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The far reaching consequences of a trade war

The year 2019 has seen the development of headwinds that are having a negative impact on the global economy and therefore, a negative impact on energy and chemical market profitability. Regional geo-political tensions, changes in government leadership, energy market volatility, protectionist trade policies, fluctuating currency and financial capital markets, are a short list of concerns that are impacting the industry. In the past 12 months, the global economy has transitioned from a state of strong growth, expanding trade and increased manufacturing output, to a much slower rate of growth on many key economic metrics. While IHS Markit is not forecasting a recession as a primary planning case, there is more acknowledgement that the risk of global recession is rising.

In many respects, the deterioration of US-China relations is viewed as the primary reason for a slowing global economy. While not the only issue, there is significant direct and collateral damage being caused by the escalating trade dispute between the world’s two largest economies. While we can also acknowledge there are areas of collateral benefits from the US-China trade dispute, the overwhelming impact on the global economy is negative, resulting in a slowdown in demand growth in many industry sectors. The timing of a slowdown in demand growth could not be worse, as a wave of new refining and chemical capacity has started to enter the market in 2019 and will continue during the next 3-4 years. The resulting imbalances of supply and demand will likely cause many sectors to see lower capacity utilization and profitability.

IHS Markit research teams work hard to bring our clients a set of analyses and forecasts that are fully integrated from energy to chemicals, to help you see the interconnected nature of global energy and chemical businesses. From our cost and price forecasts, to our capacity and supply/demand/trade forecasts, we provide our clients a view that is fully connected from the wellhead to consumer markets. In addition, in 2019, we are also very excited to add a set of Agri-business capabilities to that view. For this edition of Insights, we have asked our teams to use the subject of US-China relations as a central theme for the articles you will read.

From the energy and feedstocks teams you will see as the largest oil and gas importer in the world, China appears ready to rejuvenate its E&P sector as the government has renewed its emphasis on energy security. In addition, China has all but shut down discussions with US LNG providers despite the hopes that this could be one commodity that would be part of a solution to the trade tensions between the two countries. In the refining sector, IMO specification changes in January 2020 is expected to result in margin increases in the near term. However, with over 11.0 million b/d of additional capacity planned to start-up globally, certain refineries will come under pressure as margins ease. The addition of large scale crude-to-chemicals plants in China will only add to the competition.

The theme of US-China relations pulls in many additional topics for discussion, all of which you will find are directly or indirectly connected. Others included in this issue are rare earths, soy beans, crop-protection, animal health, fertilizers, biofuels, and polyethylene. After two years of escalating trade tensions, the various impacts on the global economy are summarized best as follows: higher costs to businesses and consumers, lower product demand, less efficient supply chains, financial market volatility, reduced international trade, increased risk aversion by investors and a scale back in business capital investment. IHS Markit teams around the world are positioned to provide companies across the energy to chemicals value-chains, with the data, analysis, analytical tools and expert advice to help them navigate this heightened level of uncertainty. Our goal is to enable actions that will help to positioned your businesses to remain competitive in a down-cycle and to thrive when the up-cycle conditions return.
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Economic impacts of an escalating US-China trade war

**In August, the US-China trade conflict intensified as the United States and then China announced new and increased import tariffs.** The cumulative impacts of nearly two years of escalating US trade protectionism and its backlash are building, adding to the fatigue of a maturing global economic expansion. These impacts include higher costs to businesses and consumers, lower product demand, disrupted and less efficient supply chains, financial market volatility, reduced international trade and investment flows, and diminished competition and innovation. Moreover, survey evidence suggests that trade policy uncertainty is fostering risk aversion by investors and prompting businesses to scale back capital investment. In turn, investor flight to safety has contributed to dollar appreciation.

**The August 2019 round of US-China import tariffs**
The August tariff announcements can be summarized as follows:
- On August 1, President Trump announced new US import tariffs on most Chinese goods not previously subject to tariffs under Section 301 of the 1974 Trade Act. A 15% tariff was imposed on USD112 billion of Chinese imports on September 1 and will be extended to USD160 billion of goods on December 15. The later date for some imports (such as laptop computers, cell phones, video game consoles, and toys) aims to soften the impact on US consumers during the upcoming holiday shopping season.
- China retaliated by imposing tariffs of 5% to 10% on USD75 billion US goods in two tranches, effective September 1 and December 15. Chinese tariffs apply mainly to agricultural products, chemicals, intermediate goods, autos and parts, and machinery and equipment. On August 5, China allowed its currency to depreciate beyond the then-presumed red line of 7.0 yuan per dollar.
- Existing US tariffs on $250 billion of Chinese goods, initiated at 10% in September 2018 and raised to 25% in June 2019, will increase further to 30% on 15 October.

The August round of trade actions against China will lift the effective tariff rate on all US imports of goods to 5.8% by the end of 2019, the highest level since the 1970s. This represents a threefold increase from the 1.8% average that prevailed from 2000 through 2017 and a substantial markup from 3.1% in early 2019. US imports of goods currently amount 12% of GDP.

**Effective US tariff rate on imports of all goods from all countries**

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<td>Percent</td>
<td>0</td>
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**Source:** Macroeconomic Advisers by IHS Markit. © 2019 IHS Markit

In the August round of tariffs, China’s market dominance will make it more difficult for US buyers to tap other suppliers. In general, Mexico, Canada, and several Asia-Pacific countries are best positioned to benefit from a less competitive China. In the computer and electronics segment, for example, Mexico and Malaysia have opportunities to gain market share. Meanwhile, Japan and Germany are alternative suppliers of chemicals, electrical equipment, machinery, and motor vehicles.
Rising tariffs will dampen US economic growth through 2022

Our analysis of post-tariff import costs through early 2019 finds that the incidence of recent tariffs on goods imported from China has fallen mostly on US consumers and businesses. The August round of US tariffs on imports from China is expected to raise the level of consumer prices (measured by the personal consumption deflator) by 0.3% by the second half of 2020.

The tariffs announced in August will sap US real GDP growth by about 0.1 percentage point in each of the next three years, leading to a cumulative output loss of 0.3% to 0.4%. During this period, real consumer spending growth is reduced by about 0.2 percentage point annually, while real business fixed investment is cut by 0.3 percentage point. GDP impacts from reduced domestic demand are mitigated somewhat by softer import demand and substitution effects. In our September forecast, US real GDP growth is projected to slow from 2.9% in 2018 to 2.3% this year, 2.1% in 2020, and 1.9% in 2021.

China has the most to lose from a trade war

The US-China trade war is redirecting trade flows. From the first quarter of 2018 to the first quarter of 2019, China’s share of US imports of products in tranches 1 and 2 fell from 7.4% to 4.8%, while its share in tranche 3 dropped from 20.4% to 15.7%. Meanwhile, Europe and the rest of Asia-Pacific increased their shares of US imports at China’s expense. Mexico, Taiwan, and South Korea stand out as market share winners. However, the growth in global goods and services trade volume has slowed from 5.8% in 2017 and 4.1% in 2018 to just 1.8% in 2019.

The USD272 billion of Chinese goods subject to new import tariffs accounts for 10.9% of China’s goods exports and 2.0% of China’s GDP. Their impact on 2019 economic growth will not be substantial; indeed, there may be a shipment rush before some tariffs take effect on December 15. We estimate that the direct impacts of new and increased tariffs will trim China’s real GDP growth by 0.15 percentage point over the next two years. Even anticipating that the Chinese government will increase fiscal and monetary stimulus measures, real GDP growth is expected to slow from 6.6% in 2018 to 6.2% this year, 5.7% in 2020, and 5.6% in 2021.

Potential global economic impacts of the August tariffs

Before the August round of US-China trade actions, we used IHS Markit’s Global Link Macro-Industry Model (GLM-IM) to quantify the impacts of an extension of 25% tariffs to the fourth tranche of imports from China, drawing insights from the observed impacts of tariffs on the first three tranches. In this scenario, the average US price of imported goods is raised 2.6%. The

<table>
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<th>Billion USD, 2018</th>
<th>China</th>
<th>Rest of world</th>
<th>World</th>
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<tr>
<td>Tranches 1+2</td>
<td>37</td>
<td>515</td>
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<tr>
<td>Tranche 3</td>
<td>207</td>
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<td>26</td>
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<td>Chinese goods</td>
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<tr>
<td>Total goods</td>
<td>540</td>
<td>2,001</td>
<td>2,541</td>
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Source: IHS Markit

Federal Reserve does not change its policy rate, viewing the inflation shock as temporary. We assume a fall in equity prices in line with past responses: the S&P500 index drops 13% below the baseline in the short term and recovers to 4% below the baseline in the long term. Consistent with the 2016 experience, China’s net capital inflows are temporarily reduced by about 7% of total fixed investment.

In this scenario, global real GDP is 0.6% lower than the baseline scenario at the height of the shock in late 2021. China’s output is down 1.6%, while US real GDP is down 1.1% as a result of the fourth tranche of tariffs. Given the difficulty of the United States finding appropriate low-price substitutes for Chinese products in tranche 4, there are no winners in this scenario. In all regions, protectionism causes a deceleration in trade, exacerbated by financial market responses. The induced stock market downturn accounts for one-third of the total impact on trade and two-thirds of the impact on real GDP by the end of 2021. The sectors targeted by tariffs are hit hard, as are their suppliers. Some of the most substantial global output losses are in computers and electronics, machinery and equipment, textiles and apparel, rubber and plastics, and chemicals.

The impacts of tranche 4 tariffs are layered upon the adverse impacts of previous rounds of US-China tariffs, likely pushing the cumulative impact on global output above 1.0% by 2021. The actions to date in the US-China trade war are not yet of sufficient magnitude to send the global economy into recession. But they have significantly slowed the world economy’s actual and potential growth path. The rise in trade protectionism has thereby increased our vulnerability to a combination of political and economic shocks at a time when policy options to counteract a global downturn are limited.
China upstream revitalized – The implications of China’s new energy security strategy

China’s increased focus on energy security is driving a revitalization phase. This shift follows a long period of muted investment caused by lower oil and gas prices, coupled with unsuccessful efforts to replicate US success in unconventional resource production. A government push to increase production is resulting in commitments from domestic national oil companies (NOCs) to ramp up domestic production and increase foreign participation. This is clearly welcome news for companies holding existing acreage, who will assess recent policy changes and signals to better position themselves in China. The implementation of the NOC plans, along with a government drive for more diversified participants in the exploration and production (E&P) sector, could signal an improved trajectory for investment and production.

China’s Energy Security Concern
As the largest oil and gas importer in the world, China appears ready to rejuvenate its E&P sector. Domestic oil production has been declining since 2016, caused by a highly mature resource base. The widespread use of enhanced oil recovery-related solutions for major producing fields was very expensive, making domestic resources less competitive. Although China has huge unconventional gas resources, the ability to translate them into real production volumes has been difficult, and it has not been possible to meet the government’s unconventional gas targets. Complex subsurface conditions and above-ground risks contributed to the challenge.

China’s dependency on imported oil reached a level of 70% in 2018. This increased dependency on imported oil and gas made energy security a top priority for the Chinese government. The China-US trade dispute has only accentuated China’s energy security concern. The US shale revolution has made US a net exporter, and it will become the biggest contributor to crude production growth in the coming years. This combination of factors is further driving China to accelerate its energy security strategy and execution.

Yet energy security is not a new concern for China. Security drove Chinese NOCs to expand their international portfolios aggressively from 2009 to 2013, when the oil price was above $100 per barrel. During those years, China’s economy was rapidly expanding, driving increasing oil demand. With oil prices forecasted to continue increasing – given the rising global demand from developing countries like China and India – aggressive international merger and acquisition activity (M&A) was considered the most viable strategy for Chinese NOCs. However, the oil price collapse in 2014 put a brake on that approach. Assets acquired at high cost became burdens to the NOCs, and further expansion was no longer a viable route.

After some portfolio reassessment and consolidation, it was expected that international M&A activity would rebound as prices recovered. Instead, NOCs renewed their focus on domestic assets as a source of production growth (see Figure 1).

NOCs in Action
ECHOING THE GOVERNMENT’S CALL FOR DOMESTIC OIL AND GAS PRODUCTION INCREASES, THE MAJOR NOCS COMMITTED TO CHINA’S SEVEN-YEAR ACTION PLANS. THE PLANS, WHICH FOCUS ON DOMESTIC UPSTREAM PRODUCTION FROM 2019 TO 2025, ARE ORCHESTRATED BY THE NATIONAL ENERGY ADMINISTRATION.

China National Petroleum Corporation (CNPC) and China National Offshore Oil Corporation (CNOOC) disclosed key targets of their Seven-Year Action plans. CNPC focuses on production growth and reserve addition in its four core regions: Xinjiang, Songliao, Changqing, and the Southeast regions. CNOOC set the target of “two twenty millions:” 20 million cubic meters of gas in the western South China Sea and 20 million metric tons of oil in the eastern South China Sea (see Figure 2).

The emphasis on exploration, especially in frontier areas, reflects the challenges of production growth with
maturing producing portfolios. Both CNPC and CNOOC plan to increase exploration spending. CNPC will spend 5 billion yuan (US$640 million) per year on frontier exploration, five times the current spending level. By 2025, CNOOC aims to double exploration activities and proven reserves compared with its 2017 level. 

Unsurprisingly, shale and tight gas remain a key focus for the NOCs. CNPC aims to produce 24 billion cubic meters (bcm) of shale gas (from 4.2 bcm in 2018) and 35 bcm of tight gas in 2025. The organization will spend 54 billion yuan (US$7.8 billion) on shale gas in the Sichuan basin in the next seven years. CNPC also revealed its four-step strategy for shale gas in Sichuan earlier this year, aiming to produce 42 bcm in 2035. 

The improved economics of shale gas – coupled with a more investor-friendly regulatory environment and clear commitments from the NOCs – provides a basis for achieving these targets. However, challenges around oilfield service capacity, as well as the anti-hydraulic fracturing sentiment in the earthquake-prone Sichuan region, add complexity. 

Policy Reforms to Attract Foreign Investors

- Over the years, the Chinese government has been exploring reforms and incentive programs to vitalize the industry. The reforms focused on four areas:
  - Optimizing subsidy and tax-reduction programs for unconventionals
  - Piloting new acreage awards and exit mechanisms to diversify participants
  - Improving administration and simplifying approval requirements
  - Improving wellhead price and pipeline access with citygate gas price and pipeline reforms
- Subsidies were the primary tools used to incentivize unconventionals when activity started. Even in May 2019, a new unconventional gas subsidy program includes tight gas for the first time. It offers extra weighting for coal bed methane and production growth in heating season.

Since 2017, policy focus gradually shifted from subsidies to structural reform. A May 2017 government document, “Several Opinions on Deepening Oil and Gas Reform,” set the blueprint for reform. It aimed to create a new E&P competitive landscape in China, which is dominated by the NOCs, has diversified participants, and includes new acreage-awarding and exit mechanisms. Reform plans have been significantly accelerated since the China-US trade dispute escalated in 2018.

Several new policies have been released to attract foreign investors, including eliminating approval by the National Development and Reform Commission for the Overall Development Program and piloting different acreage-awarding methods. A more recent step is to allow foreign investors to invest in upstream projects independently, without partnering or forming a joint venture with the NOCs. 

Through these policy updates the government also has sent clear signals to foreign investors, encouraging participation in China’s E&P. Yet attracting new foreign players poses continued obstacles, such as the availability of attractive assets for foreign companies.

More incentives and reforms can be expected to further open the market, as China aims to secure its energy supply by producing more domestic oil and gas. Overall, these recent steps are positive. However, they also should be compared to the competition from other countries that are making positive changes to attract their own new investors.
The returning spectre

As US-China relations dominate geopolitical news, industry attention turns towards the impending IMO specification changes. But further ahead, away from the headlines, conditions are conspiring to squeeze the refining industry considerably.

From 2008 to 2015, some 2.1 million barrels/day (b/d) of refinery distillation capacity in Europe was closed. A combination of weak local demand, grass-root investments in Asia and the Middle East and the resulting poor margin environment proved too challenging for several operators. Since then, generally higher margins, helped by strong demand growth and falling oil prices, have provided much-needed support for the industry, and upcoming changes to the International Maritime Organization (IMO) bunker fuel specification are expected to lift margins further in 2020.

However, after a temporary uplift in 2020-2021, the benefits of the IMO changes are expected to fade. The industry worldwide will likely face a severe, challenging business environment as demand growth reaches a plateau, and refineries – especially in Europe – will once again be under threat and facing potential rationalization.

Tough times: the downturn

European crude distillation capacity was broadly constant throughout the 1990s and early 2000s, at approximately 17.0 million b/d. Several projects were initiated not only to meet tighter fuel specifications in 2000 and 2005 but also to increase the overall yield of lighter products.

This period also witnessed rapid economic growth in China, with annual GDP rates of over 10% and refined product demand increases that affected global supply-demand balances significantly. Although demand for gasoline and middle distillates increased considerably demand for heavy fuel oil continued to decline, resulting in price spreads between light and heavy products widening. This lifted margins for conversion units such as fluid catalytic cracking units, hydrotreating units, and cokers, but placed enormous pressure on simple hydroskimming operations, especially those too small to upgrade their way to improved profitability.

This environment persisted for some eight years. Annual average gross hydroskimming margins, as measured by IHS Markit’s Northwest Europe (NWE) Brent Hydroskimming benchmark, were negative almost every year from 2006-2014, such that the severity and length of the simple margin downturn proved too great for many of these operations to survive.

The respite: falling oil prices, then the IMO scramble

The collapse in crude oil prices from late 2014 into 2015 proved to be a catalyst for a reinvigorated downstream industry. With many upstream projects facing uncertain financial returns, several companies showed a renewed interest in both refining and retail. Further, the drop in absolute prices helped to raise demand for road fuels: in the United States, for example, gasoline demand over the period November 2014 to June 2015 increased by 9% compared with the same period 12 months prior. This time of renewed growth lifted margins and effectively ended the period of rationalization.

The IMO specification changes in January 2020 also are expected to benefit the industry. IHS Markit views an increase in refining crude oil runs as essential to meet an expected increase in demand for middle distillates and to help optimize utilization rates of downstream cracking units, as intermediate streams are diverted to help produce new 0.5% sulfur bunker fuels. This is expected to result in positive price signals and margin increases over the next 12 months, for almost all refining configurations.

When the party ends, the clearing-up begins

History shows that a change in fuel specifications is often followed by a short-term shift in pricing relationships. Markets tend to place a premium on the higher-grade product over the marginal manufacturing cost to encourage supply, but as production...
increases and supply-demand balances adjust such premiums disappear. This pattern, we believe, is also probable with the IMO transition.

The likely disruptions to crude and product price relationships from late 2019 are expected to be over by the end of 2022, and refined product price spreads, relative to crude and to each other, to return broadly to current levels from 2023 onwards. Refiners will then be facing slowing demand growth owing to the increasingly efficient use of conventional transportation fuels, and most likely by 2036 a decline in absolute demand levels. Furthermore, we anticipate the addition of some 4.5 million b/d of distillation capacity worldwide between 2020 and 2025, and a further 6.7 million b/d of capacity to be required by 2035 in non-OECD markets such as the Middle East, India, China and other parts of Asia.

With over 11.0 million b/d of additional grassroots distillation capacity, certain refineries will come under pressure as margins ease. The most vulnerable – and most likely to close – will be in regions with mature or declining refined product demand, especially those with relatively high fixed costs and fuel costs.

**Identifying vulnerable refineries**

From 2020 to 2035, IHS Markit projects a decline in crude runs in OECD Asia of 1.2 million b/d, and in Europe of 2.2 million b/d – a possible return to 2008-2015 conditions. And although an overall decline in crude runs may be indicative of poor regional competitiveness, for industry players such as refiners, trading companies, ports, and engineering and construction companies, the ability to identify vulnerable refineries is a valuable strategic asset. For this reason, the use of the Refinery Cost and Margin Analytics (RCMA) tool can be particularly beneficial.

Figure 1 shows the projected margin – net of operating, variable, and fixed costs – for individual refineries in Europe in 2020. The IMO transition is expected to benefit nearly all refineries, with all but six refineries returning a positive net margin.

In the longer term, as margins deteriorate, the increase in the number of vulnerable European refineries is clear. Using 2027 as a snapshot example, 29 refineries are projected to have a negative net margin, representing a total of 3.7 million b/d of distillation capacity or 25% of the current installed base.

**Where next? Beyond the trade impasse**

Although demand for refined products is approaching a peak, demand for chemicals is projected to grow strongly beyond 2030. For refiners, petrochemical integration represents not only an opportunity to improve profitability by capturing the value of chemicals, but also helps secure national supply compared with over-reliance on imports – an important consideration in the current geopolitical climate.

However, the current trade impasse is unlikely to continue for a protracted period, and in due course some normalization is expected. The addition of crude-to-chemicals plants in China will only add to competition, thus increasing pressure on more basic refinery-chemical operations.

At a time when attention is on the benefits of the IMO specification changes it seems incongruous to suggest a return to poor refinery profitability and the increasing likelihood of closures. But the IMO party will be over all too soon and many refineries will struggle to break even. The spectre of rationalization will return.
Our client -- an Asian refiner -- planned to expand and upgrade its integrated refinery/petrochemical complex to boost the production of high-quality transportation fuels. We were engaged to assess the competitiveness of potential configurations of the upgraded complex in the East-of-Suez region to help our client make an informed final investment decision.

IHS Markit approach

We utilized our proprietary refinery model for competitiveness analysis to measure the relative advantage of refineries based primarily on the crude diet, configuration and location.

The IHS Markit refinery model calculates both Net Cash Margins and Cash Costs of Light Products:

- **Net Cash Margins** are defined as product realization less feedstock, fixed and variable operating costs per barrel of crude. Plant gate prices of crude oils and products take into account freight costs and prices at reference locations. Besides major refined products, specialties such as base oil and bitumen as well as basic petrochemicals such as aromatics and ethylene/propylene are included in the product slates of integrated complexes.

- **Cash Costs of Light Products** are defined as total feedstock costs including delivery charges as well as fixed and variable operating costs less credits from coproducts (including base oil, bitumen, fuel oil, LPG and basic petrochemicals such as aromatics and ethylene/propylene). Key light products include gasoline, kerosene/jet fuel and diesel.

We determined the competitive positioning of the existing study refinery and potential upgraded configurations in addition to key competitors in the East-of-Suez region.

Impact

Our ability to leverage in-house data and proprietary analytical tools was crucial for completing the comprehensive competitiveness analysis within a tight timeline. Our client was able to make an informed final investment decision to implement the expansion/upgrading project to stay competitive in the East-of-Suez region.

With over 400 experts focused on the Oil, Mid-Downstream and Chemical markets, our expert analysis can be as broad as it can be laser focused.

Get in touch to have a solution tailored to your needs.

Victor Shum | Vice President, Consulting Lead – Asia Pacific
Victor.Shum@ihsmarkit.com
Petrochemicals short term price forecasting model
A case study on providing market insights to develop short term price forecast models

Initial situation

The client, a large Chinese state owned refining and petrochemical company, asked IHS Markit to assist in building pricing models to analyze the products that they market, train a team of expert users in their organization and facilitate the teams for running pricing models to establish pricing guidelines.

Impact

- The Client now has a pricing tool to establish monthly prices in a consistent and transparent process across all their sales offices and across different regions China.
- This tool also allows Client to troubleshoot for price deviations through a systematic analysis of the independent contributory factors.

IHS Markit approach

- IHS Markit utilized our wide and deep petrochemical database on supply, demand, operating rates, trade flows, production cost and derivatives affordability pricing to determine a set of parameters for data analysis using a prescribed ten-steps pricing model.
- IHS Markit developed a prescriptive analytics methodology to train and test statistical correlations for short term price forecasting (up to 6 months).
- IHS Markit proposed advanced regression analytics to improve forecasting by correcting for data bias using Ridge, LASSO and Elastic-Net methods.
- IHS Markit is now helping this Client develop pricing strategies to overly marketing objectives alongside forecasted prices.

With over 400 experts focused on the Oil, Mid-Downstream and Chemical markets, our expert analysis can be as broad as it can be laser focused.

Get in touch to have a solution tailored to your needs.

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Polyolefins: Impact of trade war on the world’s most common plastics

Because of the escalating trade tensions between the US and China, the Chinese government has imposed a series of reciprocal tariff hikes on US-produced polyolefins imported into China, including polyethylene (PE) and polypropylene (PP). Because PE and PP constitute the world’s most common plastics by volume, and China represents the world’s largest market for polyolefins, these tariffs are significant.

Polyethylene is broken up into three major categories: high-density polyethylene (HDPE), linear low-density polyethylene (LLDPE), and low-density polyethylene (LDPE). On August 23, 2018, China increased tariffs on HDPE, LLDPE, and PP by 25% – an increase that was incremental to the preexisting 6.5% tariff. This tariff spike effectively limited US producers from moving these specific grades of PE and PP into China. (LDPE was not initially affected by the incremental tariffs.)

Exports of PP from the US to China were small, creating no significant impact. However, these tariffs were particularly problematic for US PE producers because they coincided with the launch and ramp up of several new world-scale PE plants based in the United States. These new plants, which mostly produce HDPE and LLDPE, are based on cost-advantaged ethane gas. They presumably had been justified and built with the expectation that a significant portion of their production would be exported to China. China accounts for approximately one half of the annual global growth for these materials. Technically US PE producers have maintained enough of a production cost advantage to still profitably ship these products to China. Yet the imposed tariffs would certainly slash margins on these sales, motivating US producers to seek alternative markets with higher margins.

Trade tensions between the US and China have thus far remained unresolved. As a result, China imposed a new round of reciprocal tariffs effective September 1. These tariffs include an additional 5% on US HDPE and LLDPE products, effectively raising the tariff on these resins to 36.5%. In addition, LDPE resins, which were previously excluded from the incremental tariffs, were made subject to an additional 10% tariff effective December 15. The new tariff on LDPE resins raises the total tariff to 16.5%. The addition of LDPE to the tariffed categories is significant, as two new world-scale LDPE plants in the US are scheduled to launch by year end.

Despite the prevailing trade tensions, US PE exports have been rising, largely due to the startup of new production capacity (see Figure 1). IHS Markit anticipates the launch of nearly 2.9 million metric tons of new PE production capacity in the US during 2019. While much of this new capacity has yet to start, US producers have recently recorded four record-volume months relative to PE exports. In 2017, US producers exported 39% of their production. By comparison, we estimate that US producers will export approximately 50% of their 2019 production.
Although US PE exports are increasing in volume, US producers are facing unprecedented challenges with respect to optimizing margin returns associated with these exports. With tariff rates approaching 40% and competition from global producers unaffected by trade war tariffs, US polyolefin producers are seeking alternative higher-netback markets outside of China. The drive to optimize export netbacks has resulted in a shift in global trade patterns. The table reflects the shift in US PE trade flow and volume since 2018 as well as the monthly US PE trade volumes shipped to various regions. It is based on government data obtained from the IHS Global Trade Atlas.

US PE producers have responded to the tariffs by redirecting exports originally destined for China to Europe and other countries in northeast Asia, such as Taiwan and South Korea. This strategy reduced US PE exports to China by 42% through June of this year, while US exports to Europe nearly doubled versus the same period last year. To fill the gap left by US producers exiting China, Middle East PE producers are reducing export volumes to Europe and increasing volumes to China.

While US exports to South America have shown a double-digit increase versus last year, it is expected that exports to South America will grow at a lower percentage than other destinations. This is due to the fact that US producers have already established a large market share in the region, and domestic demand growth in South America pales in comparison to growth rates in Asia.

The US-China trade war has not only affected trade flows and target markets. It also has had a negative effect on demand and producer margins. While it is difficult to calculate the precise effect of the trade war on polyolefin demand, we know that polyolefin demand has always been closely linked to GDP. As such, any decline in GDP negatively impacts polyolefin demand. IHS Markit economists have indicated that the trade war will likely account for a .2% to .3% reduction in global GDP in 2019. Therefore we should expect a corresponding decline in polyolefin demand. IHS Markit analysts operating in China report that resin buyers in China have been wary of potential demand and price declines since the tariffs were imposed. They have therefore limited purchases to “must-have” volumes.

The disruption of trade flows and the rebalancing of global PE trade due to the trade war also negatively affects producer margins. US PE producers who have been incentivized to move export volumes to alternative markets outside of China have assumed the role of “price maker” rather than “price taker.” This shift in persona became necessary when US producers, who were effectively blocked from accessing the China market, were required to carve out and expand market share in alternative markets.

IHS Markit analysis suggests that integrated PE margins for US producers have been trimmed by as much as $200 per ton as a direct result of the trade war. The aggressive price posture taken by US producers looking to establish or expand market share in smaller markets has had a cascading effect. The resulting margin erosion would likely not have occurred had US producers continued to have unfettered access to the China market, given that it is sufficiently large to accommodate the expanded level of exports that would have otherwise come from the US. In addition, global supply and demand balances for 2019 for PE did not indicate a significant over-supply condition prior to the trade war.

Barring a near-term resolution to the trade war and a subsequent recovery of the global economy, we can expect continued pressure on PE demand, prices, and integrated margins.

**US PE Exports by Region** (Thousand Metric Tons)

<table>
<thead>
<tr>
<th>Destination</th>
<th>1/6/2018</th>
<th>1/6/2019</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>91</td>
<td>53</td>
<td>-42%</td>
</tr>
<tr>
<td>Other Northeast Asia</td>
<td>16</td>
<td>40</td>
<td>153%</td>
</tr>
<tr>
<td>Southeast Asia (SEA)</td>
<td>33</td>
<td>67</td>
<td>101%</td>
</tr>
<tr>
<td>South America (SAM)</td>
<td>130</td>
<td>148</td>
<td>14%</td>
</tr>
<tr>
<td>West Europe (WEP)</td>
<td>59</td>
<td>116</td>
<td>96%</td>
</tr>
<tr>
<td>Rest of World (ROW)</td>
<td>317</td>
<td>488</td>
<td>54%</td>
</tr>
</tbody>
</table>

Source: IHS Markit. © 2019 IHS Markit.

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**North American PDH/PP Project**

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<table>
<thead>
<tr>
<th><strong>Initial situation</strong></th>
<th><strong>IHS Markit approach</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The Client evaluating a North American PDH/PP project needed to identify potential export markets to gain a deep understanding of the North American polypropylene market. Moreover, they sought advice for the definition of an initial tentative product slate and the development of a market-entry strategy. Additional support included suggestions for a commercial organization and a talent attraction and retention approach.</td>
<td>IHS Markit scanned the global PP market and identified the most attractive target markets in the major regions. Top-consumers lists by major region were provided. IHS Markit suggested a tentative initial product slate and mapped it out against the North American and export markets. Moreover a strategy for the premarketing-to-production product transition was proposed.</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th><strong>Impact</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The project could reach a FID.</td>
</tr>
</tbody>
</table>

---

IHS Markit provided a detailed description of the North American PP market, with demand segmentation by region and state, including an explanation of typical commercial practices and price striation. Logistics were discussed and utilized as part of a delivered-cost competitiveness analysis. Netbacks to target markets were calculated. Using the proven methodology of the traditional strategic planning process, IHS Markit suggested a phased market-entry strategy and identified necessary resources, including the structure of the necessary commercial organization and an approach for talent attraction and retention approach. Actual industry success cases were also analyzed.

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**Chris Geisler | Vice President, Consulting, IHS Markit**

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Rare earth elements –
The vitamins of modern industry

Rare earth elements (REEs) are a group of 17 chemical elements, all metals, that tend to be found together in geologic deposits. Rare earth metals and the alloys that contain them are used in a variety of high-tech applications, such as wind turbines, electric vehicles, rechargeable batteries, radar systems, and laser crystals. For this reason, they are called “vitamins of modern industry.”

The importance of these elements for key industries and the dominance of China in their global supply puts REEs at the center of power struggles. In 2010, China blocked exports of rare earths to Japan during a dispute on East China Sea islands. In early 2018, the US introduced import taxes on REEs and rare earth products from China. Tariffs were lifted shortly after, when the US realized that products could not be readily sourced domestically or from other non-Chinese sources. In mid-2019, China issued trade tariffs on REEs and Chinese government representatives made comments that could be interpreted as threats to cut REE supplies to US military buyers. In response, the US government indicated a desire to become independent of Chinese REE supplies. The surprising offer from the US government to buy Greenland also seems to be motivated at least in part by a potential rare earth mineral project.

Rare earth supply
The group of REEs includes the lanthanides, from lanthanum to lutetium, plus yttrium and scandium.

Permanent magnets are the largest and fastest-growing sector
Neodymium iron boron (NdFeB) magnets account for about 90% of the permanent magnets produced in 2018, with samarium cobalt (SmCo) making up the remainder. In 2018, 34% of the total rare earth demand was for permanent magnets. By 2023, this total is forecast to increase to a 38% market share, a 4.9% average annual growth rate.

An estimated 90% of the total permanent magnet materials were produced in China in 2018. The largest use for permanent magnets is in synchronous motors, which are found in wind turbines as well as electric and hybrid vehicles. Other PM uses include magnetic storage. Aside from magnets, REEs are used in polishing powders for tablet and mobile phone screens, refinery and emissions catalysts, and rechargeable nickel metal hydride batteries (See Figure 1).

Permanent magnets are also widely used for defense applications. Recently, the Pentagon called for increased US domestic production of NdFeB and SmCo magnets, due to sourcing concerns.
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>150 Countries
Production location (Region / Country / City)

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Situation in the United States
The US consumed 13,000 tons of REOs in 2018, which is only 8% of total world demand. China is not only the world’s largest producer, but also the world’s largest consumer, with 68% of the total.

The United States has estimated reserves of around 1.4 million metric tons. Production began in 1952 at the Mountain Pass, California mine, one of the major world reserves of rare earth. In 2013, Molycorp produced over 5,000 metric tons of REO at Mountain Pass. The mine was idled in October 2015 and shortly after Molycorp filed for bankruptcy. The continued downturn in price for REOs was blamed for the company’s financial failure. In June 2017, the Mountain Pass mine was sold for $20.5 million to MP Mine Operations LLC, a US-based consortium with Leshan Shenghe Rare Earth Co of China holding a non-voting minority interest. In 2018, Mountain Pass produced an estimated 12,300 metric tons of REO in the form of a rare earth fluoride concentrate – which was exported to China.

There are two other advanced projects in the US. The Bear Lodge Wyoming project from Rare Element Resources promises a 9,000 metric ton REO plant but is awaiting further investment. The other notable project is the Ucore Rare Metals project at Bokan Mountain in Alaska – a 2,500 metric ton-per-year REO separation plant that should begin production by 2023.

Eight companies in the US are currently able to manufacture intermediate rare earth products either from minerals or from primary products such as rare earth chlorides or oxides. In 2018, production of 74% of these intermediate products and other downstream rare earth products relied on imports from China.

Price dynamics
Over the last 15 years, the production of rare earth minerals and refined products has largely moved to China. This trend has created fears of a fundamental supply problem in the industry.

After an all-time high for REO prices in mid-2011, prices and demand slumped in 2012. The price spike in 2011 was caused by supply insecurity. The price was driven up by REE consumers stockpiling material as the Chinese authorities placed export tariffs and quotas on REEs. In 2014 and 2015, demand started to pick up slightly, but prices continued to decline for all REOs into the middle of 2017. Prices for some rare earths including neodymium, praseodymium, and yttrium increased through the end of 2018 (See Figure 2).

What are the long-term supply considerations for the US?
The main US government concern is the supply of REEs for defense purposes, which is less than 5% of the annual US REE consumption. Finding an alternative source for rare earth products will take time and be costly for the US. China produces low-cost, good-quality REE products, although there are concerns for the environmental damage caused by the industry.

When the US removed rare earth materials from the final tariff list in September 2018, it was a clear sign that the US accepts its dependency on Chinese imports. As we have seen in the past, threats to supply tend to be short-lived, and they haven’t been a suitable foundation for creating an economically viable domestic rare earth mining and production industry.
US-China trade relations and the implications on the liquefied natural gas market

China raised the tariff on US LNG imports to 25%

Trade tensions between China and the United States have been re-escalating in recent months. On May 10, the Trump administration claimed that China reneged on commitments from previous negotiations and announced that the US would increase tariffs on $200 billion of Chinese imports. Instead of the 10% tariff imposed in September 2018, the new tariff would be 25%.

China responded on May 13 by raising tariffs on $60 billion of US imports beginning June 1. On the list of products with tariffs jumping from 10% to 25% was liquefied natural gas (LNG), a commodity that was once hoped to be part of a solution to the trade tensions between the two countries.

Incremental tariff will reduce US LNG’s competitiveness in current market conditions

The higher tariff will reduce the competitiveness of US LNG delivered to China relative to other supply sources.

While contract terms vary, the higher tariff could place US LNG out of the money relative to some traditional oil-indexed supply. Let’s assume that, with no tariff, US LNG is priced at 115% of the Henry Hub pricing point for natural gas futures plus $4.50/ million BTUs (MMBtu) versus oil-indexed LNG priced at a 12% slope plus $0.25/MMBtu. In this case, US LNG delivered to China would be in the money when oil is $64/barrel or higher (see Figure 1).

When the 10% tariff on US LNG became effective, the oil price at which US LNG was in the money increased to $71/barrel. The 25% tariff will bring this price level to $81/bbl. Even with the recent oil supply disruption, however, Brent has not broken this price level since the fourth quarter of 2018. Effectively, the 25% tariff on US LNG would add nearly $1.20/MMBtu of incremental costs compared with the previous 10% tariff, bringing additional financial challenges for China at a time when most LNG sold into the domestic pipeline system is already facing financial losses.

To be competitive in China on a spot basis, US LNG would need to be priced at a discount to spot prices – which are hovering around $4.50/MMBtu for prompt month’s delivery – to account for the impact of the tariff. At the 25% tariff, the US LNG discount needed to achieve parity with the Asia spot price is approximately $1.10/MMBtu.

In addition, political headwinds are a far more important consideration compared with the additional cost of US LNG. Indeed, there has been a significant drop in imports of US LNG since the 10% tariff became effective in late September 2018. Since then, only six US LNG cargoes have arrived at China’s coast, none of those since April 2019.

Chinese contracting with US LNG projects will likely be on hold until the trade dispute is resolved

Various companies around the world have gravitated towards US LNG to meet their supply needs. The US is generally viewed as a source of cost-competitive supply, thanks to low expected hub prices; downward pressure on liquefaction fees; optionality and destination flexibility; and a wide variety of commercial terms and available business models.

China has been on an LNG contracting spree to meet its growing gas demand and to avoid the supply shortages seen during the winter of 2017-18. China National Petroleum Corporation signed the first binding deals between a Chinese company and a US LNG developer, Cheniere Energy, in February 2018. Other Chinese companies, both national oil companies (NOCs) and non-NOCs, have also signed non-binding agreements over the last few years. However, China has not executed any binding US LNG contracts since the 10% tariff was implemented.

No offtake agreements between Chinese companies and US LNG developers are likely to be finalized until the trade tensions are resolved. As state-owned companies, the NOCs—which accounted for 94% of China’s total LNG imports in 2018—will show their compliance with the central government’s political stance. The non-NOCs, although not as strictly regulated as the NOCs, still need political support in various market reform initiatives and project approvals to expand their businesses. It’s likely that they will also support the government’s stance.

China has numerous non-US supply alternatives. Many projects are competing to reach final investment decisions (FIDs) over the next several years. Some legacy projects are seeking to remarket volumes after existing contracts expire, and portfolio players are looking to place cargoes. In recent months, both
Chinese NOCs and non-NOCs have signed binding agreements with projects or companies in Canada, Mozambique, Papua New Guinea, Russia, and Qatar, as well as preliminary agreements in Canada, the Republic of Congo, and Russia. Several portfolio deals are also in the works.

While the impact of the tariffs on US projects will vary by project, it is generally negative and underscores the importance of having a diverse customer base. Projects marketing heavily toward China may need to switch gears or push back the timing of an FID. However, it may be difficult to substitute China for other growth markets on a one-to-one basis.

**Discussions are still ongoing, but reaching a deal may be a prolonged process**

LNG has been one of the key areas of common interest. The US has plenty of LNG to export, and the Trump administration is a key supporter. Chinese gas demand is still growing rapidly, making supply security a key policy consideration. More US LNG exports to China will also help narrow the trade deficit between the two countries. In our outlook, China will need an additional 48 million metric tons per annum of LNG by 2030 to meet its growing gas demand. If half of this came from the United States, the current annual trade deficit would be reduced by $10 billion, assuming an $8/MMBtu landed price.

However, a new round of tariffs has been added on both sides effective September 1, though trade talks should resume in October. In principle, the United States wants to leave at least a few tariffs in place and is concerned about the volume of goods and services China will procure from the United States. On the other hand, China wants to abolish all relevant duties. In addition, there are quite a few other key areas that the two countries still need to discuss. As a result, reaching a deal may be a prolonged process.

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**Landed cost in China: Illustrated Henry Hub versus oil-linked contract**

This is an illustrative example as contract prices vary. Assumes Henry Hub contract landed price = $3.0 Henry Hub price * 1.15 + $4.50 liquefaction and transport. Oil-linked landed prices are inclusive of a $0.25 constant.

Source: IHS Markit
Beyond soybeans: The ripple effect of US-China trade tariffs on agribusiness

Soybeans have taken center stage in the ongoing US-China trade war, ever since China’s Ministry of Commerce imposed a 25% tariff on hundreds of US products in April 2018. As the dispute between the two countries continues, the knock-on effects of restricting trade of the largest US agricultural export have rippled out into the global agribusiness industry.

Soybeans are central to the US export picture. As the largest importer of soybeans, China is the largest soybean trade partner for the US, with shipments between the two countries topping 36 million tons in the 2016-2017 soybean crop year. As the full effect of tariffs takes hold, Agribusiness Intelligence forecasts that US soybean exports to China will slump to just 13 million tons for the 2018-2019 period.

While US exports to Europe and other markets have increased, the scale of demand simply cannot match that of China. The net effect is that US soybean exports are forecast to fall 20% in the 2018-2019 period.

The US government has made it clear that it is not going to forget its farmers. It will continue to provide aid to agricultural associations and their members. However, most farmers would prefer to get their returns from the market, a prospect that looks to be some ways off.

If an agreement is reached between the US and China soon, it would provide significant support for financial markets and the economy. However, an immediate translation into increased US agricultural exports could take longer due to structural changes in the international market.

China has taken steps to broaden its supply chain, making it unlikely that export volumes would return to pre-trade war levels. Other countries that developed supply agreements with China in the last 12 to 18 months are not going to give up newly gained market share without a fight.

Brazil is best positioned to fill the gap for a range of agricultural products. Agribusiness Intelligence estimates that Brazil’s soybean exports to China have increased 36% in two years, totalling 63 million tons in the 2018-2019 period.

A prolonged trade war is likely to create a sustained impact on the US agricultural industry. Not only has the dispute impacted planting decisions by US farmers – who are focusing more on wheat, corn, and other crops – but it has affected other US agricultural companies. With financial uncertainty on the horizon, many farmers have been holding back on investment in new machinery and other inputs into their businesses such as technology.

Other adjacent industries such as fertilizers, crop protection chemicals, and biofuels are also impacted. Let’s look at how trade is changing.

Fertilizers

The trade war is not directly impacting the fertilizer market, as both the US and China are mass exporters and make the most of their fertilizer production. Indirectly, though, the change in crop planting by US farmers has a knock-on effect to the domestic fertilizer industry. As tariffs on soybean exports to China have forced farmers to rethink planting patterns, the changing mix of crops impacts the nutrients required. As a legume, soybeans absorb nitrogen from the atmosphere and do not require additional nitrates. However, like most agricultural crops, soybean yield is significantly improved with phosphates and potash.

The reduction in soybean planting has led to oversupply in the domestic fertilizer market. However, with Brazilian farmers stepping in to fill the gap in China’s soybean imports, US phosphate and potash producers have increased exports to Brazil. Compared with Atlantic market rivals Russia and Morocco, the US is better-positioned to serve the South American market, due to reduced shipping costs.

Crop Science

Developments in the US and China were already
While tariffs have not hurt the vaccination or pharma-Animal Health
ctic markets of the US and China, the indirect impact on this market is already apparent. Animal health companies in China almost exclusively serve the domestic market, with animal vaccines produced to protect the Chinese livestock population. Although not regarded as being as high in quality compared to international products, Chinese products are significantly cheaper for small farms to buy. The exception is farmers’ purchases of vaccines for fast-spreading diseases that could quickly wipe out an animal population. For example, Chinese pig farmers are increasingly purchasing doses of foot-and-mouth disease vaccines from international businesses.

This trend ties into the wider soybean-led trade war. Agribusiness Intelligence estimates that since its initial outbreak in China in August 2019, African swine fever (ASF) has decimated around 30% of the Chinese hog population. It also has spread to several other countries. As soybeans make up the largest proportion of hog feed, there is notably less demand for soybeans from Chinese farmers. There is no available ASF vaccine and the launch of such a product estimated to be five to seven years away. Thus, the contribution of the country’s hog population to soy demand will not support pre-trade war import volumes, even if the trade war concludes.

Biofuels
The US ethanol industry has reached the climax of a crisis that had been building over the last two years. Political decisions were made to support the oil industry even when reduction in demand from China was already hurting US producers.

In August 2019, the US Environmental Protection Agency granted 31 exemptions to small oil refineries. The waivers free them from an obligation – under the country’s renewable fuel standard policy – to blend biofuels such as ethanol into the gasoline they produce. The latest round of exemptions brings the total to 85 since President Trump took office in 2017. Earlier waivers already led to significantly reduced demand for ethanol, creating a disastrous psychological effect on the US ethanol industry. In fact, several players have said they will shut down or reduce production at their facilities.

Up to 40% of US corn is used for ethanol production, and many farmers that planted both corn and soybeans had increased their volumes of corn after the 2018 tariffs were imposed on US soybean exports to China. The increase in corn production exacerbated the issues of the ethanol industry – introducing more goods to an export market hit by reduced demand just as the trade war halted exports to China.

In 2017 the Chinese government announced plans to roll out nationwide use of car fuel containing 10% ethanol by 2020, in a bid to reduce pollution and smog in urban areas. Although ethanol can be produced domestically, the build-out of production capacity has not been fast enough to meet the deadline.

With the US offering the cheapest source of ethanol internationally, early 2018 saw record US exports of ethanol to China. Before the tariffs, full-year 2018 exports would have totalled over 500 million liters.

If the trade war came to an end and the export market reopened, Chinese demand for US ethanol could increase by 1 billion to 2 billion liters a year. This would in turn help to rebalance the US supply-demand issue. Only time will tell whether the key players decide this is in their best interests.
Physician, heal thyself- The importance of understanding competitive cost positions

**Considering the huge capacity expansions** occurring in the US and China, the insight gained from cost and margin curves is essential for global producers seeking to manage the downturn in margins.

“Physician, heal thyself” is a proverb from Luke 4:23, which suggests that one should look to save oneself before saving others. With the downturn in margins for many chemical value chains already well underway, it is critical that producers understand the competitiveness of their own assets and the competition. This insight is needed not just to “save” themselves, but also to gain an advantage in optimizing their production and marketing strategies.

The global basic chemicals industry has always been cyclical. During the past four years, it has experienced an extended up-cycle, characterized by steady demand growth and above-reinvestment-level profitability. In 2019, strong industry growth and above-normal profitability. In 2019, strong industry growth and above-reinvestment-level profitability. With the downturn in margins for many chemical value chains already well underway, it is critical that producers understand the competitiveness of their own assets and the competition. This insight is needed not just to “save” themselves, but also to gain an advantage in optimizing their production and marketing strategies.

The global basic chemicals industry has always been cyclical. During the past four years, it has experienced an extended up-cycle, characterized by steady demand growth and above-reinvestment-level profitability. In 2019, strong industry growth and above-normal profitability. This shift in turn has impacted the demand for basic chemicals. Trends such as energy volatility (as expressed in crude oil pricing); currency fluctuations; protectionist trade tariffs; reduction in the use of single-use plastics; geopolitical uncertainties such as US-China trade; Brexit; and political turmoil in Europe, the Middle East, South America, and the US have all created uncertainties that have caused businesses and consumers to become more conservative with their investments and spending.

This change is occurring just as new capacity start-ups – which extend across most basic chemicals value chains, with the majority in the US and China – impact the market. In the most extreme cases, such as the huge expansions of paraxylene in Asia, capacity additions will overwhelm demand growth despite strong market growth over many years. This resulting oversupply has already decreased industry profitability, and several producers have announced declining financial performance.

In such an environment, it is critical that all producers understand their own competitive cost positions relative to their competitors. IHS Markit Chemicals develops cost and margin curves for over 40 petrochemical products. Within each product, every plant is modelled individually, taking into account its nameplate capacity, technology, country-specific feedstock and unit utility costs, country-specific by-product value, country-specific labor costs and shift patterns, maintenance, and other fixed costs. We combine this data with our country-by-country capacity, supply and demand balances, and implied operating rates to show production cost curves, rather than just capacity curves. Production cost curves offer a more realistic view of how the industry operates.

The resulting cash-cost-at-plant-gate for all plants can be modified so it can be shown on an integrated or non-integrated basis. It can also include delivery costs, depreciation, corporate overhead, and even an ROI for this year and for 10 years into the future. With the IHS

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**Figure 1: World cost curve: ethylene**

(Cost Basis = Plant Gate, Product Basis = Ethylene, Operating Rate Basis = IHS Baseline)

Source: IHS Markit.

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product price forecasts, these cost curves can be turned into margin curves to forecast EBITDA per producer for the next decade. Oil or product price forecast scenarios can be performed and hypothetical new plants can be put on the curve.

An example of the ethylene cost curve for 2019 is shown in Figure 1. It is characterized by a plateau of higher-cost producers in the third and fourth quartiles. The producers are mainly naphtha crackers primarily based in Europe and Asia, as shown by the weighted averages. In the first and second quartile are the advantaged NGL crackers in the US and Middle East. There is, of course, a wide range of capacities and technologies that contribute to the weighted averages. Hence it is essential to model each plant individually.

How can these analytical and insight tools be used to “save oneself?” In the first instance, a producer can understand its own relative cost competitiveness on a global level and determine whether immediate action is needed to survive the downturn. An example of the integrated margin curves for commodity grade HDPE is shown in Figure 2. In 2018 (blue line), the commodity-grade margins for very few producers went below zero. By 2020 (red line), however, a fifth of production tons are forecast to result in a negative margin for commodity grades. A producer in this fifth may believe that the good times will return, given the anticipated growth.

Considering the capacity increases, however, IHS Markit forecasts the zero to negative margins for this group of producers will remain for many years for both HDPE and many other basic chemicals. Armed with this insight, producers can assess their options. For example, a company might look to switch to more premium grades; speed up initiatives to decrease feedstock or utility consumption; enhance process control to increase existing production tons; debottleneck to make a step change in production tons to decrease fixed costs per ton; switch production to another asset if available; switch off its least-efficient cracking furnace; minimize the number of customers with a low volume or high cost-to-serve; divest the plant before margins deteriorate even further; or even cut its losses and shutdown permanently.

For a producer that expects positive margins over the downturn, cost and margin curve insight can be used to develop strategies to mitigate the downturn and even increase production to make better-than-expected margins and earnings. Competitor producers that are in the same region and are under threat could find themselves with customers that want greater supply security. Hence there is opportunity to expand the customer base and increase production if the plant has capacity. Should the delivered cost to other regional markets become too high for other producers, there may be opportunity to expand sales to regions not previously considered. With insight from the medium-term forecast, the still-profitable producer can understand when the bottom-of-cycle is expected and can budget accordingly. With this insight, producers can put new projects on hold until a more appropriate time so that expansions or new plants can be commissioned at the start of the upcycle.

In summary, the current downturn in margins for most chemicals chains is already upon us and will extend for some years to come. However, these conditions can provide both opportunities as well as threats to existing producers. Cost and margin curves are essential to creating insight into a product chain and developing strategies for the coming years. As such, this information should be part of the workflow for every producer.

Assess the cost and margin positions of operating chemical plants according to geography, capacity, time, technology, feedstock, operating rate and integration level.

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Figure 2: World margin curve: polyethylene - HDPE

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