Chemical & Energy

INSIGHTS

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Uncertainty – the only certainty

Dave Witte |
Senior Vice President,
Division Head - Energy & Chemicals, IHS Markit
E Dave.Witte@ihsmarkit.com
T +1(281) 752 3276
L Houston

At IHS Markit we are continually focused on integrating our capabilities to provide unique perspectives and analysis of the wellhead to consumer global energy value chain, underpinned by our leading macro- and micro-economic forecasts, and augmented by key knowledge and capabilities in the technology and transportation industries.

In contrast to the broad optimism of just twelve months ago, today's geo-politics and regulatory changes plus a weathered business cycle are combining to create more uncertainty and pessimism for the chemical industry. Meanwhile, the refining complex is imminently undergoing the most disruptive change to bunker fuel standards in a generation. And as an overlay, oil dynamics have created substantive volatility, with impact on secondary inventory movements that have further aggravated chemical industry supply-demand dynamics.

In this issue of Insights, we take you on a tour of these dynamics, covering the full breadth of the interplay from economics to energy to chemicals. At IHS Markit, we firmly believe that the chemical industry, which sits at the nexus of energy and so many consumer and industrial value chains, is the bell-weather and early indicator of the global economy. And the early market indicator of those global macro-economic dynamics is China; as China goes so goes the global chemical and energy industry and often the global economy.

As such, we analyze the macro-economic pressures resulting from the trade scenarios between the US and China and leverage our knowledge of the LPG industry and its trade flows as a case study in how tariff changes have impacted global supply-demand and industry dynamics. We interweave these macro-economic pressures into an analysis of the new supply dynamics shaping the historical shale-induced rebirth of the Permian basin and the resultant new world order of the global oil triumvirate (consisting of Saudi Arabia, Russia, and the United States) with a special emphasis on how the coming changes in new bunker Sulfur specification impacts both incremental oil demand and the refinery financial platform. No doubt these are some of the most complex and inter-related variables that play on the relative dynamics of the derivative chemical value chains.

And so, it is with this backdrop we analyze the specialty and basic chemical markets. In contrast to the view of just twelve months ago, the macroeconomic uncertainty has created uncertainty around global demand growth while continued changes in the Chinese environmental/regulatory framework are unleashing new forces shaping the pace and nature of new supply and demand. As a result, each of the value chains, and end sectors, are feeling a variety of pressures with uncertainty the only prevailing constant across the markets.

I hope you enjoy reading the enclosed expert opinions.

AMERICAS
CALGARY +1 403 213 4220
HOUSTON +1 281 752 3211
MEXICO +60 4291 921

EUROPE, MIDDLE EAST, AFRICA
LONDON +44 203 253 2330

ASIA PACIFIC
CHINA +86 21 2422 9115
JAPAN +81 3 6262 177
KOREA +82 31 8039 87795

@ihsmarkitchem
linkedin.com/company/ihsmarkit

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Will low, volatile prices slow the Permian juggernaut?

Raoul LeBlanc |
Vice President, Research and Analysis, Energy and Natural resources, IHS Markit
E Raoul.LeBlanc@ihsmarkit.com
T +17135688842
L Houston

The Permian basin has been grabbing headlines for the past few years, as operators have rejuvenated the area by exploited its massive resources of shale and tight oil. Indeed, the performance has been impressive:

- Even during the worst parts of the downturn, Permian oil production showed quarter-on-quarter growth, never declining.
- Peak well production in the unconventional plays rose by 125% in the past five years.
- PV10 WTI breakeven prices fell from about $75 in 2014 to less than $40 today.
- Each month Permian production sets a new record, approaching six million barrels per day by the end of 2020.

This explosive growth justifiably created the notion that the Permian will continue its meteoric ascent and dominate global markets. Yet a careful look "underneath the hood" shows a system with important constraints that make the region vulnerable to lower oil prices than headlines suggest.

To understand how low prices can impact the play, it is helpful to break down the system into the two parts that determine oil output.

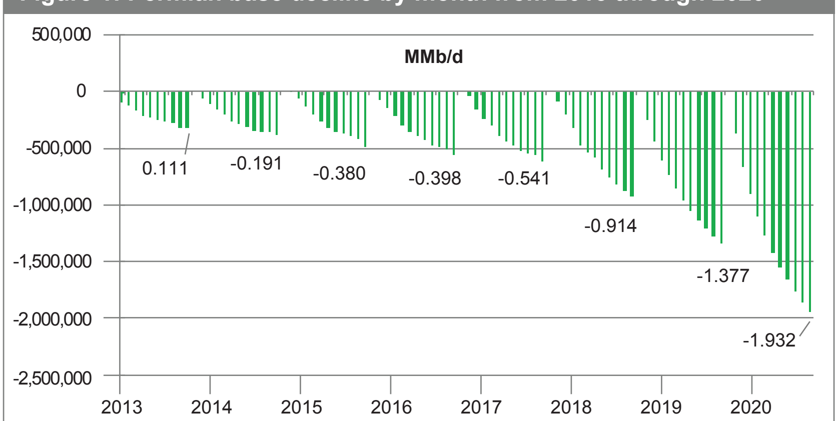
Base Decline

Simply put, for any given year, base decline equals the volumetric decline from January to December for all wells brought onstream before the first of the year. As shown in Figure 1, that figure was slightly over 110 million barrels per day (mb/d) for the Permian in 2013. This decline was very shallow because the base of historical wells was composed of older wells on the flat part of their decline. In the Permian, extensive enhanced oil recovery operations (waterfloods and CO_2 floods, for example) have low output per well, but do not decline rapidly.

Today, the situation has changed dramatically – mostly due to shale. Individual shale wells deliver very high production immediately, but they decline from this peak by 65% to 75% in the first year. Being hyperbolic, that first-year decline rate becomes increasingly shallow over time. Thus, growth in output via shale from 2013 to 2016 was relatively easy, since it involved adding high initial-rate wells on top of a slowly declining, conventional base.

However, now that shales are dominating the base of production, the "treadmill" has accelerated dramatically. We expect base decline in 2020 to be almost 2,000 mb/d – nearly 20 times the 2013 figure. Importantly, base declines in any year are largely fixed and predictable.

Figure 1: Permian base decline by month from 2013 through 2020



Notes: Base decline represents total production decline from existing wells over a given year.
Source: IHS Markit.

Wedge Volumes

The second part of production is the output from new wells that operators bring onstream over the course of the year – the "wedge." The equation is simple: if wedge volume exceeds base decline, output grows. If operators cannot match the decline, output falls.

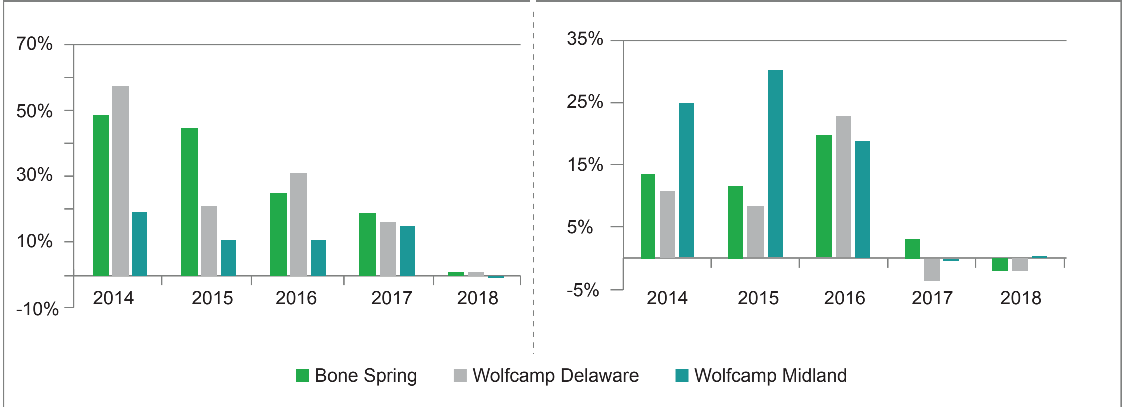
A myriad of factors influences the extent of wedge volumes. Think of it this way: wedge volumes equal the amount of capital invested in new wells multiplied by capital productivity (the average production generated by each dollar spent).

In the Permian, capital efficiency rose dramatically between 2013 and 2017. This explains why operators were able to compensate for falling capital investment levels in 2015 and 2016 to maintain production. the Permian was able to remain resilient despite dropping level of investment.

Looking closer, improved capital efficiency was driven by the compound effect of five simultaneous well improvements:

1. The single largest factor was that oilfield service costs plummeted as evaporating demand reduced fleet utilization of rigs and pressure pumping.
2. Operators became much more efficient as a relentless focus on improving logistics and cutting costs bore fruit.

Figure 2: Changes in capital efficiency factors



Source: IHS Markit.

3. Companies focused on only the best parts of their acreage, worked by their best people.
4. Lateral lengths extended, creating efficiencies in both drilling and completion.
5. Companies were able to perform better analysis and apply lessons learned to extract more oil and gas per foot of lateral, largely through the increased use of proppant to complete wells.

All of these factors are real, but a look at the current data, however, shows that the impact of each factor has diminished or stopped. This is a natural part of the maturation process for a basin and is to be expected. In fact, in some cases, such as oilfield service pricing, 2018 experienced a reversal of gains as modest inflation took hold.

Thus, unless a new technology or technique emerges, Permian productivity has likely moved from a period of breakthrough gains from 2014 to 2017 to very incremental gains. Economics are world-beating, but they are not likely to improve.

As a result, wedge volume is therefore highly dependent on the sheer amount of capital invested in new wells. More capital drives high growth and less capital reduces near-term growth. This stands in contrast to much of the conventional oil industry where capital investments do not impact production for many years due to long leads times.

Two factors determine the amount of capital that will companies will invest:

- **Prices:** The primary source of capital spending is cash flow from operations. Rising prices allow operators to spend more, stimulating growth. Falling prices reduce cash flow, forcing companies to cut back on spending or seek access to external capital through debt, equity, or other infusion.
- **Cash/capital balances** – Historically, shale-oriented exploration and production companies relied heavily on borrowing to maintain capital investment levels in times of low prices.

In the past two years, however, equity markets demonstrated less tolerance for adding debt or equity to fund growth. Instead, they are demanding that companies live within cash flow – or even return cash to shareholders. This is an important change in thinking about the growth of the Permian: each dollar returned to shareholders is not invested into a new well, eroding wedge volumes and reducing growth.

With lower prices and increased demand for reinvestment restraint combined with the rising base decline rate, it's clear why low prices are likely to succeed in blunting the momentum of the Permian. Although the region boasts extremely high capital efficiency and the ability to attract external capital despite lower oil prices, a downshift to a lower gear seems inevitable in 2019.

We also can draw lessons about the longer-term performance of the system. Low prices definitely have an impact, but not because they make individual wells uneconomical. Rather, low prices limit the total capital available for reinvestment by reducing budgets. Volatility may compound the problem by encouraging companies to budget conservatively (no one likes to retrench on spending or growth plans).

These undrilled wells remain in inventory, however, ready to come online whenever capital becomes available. This deep inventory of locations offers companies riskless flexibility and optionality. Sooner or later, they are likely to contribute to supply and may drive growth surges such as that seen in 2018.

As the market understands how the shale asset functions, this ability of the Permian (and US shale in general) to respond quickly to oil price changes may lead to reduced oil price volatility, as supply relieves tightening markets and vice versa. It is only when the inventory of the most productive acreage exhausts itself – after 2025, in our view – that the Permian encounters structural obstacles to growth.

Bhushan Bahree |
Executive Director, Global Oil, IHS Markit
E Bhushan.Bahree@ihsmarkit.com
T +1 202 463 7540
L Florida

Aaron Brady |
Vice President, Downstream Research and Analysis, IHS Markit
Aaron.Brady@ihsmarkit.com
T +1 202 463 7540
L Cambridge

Jim Burkhard |
Vice President , Oil Markets, IHS Markit
E Jim.Burkhard@ihsmarkit.com
T +12028575183
L Washington DC

The rule of three: The United States, Russia and Saudi Arabia, are the oil superpowers supplanting OPEC in a new world order

"An era can be said to end when its basic illusions are exhausted"—Arthur Miller, American Playwright.

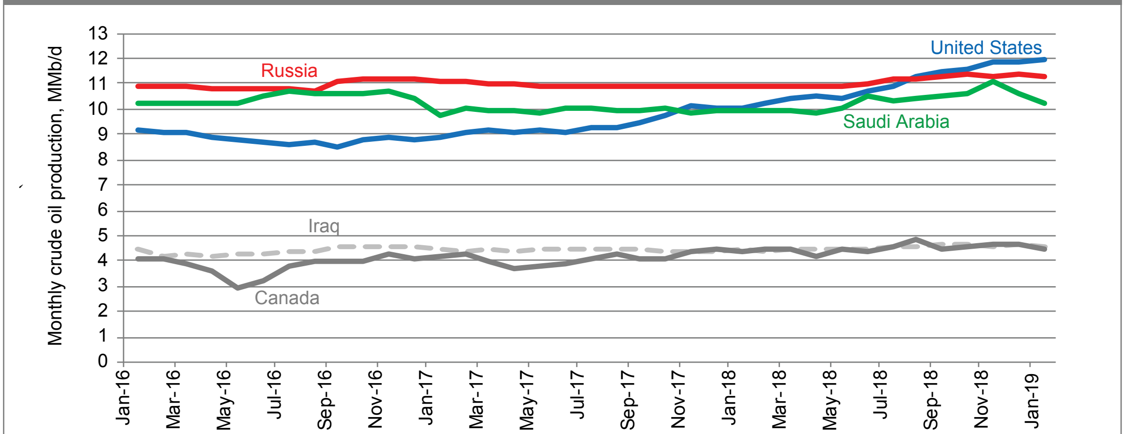
In the years after World War II until 1970, common beliefs were that the world's oil resources were plentiful, demand would rise along with economic activity, and international oil companies could find and produce enough oil to sustain the global oil order indefinitely. Then it was the turn of OPEC in an era marked by resource nationalism, high prices, and the unsettling conviction that oil was a finite, dwindling, and increasingly scarce resource. That era ended in 2009 with the start of a rapid and so far enduring expansion of US output. We are now in an age when oil resources again appear to be plentiful and an evolving global oil order in which three oil superpowers—the United States, Russia, and Saudi Arabia—are supplanting OPEC.

The massive resurgence in US oil output of the past decade has occurred in this setting, allowing Washington to set the global oil agenda and reshape the oil order to meet the diversity of its interests as the world's preeminent economic and military power. Renewed sanctions of Iran's and Venezuela's oil exports, presidential jawboning on prices, and tariff and trade spats with China are impacting or eventually will impact oil markets via changes in demand and/or supply. This is bringing Russia and Saudi Arabia, the two other oil superpowers, closer together as they jointly respond to US actions.

Last July, Russian President Vladimir Putin even went as far as to suggest during a joint press conference with US President Donald J. Trump in Helsinki, Finland, that the United States join it in the "regulation of international markets" because neither country is interested in "plummeting" prices. On a trip to Moscow in mid-September, US Secretary of Energy Rick Perry said that Saudi Arabia, the United States, and Russia can increase oil production in the next 18 months by enough to offset falling supply from Iran and elsewhere. Indeed, the subsequent increase in oil supply from the three petroleum superpowers overwhelmed oil markets, particularly after the United States issued temporary waivers to major importers of Iranian oil. Oil prices began tumbling and the Vienna Alliance of OPEC and non-OPEC producing countries had to quickly agree to jointly reduce supply in 2019. From early October to late December 2018 crude oil prices fell about 40%.

Still, an inclusive global deal between the big three

Figure 1: The US, Saudi Arabia, and Russia are, by far, the world's largest crude oil producers



Note: Crude oil only. Source: EIA, IHS Markit.

to carve up the oil market is hardly likely, given the United States' free enterprise system and the relatively limited role of government in this context. However, Trump nonetheless has repeatedly tweeted his concern about rising oil prices and OPEC behavior even as he decided to pull out of a nuclear accord with Iran and reimpose oil and other sanctions on that country, OPEC's third-largest producer. Trump even called Saudi Arabia's King Salman last year to ask specifically that the kingdom raise its production. Later in the year, Trump bluntly reminded the Saudi monarchy of its reliance on US protection.

Saudi Arabia and Russia: The response team

As market concern about dwindling inventories and the prospect of a shortfall in Iranian barrels— in addition to those being lost in Venezuela—manifested itself in rising prices during spring 2018, Saudi Arabia and Russia responded by raising their output in advance of a meeting of the Vienna Alliance in Vienna in June. The meeting duly endorsed the higher output. However, Saudi Arabia's oil minister Khalid al-Falih said after the meeting that Moscow and Riyadh had moved in advance because they had "anticipated" the alliance's decision, removing any doubts that Russia and Saudi Arabia are effectively the deciders for the 25 OPEC and non-OPEC countries that form the Vienna Alliance.

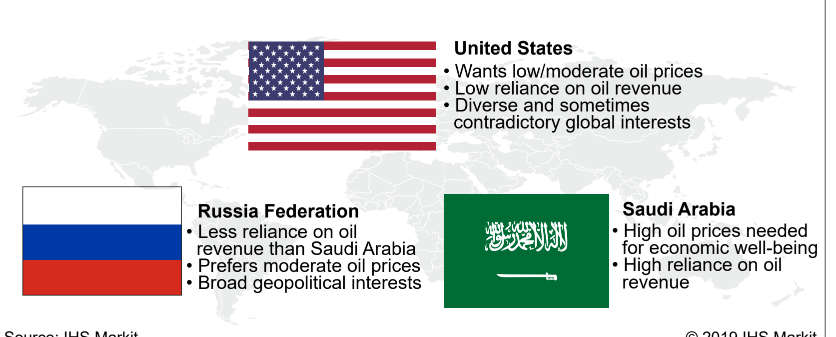
Put another way, the United States is now the prime agent of transformation of the oil order. In turn, Russia and Saudi Arabia are the leaders of a global response team, whether to sharply rising US oil output, price and political sensitivities, or oil and other sanctions and trade events. Indeed, the United States has not enjoyed such sway in the oil world since its oil output peaked in 1970.

We could call the current period the post-OPEC era, which is not to suggest that OPEC will not exist; it will, but in the foreseeable future, with nothing like the power it once had as a multistate organization. This is already evident in the insistence by Saudi Arabia since 2014 that it – and in consequence, others in OPEC – would only cut output to support prices if Russia and other non-OPEC producers joined in the effort to adjust to sharply rising production and exports from the United States. This could change if Russia joins OPEC, but this is not yet in the cards. We call it the Rule of Three because it reflects the reality that three countries, above all others, are now calling the shots in the global oil market. This is almost certain to continue for the next five years. .

The three oil superpowers account for about 40% of the world oil market—they are the three biggest crude oil producers in the world, by far *(see Figure 1)*.

Beyond that, their geopolitical profiles mean their actions will also be guided by their wider interests and

Figure 2: The rule of three: Russia, Saudi Arabia, the United States and the global oil market



Source: IHS Markit.

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priorities *(see figure 2)*.

The production of oil is an important but relatively small part of the huge US economy. By contrast, oil is vital to the well-being of Saudi Arabia, a regional power that has for long relied on an alliance with the United States and, more recently, has cultivated better relations with Russia. Between the two is Russia, which is also a military power with wide interests but whose economy is much more reliant on oil production and exports than that of the United States.

We can expect US behavior in oil markets to be the most complex because of the diversity of the country's economic and geopolitical interests. Saudi Arabia's will be the most focused because of its singular dependence on oil. In any case, the interaction among these three will establish the rules of the new oil order on the supply side.

The demand side will be different, with emerging economies – notably but not exclusively those of China and India – having a say because they are the engines of growth. Yet demand for oil also will be affected by, among other things, oil prices and the economic, fiscal, and monetary policies of the United States. This balance underlines the interconnectedness of the global economy and its sensitivity to the largest players.

Note: This report is a condensed version of the October 2018 IHS Markit World Oil Watch.

IHS Markit

Evaluating the impact of economic activity on refined product demand

A case study in vendors' due diligence support – multiple oil and chemicals storage assets in Europe, North America and Asia.

Initial situation

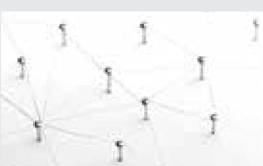
A major shareholder of an international oil and chemicals storage business planned to divest its ownership.

IHS Markit was engaged to provide the core market data and analysis for the business plans that were developed for each asset in preparation for the sale.

Impact

IHS Markit provided the client with a review of the key business activities and could **assess its competitive position relative to key competitors in the region.**

IHS Markit is unique in being able offer all the required oil products, NGL, LNG, andchemicals data and analyses 'in-house'; which ensure a **consistent applicationof macro-level metrics such as GDP growth and crude oil prices.**



Additionally, in engaging IHS Markit, the client and the advisory team had readily available access to our **international network of market experts.**

IHS Markit approach

Working as part of the client's advisory team, IHS Markit provided a detailed market outlook for the full range of bulk liquids handled by the client's storage terminals in Europe, North America and Asia. This encompassed supply-demand dynamics and global trade flow analyses, and port traffic projections.

The bulk liquids included finished refined products, base oils, blend stocks (pygas, reformate and oxifuels), natural gas liquids (ethane), LNG, and chemicals (Methanol, MTBE, Toluene, Xylene, Benzene, Paraxylene, MEG, Acetic acid, Acrylic Acid, Acrylonitrile, and Adiponitrile).

IHS Markit also leveraged our extensive databases of refineries, petrochemical plants, storage and other logistical infrastructure to support the positioning of each terminal in their respective markets.

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IMO 2020 bunker specification change: The most disruptive impact on oil markets from a planned event?

In January 2020, the global ship bunker fuel specification changes from a maximum of 3.5 weight percentage (wt%) sulfur to maximum 0.5 wt%. The shift affects approximately four million barrels per day of oil consumption or 4% of global oil demand.

IHS Markit has tracked the bunker specification change for nearly a decade. In 2009, we released a multi-client study asserting that a bunker fuel specification could result in huge disruption to global oil markets. Yet this prediction was met with considerable skepticism.

In 2014, a follow-up IHS Markit study called What Bunker Fuel for the High Seas? reasserted the expectation of likely market disruption. This study was the first to suggest that compliance would be mostly achieved through consumption of 0.5% sulfur fuel, with scrubbers that reduce emissions quickly becoming important for larger ships.

In October 2016, the International Maritime Organization (IMO) announced plans to reduce its global bunker fuel specification from 3.5% to 0.5% sulfur for maritime bunker fuel, effective January 2020. Following this, IHS Markit predicted not only that would there be insufficient time for the shipping and refining industries to prepare for this change but that significant disruption to oil markets was likely.

Optionality and the prisoner's dilemma

The key reason that three years was insufficient is optionality. For most specification changes, it is clear which player needs to make the change: the supplier, which is usually the refinery. However, IMO 2020 is different. Either the supplier can make the change or the buyer can continue to buy the "off-specification" fuel, as long as the buyer installs a scrubber on each ship to maintain atmospheric emissions at the same levels as low-sulfur fuel.

This optionality results in the classic prisoner's dilemma. If everyone invests in scrubber technology, there is no bunker fuel market disruption and no payback. Alternatively if very few invest, the market experiences a huge shortage of very low-sulfur fuel oil (VLSFO), a large excess of high-sulfur fuel oil (HSFO), and significant market disruption – along with a very attractive payback for the few that invested.

Ironically, this dilemma has effectively stalled investments. Only since mid-2018 have scrubber investments started to increase. We now expect only around 2,000 of the world's 120,000 ships to be fitted with scrubbers by the start of 2020.

Considerable uncertainty still surrounds the IMO 2020 transition. IHS Markit recently completed another major study into the IMO 2020 transition, Navigating Choppy Waters. This study reviews some of the key uncertainties and models how they will impact oil market supply, demand, and price.

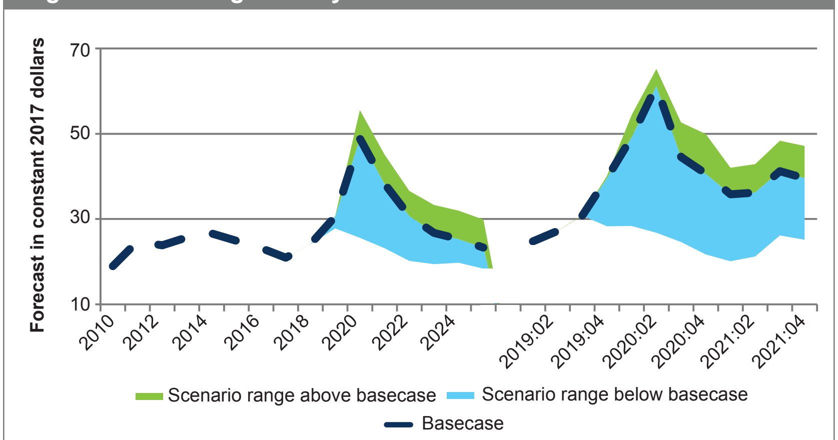
Our base case assumes 85% compliance with the new specification and 2,000 ships fitted with scrubbers at the start of 2020. We created a set of scenarios to provide a broad range of alternatives in which the IMO 2020 transition might unfold. These include high and low compliance, high and low scrubber installation, delayed commissioning in some key refinery projects, and the potential of phased implementation and enforcement in 2020.

IMO transition market impacts – a diverse potential

Figure 1 shows the modelling output on US Gulf Coast (USGC) product light-heavy differential, using both annual average and quarterly average pricing.

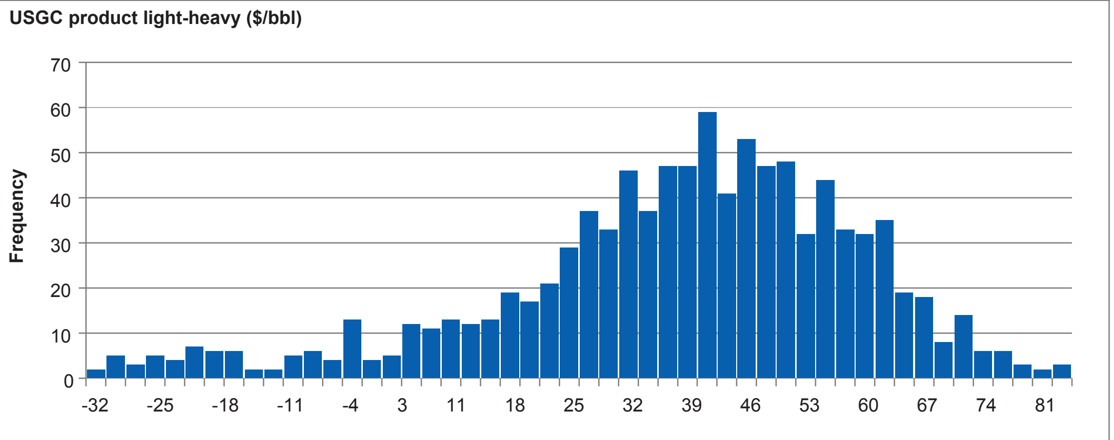
Spencer Welch |
Executive Director, IMO Study Manager and Oil Midstream Downstream Consulting Manager for Europe, CIS and Africa, IHS Markit
E Spencer.Welch@ihsmarkit.com
T +4402085447893
L London

Figure 1: USGC Light Heavy Product Differential



Source: IHS Markit.

Figure 2: USGC product light-heavy probability distribution



Source: IHS Markit.

Quarterly average pricing is important, as the market impact could be distinctly different from the first quarter of 2020 to the fourth quarter.

The USGC product light-heavy differential in 2010-2018 averaged around $22 per barrel (bbl). In our base case, we expect this gap to widen to almost $50/bbl on an annual average basis in 2020. On a quarterly basis, this differential might hit $60/bbl.

> Only around 2,000 of the world's 120,000 ships will be fitted with scrubbers by the start of 2020

In our base case, the peak of the IMO transition market impact occurs in the second quarter of 2020. Although the new specification goes live on January 1, 2020, the carriage ban (legislation preventing ships from carrying HSFO in their fuel tanks unless they have a scrubber) does not take effect until the end of the first quarter 2020. We believe this ban will be instrumental in raising compliance rates.

The market impact differs by scenario. The "very low-compliance" scenario creates almost no market impact. The compliance scenarios appear to exert much more influence on the outcome than changes in the rate of scrubber installation on ships.

Scenarios are similar when looking at crude prices, crude price differentials, individual refined products, and refining margins. All but the simplest refineries are likely to receive a margin boost from the IMO 2020 transition, because of the tightening of the distillate market. However, there are significant differences between scenarios in terms of the total margin boost and its duration.

Rolling the dice

Scenario analysis provides a strong indication of the range of potential market outcomes. To understand the probability ranges, our final step was to apply a Monte Carlo probability technique to the IMO impacts of key variables, such as U.S. Gulf Coast (USGC) compliance and scrubber installation rates.

The IMO 2020 bunker fuel transition adds another layer of uncertainty to an already ambiguous oil market, as confirmed by our scenario and Monte Carlo analysis. These analyses provide valuable granularity on the most influential variables for the IMO transition through 2019. Our analyses also provide information on the range of impacts, which helps those most affected be better prepared, minimize downside risk, and look for upside opportunities.

Note: The IHS Markit study *Navigating Choppy Waters* provides full price sets for USGC, U.S. East Coast, Europe, and Singapore crude prices, refined products, and refining margins for the base case and each of the scenarios. It also provides detailed supply, demand, and trade analysis of the new VSLFO and HSFO, using refinery-by-refinery modelling. More information on the study can be found on the website or from the author of this article.
www.ihsmarkit.com/imo2020

Navigating Choppy Waters

An IHS Markit Multi-Client Study on Marine Bunker Fuel in a Low Sulfur, Low Carbon World

The study focuses primarily on a deep-dive into 2 key aspects of the IMO 2020 transition:

1. **Regional residue supply and demand modelling:**
   Regional balances of LS and HS fuel supply, demand and trade in the IMO transition period.

2. **Shipping and refining industry scenario analysis:**
   Scenario analysis of the key variables which will define the magnitude and duration of the IMO 2020 impact on the oil markets. Principle scenarios are compliance level and scrubber uptake, but also refinery project delays and potential regulatory transitional measures intended to smooth the transition. IHS Markit will apply a Monte Carlo style probabilistic analysis to the scenario output, to create probability disruptions for market prices and refinery margins.

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US-China trade dispute – implications for the global natural gas liquids market

Dr. Yanyu He |
Executive Director, Asia Pacific and Middle East NGL Service Lead, IHS Markit
E Yanyu.He@ihsmarkit.com
T +18326797260
L Houston

The US-China trade dispute is complicating economic and political relations. The tariff coverage and levels continue evolving and are still subject to negotiations and uncertainties.

As announced in April 2018, IHS Markit expected that the global liquefied petroleum gas (LPG) market to be efficient and fluid enough to ease the situation. LPG has become a true fungible commodity, with about one-third of global production (95 million metric tons in 2018) being traded in dedicated tankers. Plus, so many traders in the marketplace can optimize cargo movements.

The market has evolved largely as we expected. US-to-China direct LPG exports began dwindling right after the tariff announcement. By August, when the tariff was implemented, the US-to-China LPG shipments were reduced to zero. At the same time, the rest of Northeast Asia (including South Korea, Japan, and Taiwan) picked up additional US volumes. Indonesia, not a regular importer of US LPG, began taking in an average of three very large gas carrier (VLGC) cargoes per month.

The trade pattern shift wasn't without a cost, however. Chinese LPG import prices were historically at parity with the broader Far East Index. Often, imports could be purchased at a $2 to $3 per ton discount, reflecting the shorter transportation distance from Middle East to China, especially South China. However, since April 2018, Chinese LPG prices have developed a cargo swap premium over the Far East Index *(see Figure 1)*.

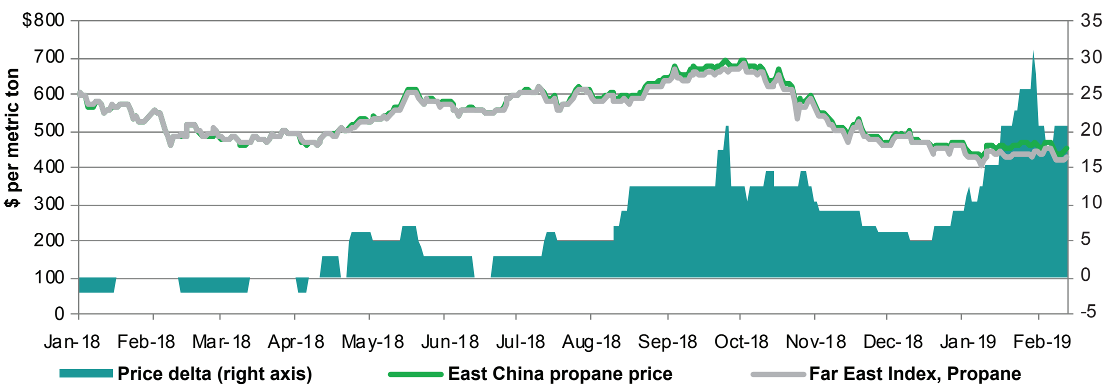
The East China premium rose as high as about $30/ton in late January, but it is still much lower than a full 25% tariff would imply. The premium itself varies, reflecting changing market sentiment. When Chinese demand is high or the overall market is tight, a bidding process typically increases the price premium. Winter residential and commercial demand also has supported an elevated premium this year.

The US is the most important market for driving global LPG incremental supply. With its market size, demand variety, and growth potential, China is the most important market for driving demand growth. The US and Chinese LPG markets not only offset each other in volumetric growth, but also largely mirror each other in LPG composition. US LPG is rich in propane, resulting in much higher propane content in exports. Chinese demand is mostly driven by propane-oriented chemical uses, including propane cracking and propane dehydrogenation (PDH) development. With these characteristics, tariff development is critical, as it will continue to affect global LPG trade flow and prices.

What should we expect in the global LPG market if the tariff remains?

US natural gas liquids (NGL) production is driven by strong gas production growth, mainly from the Permian Basin associated gas and in the Appalachia region non-associated gas. In the next few years, we expect continued US gas production growth as

Figure1: East China vs. Far East propane prices



Source: IHS Markit; Argus.

additional infrastructure alleviates take-away constraints. As a result, US LPG production and exports are also expected to increase. At the same time, after relatively muted demand growth in 2018, China is expecting another wave of PDH development. IHS Markit anticipates another 12 PDH projects will be added in China over the next five years, with a total propylene capacity of 5.3 million tons per year, implying an additional 6.5 million tons of propane demand.

So far, a head-to-head tariff conflict has been avoided via cargo swaps and trade rearrangements within Asia. As China's LPG demand and US export grow, China will continue to rely on swappable markets to avoid a direct tariff impact. Our question: Is there a point when the market runs out swap volumes in Asia? If so, what happens next?

Figure 2 compares several current and potential swappable markets. We included markets with significant size that are currently importing US LPG or might do so. The key metrics to consider are import characteristics, including volume, sources, and propane versus butane composition. Proximity to the Chinese market plays an important role, as long-distance volume swaps increase freight cost.

The first, most natural swappable market is Northeast Asia – specifically Korea, Japan, and Taiwan (JKT) – due to its proximity to China. In 2018, JKT imported 19.2 million tons of LPG, including 68% from the US, a 10% increase over 2017. In 2017, about one-quarter of China's LPG imports were from the US. That percentage dropped to just 6% in 2018 and stands at zero since August 2018. As Northeast Asia is near capacity for additional swappable volumes, additional Asian markets will likely be involved. For example, Indonesia imported about 5.5 million tons of LPG in 2018, including about 30% from the US, compared with only 12% in 2017.

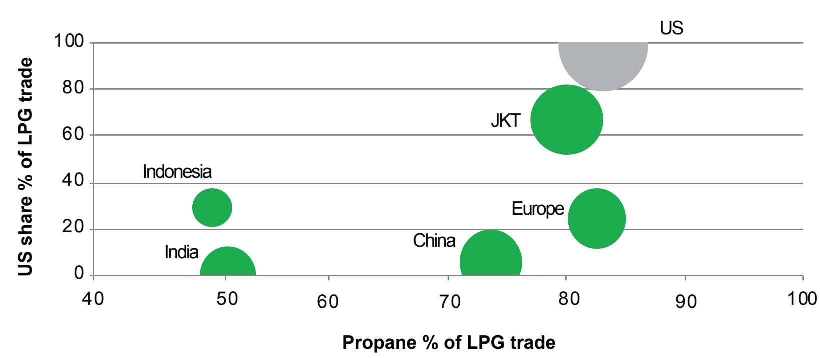
As Asia runs out of swappable volumes, the next potential markets could include India or Europe. Both markets offer the depth – and thus flexibility – for trade rearrangements. India is currently importing about 12 million tons of LPG each year. Even though it has not imported any LPG from the US due to its close proximity to the Middle East, India has been increasing propane share in its overall LPG imports, presenting itself as a strong candidate for propane cargo swaps. In 2018, propane accounted for about 50% of total LPG imports. In Europe, imports are traditionally propane-biased, and currently a quarter of these imports are from the US. If these markets are called upon to participate in the cargo swaps to avoid tariffs, however, logistics costs would rise, escalating swap premiums.

However, not all potentially swappable volumes will be exchanged. For example, the existing contract structure will constrain the flexibility of cargo movements. Additionally, import structure – such as a propane versus butane split – can also complicate cargo rearrangement. A VLGC typically carries four LPG tanks, which each store either propane or butane. An all-propane VLGC cargo can be relatively easily swapped with another all-propane cargo, but it would take multiple mixed VLGCs to accomplish the same goal. VLGCs might need to make multiple port stops, further increasing logistics challenges and swap premiums. And if Chinese importers continue to pay higher premiums, certain demand will likely be reduced, potentially weakening global LPG prices.

What will be the impact on ethane?

Ethane is not yet on the tariff list, and there is no current ethane trade between US and China. Ethane would experience a more direct impact from tariffs because it is single-sourced from the US and there is no alternative market to help work around the tariff issue. This is one of the major concerns of Chinese companies that are interested in importing US ethane.

Figure 2: Current and potential swappable LPG markets, 2018 data



Note: Bubble size denotes import (or export in the case of US) LPG volume
Source: IHS Markit.

North America NGL – Life after the surge

Cindy Poynter | Executive Director – Global Midstream Content
E Cindy.Poynter@ihsmarkit.com
T +41 22 721 1766
L Geneva

Darryl Rogers | Vice President - Midstream & NGL Markets
E Darryl.Rogers@ihsmarkit.com
T +1 832 679 7265
L Houston

Dozie Nzeogu | Senior Analyst - Midstream & NGL Markets
E Dozie.Nzeogu@ihsmarkit.com
T +18322094481
L Houston

Rapid oil and gas production in the United States necessitate new infrastructure projects that support upstream activity, increasing the production rates of oil, natural gas, and natural gas liquids (NGL) while simultaneously connecting suppliers to end-use markets. In response to elevated 2018 prices, crude oil production and associated natural gas production increased. US natural gas production rose from 76 billion cubic feet per day (Bcf/d) early in the year to 87 Bcf/d at year's end, a net 14.5% or 11 Bcf/d rise equivalent to the net gain realized between 2012 and 2017.

The prolific, highly economic unconventional oil sub-plays in the Permian basin and other unconventional oil plays such as the South Central Oklahoma Oil Province (SCOOP) and Sooner Trend Anadarko Canadian Kingfisher (STACK) were focal points in the oil drilling activity boom, bringing associated natural gas and NGLs. Other unconventional oil plays like the Bakken and Niobrara shales have also provided incremental associated natural gas and NGL volume and production support. This trend is expected to continue over the next three to five years, necessitating infrastructure capacity additions.

Correspondingly, pipeline capacity constraints developed for crude oil, natural gas, and the NGL infrastructure. Upstream companies' volumetric needs do not always match midstream asset capabilities, and at times infrastructure investment lags upstream activity. For example, in the first half of September 2018, ethane prices spiked from 41 cents per gallon (cpg) to 61 cpg over a two-week period, thanks to a shortage of NGL fractionation capacity in Mont Belvieu.

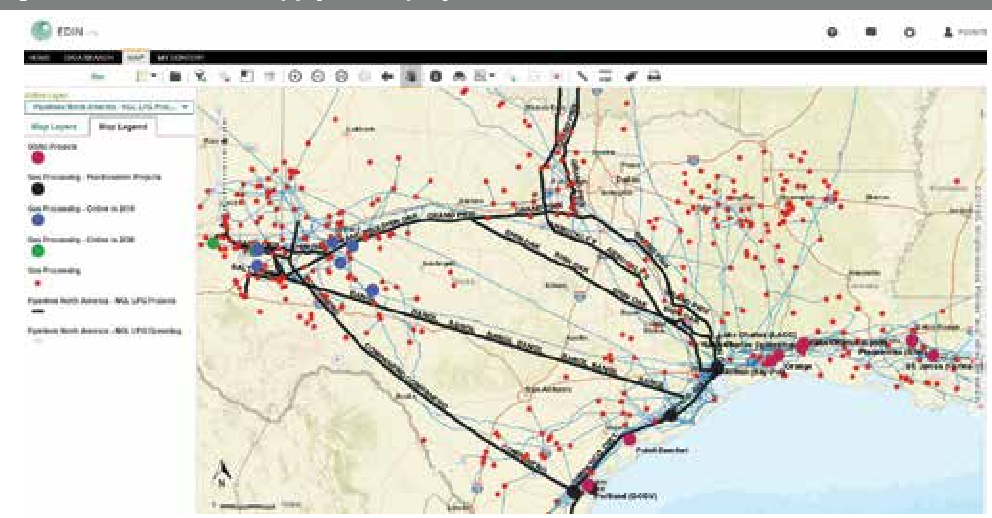
Midstream capacity additions are needed across the NGL supply chain, connecting increasing supplies with rising demand. Figure 1 illustrates new NGL supply chain projects, which are described in the following sections.

Permian Basin

NGL produced in the Permian and delivered to the US Gulf Coast will be greatly affected in the coming months by major projects from Enterprise Products Partners, Targa Resources, and EPIC Pipeline.

- Enterprise Products Partners - Enterprise is cementing its dominance in West Texas with intense growth projects. The Shin Oak NGL pipeline is a 550 thousand barrels per day (MBPD) pipeline connecting production from the expanding Orla gas plant to Mont Belvieu. Orla will be expanding by 200 million standard cubic feet per day (MMscfd) just as Shin Oak comes online in second quarter 2019. Further, Enterprise is in the process of commissioning their Seminole NGL conversion project. The 260 MBPD Seminole pipeline runs from the Permian to Mont Belvieu. The conversion is expected to be complete by April 2019 with limited service in February and March 2019. Moreover, two 150 MBPD fractionators under construction in Mont Belvieu are scheduled for completion in 2020. This brings Enterprise to a nameplate fractionation capacity of 1 million BPD in Mont Belvieu and 1.5 million BPD company-wide (see Figure 2).
- Targa Resources – Targa is strategically increasing

Figure 1. Current NGL supply chain projects



Source: IHS Markit.

its presence in the Permian with investments from Stonepeak Infrastructure Partners. Targa's NGL growth projects include the 300 MBPD Grand Prix pipeline, which is expandable to 550 MBPD and expected in service by second quarter 2019. Targa will construct over 200 miles of high-pressure rich gas-gathering pipelines in the Delaware basin as well as four 250 MMscfd gas processing plants from first quarter 2019 to second quarter 2020. Targa is also constructing three new fractionation trains in Mont Belvieu, which will add 320 MBPD of capacity. These fractionators will come online in stages from second quarter 2019 to second quarter 2020.

- EPIC Pipeline – EPIC was formed in 2017 to meet infrastructure needs in the Permian Basin and Eagle Ford Shale. EPIC announced two pipelines dedicated to crude oil and NGL service to Corpus Christi, Texas. Phase one of the pipeline runs from the DLK Black River gas plant to the Delaware Basin Midstream terminal and came online in March 2018. It is served by five gas plants with a combined capacity of 1 Bcf/d. Phase two, which started in June 2018, extends the line to Benedum, Texas. Phase three will run to Corpus Christi, Texas and is scheduled to be in interim service in third quarter 2019. When finished, the pipeline will have a throughput capacity of 440 MBPD.

Soaring crude oil transportation demand led EPIC to designate phase three for crude service until construction on the EPIC Crude Oil Pipeline and first EPIC NGL fractionator is complete in early 2020. A second fractionator is expected in service in 2021. Both fractionation trains are in Corpus Christi and have capacities of 100 MBPD each.

Cushing Hub – SCOOP/STACK Oklahoma and Mid-continent

NGL production from Mid-continent will see significant near-term increases from projects by DCP Midstream and ONEOK, Inc.

- DCP Midstream – DCP completed major projects in the DJ Basin in 2018. The 200 MMscfd Mewbourn 3 and 300 MMscfd O'Connor 2 gas plants will increase the company's processing capacity in the region to more than 1 Bcf/d by second quarter 2019. DCP plans to expand its existing NGL pipeline capacity at the same time. The partnership announced a 100 MBPD expansion for the Front Range pipeline, bringing total takeaway to 250 MBPD. An expansion of 90 MBPD was also announced for the Texas Express pipeline, bringing nameplate capacity to 370 MBPD. In May 2018, DCP announced that the Southern Hills NGL pipeline will connect the DJ Basin to Cushing, Oklahoma and beyond via the White Cliffs pipeline. The White Cliffs pipeline, formerly in crude service, is expected to have a total capacity of 90 MBPD and is scheduled to be in service in fourth quarter 2019. White Cliffs is expandable to 120 MBPD.
- ONEOK, Inc - ONEOK announced multiple new infrastructure projects in 2018 with a capital expenditure of over $2B, including:
  - The 400 MBPD Mid-continent to gulf coast Arbuckle II NGL pipeline slated for first quarter 2020 with a 100 MBPD expansion in first quarter 2021
  - The 240 MBPD Williston Basin to Conway Elk Creek NGL pipeline, expected in service at the end of 2019
  - Two 200 MMscfd gas processing facilities at its Demicks Lake complex in McKenzie County, North Dakota, slated for first quarter 2020 and first quarter 2021 service
  - A 60 MBPD expansion of its West Texas LPG (WTLPG) pipeline system, planned for first quarter 2020.
  - Two 125 MBPD fractionators in Mont Belvieu, Texas, expected in service first quarter 2020 and first quarter 2021

Thus, 2019 will register net additions of 1.3 million BPD of NGL pipeline capacity and 305 MBPD of fractionation capacity on the US Gulf Coast. In 2020, another 900 MBPD of pipeline capacity is scheduled, with 1.2 million BPD of fractionation capacity on the US Gulf Coast.

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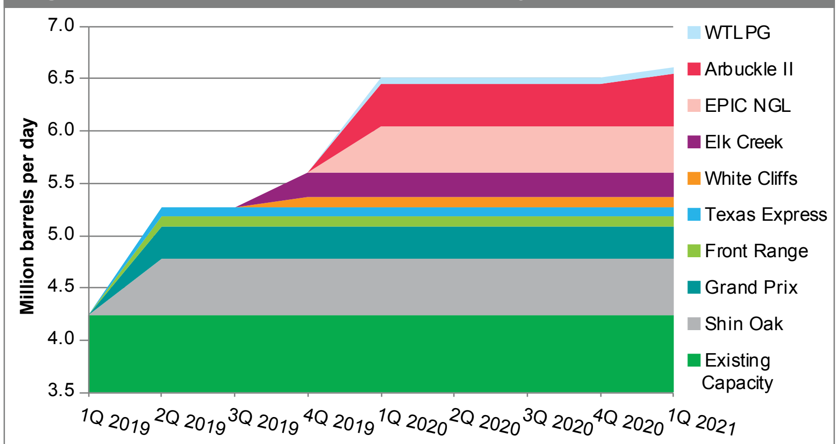
Figure 2:Mont Belvieu NGL pipeline capacity additions



Source: IHS Markit. © 2019 IHS Markit

Global basic chemicals outlook

Following an extended period of strong profitability, the chemical industry anticipates a downturn, as economic headwinds threaten slower demand growth

Mark Eramo |
Vice President, Global Business Development – Energy & Chemicals, IHS Markit
E Mark.Eramo@ihsmarkit.com
T +12817523202
L Houston

The global basic chemicals industry has been experiencing an extended up-cycle, characterized by record levels and steady demand growth, and above-reinvestment level profitability during the past four years. In early 2019, the strong growth and elevated profitability appears to be threatened by developing economic headwinds at the same time a wave of new capacity prepares to start-up.

Basic chemicals for this discussion include ethylene, propylene, methanol, benzene, paraxylene, and chlorine. These six chemical products represent the basic building blocks from which a significant amount of durable and non-durable consumer goods are produced. Roughly half of these chemicals are converted into plastics materials, which have been a primary growth engine for the chemical industry for decades. Plastics represent one of the foundations of modern living, enabling basic needs such as clean water and fresh food to everyday items such as smart devices, sporting equipment, auto parts, appliances, clothing, and footwear. These consumer items are more durable, lighter, energy efficient, and environmentally sustainable thanks to plastics. Demand for commodity plastics (such as polyethylene, polypropylene, polyethylene terephthalate, polystyrene, and polyvinyl chloride) in 2018 is estimated at 255 million metric tons, representing about 50% of basic chemicals demand.

IHS Markit estimates that total basic chemicals demand in 2018 increased to 515 million metric tons, a 20-million metric ton increase over 2017 total demand (see Figure 1). The strongest growth (in 2018) was reported in the ethylene (8 million tons), propylene (5 million tons), benzene (1.6 million tons), and paraxylene (3 million tons) markets. Starting in 2015, basic chemicals demand growth averaged 19.6 million metric tons per year, being fueled by a global economy that has been expanding in recent years at an annual rate of more than 3%. For the past three years, all major regions of the world have been growing and urbanization is on the rise. This combination results in strong consumer spending on durable and non-durable goods.

Steady and strong global economic growth has been the single most positive factor influencing strong demand growth for basic chemicals for the past four years. However, at the end of 2018, and continuing into the early months of 2019, major headwinds began threatening to slow global economic growth, which in turn will impact the demand for basic chemicals. Energy volatility (crude oil pricing), currency fluctuations, protectionist trade tariffs, and an endless list of geopolitical uncertainties – from US-China trade and Brexit, to political turmoil in Europe, Middle East, South America, and the US – create uncertainties that cause businesses and consumers to become more conservative with their investments and spending. If global economic growth begins to slow, it will occur at a time when new capacity start-ups across most basic chemicals value chains will begin to be felt in the market. In markets such as paraxylene, capacity additions will overwhelm demand growth even under strong growth conditions. If new capacity growth combines with a slowdown in demand growth, the resulting

Figure 1: Growing Demand for Base Chemicals

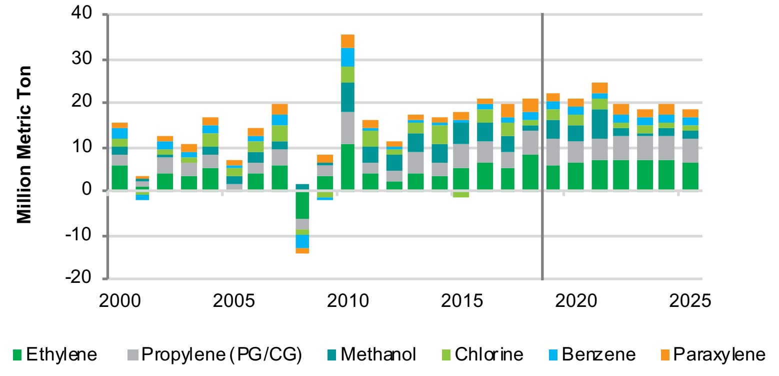


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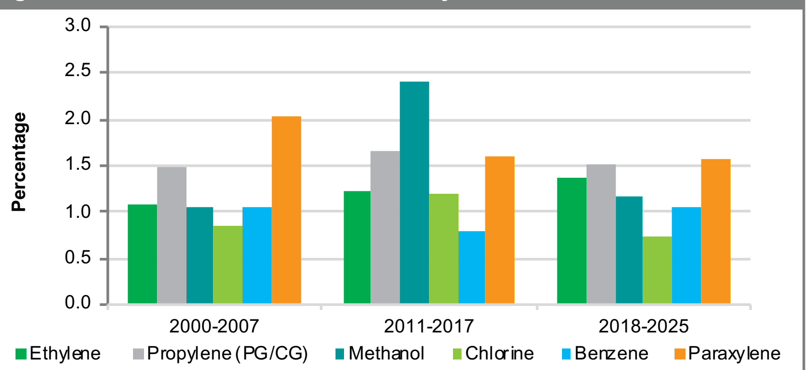
Figure 2: Base Chemicals GDP Elasticity



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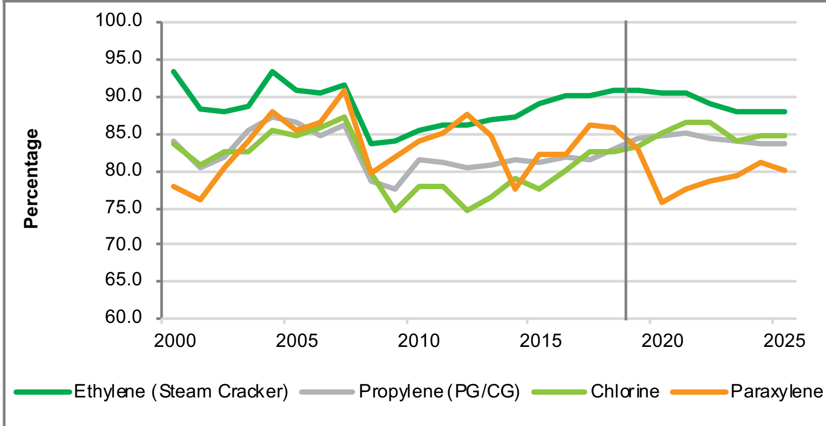
oversupply scenario will significantly affect industry profitability.

In addition to the threat of slowing economic growth, in 2018 the issue of plastics waste was thrust into the global spotlight. It is now threatening long-term demand growth for the chemical industry. The growing demand for plastics has created an unexpected and serious waste problem, as it is estimated that 8 million metric tons of plastics waste ends up in the oceans every year. Consumers and governments are responding to the visibility and enormity of the plastics waste problem by often supporting bans and de-selection initiatives that impact potential growth in the future. The industry has been responding to this issue for many years. The effort was accelerated in 2018, as more producers and brand owners pledged resources to support global efforts to clean up plastics waste in the environment and fund research that will develop economic and sustainable solutions for managing plastics waste in the future. Long-term forecasts for chemicals demand growth must now include scenario analysis that evaluates the impact of plastics waste issues in the future.

GDP elasticity is a measure of the rate of growth in a market (such as propylene) relative to global GDP growth. For example, propylene GDP elasticity, represented by the gray bars in Figure 2, is sustained at 1.5 or higher. This means that global propylene demand has been growing at a rate of 1.5 times global GDP growth in the period from 2000 to 2017. IHS Markit is also forecasting this growth level will be sustained from 2018 through 2025. The forecast results in an average demand growth for propylene of more than 5.0 million tons per year (or an average of more than 4% per year). Five of the six basic chemical markets are forecast to grow at a rate equal to or above GDP for the near term. Chlorine is forecast to be constrained by a lack of new investment in the near term.

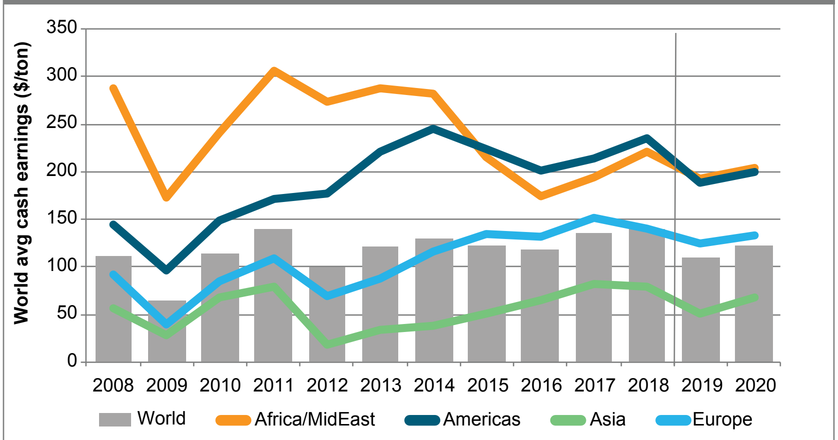
During the period 2019 to 2020, the new basic chemicals capacity being planned for start-up is well-defined. When combined with the IHS Markit base-case forecast for demand growth, the resulting market balances (represented by capacity utilization trends in Figure 3) show continued strength in global ethylene, propylene, and chlor-alkali markets, with weakness developing in global paraxylene that is driven by oversupply relative to demand growth. The resulting forecast of weighted average cash earnings by major region (see Figure 4) projects a slowdown in industry profitability compared to the last two years. That resulting profitability forecast includes not only the assumptions for supply-demand, but also the IHS Markit forecast energy and feedstocks. Also, it assumes no surprises from a geo-political perspective. All four major regions are forecast to see a decline in profitability as oversupply in key markets forces chemicals and derivative prices lower in the face of steady or higher energy and feedstock costs.

Figure 3: Base Chemicals Capacity Utilization



Source: IHS Markit

Figure 4: Base Chemicals Cash Earnings Trends



Source: IHS Markit.

The important question to ask when assessing the near-term forecast is where are the most significant risks? Are they in supply? Demand? Energy? Economy? Geo-politics? While one would conclude today that the “consensus sentiment” in the industry seems to lean towards a decline in profitability over the next few years, there remains a chance that continued strong economic growth combined with supply-side interruptions could enable the upcycle to continue. If such a scenario develops, is your organization ready to capture the opportunity and the related profits? IHS Markit fully integrated analysis connects energy and economic outlooks directly with the forecast of supply and demand. It can help companies develop scenarios for their own businesses, enabling scenario planning that will allow your organization to respond to risks and opportunities as they arise.

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A Sea Change: Plastics Pathway to Sustainability Special Report

Plastics sustainability is the most critical issue facing the plastics industry and is likely to lead to greater regulation (including bans) and deselection by consumers, retailers & brand owners.

This issue is challenging the entire chemical value chain.

A Sea Change: Plastics Pathway to Sustainability special study helps stake holders move progressively to understand the issues of plastics sustainability with extensive analysis and data quantifying the impacts.

This study will address key questions surrounding plastic sustainability:

- What is the current and future impact on virgin and PCR plastics demand from sustainability initiatives?
- How will various end-use demand segments be impacted by sustainability developments?
- What is the potential impact on petrochemical monomer and feedstock demand resulting from plastics sustainability development?
- How do global and regional regulatory trends impact plastics demand?
- How well is PCR supply positioned to satisfy demand? What are the current and future constraints?
- How do sustainability initiatives affect future plastic prices?
- How much PCR will be available? Where does it end up and why?

For more information www.ihsmarkit.com/plastics

Plastics sustainability: Risks and strategy implications

Dewey Johnson |
Vice President, Base Chemicals and Plastics, IHS Markit
E Dewey.Johnson@ihsmarkit.com
T +128 1752 3213
L Houston

Robin Waters |
Director, Plastics, Planning and Analysis, IHS Markit
E Robing.Waters@ihsmarkit.com
T +183 2619 8576
L Delaware

Plastics are an indispensable part of modern society. Compared with alternative materials, plastics reduce the overall carbon footprint – both for the durable and no-durable goods we consume and the packaging used to protect and distribute those goods. Plastics demand growth has been driven by its value-in-use, as it represents the best material choice for a wide array of applications due to its many cost-effective properties. However, the impact of uncontrolled management of plastics waste after initial use, which contributes to land, river, and ocean pollution as well as biological food chain effects, is damaging the public image of chemicals. It is also fostering an increasing number of regulatory mandates and policies from consumer product companies seeking to curb plastics usage. The proposed solutions often do not consider the viability of other materials solutions and lack a fundamental understanding of the associated infrastructure capabilities or needs.

From a waste management standpoint, the chemical industry has historically focused its attention on technical achievements that reduce the initial consumption of plastic used to produce and package products. However, the lack of a more robust and circular approach by value chain stakeholders has led to a crisis of plastics pollution, which has become a disruptor for the chemical industry.

The global scale of the problem is daunting, and the industry's challenges continue to escalate with global demand growth, which is fueled by consumer convenience trends and the robust performance properties of plastics. If overall plastics consumption continues with the same usage patterns (see Figure 1) plastics waste in landfills and the environment will grow to over 10.5 billion metric tons by 2030.

This "plastics paradox" of high value-in-use versus unmanaged waste has placed plastics and the chemicals industry under intense public scrutiny. Accumulated plastics waste in oceans from the uncontrolled release of debris via rivers, particularly in Southeast Asia, provides a striking visual reminder of damaging environmental effects. Plastics sustainability is now one of the top priorities for the chemical industry as it threatens to disrupt demand and, at the public level, be viewed as an existential threat that will challenge the industry's social license to operate.

The findings from a recent IHS Markit multi-client study, Plastics Pathway to Sustainability, exposes four key findings associated with plastics sustainability and reviews numerous strategic implications for the plastics value chain.

The potential impact on virgin resin demand is significant.

Near 50% of the virgin demand growth (from 2018 to 2030) for polyethylene (PE) and polypropylene (PP) is viable for recycle or displacement for the major demand centers. This represents over 20 million (MM) tons of PE and 20 MM tons of PP). Nearly 20% of polyvinyl chloride (PVC) virgin demand growth (from 2018 to 2030) is also viable for recycle or displacement for the major demand centers. This is occurring at a time when chemicals are increasingly viewed as a strategic portfolio hedge to plateauing oil demand. While global demand for fuels is growing at 1% annually and expected to plateau in about two decades, the demand for chemicals is growing at a multiple of GDP –3% to 4.5% annually. While chemicals represent nearly 7% of the refined barrel, by 2030 chemicals may comprise over 14% of the refined barrel. With chemicals outpacing refining on demand growth and returns on capital expenditures over the last decade, chemicals represent an opportunity to balance the diversified product portfolios of oil and chemical companies and help them manage risk. The additional uncertainty of future demand growth for plastics adds further complexity to capacity planning and increases the competitive hurdles for attracting capital.

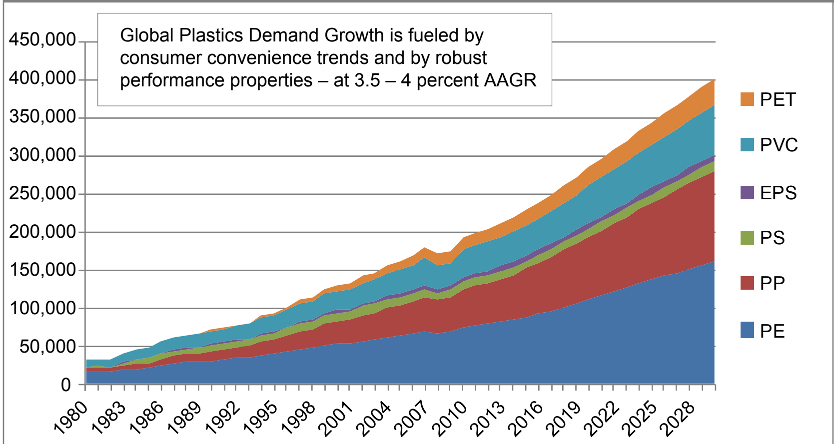
Strategic implications of demand risk include the possibility that diversification from oil to petchems may be less impactful than currently anticipated. In addition, slower market growth creates the potential for extended down cycles, and marginal supply curves flatten with potential lower long-term margins. Moreover, the demand contribution from developing markets may evolve much differently than anticipated. Furthermore, sustainability performance potentially affects entity valuations as well as available financing.

Policy decision-making occurs at a faster pace but without validated data.

Today, over 60 countries have introduced bans and levies on the use of plastics. Both the public and private sectors are increasing efforts to curb consumption and improve management of single-use plastics. These actions are often driven by limited understanding of the consequences and available alternatives or the ability of infrastructure to deliver. The EU directive requires new plastic products to contain at least 50% recycled materials by 2025 and 75% by 2035. On May 9, 2018, the American Chemistry Council's (ACC's) Plastics Division announced goals that commit US plastics resin producers to recycle or recover all plastic packaging in the US by 2040.

The issue represents a mismatch in scale: The problem is at large scale (e.g., 20 MM tons each for PE or PP), while the scale of current commercial solutions is orders of magnitude smaller. Also, the geographic dispersion of the problem is orders of magnitude larger than chemical industry standards. The EU policy will require significant investment in physical infrastructure, with initial estimates in the range of €1.5B per year. ACC's policy requires development of technology, massive infrastructure, and social systems.

Figure 1: Projected global demand growth



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Technology is not ready for required recycle volumes.

Current mechanical recycling processes mechanical have scale and economics limitations while processes such as chemical recycling are in their technology development infancy. Waste collection streams and systems are dispersed with relatively low-input volumes compared with the requirements needed to achieve economic scale. From a strategic standpoint, forced regulated solutions have limited ability to deal with massive plastics volumes without scaled technology. To be competitive with natural feedstocks, recycle economics also require logistics efficiency to convert plastics waste into high-quality, prime-equivalent, fit-for-use materials.

The infrastructure is inadequate to address sustainability policies.

Critical infrastructure elements – including collection, sorting, processing, and end-use application facilities and their harmonization – remain in early development. In the U.S. in 2016, 50% of PE material purchased for recycle was of unsuitable quality for further processing. Gaps in supply and end-use demand for recycle material remain. Current plastics processing technology is labor-intensive, high-cost mechanical recycling, compared with thermal and chemical process technology under development. Today, many collection systems are under economic pressure and are overwhelmed with waste volumes of all materials. Stakeholders such as chemical producers, converters, brand owners, retailers, and waste management companies are confused about their sustainability responsibilities. System design, mechanisms for consumer social behavior, and viable value chain economics for recycling continue to trail demand. The underlying strategic challenge for participants and stakeholders is how to align waste management priorities with other societal needs, which differ significantly among regions. Additionally, while the impact of mechanical recycled plastics replacing virgin resin is potentially significant, those volumes fall well short of addressing the disposition of plastics waste beyond landfill. New application areas must be developed for mechanically recycled plastics, and the chemical and thermal recycling infrastructure will play a critical role.

Participants in the plastics value chain are just beginning to understand the complex solution options and the related strategic implications. As a result, we are now seeing the emergence of more sophisticated and collaborative cross-value chain efforts, compared with previous ad-hoc, sometimes desperate responses from businesses and governments. The value chain is moving away from "who is responsible?" to "what role do I play in collaborations along the value chain?" Recent good examples of this step-change in approach by industry participants include the Alliance to End Plastics Waste and the TerraCycle Loop™ Shopping System.

Much work remains to develop sustainable business and behavioral models that address this systemic issue, and the call to action needs to be dramatically expanded. Ad-hoc actions by governments and corporations to ban plastics could prove costly if policy makers do not consider whether there are viable, economical alternatives. They must also carefully balance the prioritization of plastics waste versus other social needs.

Impact of growing headwinds in China on the specialty chemicals market

Vivien Yang |
Research and Analysis Executive Director, Chemicals, IHS Markit
E Wei.Yang@ihsmarkit.com
T +861065334695
L Beijing

Masahiro Yoneyama |
Research and Analysis Executive Director, Chemicals, IHS Markit
E Masahiro.Yoneyama@ihsmarkit.com
T +81362621712
L Tokyo

After 30 years of high-speed growth, the Chinese economy is due for correction. In China, real-term GDP grew at an average of 8.4% per year from 2007 to 2017. However, GDP growth is projected to slow to 6.6% in 2018, 6.3% in 2019, 6.0% in 2020, and 5.9% in 2021. The big problems include non-performing assets – including excessive production capacity and non-competitive companies – and significant environmental pollution. The manufacturing industry struggled for the last five years with excessive competition, mainly based on low-price strategies and expanding capacity. To restructure the supply side, the Chinese government implemented a deleveraging policy and optimized non-performing assets. These changes reduced excessive production capacity and caused some non-competitive companies to exit the market. In the short-term, however, these policies created an economic slowdown.

The other major factor affecting the Chinese economy is the acceleration of China's environmental protection campaign since early 2017. Tightening environmental protection added new business operating costs and led to factory closures in high-polluting sectors, which weighed on industrial production. The 2017 Annual Economic Work Conference further emphasized environmental protection as one of the major policy focuses of the government in the coming three years. These policies mainly affect small and private companies, causing some to close their factories. In contrast, large enterprises can afford to install equipment and upgrade technology to meet the standards, allowing them to survive and benefit.

Stricter environment regulations have negatively impacted industrial output since 2017. As indicated in Figure 1, industrial output growth remained weak as light-manufacturing output declined. Under these circumstances, the growth of the Chinese specialty chemicals market also has been slowing. In addition, recent trade friction between the United States and China reduced Chinese exports.

Specialty chemicals are widely used in everything from household items such as detergents, cosmetics and processed food to high-tech products such as aircraft and mobile phones. With 24% of the world's 2017 consumption, China is the largest consumer of specialty chemicals. Therefore, slowdown of the Chinese economy significantly impacts the world's specialty chemical market.

Recently China experienced an 8% to 10% annual growth rate in specialty chemicals. However, lower GDP and tighter regulations directly impact the consumption of related specialty chemicals. As a result, we project that China's specialty chemical growth rate will slow to 6% between 2017 and 2022 (see Figure 2).

Specialty chemical growth rates in China vary widely depending on industry trends, ranging from 1.7% for specialty paper chemicals to 15% for integrated circuit (IC) processing chemicals. For example, specialty chemicals used for paper processing are decreasing mainly because of digitalization, creating stagnant industry growth. Many small to mid-sized paper processing mills have closed in response to strict environmental regulations, reducing specialty paper chemicals consumption. Another low growth specialty chemicals sector is that for textile industry. China's rapidly increasing labor costs are causing textile industry to move to Southeast Asia, which results in lower growth rate for the specialty chemicals. In contrast, strict environmental regulations have catalyzed the replacement of some non-environmental friendly or harmful chemicals, such as bleaching agents containing chloride [hydro-fluorocarbon used as blowing agents, and some types of brominated flame retardants].

Although the average growth rate for chemicals used in manufacturing has declined, some Chinese manufacturing markets are still growing. For example, specialty chemicals for personal services and goods, including cosmetics, nutraceuticals, and flavor and fragrances are growing at a faster pace because they have low elasticity relative to GDP. Another high-growth market is specialty chemicals for production of ICs. Because China heavily relies on imported ICs, its government implemented a policy to increase domestic manufacturing ICs from the current 20% to at least 50% within the next five years. Electronics chemicals growth is also stimulated by

> The slowdown of the Chinese economy will affect the specialty chemical market not only in China, but also in Asian countries that trade large volumes with China

high-technology advances, including artificial intelligence and the Internet of Things. Consequently, China is investing in R&D for electronics and related manufacturing industries. Automotive computerization and the development of electric vehicles also positively affects the consumption of IC chemicals. In the coming years, we expect the market for IC and semiconductor processing chemicals to rise 15% and the market for printed circuit board and IC packaging materials chemicals to expand 8%. High-performance thermoplastics, which are mainly used in automotive and electronic products, also will grow quickly.

Another factor changing the specialty chemical market is the evolution of Chinese lifestyles and consumer attitudes. A focus on rapid growth has shifted to improved quality, and price-conscious consumers stress quality. Because these conditions make it difficult to achieve high growth rates based on volume, the government and investors are paying more attention to quality.

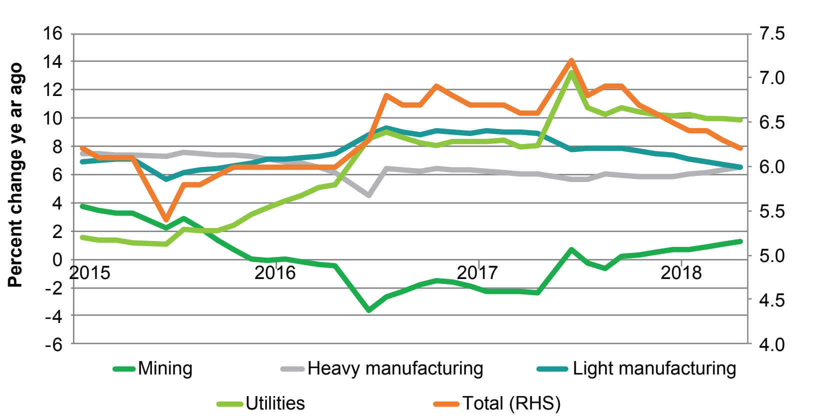
Trade friction between the United States and China may indirectly influence consumption of some specialty chemicals. For example, reduction of plastics exports to the U.S decreases the consumption of plastic additives in China. As China is the largest producer of electronic end-use products, a decrease in exports will reduce consumption of electronics chemicals. Fewer exports will also negatively affect the Chinese economy, further decreasing domestic consumption of specialty chemicals.

Many other Asian countries that export large volumes to China are affected by its economy. For example, Taiwan and South Korea send 30% to 40% of their total exports to China on value basis. Singapore and the Philippines export 20% to 30%. And Japan, Malaysia, Thailand, and Indonesia export 10% to 20%. Therefore, any slowdown in the Chinese economy will negatively impact these countries.

Other Asia excluding China accounts for 23% of the world's specialty chemical markets. IC chemicals represent the largest market segment, especially in North Asian countries. Taiwan, Japan, and South Korea are major producers of ICs, many of which are exported to China. These countries increased their IC exports to China as the Chinese electronic industry grew. However, IC imports are falling with the Chinese demand for electronics ICs. Chinese imports of ICs from Taiwan, South Korea and Japan have been decreasing since November 2018. In December 2018, Chinese imports of ICs decreased from Taiwan by 21%, South Korea by by14% , and Japan by 9%, compared with December 2017. This trend will continue for at least the first half of 2019.

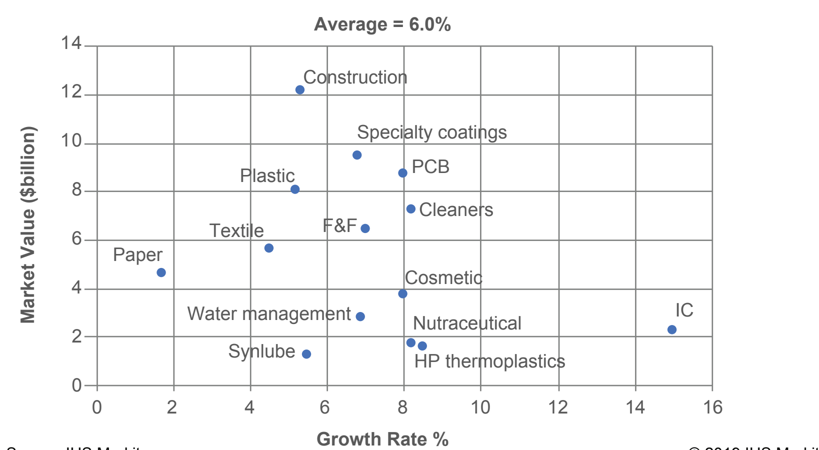
The slowdown of the Chinese economy will affect the specialty chemical market not only in China, but also in Asian countries that trade large volumes with China.

Figure 1: Industrial value added growth by sub-sector, cumulative



Source: National Bureau of Statistics, IHS Markit. © 2019 IHS Markit

Figure 2. Growth of China's Specialty Chemical Market 2017-2022



Source: IHS Markit. © 2019 IHS Markit

These countries should prepare for lower Chinese growth by stimulating domestic consumption of specialty chemicals. In addition, trade friction between the United States and China could worsen the Chinese economy, although the precise impact is still unknown.

IHS Markit

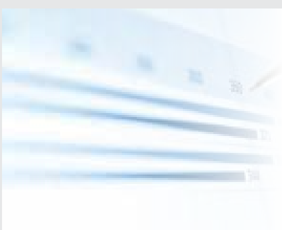
The new silk road: a case study on identifying strategic European M&A targets in specialty chemicals

Initial situation

IHS Markit was contacted by a Chinese client who wished to acquire a European Specialty Chemicals company as part of its M&A growth strategy

The brief required the target acquisition to fit within the Chinese Government's "Made in China 2025" and "One Belt One Road" initiatives

Impact



IHS Markit delivered a comprehensive screening analysis providing the client with a **ranked shortlist of top 10 target companies** including "fast track" targets which were known to be available

A year after completion of the study, over a dozen of the **top 50 companies profiled had been involved in M&A activity**, validating IHS Markit's approach and recommendations

IHS Markit approach

1. The first phase determined the acquisition domain which fit with the company's strategy and the government's briefs

2. IHS Markit then identified 21 relevant specialty product sectors with a long list of over 250 companies, profiled and sourced from in-house databases – Directory of Chemical Producers, Specialty Chemicals Update Program, Chemical Economics Handbook, Global Trade Information Services and ChemicalWeek

3. Progressively detailed screening steps, narrowed the list to 140 and then a top 50, using agreed criteria

4. Additional information was gathered to develop deeper profiles of the top 50 targets, including IP and technology position, market outlook, competitive assessment, valuation and availability

5. Further listing of potential JV and "step out" target opportunities

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