

SPECIAL REPORT ON SINGAPORE CHEMICALS, INGREDIENTS, AND MATERIALS

A Global Business Reports publication presented with Chemical Week

This report has been produced by Global Business Reports. Research conducted by Margarita Todorova, Micah Lanez, Maeve Flaherty and Alexander Stonor. For more information, please visit gbreports.com, or contact info@gbreports.com. Main cover photo courtesy of Sreehari Devadas (Unsplash). Other photos courtesy of Borouge, William William (Unsplash), and Siemens.

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Chemical Week

by S&P Global



INTRODUCTION

State of the Industry

Singapore is a leading hub for chemicals; Singapore exported over S\$80 billion in chemicals and chemical products in 2022 and over 25,000 people are employed by the industry. The meteoric growth of the chemical sector in Singapore is a result of years of heavy investments in infrastructure and the success of the industrial Jurong island complex, where over 100 global chemicals firms have located operations. Along with a strong physical and financial structure, Singapore's stable social and political environment and its skilled workforce have nurtured innovation and collaboration in the industry for decades.

The last few years have been turbulent, such that Singapore's overall chemicals output in March 2023 fell by 11.8% year on year. Petrochemical exports experienced a steep drop, with June marking the tenth straight month of contraction, falling 34% year on year to S\$1.07 billion.

Some players, such as those in the food and ingredients market, have been sheltered from this softening demand. Jun Saplad, the region president APAC at dsm-firmenich, a global

nutrition, health, and beauty company, said: "Demand for our solutions has not dipped significantly as food is always a necessity."

Like elsewhere, Singapore is still dealing with the fallout of the pandemic as well as ongoing inflationary pressures that result in consumers spending less on goods, leading to a global slowdown in growth for industrial production and trade volumes.

Singapore, one of the world's leading nations when it comes to embracing and developing new technologies, has turned to digital and automation solutions to address many of the challenges that its chemical industry is currently facing.

Singapore's population is replete with talent and well suited for such an adjustment. More than 30% of the workforce holds a university degree, and most people are proficient in English. The city-state is host to six autonomous local universities as well as 14 foreign universities, and numerous specialized educational institutes, many of which have established partnerships with leading companies in the chemical sector. "Singapore is a very business-friendly city, with an immense amount of knowledge to be found locally," said Andreas Igerl, president APAC, IMCD Group.

Singapore is also not averse to importing talent. "As usual, the Singaporean government was a pioneer in terms of initiatives to attract talent. Initiatives such as the Overseas Networks & Ex-



Josephine Moh, Vice President and Head, Chemicals & Materials, Singapore Economic Development Board (EDB)

pertise Pass as well as other immigration schemes were launched to make it easier for skilled foreign workers to move to Singapore and establish themselves in the job market," said Charles Pfauwadel, senior vice president Asia & PNG, Airswift.

Singapore will also benefit from its world-class port infrastructure and its status as a leading shipping and bunkering hub. The Maritime and Port Authority (MPA), is determined to maintain this leadership, and Kenneth Lim, the assistant chief executive at MPA, shared with us the various digitization and sustainability initiatives the MPA is currently undertaking, including the first methanol bunkering operations in Singapore, AI-powered vessel traffic management systems, and 5G network rollouts. "The successful completion of the first methanol bunkering operation in July 2023 marks a significant milestone for Singapore's development towards a multi-fuel future and is a testament to Singapore's commitment as the world's largest bunkering hub," he said.

On Jurong Island, the chemical industry is also keen to adopt technologies, particularly after the pandemic showed just how quickly a physical workforce can be decimated overnight by quarantine measures. This was felt acutely in Singapore, where over 350,000 Malaysians cross the Johor-Singapore Causeway daily to work.

Singapore must also confront the pressure on energy-intensive industries such as chemicals to decarbonize. Gains in energy efficiency from adopting new technologies are critical. Josephine Moh, vice president and head, chemicals & materials, Singapore Economic Development Board (EDB), explained Singapore's ambition: "We have a vision for how we want to transform our industry for the future and support international efforts towards sustainable growth. We want the energy and chemicals industry to be sustainable and competitive, producing more sustainable products via sustainable pathways."

Despite the challenges facing the chemical industry globally, most of the interviewees featured in this report firmly believe that Singapore's chemical industry will emerge from this storm stronger, and that the small island will continue to punch well above its weight. ■

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THE RECOVERY THAT NEVER WAS

How the industry is reacting to softening demand in a turbulent market

High energy costs and inflation levels, the ongoing conflict in Ukraine, and increasing interest rates have created a perfect storm for chemical companies worldwide, particularly those that are exposed to industries such as electronics and construction. “Continued economic growth in ASEAN is expected, but the global slowdown will continue to pose challenges to many industries, including the chemical industry,” explained Takayuki Inagaki, managing director and CEO at Mitsui Chemicals Asia Pacific.

Moreover, across the entire chemical industry, from distributors to toll manufacturers and shippers, the theme of 2023 has been the same; the big post-pandemic economic rebound everyone was expecting from China has not yet arrived. These circumstances have had far-reaching consequences for the industry globally, as HELM Asia’s managing director and pres-



Johnson Lai, Vice President, Chemical Specialties Limited (CSL)

ident of chemicals Kew Hui Chin explained: “The chemical industry is cyclical, and we are currently in a trough. We are faced with a triple whammy of oversupply, slower-than-expected growth in demand, and high energy costs.”

dsm-firmenich’s APAC region president Jun Saplal, described the current situation as a VUCA (volatile, uncertain, complex, and ambiguous) environment.

Although the APAC region has perhaps not felt the sting of rising energy costs as sharply as some European countries, inflationary pressures have driven up costs nonetheless in other areas.



Jun Saplal, Region President APAC and SVP Asia Taste, dsm-firmenich

However, Singapore’s Monetary Authority announced that core and headline inflation rates have started to drop, and many expect this trend to continue throughout 2023. Johnson Lai, vice president at Chemical Specialties Limited (CSL), said: “Energy costs are high, but they at least seem to be plateauing now, and the shock of the initial increase has somewhat normalized. What continues to impact the industry is the rising cost of raw materials, construction costs, and labor.”

CHINA

China has been plagued by strict lockdowns due to the pandemic until restrictions started being lifted in late 2022. Many expected a surge in activity and demand from the Chinese market to follow, however China’s highly anticipated reopening has been underwhelming, compounded by a slump in the Chinese real estate market and sanctions from the West. China has an outsized impact on the chemical industry, accounting for around 45% of global demand for chemicals and petrochemicals. According to the Observatory of Economic Complexity (OEC), 16.7% of Singapore’s chemical exports, amounting to US\$7.9 billion, were destined for China in 2021, thus making China the largest importer of Singaporean chemical products.

Following years of significant investment in production capacity, this year China is expected to add a record-breaking chemical and fertilizer capacity of nearly 140 million t/y (dwarfing the previous record of 90 million t/y in 2014). The Independent Commodity Intelligence Services (ICIS) reports that between 2000 and 2022, global capacity exceeding demand in the six building block petrochemicals averaged 76 million t/y. ICIS forecast this figure to surge to 218 million t/y in 2023 from 191 million tons last year. “The increasing balance of China’s new capacities coming online could impact Southeast Asian markets most as volumes find their way there first. Despite a demand rebound, the supply overhang will likely continue to impact midstream players in Southeast Asia sig-



Takayuki Inagaki, Managing Director and CEO, Mitsui Chemicals Asia Pacific (MCAP)

nificantly,” said Thomas Luedi, senior partner, head of Asia chemicals, Bain & Company.

The weaker-than-anticipated demand in China is also felt by service providers like shipping companies. “There has been a decrease in chemical charterers, especially on the commodity side. These changes are mainly due to the global economy and China’s significant role in driving demand for chemicals,” said Sudheer Vijapurapu, managing director, New Asia Shipbrokers.

COVID’S LEGACY

The chaos wrought upon supply chains during the pandemic is having lasting effects. Many companies realized that they were unprepared for such black-swan events, and are re-vamping their supply chain strategies, with an emphasis on having contingencies in place and ensuring supplies are always at hand. Supply chain bottlenecks led many players to build excess inventory. “In addition to the macroeconomic situation, demand is also softening as there was significant overstocking during the pandemic as supply chains were extremely tight, and many companies have built up buffer stock that they now have to deplete,” said Ruben Mannien, executive vice president APAC at allnex, an industrial coating resins producer in Singapore.

The subsequent de-stocking effect created a lot of uncertainty and global production volumes of chemicals fell 5.3% in Q1 2023 on a year-on-year basis. Nevertheless, most predict this situation will not last long. “If we look at APAC itself, in general, the region is holding up, but there is still limited growth. With built-up stock starting to deplete, we expect to start seeing a rebound in the second half of 2023,” continued Mannien.

Despite the turbulent economic situation, some new doors are opened as others are closed. Roger Marchioni, olefins & polyolefins director – Asia at Braskem, explained that sustainability continues to become increasingly important to consumers worldwide: “The demand for sustainable products, such as biopolymers, has shown a strong resilience. People are more

CIRCULARITY

Closing the loop on chemicals

Like many nations, Singapore has been grappling with the issue of waste disposal for years, and the situation has only worsened with time. According to a report by the World Bank, global waste generation is expected to grow by 70% to 3.4 billion t/y by 2050. The only landfill in Singapore, the Semakau Landfill, is projected to run out of space by 2035 based on the current waste disposal rate.

To tackle this issue, Singapore has taken several steps towards a circular economy. The government launched the Zero Waste Masterplan in 2019, which aims to reduce the amount of waste going to landfills by 30% by 2030. This initiative is supported by the Plastics Recycling Association of Singapore (PRAS), launched in 2021 to enhance Singapore’s capability in plastics recycling by bringing together various stakeholders, including companies, institutions, and government agencies to exchange knowledge and best practices on plastic waste management and recycling.



Roger Marchioni, Olefins & Polyolefins Director – Asia, Braskem

aware that climate change must be tackled globally, and that is why everywhere in the world sustainable solutions have been more resilient against softening demands.”

According to data from Enterprise Singapore, petrochemical and primary chemical exports from Singapore experienced a 34% and 61.8% drop respectively in June 2023 on a year-on-year basis. Singapore nevertheless maintained its status as the world’s 9th largest exporter of chemicals in 2022, and its prowess in chemical manufacturing will maintain its future growth. ■

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Furthermore, the Resource Sustainability Act, introduced in 2019, has put in place an Extended Producer Responsibility framework for three priority waste streams: electrical and electronic waste, food waste, and packaging waste, which includes plastics.

Various chemical industry leaders in Singapore expanded on how they are contributing to developing a circular economy. The CEO of Borouge, Rainer Hoefling, showcased an all-polyethylene (PE) pouch, and described the various challenges in developing mono-material packaging products - which include ensuring reliable sealability, good mechanical properties, and thermal stability. The result is a plastic packaging solution that is easier to recycle and that has a less energy and resource-intensive manufacturing processes.

“We are actively developing advanced mono-material designs that will enable post-consumer packaging to be easily recycled,” said Hoefling.

The EU’s Packaging and Packaging Waste Directive stipulates that all plastic packaging must be reusable or recyclable in a cost-effective manner by 2030. Post-consumer recycled content (PCR) is not yet mandatory in packaging in any Asian country, nevertheless, it is probable that Asian manufacturers, particularly those that export heavily to Europe, will make the first move and incorporate circular solutions, such as mono-material packaging products, to meet these targets. “There is a dynamic environment around circularity, and different regulations in different countries are fostering initiatives and collaborations to build effective collection and recycling systems,” said Thomas Leudi, senior partner, head of chemicals at Bain & Company.



Sherif Fahmy, Vice President, Southeast Asia, Diversey

Wilson Chew, the chairman at Fortrec Chemicals & Petroleum, explained how Fortrec has pioneered a distillation process for oil refinery bottoms, thus preventing the bottoms from being incinerated. The output of this distillation process can be used as a feedstock for solvents to be used for coatings and paints, for example. Dr. Chew described how increasing demand for sustainable solutions is attracting refineries that may have previously overlooked this process. “With the growing sustainability push, more refineries are providing us with their bottoms since this leads to significant carbon savings for them,” he said.

Fortrec’s managing director, Ajay Bhattacharya, stated that re-purposing of refinery bottoms in this way has been proven to save 3.3 tons in carbon emissions for every ton of refinery bottoms distilled.

Thomas Leudi of Bain & Company described how circularity is becoming vital in all aspects of the Asian chemical market: “Companies are diversifying into alternative feedstocks and increasing their use of recycled materials. Companies in Thailand, for instance, are making a push into biofeedstocks for bioplastics. The emergence of bio-refineries for renewable diesel and sustainable aviation fuel production provides a low-carbon feedstock alternative for petrochemical products.”

Producing biofuels and re-purposing oil refinery bottoms are of course not simple processes. There are other ways of promoting circularity that, although less technically complex, can still yield great environmental benefits. Diversey’s Southeast Asia vice president, Sherif Fahmy, explained the ‘Plastic Shreds’ program, where single-use plastic waste is shredded into plastic chips, which are then used as gravel replacement in the building of horizontal structures such as basketball or badminton courts, village roads, pavements or to fill up potholes in roads. “Circularity-based initiatives like this make perfect business sense, on top of the environmental and societal benefits they bring,” he said.

On the specialty chemicals side, there are also various ways of incorporating circularity into operations, and for those involved in the food and ingredients markets, opportunities can arise in the form of natural ingredients. Seow Hoon Tan, executive chair of Maha Chemicals (Asia), a specialty chemicals distributor focused on the ASEAN region, explained: “The trend towards natural ingredients is prevalent all over Asia due to the rising middle-income group. This group values treating themselves better and is willing to pay for healthier and better-quality products.”

Singapore, having pioneered carbon tax in the region, is a frontrunner when it comes to sustainability. In order to safeguard its prominent manufacturing capabilities, its government is acting to ensure the foundations are in place for corporate stakeholders to build upon. ERM’s South & Southeast Asia managing partner, Wei Chee Liew, mentioned the Extended Producer Responsibility (EPR) initiative that mandates companies to report their packaging usage and their Reduce, Reuse, Recycle plans. In addition to this, Liew outlined how Singapore is exploring alternative feedstocks to promote circularity: “The government is exploring various feedstocks, with plastic being one of them. For instance, recycled plastics could be used as an alternative to fossil fuels in plastic production.”

Singapore’s rapid development over the past four decades has come with a seven-fold increase in waste. As with most sustainability challenges, if the issue is to be solved, collaboration and partnerships across industry and government are necessary. As new technologies enable cheaper and better recycling processes and recycled products, Singapore is ensuring that it has the right legislation in place to facilitate the shift from a linear to a circular economy. ■

ROAD TO NET-ZERO

Decarbonizing the supply chain

For many years now, decarbonization has been a hot topic. It is impossible to go to a chemical conference or attend a company presentation without hearing the words “carbon”, “sustainability”, and “greenhouse gases” echoing around the hall. However, recently we hear these words accompanied by mentions of “scope 3” and “LCA” and other specific terms. As regulations around GHG emissions tighten across the world, companies across all industries are going beyond the borders of their own factory and office walls to curb emissions, and the measures and processes they implement to achieve this are increasingly sophisticated.

Manufacturers now generally have a good understanding of their direct scope 1 emissions, such as fuel combustion or refrigerant leaks within their plants, with many companies laying out a clear path forward to further reducing these emissions.

Scope 2 emissions, the indirect emissions from the generation of purchased electricity, steam, heating, or cooling etc, have also been relatively well documented and assessed. However, scope 3 emissions, the indirect emissions that occur along a company’s value chain, are perhaps the most difficult to measure and manage, as they depend on many factors outside the direct control of the manufacturer. According to Together for Sustainability, scope 3 emissions account for around 70% of a chemical company’s total emissions on average, but this can be up to 90% in some cases. As Gabriele Unger, general manager at Together for Sustainability, explained: “Even if a company’s own emissions might be well under control, they may still use supplies that have huge carbon footprints.”

Singapore companies are now investing significantly in Lifecycle Assessments (LCAs) for their products, often with the use of sophisticated digital tools as the value chain can be long and complex. Wei Chee Liew, South and Southeast Asia managing partner at ERM, a pure-play sustainability consultancy, explained how LCAs are driving demand for his services in Singapore: “A high-demand area is lifecycle assessment and carbon footprinting due to the changing nature of traditional value chains. We are being asked to help re-define carbon footprints from an end-to-end perspective for new value chains with recycled feedstock.”

There are many challenges in the reduction of scope 3 GHG emissions, even for the most committed chemical companies. One challenge is the lack of transparency in value chains, which makes GHG emissions particularly difficult to quantify and reduce. Many players along the value chain may not measure or report their emissions data correctly, if at all, and in long and complex value chains there may be a myriad of elusive emission sources that are easy to miss.

Furthermore, the complexity of the global chemical sector value chain can make it difficult to harmonize calculation approaches and compare results. Generic standards are a basis for these calculations but are not sufficient due to the lack of specificity for key aspects in the chemical industry.

The GHG Protocol, created by the World Business Council for Sustainable Development and the World Resources Institute, establishes comprehensive global standardized frameworks to measure and manage GHG emissions from private and public sector



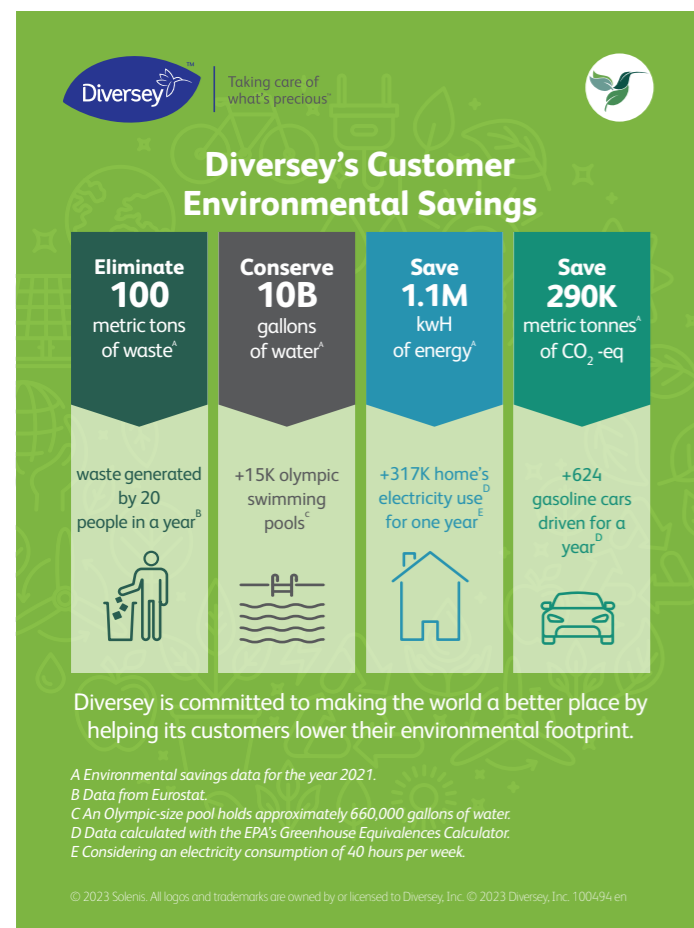
Ajay Bhattacharya, Managing Director, Fortrec Chemicals & Petroleum



Wilson Chew, Chairman, Fortrec Chemicals & Petroleum

operations, value chains, and mitigation actions. The GHG Protocol identifies 15 categories of scope 3 emissions, including ‘scope 3.1’, which covers emissions from the production of purchased goods and services.

According to the International Energy Authority, the chemical sector is the largest industrial energy consumer and the third largest industry subsector in terms of direct CO2 emissions. This is largely because around half of the chemical subsector’s energy input is consumed as feedstock – fuel used as a raw material input rather than as a source of energy.



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Given the scale and importance of the chemical industry in Singapore, this is an area of great concern.

“The [Singaporean] government is exploring various feedstocks, with plastic being one of them. For instance, recycled plastics could be used as an alternative to fossil fuels in plastic production. Additionally, biomass sources like wood chips, rice husks, and palm oil waste can be transformed into potential chemical feedstocks or even bio-fuels. The government has even issued a tender for a feasibility study on importing regional feedstocks into Singapore, illustrating its commitment to reducing the use of fossil fuels,” said Wei Chee Liew.

Singapore’s chemical industry has a few aces up its sleeve too. The industry benefits from being highly localized, with Jurong Island being home to over 100 petroleum, petrochemical, and chemical companies in a land area of only 32 km². Vickrem Vijayan, Singapore head of energy commercial at Sembcorp Industries, a Singaporean energy company, explains how this can be used to the industry’s advantage: “By aggregating demand, we can invest in more energy-efficient systems. For example, we can build

a co-generation plant instead of putting in individual boiler systems to produce steam and power. The same goes for wastewater treatment, whereby we can aggregate waste streams from various plants and have a centralized wastewater treatment facility.”

Local companies, like Apeiron Bioenergy, founded in 2007, can offer alternative bio-feedstocks such as used cooking oil methyl ester (UCOME). This provides a greener alternative compared to virgin feedstocks from fossil fuels as it is produced from used cooking oil that has been repurposed. Chris Chen, co-founder and director, Apeiron Bioenergy, said: “Our core product, UCO, saves a significant 84% in greenhouse gas emissions compared to fossil fuel-based alternatives.”

Digitalization will play a big role in gathering and analyzing the huge amounts of emissions data required across the value chain. Andreas Kappler, who heads the vertical management chemical & pharma ASEAN division at Siemens, shared some thoughts: “If you want to improve, you need to measure and collect data. Today’s emissions are partially estimated based on industry averages with the result that improvements in your supply chain will not be



Andreas Kappler, Head - Vertical Management Chemical & Pharma ASEAN, Siemens Singapore

reflected in your product carbon footprint (PCF), meaning you cannot leverage this competitive advantage immediately.”

Singapore’s chemical industry can also benefit from its experienced trade organizations, such as the Singapore Chemical Industry Council (SCIC) and Association of Process Industry (ASPRI), to facilitate collaborations and partnerships between various stakeholders and the government, which will be crucial if Singapore’s chemical sector is to achieve its emissions targets. We have already started to see this in action with investments, and research initiatives. Pedro Vasconcelos, CEO of the renewable energy company EDPR APAC, shared one such example: “GIC, Singapore’s sovereign wealth fund, invested a billion euros in EDPR, making it the second largest shareholder after EDP. GIC’s financial prowess combined with EDPR’s strategic and operational capabilities forms a strong duo.”

The Singaporean government and local energy providers have to consider a wide range of solutions. As it is, the city state’s diminutive geography limits its ability to decarbonize its chemical industry in the same way as other nations might. “It is unlikely that there is a single solution for Singapore, it will likely need a combination of factors,” explained Chevron’s Singapore country chairman Law Tat Win.

Unlike many countries in the region, Singapore’s CO₂ emissions per capita have been steadily decreasing since their peak in the mid-1990s. The World Bank reports a decrease in emissions from 11.1 t/y of CO₂ per capita in 1994 to 7.7t in 2020. In light of this track record, the government appears committed to continuing this trend until net-zero is finally achieved. ■

THE CHEMICAL PLANT OF THE FUTURE

How and why the Singapore chemical industry is adopting new technologies

In this article, we will explore some ways these technologies are revolutionizing the chemical industry in Singapore, from manufacturing to health and safety compliance.

Before any process can be automated or improved, data must first be collected using sensors. During our research, we met with Jonas Berge, senior director of applied technology at Emerson Automation Solutions at the Emerson Solutions Center in Tuas, where new sensing hardware is incorporated into chemical plants and refineries on the nearby Jurong Island. “A lot of plants wrongly believed they already had sufficient data that they just needed to put to good use, but it turns out that many need a lot more data, and therefore more sensors,” he explained. “We have found that a lot of smaller chemical companies seem keener on adopting automation and digitalization compared to large refineries. Perhaps this is because their smaller size affords them more agility, and it is easier to make changes to a smaller plant,” he continued.

As technologies have matured, equipment and providers have reported a shift in demand trends from the local chemical industry. “We have noticed that chemical customers are becoming increasingly well-informed when it comes to selecting components, and thus more demanding in terms of the sophistication and complexity of the services they require,” said Steve Sparkes, managing director - Singapore at Swagelok.

Although historically the chemical industry has lagged behind other sectors, such as semiconductors, when it came to adopting industry 4.0 practices, the tide has now turned, particularly in Singapore, where industry associations are pushing for their adoption. The Association of Process Industry (ASPRI), a trade association that represents Singapore’s Process Industry, launched the Process Construction and Maintenance (PCM) Industry Digitalization Readiness Index (DRI) to provide guidance and industry benchmarking for its members. “The association remains fully committed to guide our members to embark and sustain their digitalization journey,” explained Wayne Yap, the executive director at ASPRI.

If a system can be automated successfully, it can reduce the amount of physical human presence required for the operation of a plant, thus limiting workers’ exposure to potentially hazardous equipment or chemicals. Furthermore, the reliability and accuracy afforded by modern sensors mean that faults in a plant’s systems can be detected faster, allowing them to be fixed sooner. This rapid detection may not only prevent costly downtime for a plant, but more importantly avoid catastrophic failures. Singapore’s government is all too aware of this fact, and in 2017, the Prime Minister announced a target to reduce and sustain Singapore’s workplace fatality rate at less than 1 per 100,000 workers by 2028. To help achieve this, the Ministry of Manpower has released a Workplace Safety and Health (WSH) 2028 report containing recommendations on Singapore’s national WSH strategies for the next decade. The report acknowledges the immense potential for WSH to be transformed through technology and recommends the development of a WSH Technology roadmap to identify emerging technologies that can solve WSH problems.

Chandran Jayabalan, head of sales – Asia at Aggreko, which provides energy solutions to the petrochemical and refining industry, described how Singapore’s increasing regulations around sustainability are driving demand for Aggreko’s services: “The PCR industry is looking at carbon



Law Tat Win, Singapore Country Chairman, Chevron



Steve Sparkes, Managing Director, Swagelok Singapore

sustainability, especially following the implementation of the carbon tax in Singapore, while digitalization and remote monitoring plays an important role to manage their emission portfolios,” he explained.

Beyond the manufacturing of chemicals themselves, AI and digital tools can play a role further downstream in the packaging process. Chin Hui Ho, Singapore hub director at SICK Sensor Intelligence, a sensor solutions provider, said: “There has been an uptick in the use of AI, particularly when it comes to packaging within the chemical industry. These AI tools are particularly useful for the identification of repeated patterns and foreign object detection.”

The digital revolution is not limited to manufacturing and factory floors. Ai Lee Ng, Singapore director of Lisam Systems, a provider of environment, health, and safety (EHS) compliance solutions and services, explained: “Regulations change frequently nowadays, particularly in the fields of Global Harmonized Systems (GHS) and transportation, so new technologies are essential to keep up with a fluctuating environment. Singapore remains stricter than other SEA countries. Even though these countries have regulations, enforcement will not be as strict as here.”

Digital tools like Lisam’s ExESS chemical management software enable the efficient management of all product data relating to compliance, hazard communication, environmental reporting, and inventory management throughout a product’s life cycle.

The World Economic Forum’s 2020 Global Competitiveness Report (the last produced) ranked Singapore sixth globally in ICT adoption and digital skills, and third in digital legal framework, and the country has only improved these since. Moreover, the nation boasts the world’s second-fastest broadband speeds. Chemical manufacturers based in Singapore are in a prime position to leverage technology, as the country enjoys excellent infrastructure, strong IP protection laws, and an excellent talent base. Organizations like the Singapore Chemical Industrial Council (SCIC) are also making efforts to ensure that the talent pool does not get left behind as technology advances ever forward. “As businesses embrace technological advancements, it becomes imperative to ensure that the workforce also undergoes a similar transformation by acquiring new knowledge and skill sets to support these emerging roles,” said Terence Koh, the executive director of the SCIC.

Singapore’s rich ecosystem of start-ups, tech companies, and service providers means that plant owners need not look far to find a digital solution to their operational challenges. The Singaporean government, through its various arms such as the Agency for Science, Technology and Research (A*STAR), continues to push technological innovation and R&D and bridge the gap between academia and local industries. All this puts the Singaporean chemical sector in a prime position to exploit emerging technologies to gain an edge over competitors abroad. ■

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A CHAIN IS NO STRONGER THAN ITS WEAKEST LINK

The importance of a robust supply chain and efficient logistics in a post-pandemic world

Until recently, the importance and the vulnerability of the chemical industry's supply chain had been underestimated; this is no longer the case. "The landscape changed dramatically in 2020, when numerous businesses experienced significant losses due to logistical challenges and disruptions in the supply chain. As a result, there is now a heightened focus on establishing a robust and efficient supply chain," said Raj Kaushik, director, FRP Services (Asia).

The supply chain disruptions caused by the pandemic seem to have largely subsided. Additionally, for many Singaporean stakeholders, their supply chain woes appear not to have been as severe as those of their Western counterparts. Vinod Agnihotri, managing director at LANXESS, observed: "Our manufacturing business in Singapore and Southeast Asia proved more stable and resilient, largely due to the more robust Asian supply chains."

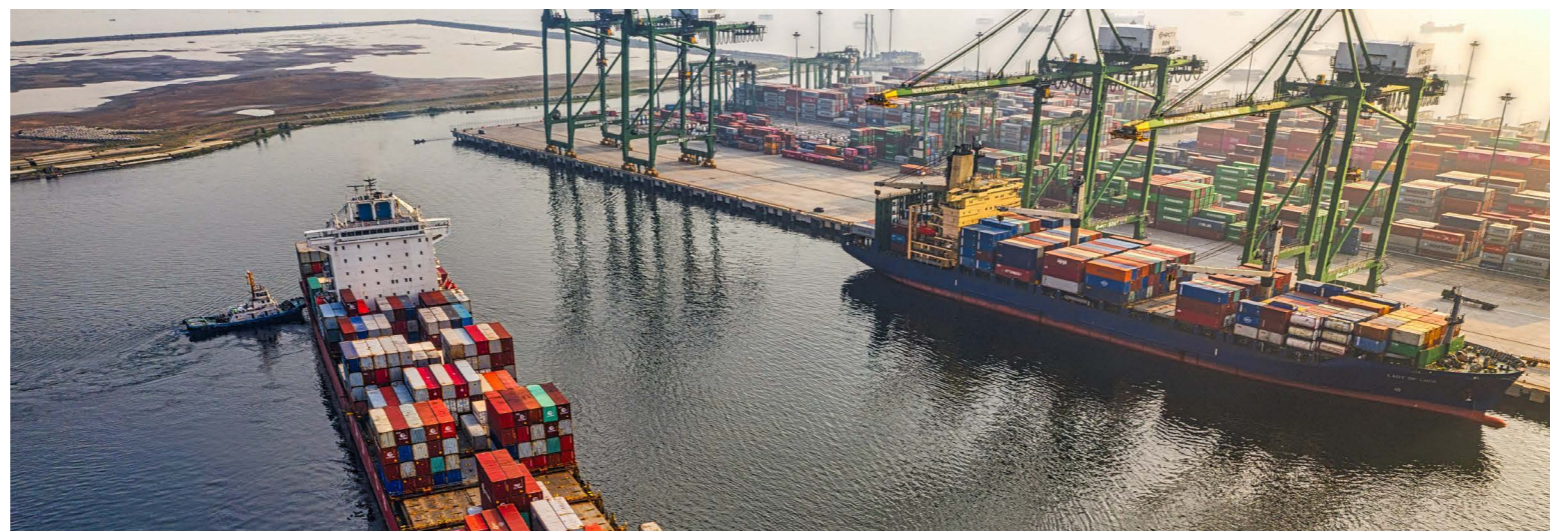


Image courtesy of Tom Fisk (Pexels).

Nevertheless, industry players in Singapore have revamped strategies around their supply chain management. "Particularly for the chemical industry, now is a time of transition where they are moving from a stable systematic approach to a more resilient regional approach, and onshoring and nearshoring will remain hot topics in the industry moving forward, moving away from just efficient production to more sustainable, resilient, and probably more regionalized production," explained Alexander Donau, APAC regional head at the global logistics solutions provider Leschaco.

This has led in some instances to companies relocating their operations. Vimala Arumugam, managing director, BASF South East Asia & BASF (Malaysia), explained: "We will also produce products that were previously manufactured in Europe in the Tuas site to better serve the Asian market."

Lubrizol Southeast Asia's managing director Paul Nai, said: "As supply chains move from a 'just-in-time' model to 'just-in-case', we expanded the blending capacity at our Singapore site to improve product mix and supply resilience in the region."

Service providers, meanwhile, are invested in improving their logistics capabilities, characterized by several trends, including the adoption of digitalisation, AI and automation, as well as extending their services to include additional services such as reverse logistics, e-commerce management, and analytics capabilities. Atul Chandna, EY's Asia-Pacific supply chain leader, said: "We are seeing fully networked ecosystems of suppliers, carriers, and companies working together."

Artificial intelligence in particular has exploded in popularity when it comes to supply chain management. Atul Chandna continued: "Large enterprises today are pushing for 50-60% of their key decisions to be AI-assisted or fully automated."

The Maritime and Port Authority of Singapore (MPA) reported that Singapore's container throughput in 2022 was 37.3 million twenty-foot equivalent units (TEUs), a slight decline of 0.7% from the record throughput of 37.6 million TEUs in 2021. The port's performance was resilient compared to the decline in global container trade of about 3 to 4% in 2022. Nevertheless, the maritime industry in Singapore has had its challenges. "Shipbrokers have recently seen a decrease in chemical charterers, especially on the

commodity side," said Sudheer Vijapurapu, managing director at New Asia Shipbrokers.

To maintain Singapore's dominance in the maritime space, the MPA has announced a flurry of new digitalization and automation initiatives to further improve the fluidity and efficiency of port operations. "Digitalization is a cornerstone of our strategy, along with decarbonization and talent development. We have various collaborations with research institutions underway to develop cutting-edge

tech," said Kenneth Lim, the MPA's assistant chief executive of industry and transformation. Chye Poh Chua, the founder of Ships-Focus, is seeking to transition the maritime industry into the digital world. He explained: "A cargo owner's biggest problem is lack of visibility, and in mitigation, they incur significant costs on contingency planning. If the cargo owners can capture data on a real-time basis it will allow for better planning, and gradually they will be able to cut down on the necessity of putting contingencies in place." ■



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