

Taiwan: Seizing opportunities in a changing world

Petrochemicals special report

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ASIA'S UNRELENTING NEED FOR PETROCHEMICALS LEADS TO OPPORTUNITIES – AND CHALLENGES

Asia's thirst for petrochemicals remains unquenched despite strong growth in regional production capacities in recent years, especially with demand coming from China and India on the back of GDP growth and key trends such as urbanization.

While this presents opportunities for petrochemical producers in the region, naturally, some challenges are to be found – especially amid key shifts in upstream markets.

The feedstock landscape for petrochemicals is changing rapidly across the world, with US shale output changing the game for Asian petrochemical producers.

Some in Asia saw the writing on the wall early – Taiwan's Formosa has existing olefins crackers in the US with plans for more, while India's Reliance has positioned vessels to take US ethane into Asia – while others are still adapting.

Unsurprisingly, these upstream movements are having a ripple effect on petrochemical production, with plants using new technologies like coal-to-olefins, methanol-to-olefins and propane dehydrogenation springing up. Over time, these production processes have established themselves as a force to be reckoned with, oftentimes being the marginal producer of key chemical building blocks such as ethylene and propylene. Further downstream, end-users are riding the waves of demand, supply and pricing changes in petrochemicals.

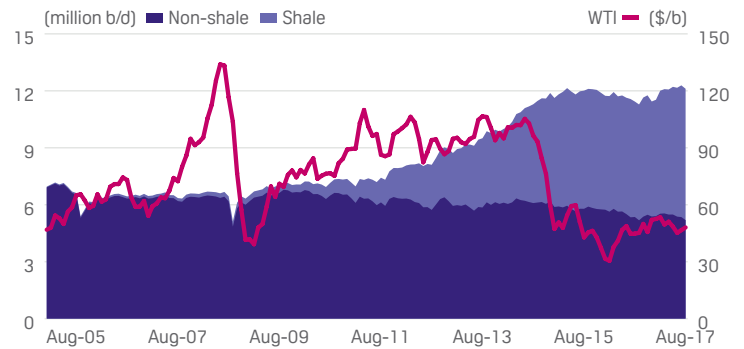
While there are differences in the various stages of chemical production, what every market participant has in common across all chains of the petrochemical complex is a keen eye on margins. This special report examines what these changes mean for Taiwan – from US shale and NGLs, to naphtha, olefins and the aromatics that the region produces – as it steers its ship into the future.

TRANSFORMING THE PETROCHEMICALS FEEDSTOCK LANDSCAPE: THE RISE OF US SHALE AND NGLS

The rise of shale oil has had a huge impact on oil markets in recent years. However, the growth of shale oil, also known as tight oil, and its influence on global markets has not ended; indeed, it has only just begun.

It was during the three-year period over 2011–2014 that production of shale oil exploded as US producers responded to crude at \$100/barrel by applying existing technologies, including horizontal drilling and hydraulic fracturing, to extracting oil trapped inside shale and tight rock formations.

US CRUDE PRODUCTION AND PRICE OF WTI



Source: US EIA, S&P Global Platts Analytics

The result has radically reshaped global oil markets.

Despite WTI crude prices falling back to levels last seen more than a decade ago, US shale production has continued unabated, leaving those that hoped the fall in crude prices would see a drawback in US production sorely disappointed.

Shale was slow to respond to the fall in WTI, with production barely dropping as prices fell to a low of \$30/b. However it was very quick to respond to rising prices; production was up 9% in the first eight months of 2017 compared with the same period a year earlier, even though average prices remained at around half the level seen over 2011–2014, when \$100/b oil drove shale's initial boom. Capital expenditure in US shale rose around 60% in 2017 from the year before, driving a rise in horizontal rig activity – one of the key leading indicators of shale production.

Shale's resilience in 2017 even as prices hovered a few dollars above \$50/b is a story of falling costs, which collapsed along with the crude price, and productivity gains which have helped to lower breakeven levels.

The number of fracking stages per well, the volume of proppant – the material used to keep the fracks open to allow the oil to flow – and the length of horizontal wells drilled are all up by around 15–20% on levels seen in 2014.

All this means operators are drilling faster and getting more oil from each well. Rig productivity, measured in barrels per day per month, rose from around 600 b/d at the end of 2014 to nearly 1000 b/d by the end of 2016. While costs have also risen, for the moment, increased well productivity means that the marginal breakeven cost of wells in major US shale plays like the Permian and Bakken are around \$50/b, supporting the rise in US shale oil production.

In medium term, global crude prices will be dependent on US shale economics

Crude prices have been rising since the second half of 2017, supported by a decline in surplus crude stocks across the

globe, which Platts Analytics estimates fell by over 30% in the third quarter. While Hurricane Harvey impacted US refinery production, leading to a buildup in crude inventory, the disruption to production saw a significant drawdown in light product stocks.

This decline in crude stocks along with the backwardation of crude, strong global macroeconomic environment, and continuing restrictions on OPEC output has supported the rise in crude prices we have seen since mid 2017.

Stronger crude prices in the fourth quarter, well above shale's breakeven cost, which is estimated at \$50/b in major shale plays, has driven an expansion in shale production. But shale's ability to expand production so quickly in response to price will limit any sustained rise in crude prices.

With US refineries running at close to maximum utilization and with most US Gulf refineries designed to run medium and heavy sour, as well as lighter domestic grades, much of this light sweet shale oil will end up on the global market.

From January to November 2017, US crude exports averaged 1,080,000 b/d, up 60% on the same period last year, with over half of this flowing to Asia. Platts Analytics expects the average price of Dated Brent in 2018 at only a dollar or so under \$70/barrel.

US shale production to more than double in a decade

With enough technically recoverable shale resources to last decades, Platts Analytics believes that US shale production will continue, with total liquids production potentially rising from just over 7 million b/d in 2017 to more than 14 million b/d by 2027.

A significant proportion of these liquids will be NGLs – primarily ethane, propane, butane and pentanes stripped from wet shale gas. Platts Analytics expects shale NGLs to grow by just over 2 million b/d over 2017-2027, accounting for just over two-thirds of total global expansion in NGL, which we forecast to rise by 3.2 million b/d over the same period. While we expect more ethane and propane steam crackers to come online in the US as a result of this abundance of NGLs, they will be unable to absorb all the new supply and we expect the trend of NGL exports to continue.

Rise of US NGL exports will see increasing use of ethane in Asian steam crackers

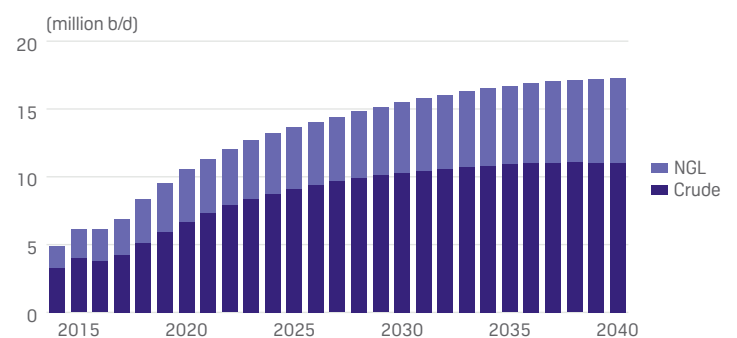
The US has been a significant exporter of propane for several years, but the fastest growth in NGL exports over the last year has come from ethane. This is due to two ethane export terminals - Marcus Hook in Pennsylvania and Morgan's Point in Texas – coming on stream in 2016. The latter sent shipments to India on two new very large ethane carrier vessels, the first of six VLECs commissioned by Reliance Industries for transporting US Gulf Coast ethane to its petrochemical plants in India.

PLATTS ANALYTICS FORECAST DATED BRENT PRICE



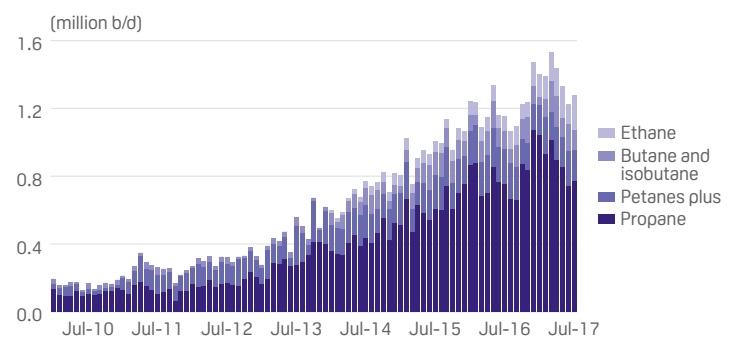
Source: S&P Global Platts Analytics

PLATTS ANALYTICS FORECAST US SHALE PRODUCTION



Source: S&P Global Platts Analytics

US NGL EXPORTS



Source: US EIA

Aside from offering more choice to flexible feed crackers like those being built in India, we expect US ethane to be consumed by some of the new steam crackers being built in China. Across Asia as a whole, naphtha will still dominate as a feedstock. But the use of ethane, which has a much higher ethylene yield than naphtha, will grow faster, helping supply sufficient ethylene for Asia's increasing demand for petrochemicals.

US propane takes cue from global price trends

However, in terms of volume, LPG - propane, butane and isobutene – still dominate US exports. As LPG export capacity has grown along the US Gulf Coast in recent

years, the US market has been taking more of a cue from global prices. The propane market in particular has reached prices last seen before the oil downturn and the polar vortex winter of 2013-14 in the US due to strong demand in Asia.

Prices for non-LST propane at Mont Belvieu, Texas, the North American pricing hub for NGLs, have been higher this year than in previous years, averaging 70.9 cents/gal over January to October this year, up considerably from 45.8 cents/gal over the same period last year.

US propane prices are being supported by Asian LPG demand this year, boosting exports and keeping inventories below the 100 million-barrel levels of the past two years.

Propane exports started out the year averaging 993,000 b/d in the first quarter but have come off since, when the price spread between the regions narrowed to the point where it was no longer economic to ship cargoes to Asia. This saw many cargoes cancelled. However, a recent pickup has seen more people returning to the market to ship cargoes.

Hurricane Harvey delayed some cargoes as ports in the region shut down, resulting in two weeks of 1 million b/d exports once the ports reopened. Even as port and fractionators shut down during and after the storm due to flooding, leaving few outlets for propane or any NGL, propane prices remained strong tracking Asian prices, market sources said at the time.

With the coming winter months forecast to be colder than last year, propane demand from heating is expected to pick up. With inventories low, prices have recently surged at Mont Belvieu to as high as \$1.70/gal, as market players are concerned about supply during the winter months.

The uncertainties around the severity of winter temperatures and the subsequent heating demand associated with that are bound to be a factor in further opening or closing the US propane arbitrage to Asia.

Overall, these changes in the US are now coming head to head with the Asian feedstock story – that of naphtha, which is now facing a challenge from non-traditional feedstocks in the region.

Naphtha's competitiveness in an increasingly volatile cost environment

Despite the increasing production and use of NGLs, and newer technologies such as coal-based chemicals production via methanol, naphtha remains the key petrochemical feedstock for Asia.

The massive production capacities in Asia have led to a naphtha deficit in the region, with Taiwan, South Korea, Japan and China becoming key importers. However, import

growth in these markets has slowed significantly in the past decade due to a combination of higher domestic production and slower domestic demand for petchems.

China, on the other hand, has been seeing significant growth in naphtha imports, boosted by a rise in naphtha reforming capacities that has outpaced its domestic supply increase. This means that Taiwan is also facing an increasingly competitive market for naphtha.

The price difference between the price of naphtha – which is linked to crude oil – and ethane in the NGL stream alongside natural gas has meant the fortunes of petrochemical producers have varied wildly depending on the feedstock they use. In June 2014, when crude oil was at a peak of \$115/b, the average cost of producing ethylene from naphtha in the Far East was a massive \$1,409/mt.

However, for US ethylene producers, who could take advantage of cheap ethane arising from shale gas production, was a quarter of this at \$347/mt.

Since then crude prices have more than halved. Far East Asian naphtha-based units have seen production costs drop as much as 65% to a much more competitive \$493/mt, while US ethane based ethylene production costs remain little changed from 2014 at \$320/mt.

With this feedstock story in mind, let's now turn to Asian petrochemicals, which have seen key transformations in olefins and aromatics markets amid growth in US ethane and LPG supplies.

OLEFINS: TAIWAN, A REGION THAT PUNCHES ABOVE ITS WEIGHT

Taiwan's role in Asia's petrochemical markets far outweighs its size. For an island that makes up just 7% of the land mass of the three traditional producers – the other two being Japan and South Korea – Taiwan accounts for more than a fifth of the total ethylene capacity.

Taiwan currently has five naphtha-fed steam crackers with a combined ethylene production capacity of 4.03 million mt/year, compared with 6.059 million mt/year in Japan and 8.14 million mt/year in South Korea.

Age, size, and flexibility of Taiwan's plants give them a competitive edge

Taiwan's steam crackers are also more cost competitive compared with others in the region, as its crackers are newer and larger. According to Japan's Ministry of Economy, Trade and Industry, around 53% of Japan's ethylene plants are around 45-49 years old, while the oldest steam cracker in Taiwan is CPC's No. 4 steam cracker in Linyuan, which was built 34 years ago.

This elevated efficiency is the result of a “scrap and build” policy by the two steam cracker operators in Taiwan, state-owned CPC and private entity Formosa Petrochemical. CPC used to have three steam crackers – No. 3 and No. 4 in Linyuan and No. 5 in Kaohsiung. It scrapped No. 3 in 2012 and No. 5 in 2015, while starting up its No. 6 steam cracker in Linyuan in 2013, bringing its combined ethylene production capacity to 1.1 million mt/year.

Meanwhile, Formosa started up its No. 3 naphtha-fed steam cracker in Mailiao in 2007, increasing the company’s combined ethylene production capacity to 2.93 million mt/year.

In this way, Taiwan has become a key olefins exporter and importer in Asia since 2007. Prior to the startup of Formosa’s No. 3 steam cracker, Taiwan was importing around 300,000-400,000 mt/year of ethylene, higher than China’s ethylene imports of 110,000-120,000 mt/year recorded for 2005 and 2006, according trade statistics.

After 2007, Taiwan’s ethylene import volume began shrinking, and it started emerging as a key ethylene exporter in the region.

In 2015, Taiwan’s ethylene exports were greater than its imports, making it a net exporter for the first time with a surplus of 110,820 mt, although this reversed in 2016, when Taiwan was a net importer of 60,150 mt of ethylene.

Integrated refineries give Taiwan ability to improve margins with feedstock flexibility

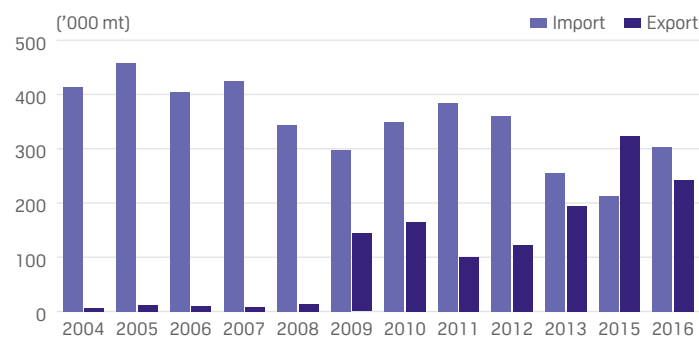
Apart from plant age and size, both CPC and Formosa have another advantage over other Asian steam cracker

TAIWAN’S STEAM CRACKERS (mt/year)

Company	Location	Ethylene capacity	Completion	Status
Formosa	Mailiao 1	700,000	1998	
	Mailiao 2	1,030,000	2000	
	Mailiao 3	1,200,000	2007	
CPC	Linyuan 3	230,000	1977	Scrapped in 2012
	Linyuan 4	380,000	1983	
	Kaohsiung 5	500,000	1994	Scrapped in 2015
	Linyuan 6	720,000	2013	

Source: Platts

TAIWAN ETHYLENE IMPORT AND EXPORTS



Source: UN Comtrade

No data for 2014 available

FORMOSA’S STEAM CRACKER EXPANSION PLANS IN THE US (million mt/year)

Location	C2 capacity	Startup	Note
Texas	1.5	Existing	existing plant
Texas	1.2	2018	under construction
Louisiana	1.2	After 2021	Waiting for approval, joint investment with FCFC
Louisiana	1.2	After 2021	to be conducted in two phases

Source: Platts

operators – refinery integration. CPC has two refineries in Talin and Taoyuan with a combined crude processing capacity of 550,000 b/d, while Formosa has a 540,000 b/d refinery in Mailiao.

As a result, both companies have the ability to make feedstock choices, and can include more LPG in their feedstock slate should the economics make sense. Typically, Asian steam cracker operators can start switching to LPG from naphtha when LPG prices fall at least \$50/mt below naphtha.

While non-integrated steam cracker operators find it hard to switch to LPG in a timely manner as they need to purchase LPG cargoes in the spot market, Taiwan’s steam cracker operators are able to switch back and forth when needed as they are able to source LPG feedstock from their own refineries.

In April, the spread between LPG and naphtha fell to minus \$86/mt, according to S&P Global Platts data. During this time, Taiwan steam cracker operators were able to switch while others in the region did not.

Overseas expansions to take advantage of growth in US feedstocks?

Going forward, Taiwanese companies are also looking externally for expansions. Formosa is eyeing ethylene capacity expansions in the US, where it is building an ethane-fed steam cracker in Texas with a total ethylene production capacity of 1.15 million mt/year that is due to start up in early 2018. Within Taiwan, the company faced difficulties getting approval to build another naphtha-fed steam cracker due to growing environmental concerns.

Formosa is planning to build an ethane-fed steam cracker in Louisiana as well, with an initial ethylene production capacity of 1.2 million mt/year. It is planning to double the capacity in the second phase of investment. The company plans to start up its new Louisiana plant after 2021.

Given current market circumstances, external-facing plans such as diversifying feedstock portfolios and going global to set up plants near demand centers are suitable approaches. However, more flexible approaches such as investing in usage of alternate feedstocks at Asian operations could be considered down the line, as this would help Taiwan add further to its predominant geographical advantage.

AROMATICS: MAINLAND CHINA A GAME CHANGER FOR THE REGION

While Taiwan's position in olefins is relatively strong, as a net importer of aromatics products, it may be more open to the whims of global tradeflows buffeting domestic demand and supply fundamentals than other markets in Asia. With Chinese producers adding many more downstream units across the spectrum, the challenges – and potential opportunities – for Taiwan are many.

Asian benzene: The search for balance amid the supply overhang

In a global context, Taiwan has always been an importer of benzene, along with China, the US Gulf Coast and Southeast Asia, among others. In the last five years, Taiwan has been a reliable and consistent buyer, importing an average of 715,000 mt/year over the past five years, meeting around 30% of its total requirements. It has produced an average 1.7 million mt/year of benzene over the same period.

The relative stability in output and imports reflect steady benzene fundamentals in Taiwan, which have plateaued over the years.

In comparison to other importers, such as China, which is expected to import over 2 million mt of benzene in 2017, and the USGC, which buys around 1.2 million-1.5 million mt/year, Taiwanese buyers have less bargaining power in price negotiations.

However, with 2.9 million mt of new benzene production slated to start up across Asia and the Middle East, excluding China, over the next three years, the pool of suppliers for Taiwanese buyers will increase across the globe.

China is expected to add at least 3 million mt of new benzene production over the same period, likely dousing its import demand. This will result in an extended supply overhang of benzene that will offer Taiwanese buyers plenty more supply options in the future.

South Korea and Japan have long been the main suppliers of benzene to Taiwan, with China usually the third largest supplier. Trade flow shifts have started to occur this year as new capacities come on stream, resulting in Singapore overtaking China in the first half of 2017.

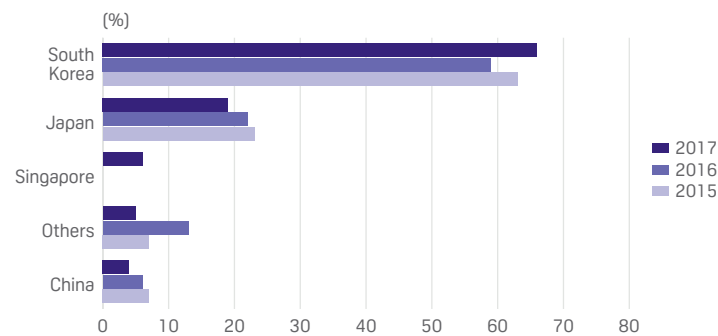
TAIWAN'S TOTAL PRODUCTION OUTPUT OF BENZENE AND TOTAL IMPORT VOLUMES (mt)

	2012	2013	2014	2015	2016	2017*
Total output	1,683,579	1,567,241	1,793,825	1,740,390	1,695,046	629,294
Total imports	603,524	708,956	760,183	707,293	786,102	292,165
Imports dependence	26.4%	31.1%	29.8%	28.9%	31.7%	31.7%

*Jan-May

Source: Taiwan trade statistics

BREAKDOWN OF IMPORT ORIGINS INTO TAIWAN



Source: Taiwan trade statistics

*Year-to-date

OCTOBER 2017 FREIGHT RATES TO TAIWAN (\$/mt)

BZ freight rates from:	3kt to Taiwan	6kt to Taiwan
Korea	23-25	17-19
Singapore	32-35	27-29
Thailand (MTP)	30-32	25-27
East Coast India	58-60	40-48
West Coast India	47-51	39-41
Saudi Arabia	50-60	46-48

Source: Market sources

Hence, as more benzene production comes online, further trade flow changes could be expected within Asia that could be advantageous to Taiwanese buyers. Disadvantages such as freight costs based on geographical location could also be trimmed by other factors, such as co-loading with other products like toluene, or bulk shipments to ports in the vicinity such as East China.

China turns toluene exporter as supply rises – and its impact on Taiwan

China has been actively increasing its toluene supply in the past two years in a bid to reduce its reliance on imports and move towards greater self-sufficiency. China's estimated total toluene production capacity in 2016 was 11 million mt and it is expected to add another 1 million mt of new capacity in 2017.

On the other hand, China imported 330,896 mt of toluene in the first seven months of 2017, with the volume gradually decreasing each month amid the increase in domestic supply.

The rise of Chinese toluene supply means Chinese exports are a future possibility and Chinese sellers have begun to explore ways to export toluene, especially to neighbors such as Taiwan, as freight economics would make sense. The China-Taiwan free trade agreement or FTA signed in 2010 could see Taiwanese buyers receiving economic incentives should China begin exporting toluene.

At present, China's toluene export tax stands at 17% but exporters are entitled to a 4% rebate, which effectively puts the export tax at 13%. However, sellers are deterred from exporting from China at present as they are required to absorb the export tax.

ASIA AND MIDDLE EAST BENZENE/PARAXYLENE 2017-2020 PLANT EXPANSIONS ('000 mt/year)

Company	Location	Time	2017		2018		2019		2020	
			Benzene	PX	Benzene	PX	Benzene	PX	Benzene	PX
Petrochina Yunnan	Yunnan, China	Q2	130							
CNOOC Huizhou	Huizhou, China	Q4	250							
Sinochem Quanzhou	Quanzhou, China	2018			220					
Hebei Qianhai	Hebei, China	2019					500			
Ningbo Zhongjin 2	Ningbo, China	2019					500	2,000		
Zhoushan Rongshen 1	Zhoushan, China	2019					700	4,000		
Zhoushan Rongshen 2	Zhoushan, China	2020							700	4,000
Fujian Gulei	Fujian, China	2020							220	
Total			380	-	220	-	1,700	6,000	920	4,000
KPIC	Onsan, South Korea	Q2	130							
S-Oil	Onsan, South Korea	Q2	40							
Hanwha Total	Daesan, South Korea	Q3	80							
Reliance	Jamnagar, India	Q3	500	2,200						
Nghi Son Oil Refinery	Vietnam	Q1			240	700				
JG Summit	Philippines	2019					72			
Hengyi Refinery	Brunei	Q4					500	1,500		
Petronas	Malaysia	2019					226			
Sadara Chemical	Al Jubail, KSA	Q2	280							
Saudi Aramco	Ras Tanura, KSA	H2			285	1,360				
RLGAP	Ras Laffan, Qatar	2020							890	1,300
ChemaWeyaatt	Tacaamol, UAE	2020							500	1,400
Total			1,030	2,200	660	3,421	798	1,500	1,390	2,700

Source: Market sources, S&P Global Platts

On the other hand, due to the FTA, exports to Taiwan may be at lower tariffs and this could incentivize Chinese sellers to target the Taiwan market, although nothing had yet been formally announced at the time of publication.

However, should this happen, Taiwanese sellers may see their traditional market share of Asian exports eroding and, in the worst case scenario, may face competition in their domestic market. Taiwan's toluene exports to China totaled 64,393 mt in the first seven months of this year, or 19.5% of China's total toluene imports. Taiwanese sellers could see this volume gradually decreasing once China produces sufficient toluene to meet its demand.

Meanwhile, Taiwan's imports of toluene totaled 78,016 mt for the first seven months of 2017, with the majority of cargoes sourced from South Korea and Japan. Often, these

NEW CHINESE TOLUENE CAPACITIES 2016-2017 (mt/year)

Plant	Location	Year	Capacity
CNOOC Daxie Petrochemicals No.1 and No.2	Zhejiang Danshan	2016-2017	Combined 420,000
CNOOC Taizhou Petrochemicals	Taizhou province	2016	230,000
Sinopec Changling Petrochemicals	Guangdong Province	2016	70,000
Petrochina Zhongjie	Hebei province	2016	120,000
Baolai Petrochemicals	Liaoning	2016	240,000
Hongrun Petrochemicals	Shandong	2017	120,000
CNOOC Huizhou No.2			
CNOOC Huizhou No.1 + No.2	Huizhou	2017	Combined 450,000
Petrochina Yunnan	Kunming	Sep 2017	250,000
Jingbo Petrochemicals	Shandong	Q4 2017	120,000
Sinopec Luoyang Petrochemicals	Henan	Q1 2018	100,000

Source: Market sources, S&P Global Platts

CFR TAIWAN PRICES MOSTLY TRADING AT A PREMIUM TO CFR CHINA PRICES FOR MOST OF 2017 (\$/mt)

Source: S&P Global Platts

cargoes are sold at a premium to CFR China prices at zero import duty. China's sellers, on the other hand, would be pricing their cargoes based on domestic prices, which could trade at lower levels due to ample supply, and this presents an opportunity for Taiwanese buyers to import high quality Chinese toluene of 99.5% purity grade.

Antidumping concerns in China's styrene monomer market could affect Taiwan activities

Taiwan has maintained a special relationship with China over the years, especially for styrene monomer and downstream markets, which it has relied upon as its largest trading partner and customer.

That relationship has come under pressure recently, with China's Ministry of Commerce announcing in a statement on June 23 that it had launched antidumping investigations into SM imports from Taiwan, South Korea and the US following a petition filed by Chinese SM producers.

The petition was filed collectively on May 25 by six of China's SM producers, and supported by six other major private and state enterprises. The statement said the six producers and the six companies supporting the petition had collectively produced more than 50% of China's SM output in each of the last four years, so the petition was in line with China's current antidumping guidelines.

The investigation covering SM imports from Taiwan, South Korea and the US over January 1-December 31, 2016, is expected to be concluded before June 23, 2018, but may be extended to December 23 of that year under special circumstances, the ministry said in the statement.

Taiwan has a total SM production capacity of 2.05 million mt/year, with Formosa Chemicals' three units in Mailiao accounting for 1.32 million mt/year, Grand Pacific or GPPC's two lines in Tashe 370,000 mt/year and Taiwan SM or TSMC's two units in Linyuan 340,000 mt/year.

Of the estimated 2.05 million mt of SM produced in Taiwan in 2016, around 25.2% was exported, and 88.7% of that headed to China, Asia's largest importer of SM.

TAIWAN STYRENE MARKET DEMAND AND SUPPLY SITUATION (mt)

Styrene	Year	2013	2014	2015	2016*
Supply	Production	2,044,325	1,974,323	2,020,355	2,050,660
	Import	393,855	384,808	335,965	341,004
	Total	2,438,180	2,359,131	2,356,320	2,391,664
Demand	Domestic Consumption	1,924,233	1,794,666	1,863,540	1,874,245
	Export	513,947	564,465	492,780	517,419
	Total	2,438,180	2,359,131	2,356,320	2,391,664

Source: Petrochemical Industry Association Taiwan

China's total SM demand has gradually increased from 8.49 million mt in 2013 to 9.1 million mt in 2016, at an average growth rate of 2.38%/year. China's domestic SM production capacity currently stands at 8.39 million mt/year, according to industry sources, and is expected to rise 2.3 million mt/year to 10.7 million mt/year by 2019.

To meet rapidly increasing domestic demand, China imported 3.5 million mt of SM in 2016, of which 1.23 million, or 35%, came from South Korea, making it the largest SM supplier to China, at more than double the volume sent by second largest supplier Saudi Arabia. China's imports from Taiwan were not far behind Saudi Arabia's, and just ahead of the US'. The percentage of

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Taiwan-origin cargoes imported by China has remained relatively stable at around 13% since 2013, despite fluctuations in the total volume imported.

The antidumping investigation and a potential antidumping duty on Taiwan-origin cargoes have cast a shadow over Taiwan maintaining a competitive edge over other SM exporters to China, particularly from the Middle East and Southeast Asia, which are not subject to the probe.

Iran, Kuwait and Saudi Arabia in particular provided a combined 26% of total Chinese SM imports in 2016, and could potentially be the largest threat to Taiwanese SM producers should antidumping duties be imposed from next year.

However two of Taiwan's three major SM producers have already divested heavily in the production of styrene downstream products in China, in particular acrylonitrile-butadiene-styrene and polystyrene, which will help mitigate any potential impact from antidumping duties, or ADDs.

It could be argued that of the three suppliers under investigation, Taiwan will likely face the least impact from ADDs. This is due to the premium it commands over Middle East and US origin cargoes due to geographical proximity

with China, the close business relationships Taiwanese producers have already forged with downstream end-users in China over the years, and the fact that Taiwanese cargoes are mostly exported to China on a term basis; South Korean and US origin cargoes are predominantly spot cargoes and tend to be more opportunistic in nature.

About a quarter of Formosa's SM output from Mailiao, or 330,000 mt/year, is currently exported to Ningbo on a term basis for the production of PS and ABS. This comprised 71.9% of Taiwan's total SM exports to China in 2016, and is unlikely be impacted too much if an ADD is imposed on Taiwanese SM.

China accounted for around 86% of the growth in global styrene demand between 2007 and 2017, according to industry sources.

Looking forward, Taiwan can strive to remain relevant and competitive in an ever-changing Asian styrenics landscape by embracing China's drive towards self-sufficiency for styrene, while continuing to ride on its growing strategy of achieving self-sufficiency through a combination of expanding domestic capacity, in addition to relying on close ties with existing capacities in fellow One Belt, One Road countries.