities in the world, yet there is little talent to spare for chemical companies. "There is a shortage of qualified R&D professionals in Taiwan because graduates here prefer careers in electronics rather than in the chemical or pharmaceutical industries," explains Weichyun Wong, president of API manufacturer SCI PharmTech.

Because of the scarcity of chemical professionals, companies like SCI PharmTech take advantage of Chinese talent to staff early-stage laboratories in mainland China. Industry players also supplement their internal R&D staff through partnerships with academic and state-run

research institutions. The Industrial Technology Research Institute (ITRI), for example, is a unique, partially state-funded research organization that aids companies in product commercialization and enterprise spin-offs. "In all of ITRI's laboratories, commercialization is a main focus," says Tsung-tsan Su, general director of ITRI's Material and Chemical Research Laboratories. "Once we identify a good project, companies can invest through our early participation process. Once ITRI has completed a project, we organize various workshops and conferences to raise industry awareness of the technology so that it can be transferred."

The MOEA's Industrial Development Bureau is currently working to develop new technologies with the help of ITRI to stimulate cross-sector new product development, yet R&D subsidies remain difficult to obtain. "With regards to government support, Taiwan has aligned itself with Singapore on corporate taxes but it is a more complicated and longer process to obtain subsidies," says Berote of Evonik. "In order to obtain a subsidy, you have to share information with institutions, because the outcome must benefit the Taiwanese industry, which may not be favorable when developing a new and innovative product."

By opting instead for partial government support, companies like Evonik can take advantage of the R&D resources on offer while also protecting proprietary information.

GROWTH IN SPECIALTIES

A WINDOW TO ASIA

The Greater China region offers enticing growth opportunities in the specialty segment and a market like Taiwan can provide the ideal point of entry for companies searching for strong foundations in the region.

In mainland China alone, revenue growth in 2011 for specialty chemicals was 21%, compared to 7% for the overall chemical industry, according to the National Bureau of Statistics of the People's Republic of China. From 2009 to 2014, the market value growth of specialty chemicals in China is estimated to increase by 44% to \$81.6 billion.

With its strong IP protection and stable business environment, Taiwan is a strategic location from which international companies can target this enticing growth potential. Polysciences Inc., a US-based custom specialty manufacturer with an office in Taipei since 2011, is just one example of a company using Taiwan as a springboard in the region.

"Taiwan was chosen as a strategic location for Polysciences for a few reasons," explains Jeffrey DePinto, the company's vice president of International Business Development. "It is a well-known hub for the semiconductor industry, which

Polysciences serves. Taiwan is also well-placed geographically to support our sales efforts in mainland China and, in future, the rest of Asia."

TO CHINA AND BEYOND

With the world's largest chemical market in its backyard, Taiwan and its local producers are also making calculated leaps into mainland China investment.

Taiwan Surfactant, a producer of specialty surfactants ranging from cationic to non-ionic and amphoteric surfactants, set up a sister company in mainland China in 2004 when the market became too attractive to discount. The expansion has brought measurable rewards, bringing in a volume and turnover five times larger than the company's domestic business. As the only Taiwanese surfactant manufacturer in mainland China, Taiwan Surfactant has a significant cost and quality advantage.

Although Taiwan Surfactant originally did not want to invest in their own operations there, it proved too difficult to find a reliable production partner. "Many Taiwanese companies at this time suffered for their investments, but the situation has improved in recent years," says Amber Hsieh, president of Taiwan Surfactant.

Taiwan has a reputation in the region for its high quality surfactants and enjoys its status as a preferred sourcing destination. To target the projected growth in the regional market, local producers are examining expansion plans beyond China.



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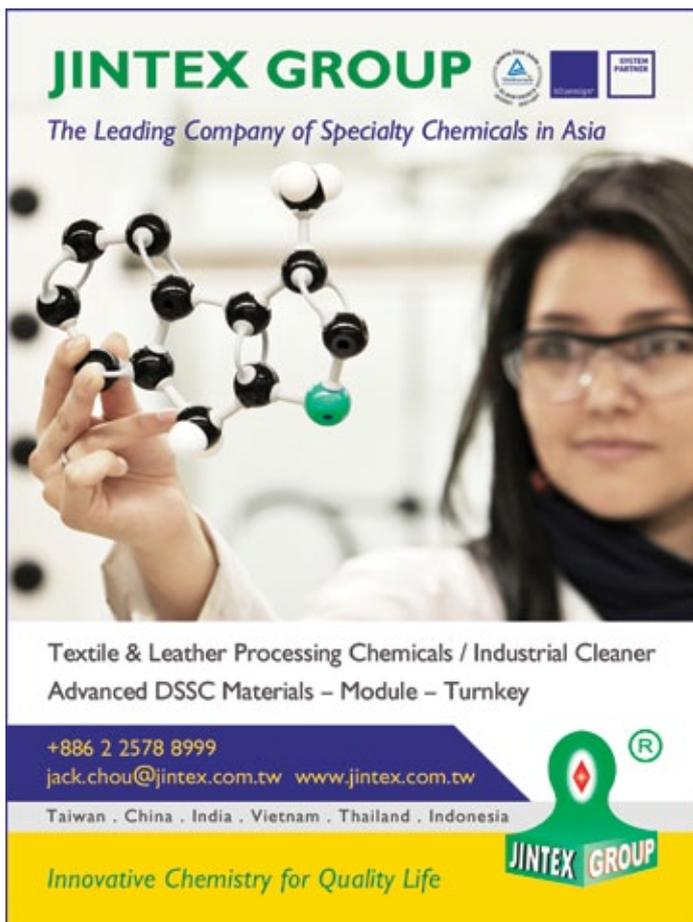
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According to Tatsuhiro Matsuda, president of Taiwan's largest and oldest surfactant manufacturer, Sino-Japan Chemical Co. (SJC), the total surfactant market is expected to double globally from 2010 to 2030, while the Southeast Asian market should triple within that same period.

SJC originally manufactured surfactants for agriculture but has since diversified into applications for different industries, such as detergents, electronics, resins and construction. Four years ago, the Japanese chemical company Nippon Shokubai Company became SJC's major shareholder, facilitating the company's global expansion, particularly in Southeast Asia.

"SJC is considering setting up operations in Southeast Asia, and it is likely that our next plant will be outside of Taiwan," says Matsuda.

Expanding internationally is practically an imperative strategy for local companies dealing with Chinese products flooding the domestic market. "Since the ECFA with mainland China came into effect, SJC's non-ionic surfactants exported to China are duty free. Conversely, we now see very cheap products come into Taiwan," says Matsuda. "Despite the cheap products flooding the market, Taiwan is well-positioned to supply leading technology and high quality products." Jintex Corporation, Taiwan's top producer of specialty textile and processing chemicals, began as a trading company for global brands of textile auxiliaries and now produces its own brand of finishing technology materials, la Fanta.



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The first company in Asia to have bluesign® approval for the sale of textile chemicals in Europe, Jintex is using this advantage to make further inroads into the textile markets in the region, with operations in mainland China and Indonesia, and agents as far as Bangladesh, Pakistan and Iraq.

"Jintex focuses on providing more value-added products and services to export to international markets. We continue to extend our resources to new technologies and products, expanding into new areas like photovoltaic technology," says Tim Lai, Jintex's vice president and spokesman.

For Taiwanese companies that choose not to partner with companies in emerging markets in Asia, they need to be prepared to compete with these new low-cost producers.

"New competitors from China and India are continuing to grow using a low-price strategy," explains Tien-Yu Chen, chairman of Diamonchem International Co., the largest active zinc oxide producer in Taiwan and all of Asia. "We knew this day would come, which is why Diamonchem has updated our facilities and introduced automation to cut down on the costs of labor and energy."

EXPERTISE IN NICHE MARKETS

To develop new products and penetrate markets farther afield, local manufacturers have the benefit of a small test market where SMEs have historically thrived.

"In Taiwan, small- and medium-sized manufacturers concentrate on one or two chemicals for a specific process. They work with manufacturers and use their experience to make very high-quality products. International suppliers supply a lot of items and cannot concentrate on specific products," says Scott Chen, vice president of Geetmann Taiwan Ltd., a manufacturer specialized in producing materials for print circuit boards (PCB).

Geetmann, a local producer established in 1992, has expanded operations to mainland China to follow the PCB industry. Although the company has production facilities there to be close to customers, Taiwan is still an advantageous location from which the company can direct its new product development efforts.

"When you are developing a new product in mainland China this requires many new materials; it is difficult to get them very quickly or easily. Taiwan provides easier access to raw



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Tatsuhito Matsuda, president of Sino-Japan Chemical Co.

materials and the necessary technical information. We can work together with universities to communicate and share information,” says Warren Tsai, Geetmann’s managing director. “Overall, it is a smoother development process here and it is easy to transfer from the laboratory to the production line.”

Yet due to the high fragmentation of Taiwan’s specialty chemical sector, many SMEs find themselves falling through the cracks of the government’s innovation support framework.

“While we do have some cooperation with state research centers, because we are a small company, we primarily perform our own research,” says Charlie Cheng, CEO of fine chemical supplier Repoly Resin Corporation. “We are hoping to get more support from the government, but Taiwan’s government cooper-

ates on a more regular basis with much larger companies.”

Many smaller companies, therefore, choose to focus on niche items. In the case of Repoly, they have developed eco-friendly polyurethane products, including materials for LED light bulbs and water-based fire extinguishers, which they are bringing to international markets after years of independent R&D.

TRADE BARRIERS

Although its local industry praises its beneficial positioning in the region, from the perspective of international trade, Taiwan’s chemical sector is at a significant disadvantage.

“Southeast Asian companies are developing rapidly and trying to catch up with Taiwan and Korea. Countries that are ASEAN members enjoy no duties with mainland China, which conversely, is a disadvantage to Taiwan,” explains Matsuda of SJC.

The signing of ECFA in 2010 generated excitement in the industry as companies anticipated more favorable import tariffs with their biggest trade partner. In the first round of trade liberalizations, which most believe will be the most favorable to Taiwan, 88 petrochemical products were included in the Early Harvest list of provisions. With ECFA’s Early Harvest program, the tariffs for 539 Taiwanese products and 267 Chinese products will be lowered in three phases,

reaching zero in 2013. Yet many were dissatisfied to see that the chosen petrochemical products had very little impact on Taiwanese producers.

In light of this disappointment, the industry is eagerly awaiting developments from Taiwan’s ongoing talks with Singapore to examine the possibility of a Free Trade Agreement (FTA). An FTA with Singapore would set a symbolic precedent that would make way for future agreements with other neighboring countries.

Struggling to compete with other high-value industries in the region, Taiwanese producers encounter fierce competition from South Korea on the basis of the country’s preferential trade agreements with the US and Europe.

“FTA issues are the main obstacle for Taiwanese exporters,” says Catherine Yu, president of Rich Yu Chemical, a local specialty plastics additives producer. “Korea has signed agreements with Europe and the US, while Taiwan has to pay import duties of around 6.5% in these regions. When polymer additives already have very limited profit margins, balancing high standards with competitive prices is a key issue.”

With market dynamics in the US and Europe exacerbated by unstable exchange rates, Rich Yu Chemical has reorganized its export markets and shifted its focus to emerging markets such as the Middle East, Russia, Latin America and developing Asian countries.



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PHARMACEUTICALS

A NEW ERA FOR DRUG DISCOVERY

While other segments of the chemicals market struggle to reap the benefits of government support for R&D, pharmaceuticals are one area in which many companies owe their establishment to effective economic policy. For biotech startups in particular, the government is throwing its support behind the sector in the hope of improving Taiwan's chances for drug discovery.

Taiwan's government identified biotechnology as key growth area as early as 1995, and has passed three pieces of legislation since 2007 aimed at improving the environment for biotech startups; these laws pertain to guidelines for the issuance of stock options and regulations governing R&D and training tax credits, as well as investments for shareholders.

In the period of 2007 to 2011, following the government's new legislation, 38 new biotech drug companies were established. Between the National Development Fund and the private sector, \$2 billion has been earmarked for investment in start-ups.

"This new era of the biotech sector in Taiwan is due to the strong financial situation, good IPO market and good policies from the government," says Ko-Chung Lin, founder president and CEO of phar-



Jo Shen, CEO and president of API manufacturer ScinoPharm

maceutical firm Pharmaessentia. Attracted back to Taiwan by the government's initiatives, Pharmaessentia was founded by a team of experienced Taiwanese professionals who returned to the island from the US biotech sector.

"Given the size of the market in China, there is a lot of opportunity—and responsibility—for us here. In 20 to 40 years, we should have one or two local companies that are competing with big pharma firms. We plan for Pharmaessentia to be one of them," says Lin.

Given Taiwan's highly skilled workforce and world-class research institutions, the atmosphere is ripe for drug discovery, even if the island does not have the muscle for full-scale development.

"The technical chemical side of Taiwan's industry has always been very strong. However, in the last 20 years,

Taiwan's brilliant chemists could not find any stage on which to perform. The pharmaceutical field has become an excellent area where they can exhibit their talents," says Jo Shen, CEO and president of API manufacturer ScinoPharm.

As a boost to the burgeoning sector, Taiwan's Food and Drug Administration (TFDA) became a member of the Pharmaceutical Inspection Convention and Cooperation Scheme (PIC/S) at the start of 2013, joining 43 countries across five continents in a regulatory scheme aimed at promoting international GMP cooperation.

"We hope to have a new drug, either a synthetic chemical or a biological drug, developed in Taiwan and marketed globally, passing through international hurdles," says Dr. Chien-Hsin Daniel Cheng, director of the MOEA's Biotechnology and Pharmaceutical Industries Program Office. "Currently we have 45 FDA-Investigational New Drug-approved drug candidates in Taiwan in different phases and it is possible that in two to three years some of them can go through FDA review and enter the market."

API ABILITY

While Taiwan's pharmaceutical firms are making strides towards drug discovery, in the API segment of the market local players with a long-time presence in the market are beginning to see a rise in global demand for their products.

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Steve Chang, president of Chunghwa Chemical Synthesis & Biotech (CCSB)

“Taiwan is ideally placed to serve ‘pharmerging’ Asian markets. We are an easy partner for Chinese companies, while countries like Malaysia and Indonesia are not too far away and their Chinese populations give us an advantage,” says Wong of SCI PharmTech.

Steve Chang, president of Taiwanese API manufacturer Chunghwa Chemical Synthesis & Biotech reports seeing 20 to 30% increases in the market’s exports in the past several years. “Manufacturing costs for APIs are gradually increasing in China, so there is a growing trend of global pharmaceutical companies looking for reliable and reasonably-priced suppliers from Taiwan,” he says.

In the midst of this growth, API manufacturers are upgrading their facilities and strengthening their business development capabilities.

A new product from CCSB—pure ethyl-eicosapentaenoic acid—received FDA approval in July 2012, and the company plans to launch it in generic form within the next three years to become a main source for sales growth.

ScinoPharm, another leading local API producer and process R&D provider, is in the process of building a high potency cytotoxic injectable plant for the production of cancer drugs, which will enable the company to provide vertically integrated service to customers.

API producers like CCSB are also hoping to use their strong regional reputations to gain more business as contract manufacturers for big pharma.

“Many are closing down or consolidating their manufacturing sites and out-

sourcing more projects,” says Chang. “With CCSB’s fermentation capabilities, we have a better chance of getting a hold of these contract manufacturing projects.”

Generics producers, too, are targeting export-oriented growth in the face of fierce local competition. For a country of 23 million people, a pharmaceutical industry of over 150 companies makes for a crowded market. “We are all competing

for the local market and as a result there are not enough resources being pooled for export purposes,” says Ray Fan, CEO of Standard Chem & Pharm Co., a local generics producer.

With PIC/S membership signifying an international vote of confidence in Taiwan’s local regulations, management systems and auditing standards, the pharmaceutical sector is well-positioned to meet its global goals.



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DISTRIBUTION

TAIWAN'S WINDOW TO THE WORLD

In Taiwan's relatively mature, export-oriented economy, distribution plays a crucial role in the development of the island's chemical market. Between providing international representation for growing local producers or offering boots on the ground to international players hungrily targeting the chemical needs of the growing industries in Asia Pacific, Taiwan's local distribution industry has risen to meet the changing demands of chemical producers.

Taiwan's distribution industry has historically been a highly fragmented market of small trading and distribution companies. As Asia Pacific's growth rates continue to thrive ahead of markets in North America and Europe, however, more international distributors are moving into the region. Yet for local players, the arrival of players like Brenntag is not the threat that one might think.

Although industry consolidation will be inevitable as the regional chemical market matures, for the time being in Taiwan, homegrown players remain confident in their specialized product offerings and intimate knowledge of the local market, language and culture. With over 10,000 domestic specialty chemicals companies in mainland China alone, the

region's smaller distributors and traders provide the low-volume, localized services that MNCs cannot.

"In an emerging region like Asia, reachability is a very important factor. Some customers are so small to the point that larger distributors potentially cannot address them. Until the industries consolidate, there is a role for some of these smaller distributors and perhaps some of them have the opportunity to grow alongside suppliers," says Azita Owlia, North Asia vice president for global specialty distributor Connell Bros. Company.

In spite of the dominance of local players, international players inarguably have the right to play when it comes to providing the platform necessary for globally-ambitious local producers. For manufacturers in Taiwan, continued growth will inevitably require international expansion.

DKSH, in Taiwan since 1958, has seen growing business coming from local specialty players, which translates into growing demand for distribution and market expansion services. "DKSH can support the large number of smaller players in Taiwan who have very much improved in quality but still lack international networks," says Roger Lu, general manager of Performance Materials for DKSH Taiwan. "The market here is extremely competitive, with tight margins, so it is helpful for our clients to be able to outsource non-core expertise to us and simply concentrate on their products."

THE LOCAL ADVANTAGE

While international companies are finding their place in the market assisting Taiwanese players to go global, local distribution players are expanding farther afield themselves. For Evermore Trading Company, a diversified local distributor whose main business is in the supply of specialty materials for composite, rubber, resin and plastics applications, building a regional presence was necessary to develop the sourcing and application networks that could give the company a competitive edge. With multiple offices across China and an office established in Japan in 2009, Evermore has now obtained a business license in Vietnam.

"China is an important market for Evermore because of its size, whereas the Japanese market has very advanced applications," explains Luhao Wu, Evermore's managing director. "What Evermore's Japanese customers use and require are quite different from other markets and our business there is a very good learning experience. In Vietnam, we plan to penetrate this new market by leveraging our experience in other countries, as well as examining its market as a location for sourcing, especially in the rubber industry."

It is no secret that rubber is a volatile commodity to trade in, and Taiwan's rubber distributors are no more immune to the instability of the market than any of their regional counterparts.



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“Rubber prices are volatile and deals are not easy to make if neither side can trust the other; this is why most tire makers in Taiwan always buy natural and synthetic rubber from us,” says Burgee Chang, president of Ukko Corporation, a local synthetic and natural rubber distribution company active since 1988.

“In Taiwan, end-users ask Ukko Corporation about prices and we then make inquiries to suppliers. In China, it is quite different; distributors do not know where the end-users are, so they collect low-cost material from the market and reap high profits when the prices increase,” says Chang. “In the past 10 years, Chinese firms have entered the Taiwanese market, originally through Taiwanese agents, but in the last two years they have begun to sell here directly. As their prices can be as much as \$100 below ours, these firms have been influential in increasing competition and determining market prices.”

Adding further pressure to local rubber traders, many Taiwanese rubber producers have moved manufacturing to lower cost jurisdictions in Southeast Asia, bringing their local distributors with them. Given its central positioning, however, Taiwan is still an advantageous location for warehousing in spite of the production shift, creating no incentives for companies like Ukko to relocate.

The pressure from mainland China extends far beyond only rubber trading, however. As China’s chemical market upgrades its regulations and quality, its



Luhao Wu, managing director of Evermore

proximity is becoming less of an advantage and more of a threat.

“Ten to 15 years ago, labor and environmental costs in China were very low. We made frequent visits to mainland China to find the most reliable suppliers, and we have been able to take advantage of price gaps and our strong service capabilities to excel in the export business,” says Ming-Che Liao, managing director of Keeneyes Industrial Corp, a distributor of polymers, plastic and coating additives and specialty fine chemicals. “In the last three or four years, however, costs in China have gone up and information has become more transparent. Competition has become very severe and we have decided to do more work with new fine chemicals.”

Companies like Keeneyes are looking to follow customers as they move through-

out the region. “In the past, Asia used to mean just China—but with costs in China now rising, customers are moving their businesses to countries like Myanmar and Cambodia,” says Liao.

TAKING CONTROL

Faced with market dynamics outside of their control, many distributors are examining diversification options, such as contract or toll manufacturing and even original production.

Evermore, which previously operated production facilities in Shanghai, reports they are reexamining the opportunity. “We are trying to move into more high value added products and we are working in cooperation with some research institutes,” says Evermore’s Wu. “We have one lab in Tainan where we work on developing applications. Not many distribution companies of our size also carry out their own development work; however, Evermore sees research as a good investment to transform the company.”

Yet introducing innovative materials into a distributor’s portfolio can be costly. Distributor Keeneyes offers new products at little to no profit in order to encourage customers to test them. “Once they are demanding more, our sales volumes increase and we see greater profits,” says Keeneyes’ Liao.

A leading local distributor, Union Chemical, has also taken a more strategic approach to developing their place in

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the supply chain. Specialized in trading, manufacturing and tank storage, Union Chemical has also created a subsidiary, UFC Corporation, through which they offer customers toll and contract manufacturing, as well as custom synthesis.

In addition to production in Taiwan, UFC Corporation operates three running plants in mainland China. While the Chinese market only contributes 30% to Union Chemical's total business today, the company foresees it eventually overtaking their local business. "Many big plants have moved out of Taiwan and the total demand for chemical materials in Taiwan has dropped," says S.W. Lee, chairman of Union Chemical. "Our business in Taiwan grows at a rate of about 5%, while our business grows at a rate of 30 to 50% in China. We expect that the fast-growing Chinese market will contribute more than 70% of our business in the next decade."

Despite recent improvements in mainland China's business climate, the investment environment remains unpredictable. "To balance the risks of operating in China, we are planning to establish a factory in Vietnam within the next two to three years; meanwhile we have plans to make an investment in Taiwan," says Lee. "Despite the numerous difficulties of environmental restrictions and land availability in Taiwan, we still find certain advantages to having facilities here, where we have sufficient technical manpower and easy access to capital from Taiwan's banks."

SERVICES

LOGISTICS: THE NEXT FRONTIER

Further helping to facilitate the growth of Taiwan's chemical industry in international markets is the logistics industry. With well-developed infrastructure, sufficient carrier capacity and strategically-positioned ports, transportation is not a challenge for chemical producers in Taiwan. When it comes to the supply chain management services that the logistics sector can provide, however, fewer chemical companies are willing to pay the higher prices to take advantage of them. In a report compiled last year by the Taiwan Association of Logistics Management (TALM) for the Department of Transportation and Communication, Taiwan's national supply chain capabilities were ranked third best of the region, behind Singapore and Hong Kong, and far ahead of China and Southeast Asia. "Taiwan has improved its customs clearance efficiencies, goods trading and application of information technology. However, our logistics systems still have room for improvement," says James Chung, secretary general of TALM. "Companies here generally consider logistics to be of lesser importance than R&D, marketing, manufacturing and finance. CEOs, particularly those of SMEs, think logistics are just transportation and warehousing, and will outsource the work to whichever company is cheaper."

Overall the chemical industry has yet to fully embrace the presence of third-party logistics providers and the benefits that they can provide. TALM estimates that only about 20 to 30% of local chemical manufacturers outsource logistics to 3PLs. "Within this market, producers are building their own warehousing as part of their manufacturing, and they are either building their warehouses too big or too small," says Ken Breinholt, director of Asia Operations for Rinchem, a US-based specialty chemical 3PL that recently established operations in Taiwan to service the strong semiconductor industry.

Global logistics company BDP International sees the market dynamics in Taiwan as a sign that demand for 3PL services will increase. "Since the domestic demand in Taiwan is getting weaker, BDP can use its wide network, experience and knowledge to help Taiwanese companies develop new markets overseas," says Wei Heng Chen, general manager of the company's Taiwan branch. "The major challenge is that demand is dropping; however, productivity is still high so they must find new markets."

As local players continue to grow, they will need to outsource more non-core services such as logistics in order to compete globally. Given the growth coming from specialty and pharmaceutical players in Taiwan, they will need assistance in keeping up with international standards as they continue to evolve.

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John T. Yu, chairman and CEO of CTCI

ENGINEERING SERVICES

As most local producers prefer self-sufficiency in their supply chain management, many also prefer to keep engineering, procurement and construction (EPC) services in-house, particularly when it comes to the island's many specialized players. When it comes to EPC service providers in the chemical industry, Taiwan's largest and only international player is CTCI Corporation. Earning roughly 50% of its revenue from the hydrocarbons sector, CTCI has grown over the years thanks to a constant stream of work coming from key chemical companies in Taiwan, such as Formosa Plastics and CPC.

"Our local competitors are smaller in size, with revenues perhaps only a tenth of CTCI Corporation's," says Yu of CTCI. "We grew from acting as a subcontractor



Diamonchem is updating its facilities and making the effort to cut down on energy use and carbon emissions.

to the foreign firms that built Taiwan's early crackers in the 1960s, and we entered overseas markets back in the 1970s while local competition was still concentrated on the domestic market."

Today, roughly 50% of CTCI's revenue comes from outside of Taiwan. To meet its goal of growing from a \$2 to \$3 billion company, CTCI is aggressively pursuing projects in neighboring countries and the Middle East. "Next year there will be huge opportunities from several projects in Southeast Asia, including the enormous investment by PETRONAS in Malaysia. Vietnam and Myanmar are also heavily increasing their investment," says Yu. "India is booming, and it is difficult to find well qualified contractors, so there are many opportunities for CTCI in the coming years."

A GREENER TOMORROW

MANAGING ENVIRONMENTAL CONCERNS

With Taiwan's lengthy EIA review process and lack of governmental coordination between the MOEA and the EPA, the industry is put in an increasingly difficult position to meet ever more stringent environmental requirements.

"The EPA classifies the chemical industry in the highest category of potential polluters, so the government closely watches companies and has shifted the burden onto them to prove their innocence," explains Wen-Jei Fang, general manager of the Taiwan branch of environmental engineering and consulting firm Weston Solutions. "There are long monitoring processes to go through if you are at risk of causing minor contamination and the government has the absolute authority to force the closure of operations until they address issues."

As public scrutiny of the chemical industry continues to grow, however, Fang notes that company leaders are beginning to pay more attention to corporate social responsibility and community outreach. "Social responsibility is a new addition to the Health, Safety and Environmental audits Weston Solutions has done here

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for years, and we help clients organize events. Unfortunately damage has already been done, and most firms—even the multinationals—are still well behind the West. Even China has established a social responsibility index, which Taiwan does not have,” he says.

In response to the tightening regulations, CTCI Corporation has developed its service portfolio to meet these growing needs. Specialized in air pollution reduction, wastewater treatment and water recycling, CTCI frequently installs environmental protection equipment to help clients meet requirements.

Gradually, the industry is recognizing that it must step up and undertake sustainability initiatives to ensure its future. Yet on the part of the government, improvements in the environmental regulatory framework could go a long way in helping the industry achieve these goals.

“Taiwan has a unique law, whereby the EPA selects academics to look at environmental impact studies and gives each individual veto power,” says LCY’s Lee, also chairman of the Taiwan Responsible Care Association. “The system creates real difficulties. The government understands this and is now trying to change the law so that it is ultimately responsible for decisions itself, as in every other country.”

TRCA has been exemplary in helping local players to meet international standards. “About ten years ago, TRCA started a buddy system, pairing off in-

ternational and local companies; the system helps to mentor small firms and bring everyone up to speed very quickly,” says Lee.

Reporting regularly and consistently to the International Council of Chemistry Associations, TRCA is the best reporting body in Asia along with Japan. “Across the industry, Taiwan’s Environmental, Health and Safety accident rate has decreased, employees’ health has improved, water efficiency is up and greenhouse emissions are down,” says Lee.

While reform could be a significant help to the industry, most companies are going ahead and making the necessary investments to meet current requirements. Taiwan’s regulations are strict by global comparison, but their stringency advantages local companies in the international marketplace as clean production becomes more important on a global level.

“Years ago, when the regulations were much looser, most companies in the industry did not even have in-house regulations. As the regulations have become stricter, it has created pressure for us to improve,” says Chen of Diamonchem. “Diamonchem is updating its facilities and making the effort to cut down on our energy use and carbon emissions. As natural resources become scarcer, we plan to focus more on metal recycling. It is important to recycle metals from city waste, like electronics, for raw material use,” he said.

CONCLUSION

While environmental concerns have weighed heavily on the industry, companies across the value chain are adjusting to meet new standards and reduce emissions and energy consumption.

The Kuokuang project’s cancellation may have signaled the end of high-volume petrochemical commodity output, but Taiwan’s chemical industry is by no means at the end of its rope. A bright future lies ahead for companies with the ambition and competitive quality to succeed in global markets. Situated in the backyard of the world’s biggest market and without the investment risks associated with mainland China, Taiwan stands to be an increasingly attractive location for foreign investment. “The contribution of Taiwan in the Greater China market is remarkable when taking into account the size of the country. With its location, entrepreneurial spirit and network, Taiwan is a fantastic hub,” emphasizes Berote of Evonik.

As the role of Asia Pacific evolves in the global chemical industry value chain, Taiwan is poised to evolve in step. Despite the challenges ahead, a strong chemical foundation, political and economic stability and an innovative edge point to continued rise of one of Asia’s Tigers.

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