

Chemical & Energy

# INSIGHTS

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# When do Major Headwinds become a Storm of Uncertainty?



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## ➤ For many years the European Petrochemical

Industry has had to battle hard to keep afloat and maintain its competitive edge to other regions. European producers have had to work without two major pillars of competitive advantage of the Chemical Industry and it has prevailed without the feedstock cost advantage of the Middle East, Russia and North America, or the rapidly growing consumer markets enjoyed by China and Asia. Cost reduction, asset sweating, technology and product innovation have battled heroically against European regulation, environmental pressure, globalisation, commoditisation and rationalisation. Ownership changes to lower-cost, more focused models have been the order of the day, followed by further waves of M&A activity as players exchange cards to further enhance their hands in what has become a global asset and knowledge poker game.

European producers have been remarkably successful at playing the hand they were dealt. Their success has been such that now competitors from low-cost and fast-growing regions continuously knock on the door of European companies to try and acquire assets. Assets that would allow them to leverage the technology and product innovations which were created out of necessity, from those sustained European headwinds. Not bad for an industry once thought of by many as more night-time than sunset.

What is more remarkable is that “Breaking news” is now sometimes about new investments, yes investment in commodity chemicals. Ethane import facilities, new cracker furnaces, PDH units and even a cumene facility... whatever next!

So are we now sailing into calmer waters? Unfortunately not, the same headwinds continue to blow, and we now see further and more powerful headwinds appearing on the horizon:

The **International Maritime Organisation (IMO)** sulphur limit change in 2020 is going to create a shockwave that will radically alter the relative values of

different refinery product streams. Margins for complex refineries should improve but will the refineries supply the Chemical Industry with the same volume of feedstock at the same value as today? As always a refiner's first priority will be to support their core fuels market, with the Chemical industry being given what is left over.

The **Circular Economy** is being embraced globally as a worthy concept. Major opinion formers such as the Ellen MacArthur Foundation are putting their weight behind it, with news stories about “more plastic than fish in the ocean” getting magnified by social media channels. Although a worthy cause and global issue, the constant news stories create pressure on our politicians to act, and it is the European appetite for taking a lead and acting alone that has the potential to create a competitive disadvantage and headwinds for European producers.

New **Autonomous Vehicles (AV)** technology now exists and offers significant advantages in safety, cost and time over manually driven vehicles. A switch to AV will accelerate a switch to Electric Vehicles (EV) with zero emissions, lower maintenance costs and enhanced lifetime mileage capability compared to Internal Combustion Engine vehicles (ICE). In **Reinventing the Wheel**, a significant new study by IHS Markit, one scenario sees a rapid adoption of AV. If Europe acts first on AV, this will significantly change petrochemical feedstock availability as well as the demand for the different materials used in the production of ICE versus EV.

The existing and approaching headwinds could signal a storm of uncertainty approaching the European industry certainly can't sit back and relax. Undoubtedly further significant challenges lie ahead but in Europe we have a strong track record of reacting to change and succeeding. Perhaps it is that experience and ability to innovate to change that is our greatest competitive advantage.

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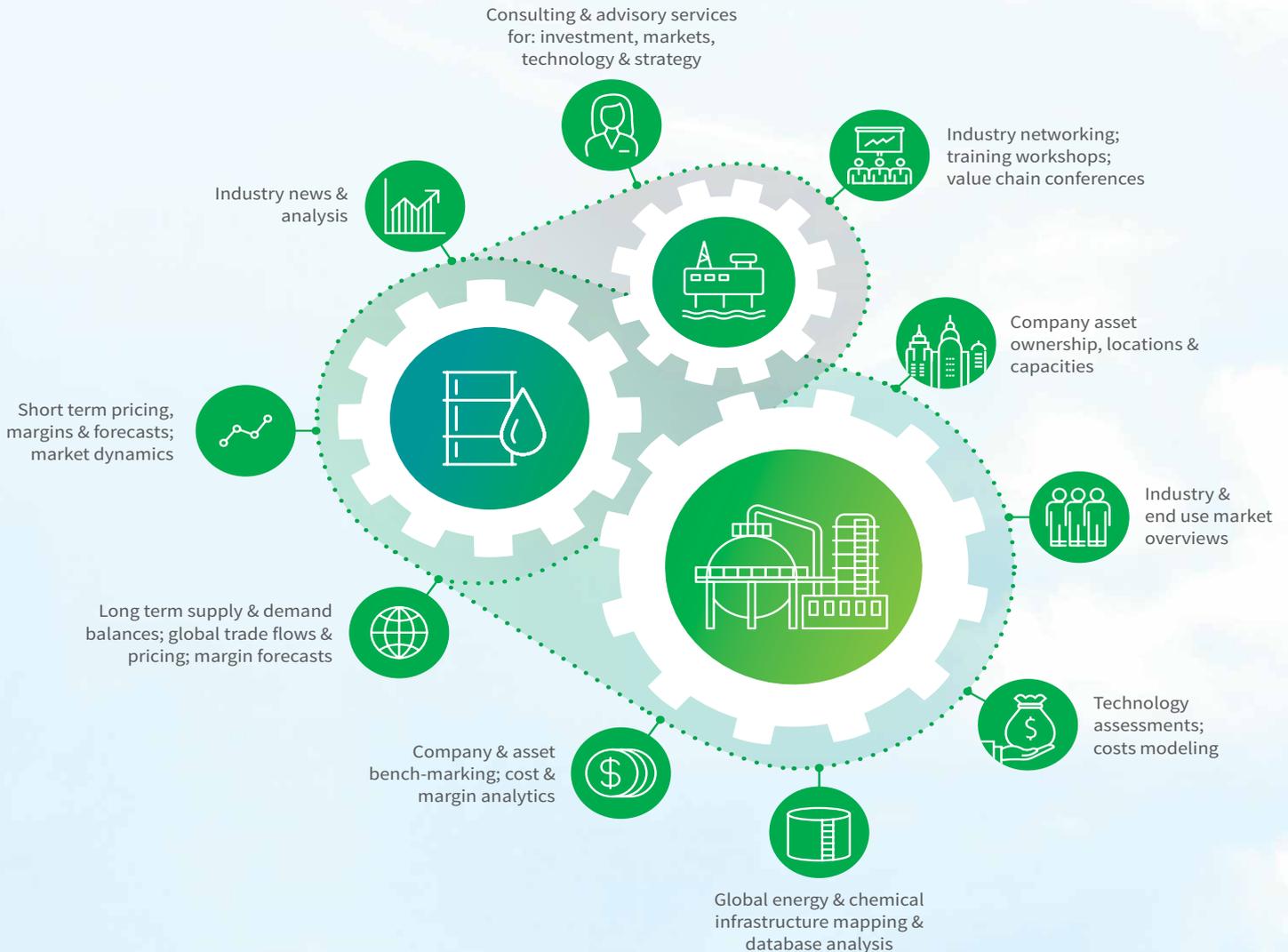
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# Better A Diamond With A Flaw Than A Pebble Without

Creating Value In Petrochemicals



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➤ **Creating value is the essence of business; our purpose and greatest challenge.** I will address approaches to creating value in the European chemical industry and consider the fine distinction between value and valuation.

Competition is healthy, but having none is healthier! Successful businesses have a ‘moat’ to protect them from competition. The chemical industry is susceptible to an erosion of competitive advantage; commoditisation of once-speciality products reduces barriers to entry. Where technology is readily available, and with declining customer service models, barriers to entry fall and the consequences can be severe. Consider 1,4-butanediol, where unrestrained investment in China saw margins plummet and producers forced to shutter capacity.

Sources of sustainable competitive advantage are limited, they include: a cost advantage; a technology advantage giving either superior product performance or a cost advantage; or a hard to replicate service model.

## Models of building and shaping a business in our industry:

The **Traditional** model is to build new production assets. Success requires access to significant capital, investment in world scale, state of the art assets that deliver competitive economics across the cycle and an operational life in excess of 20 years.

We see signs of a much needed renaissance in Europe with a number of capital projects being mooted along the olefins and derivatives chain (see Matthew Thoenke’s article). Without a renewal of the asset base, the foundations of the industry erode as plants age, becoming uncompetitive and costly to maintain.

A **Transformational** approach shifts the business to focus on areas of higher value creation. Transformation might include integration, value chain extension, portfolio diversification, addition of product development capabilities or expansion of R&D efforts. Exiting less attractive business areas is as important to the transformation as enhancing the higher value offerings. Transformation is typically achieved through a mix of new build and transactional changes, which brings us to the third and most dynamic growth lever: the **Transaction**.

Many industry leaders have grown up through mergers and acquisition. Examples include Ineos,

Huntsman and Lyondell Basell, to name but three. Transactions deliver instant gratification versus the snail’s pace of large scale capital projects

Chemical M&A transactions continues to rise, both in number and value, driven partly by mega deals such as the DuPont-Dow merger and Chem China’s acquisition of Syngenta. Purchase multiples are also rising to historic highs. Does this mean the value of the industry is higher than previously? Or are buyers over paying?

There is a wealth of data detailing the (usually disappointing) outcome of mergers, and it is more important than ever that an acquirer truly understands the business it is buying and the outlook for the industry segment. Effective due diligence is an imperative, expert insight is critical in assuring value delivery through M&A. Acquirers frequently believe they can manage a business better than the incumbent. Statistically this is not so, and a structural rationale is imperative in order to raise the opportunity for success.

## Optimists rule the world, but pessimists are seldom disappointed.

Daniel Kahnemann in his wonderful book *Thinking Fast and Slow* states “Optimists are normally cheerful and happy...they are resilient in adapting to failures and hardships...they feel healthier than others...”

Optimistic individuals play a disproportionate role in shaping our lives. Their decisions make a difference; they are the inventors, the entrepreneurs, and the business leaders, they live longer and take more risks in life. As businesses are almost entirely led by optimists, there is a cognitive bias at play most transactions. Justifying a purchase based on ‘superior ability to manage the business’ could be true, but statistically 50% of the time it’s incorrect.

Transactions require an anchor in data and statistical rigour. The acquisition process can take a life of its own, being led by zealots. Advisors are frequently incentivised upon a transaction’s close, an arrangement certain to see soothing words whispered in the acquirer’s ear confirming the farsighted wisdom and world class team, assuring future riches. For a rational grounding, independent due diligence is required to set an analytical framework against which to test the likely future performance of the business.

When acquirers are asked to score the probability of

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### IHS Markit's analysis enables a potential acquirer to answer key questions:

- What is the potential upside and downside of the transaction?
- How does the IHS Markit forecast compare with the company's business plan?
- Are there premium products and what is the outlook for margins?
- How does the company differentiate itself from competitors?
- How strong is the company's IP position?
- How well maintained are the assets?
- What are the risks associated with this transaction, what are the potential failure points?

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a successful, value accretive transaction, they will make an earnest assessment that the likelihood is over 70 percent. The real world differs, with 60 percent\* of M&As destroying shareholder value. This is cognitive bias in action.

It is critical to ask tough questions: "of transactions of this nature, what percentage meet our criteria of success" and "why do we believe our probability of success is much higher?"

IHS Markit's involvement in numerous due diligence support exercises demonstrates the importance of understanding the changing landscape with respect to energy, macro-economics, and geopolitics. It is critical to address demand outlook, the competitive landscape, the role of disruptors, pricing mechanisms and regulatory environment.

IHS Markit's rigorous due diligence process delivers a clear view of the underlying value of the business through evaluation of:

- Clear industry benchmarks and cost positioning
- Sustainability of margins
- Testing the business plan under a range of scenarios
- Independent view of accessible market share
- Independent view of competitor positioning
- Assessment of risks: macro-economic, energy and feedstocks, demand drivers, regulatory and country level political risk

IHS Markit's recent analysis of the cellulose acetate industry for a potential buyer was able to identify structural decline in the generally vigorous China market. This conflicted with the Vendor's views and was an important element in understanding a weak outlook for a historically robust business.

### Separating value from valuation

A material element of the rise in M&A activity is the activist investor, pressuring management into delivering shareholder value in a relatively low growth environment. Here, we can separate the notion of a business's true value from its market price, or valuation. Benjamin Graham famously observed "In the short run, the market is a voting machine but in the long run, it is a weighing machine."

The stock market loves a growth story and will pay a premium for such potential, but beware, it is quick to snatch it away at the first hint of a company's serene progress being interrupted.

Activist investors are arguably focussed on valuation ahead of value-creation. Increasing a trading multiple is the easiest way to enhance valuation. In stock price terms, a ten percent shift in price:earnings ratio is as valuable as a ten percent increase in earnings (at unchanged multiple). A rise in price-earnings ratio can be far easier to achieve than a hard won rise in real earnings.

Take the Dow-DuPont merger as an example: Chemical Week reported "activist hedge fund Third Point (New York), led by investor Dan Loeb, called for the companies to shift several "high-multiple" businesses from their planned materials science spin-off into the planned specialty products company. Third Point argues that the change could create \$20 billion in additional value by shifting high-multiple businesses into more focused companies that it thinks will trade at premium multiples."

This is simply cutting the deck in a different way; we don't gain more cards and as we slice and dice, we risk adding diseconomies of scale, potentially sacrificing value for valuation. We play to the voting machine yet lose mass for the weighing machine. Of course there are cases of focussed companies being unshackled and growing rapidly, delivering on both value and valuation, however again the statistics are against us.

Businesses must deliver across three planning horizons: short term; paying attention to valuation, keeping the activist wolves at bay; mid-term to keep margins and volumes progressing in the next two to three years and long term to ensure value growth and development of the business for years to come.

\* Lewis and McKone Harvard Business Review 10, May 2016

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# Geopolitical uncertainty and the global petrochemical industry



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## ➤ Things have not looked this good economically

for a long time, and they continue to improve. On several occasions over the past six years, the global economy seemed to be taking off on a strong growth path only to slow once again due to an unforeseen constraint. Presently, global economic growth looks to be on track to be the strongest since 2011. Several positive factors contribute to this: strengthening growth in the Eurozone, a bounce-back in the US economy, a sustained rate of expansion in Japan, and economic recovery in important emerging markets like Russia and Brazil.

Barring any major unforeseen events or major policy errors, IHS Markit's moderately optimistic outlook is unlikely to change very much. The recent IHS Markit Purchasing Managers Indices (PMI) and other surveys of consumer and business sentiment remain positive. We observe steady improvement in the growth of world trade. The slight acceleration in growth from 3.0% this year to 3.2% in 2018 assumes that the United States will enact fiscal stimulus. The good news is that even if there is no growth boost from US fiscal policy, the underlying dynamics of the global economy will support a rate of expansion of around 3.0% next year.

Yet, in spite of all the positive news, the potential negative impact on petrochemical demand of geopolitical developments should be considered, when thinking about potential scenarios for our industry. In the following text, we highlight three of the most important ones.

## Great Britain falls off a cliff

The UK economy has lost some of its resilience and the recent election has thrown the Brexit process into disarray. We have revised down 2017 growth from 1.7% to 1.5% and 2018 growth from 1.2% to 1.1%. Heightened political and policy risks could mean further downward revisions. At the same time, the rest of the European Union seems to be gathering economic momentum.

Whatever the British negotiators are currently claiming, there is the distinct possibility that Great Britain could fall off a cliff in 2019, if no agreement is made with the European Union in the next year and a half. If there is no deal, Britain will simply fall out of the EU in March 2019, which would mean that Great Britain would spend years entangled in lawsuits about payments and liabilities, EU citizens in Britain would lose their rights as would British citizens on the

Continent. There would not be a free trade deal and businesses would virtually run up against a trade wall.

Nevertheless, the impact on the global petrochemical industry will likely be minimal. The UK produces less than 1% of global petchems and the UK is neither a major importer nor exporter of chemicals. The much larger effect would be the result of a much weaker UK economy and disruptions to product and service trade flows in and out of Great Britain. Much depends on the extent of the trade agreements the United Kingdom reaches, not only with the European Union but also with other countries and regions, how much access the United Kingdom will have to the EU single market.

## China's future lost decade

The IHS Markit baseline economic growth scenario for China in the medium term is around 6%, but it is also possible that China's growth could be much lower, resulting in what in the future could be known as China's lost decade. If this should happen, the impact on the global petrochemical industry would be enormous, as will be discussed later.

China's economy in the medium term faces sizable challenges. Export growth will likely be subdued in the future, as demand from China's major markets of the United States and Western Europe will not likely return to high 2008/2009 pre-crisis levels. In addition, China's expansion as the export factory of the world has plateaued, which means Chinese exports will no longer be able to outgrow world import demand as it did before. At the same time, Chinese household demand weakness is structural in nature and will unlikely be corrected quickly. Without buoyant exports or consumer demand, business conditions in China will make it difficult to support robust growth in private investment. Other downside risks to consider include:

- An isolationist approach to international trade policy by the USA could trigger a trade war, which would severely damage China's export sector and erode business confidence
- Chinese commercial banks' poor health could lead to a collapse of the banking sector
- The Chinese real estate market could crash again. Such a market collapse would destroy substantial sums of household wealth and depress consumer demand

- Lack of political will to implement serious economic structural reforms could lead to prolonged economic growth slowdown in China, even stagnation.

As would be expected, any slowdown of Chinese economic growth would have a major impact on petrochemical production, demand and trade flows. China is currently responsible for an estimated one-third of total petrochemical production globally, and Chinese chemical demand is expected to grow at a rate slightly higher than GDP growth in the near to mid-term. Preliminary estimates indicate that 20% of global demand growth for petrochemicals over the next five years would simply disappear, if China's economic GDP growth rate drops from 6% to 3%. The result would be a tremendous oversupply of basic petrochemicals and polymers and very poor margins for the global industry. This dependency on China is the single biggest risk to the petrochemicals industry in the near future.

### OPEC loses it

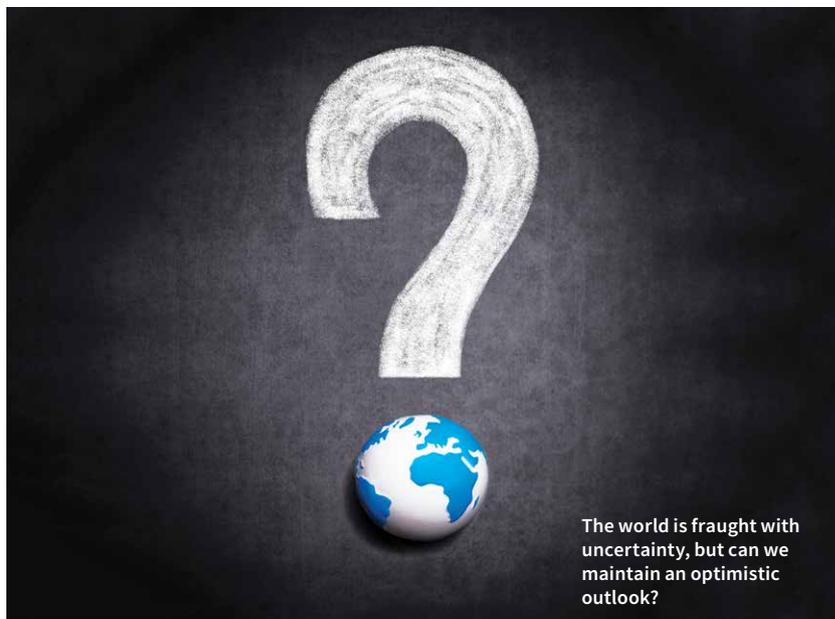
Oil markets have largely shrugged off the 25 May 2017 OPEC agreement to extend production cuts through the end of March 2018. Oil prices fell after the meeting and have remained soft in the following weeks. The challenge facing OPEC is rising US tight oil production. Partly as a consequence, the price of Dated Brent is projected to average in the low \$50s per barrel, but at times both below and above this price level. Price volatility is to be expected.

On 15 June 2017, Daniel Yergin, IHS Markit vice chairperson, was a guest on CNBC's "Squawk Box" and offered two reasons to explain why oil prices are "back to the past". First, oil inventories are now 10 percent higher than they were in the past, and second, the remarkable rebound in U.S. shale oil production.

Until recently, common belief was that U.S. shale oil companies needed a crude oil price of roughly \$60 to \$70 per barrel to survive, but due to new processes and technology advances, the minimum price level has now dropped to a range of \$40 to \$45 per barrel.

OPEC members and Russia were anticipating that production cuts would move oil inventories lower, and thus boost prices in the near term. However, the problem for OPEC members is that the growth in U.S. production is already set for 2017, so the possibility of any relief will be difficult this year.

If crude oil prices stay at current levels, or drop even lower, what will this mean for global petchems? Overall, the global economy has and will continue to benefit from lower crude prices; certainly in energy-importing markets, such as Northeast Asia, India and Europe. At lower energy prices, plastics and polymers (also at lower prices) will continue to replace other materials (and recycled polymers), simply because they are typically viewed as a lower cost



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alternative for use in non-durable applications where performance standards are lower compared to durable applications. On the other hand, at low crude oil prices, some investments in new capacities could be postponed or cancelled, inevitably leading to tighter markets and overall better profitability for crude oil/naphtha-based petrochemical plants.

As can be seen from this short analysis, the world is fraught with uncertainty. However, this has always been the case. The prudent business executive factors in these and other geopolitical uncertainties when planning investments, acquisitions or forays into new markets. Certainly, a balanced portfolio, both geographically and product wise will be crucial elements in any risk management strategy. IHS Markit Energy and Chemical teams are positioned to support clients with a multitude of tools and consultancy services based on fully integrated forecast data, extensive market expertise and scenario planning capabilities to help mitigate some of these risks.

Mr. Michael D. Smith serves as vice president of EMEA - Chemical at IHS Markit. He has 34 years of experience in the chemicals industry, including 20 years working with petrochemicals and plastics. He started his chemical career in 1980 at BASF AG in Ludwigshafen, Germany. He holds a bachelor's degree in Business Administration and an Master of Business Administration from Arizona State University, Tempe, Arizona., US

# Anglo Saxon Majors in African downstream: The twilight of the gods



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➤ **Since the middle of the last decade, Anglo Saxon Majors** BP, Chevron, ExxonMobil and Shell have been reducing their exposure to refining and marketing globally. The most extreme example of the retreat from downstream can be seen in Africa, where the divestment of their portfolios is almost complete. As the sole remaining Major, Total has taken this opportunity to reinforce its leading regional position. However, the vacuum created by the exit of the Majors has allowed new players to enter and expand in the region. Traders have seen an opportunity in the region's fast growing needs for imports while local independents have benefited from the liberalization of the sector substantially growing their market presence. The region's growing oil product import requirements along with a radical transition in the competitive environment highlight the significant opportunities in the region as well as an urgent need for incumbents to revisit their strategies and business models.

## The exit of the Anglo Saxon Majors is almost complete

With few exceptions, Anglo Saxon Majors were present in all African countries as recently as 2004. Since then, BP, Chevron, ExxonMobil and Shell have divested most of their African affiliates as they pivoted away from

downstream and considered African markets too immaterial and too risky.

As of June 2017, only BP, ExxonMobil and Shell are still present in Africa. BP retains positions in South Africa and Mozambique, ExxonMobil has a marketing position in Egypt and Shell is still present in South Africa. South Africa has not been a divestment priority for BP and Shell due to the materiality of the market, its oligopolistic structure and high profitability. However, in March 2017, in the context of regulatory uncertainty linked to clean fuels policies, Chevron announced the sale of its 75% owned refining and marketing affiliate (which included some minor operations in Botswana) to Chinese National Oil Company (NOC) Sinopec for US\$ 900m. This opens the door for BP and Shell to sell their South African affiliates, which is expected in the short to medium term. IHS Markit thus anticipates the full exit of Anglo Saxon Majors from the Sub-Saharan African downstream by the end of the decade.

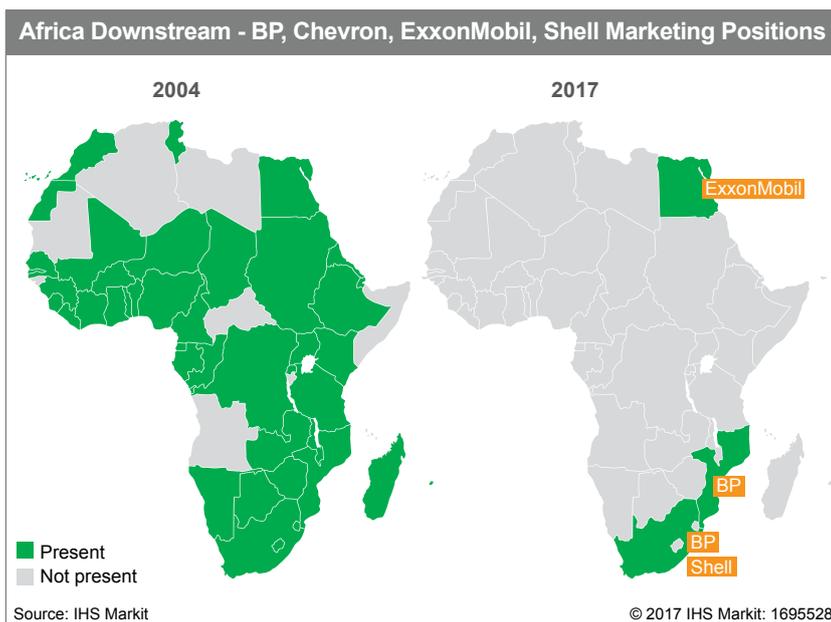
## The void left by the retreat of the Majors has created huge opportunity

The reshuffle of the competitive landscape in Africa started in 2005 and has undergone three main phases. Phase I was characterized by a consolidation of the Majors' stakes in the industry with Total acquiring 14 of ExxonMobil's affiliates. Total has since then continued to have an opportunistic growth strategy, acquiring other Majors' affiliates but also expanding via other acquisitions such as the recent purchase of Gapco in Eastern Africa for example.

Phase II which was between 2006 and 2010, was characterized by the acquisition of most of the affiliates sold by Anglo Saxon Majors were by regional oil companies (ROCs) Corlay, Engen, KenolKobil, OiLibya and Sasol who then sought to expand beyond their original limited geographical footprint.

Phase III began in 2011 with the over-extension of the ROCs and the slowing of their M&A activity. As the ROCs expanded they faced a number of obstacles linked to governance issues (Corlay), shareholder commitment (Engen, OiLibya and Sasol) or financial difficulties (KenolKobil). Their expansion thus stalled, with some even reducing regional exposure via the sale of affiliates. The future sales of Corlay, KenolKobil and Engen (owned by Petronas) cannot be ruled out.

As ROC expansion slowed, the remaining Anglo Saxon Majors' affiliates were sold to quasi traders, ie



companies partly or fully owned by traders such as Oryx Energies, Puma Energy (49% Trafigura) and Vivo Energy (60% Vitol). The rationale for these traders to invest downstream in the region is notably linked to the fact that net imports of white oil products in sub-Saharan Africa have increased six fold in the past fifteen years, reaching 1,25 million barrels per day in 2016. Growing regional import requirements therefore offer substantial integration opportunities for traders.

Moving forward, this third phase is accelerating, with growing imports requirement attracting more traders such as Glencore, Oman Trading International or SOCAR who all made investments recently in the region. It is also noticeable that bidders for Chevron’s assets in South Africa and Botswana reportedly included traders Gunvor, Puma Energy and Vitol, the latter losing at the final round against Sinopec. And it is no secret that other international traders are looking at investment opportunities in the region.

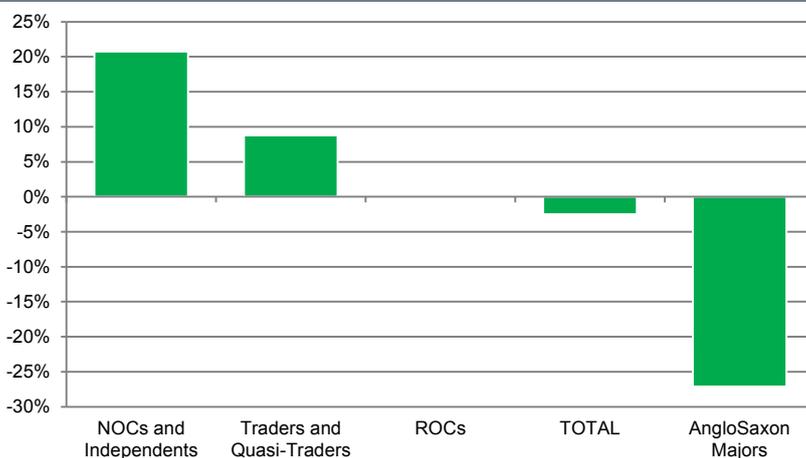
The limitations of traditional business models are exposed by the fact that although Total and the ROCs expanded their site count significantly since 2004, their market share has remained flat. Whilst, these companies continue to dominate, with Total by far the largest downstream company in the region - with a market share almost twice as large as the second company’s Engen - in reality, it is traders and independent African companies that have grown their market share most successfully over the last decade.

Market liberalization combined with the desire of governments to increase competition, drive down pump prices and create “local champions” has seen the number of –sometimes politically connected - independent companies boom with some expanding regionally. While many independents have taken advantage of poor regulatory enforcement to play by different rules to the more established players, it must be noted that a number of them are very well managed and have successfully built their brands to the extent that they represent serious long term threats for international players. The success of the traders is built on their ability to rapidly adapt to the shifting operating environment, something more traditional players have struggled to do.

**Conclusion: The African market remains very dynamic and more M&A is expected in the coming years**

Anglo Saxon Majors are close to finalizing their retreat from African downstream. Their remaining assets represent a unique opportunity for investors with relatively deep pockets to leapfrog into leading positions in Egypt and South Africa; two of Africa’s largest fuel markets. Other opportunities include potential acquisitions of pan-regional players, such as Corlay, KenolKobil, Oryx Energies or Engen. However,

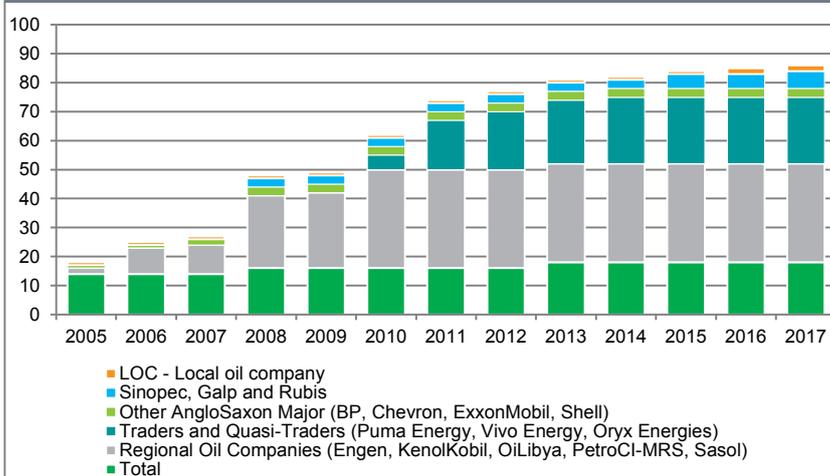
2004-2016 Changes in Market Shares in SSAfrica



Source: IHS Markit

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Cumulative Number of African Affiliates Sold by AngloSaxon Majors



Source: IHS Markit

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the growing strength of independents and quasi-traders in the region represents a real risk for companies still pursuing strategies and using business models created in the era of the Anglo Saxon Majors.

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# The Circular Economy

A circular economy is an alternative to a traditional linear economy (make, use, dispose) in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life.



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➤ **IHS Markit is committed to sustainability, both** in terms of its own business ethos as well as supporting its customers in improving their sustainability performance. The circular economy (“CEC”) and sustainability go hand in hand.

A key area for the chemicals industry where CEC and sustainability are important is unsurprisingly plastics and polymers. IHS Markit, in its everyday business tracks and forecasts over 50 polymer families. In simple terms, the global market in terms of volume exceeds around 310 million metric tons or > \$400 billion as a business. These range from the commodity polymers, much of which is used in packaging, through engineering polymers used in durable goods in sectors such as automotive, construction, etc., through to advanced high performance polymers for aerospace, defence, etc. Elastomers too, are polymers with a life cycle, as well as more specialised polymers for personal care, cosmetics.

From a holistic perspective, the Ellen MacArthur Foundation has been established to promote and facilitate CEC developments across multiple industries. In the plastics industry the vision reflects several initiatives from exploiting renewable resources for polymer building blocks, designing polymers for enhanced recyclability, maximising re-use, optimizing recycling and overall reducing environmental impact, most notably polymer leakage into natural systems.

## Recycling Revisited

Today many communities in the world collect plastics for recycling and energy recovery. However, on a global basis according to the Ellen MacArthur Foundation, only 14% of all polymer packaging is recycled. The industry needs to do better. Recycling occurs in many ways from re-use to re-purposing. The plastics industry has reacted with sorting technology improvements as part of a wider strategy to recover quality products for recycle. Some of the challenges are as follows:

- Accessing mono-polymer types in high purity, > 99.9 percent
- Recycled polymer that is contaminant-free
- Reliable supply chain
- A quality recycled resin quality able to displace virgin material

- Cost-effective, i.e., at a comparable price to virgin polymer.

However, there is a growing move to rethink polymer design in a way that facilitates recycling to enable clean polymer recovery for the replacement of virgin resin. The recycling industry plays a substantial role in the evolution of the CEC.

## Time for a Rethink

Perhaps it is now time to rethink and revisit older approaches to recycling and their impact on the CEC. In the early 1990s, a number of companies were exploring the idea of polymer cracking, not so much to recover monomer units, but rather hydrocarbon feedstocks that could slot into the existing hydrocarbon supply chains for refinery FCC use (for fuels, propylene, butylenes, etc.) and steam cracking (for ethylene propylene, butadiene, etc.), e.g., as described in US 5,364,995. Many companies and consortia were involved: BP Chemicals, DSM, Enichem, El Atochem, etc. Today, revisiting this type of approach could be worth reconsidering. The simplified flow diagram opposite provides an artistic view of how such a process could operate integrated with an optimised plastics collection, advanced sorting, densification processes, etc. In this case plastics are cracked in a fluid bed reactor at 500°C-550°C in an inert atmosphere. This supplies a complex separation train to recover off-gases for fuel, filers, and hydrocarbon streams for resupplying polymer building block production.

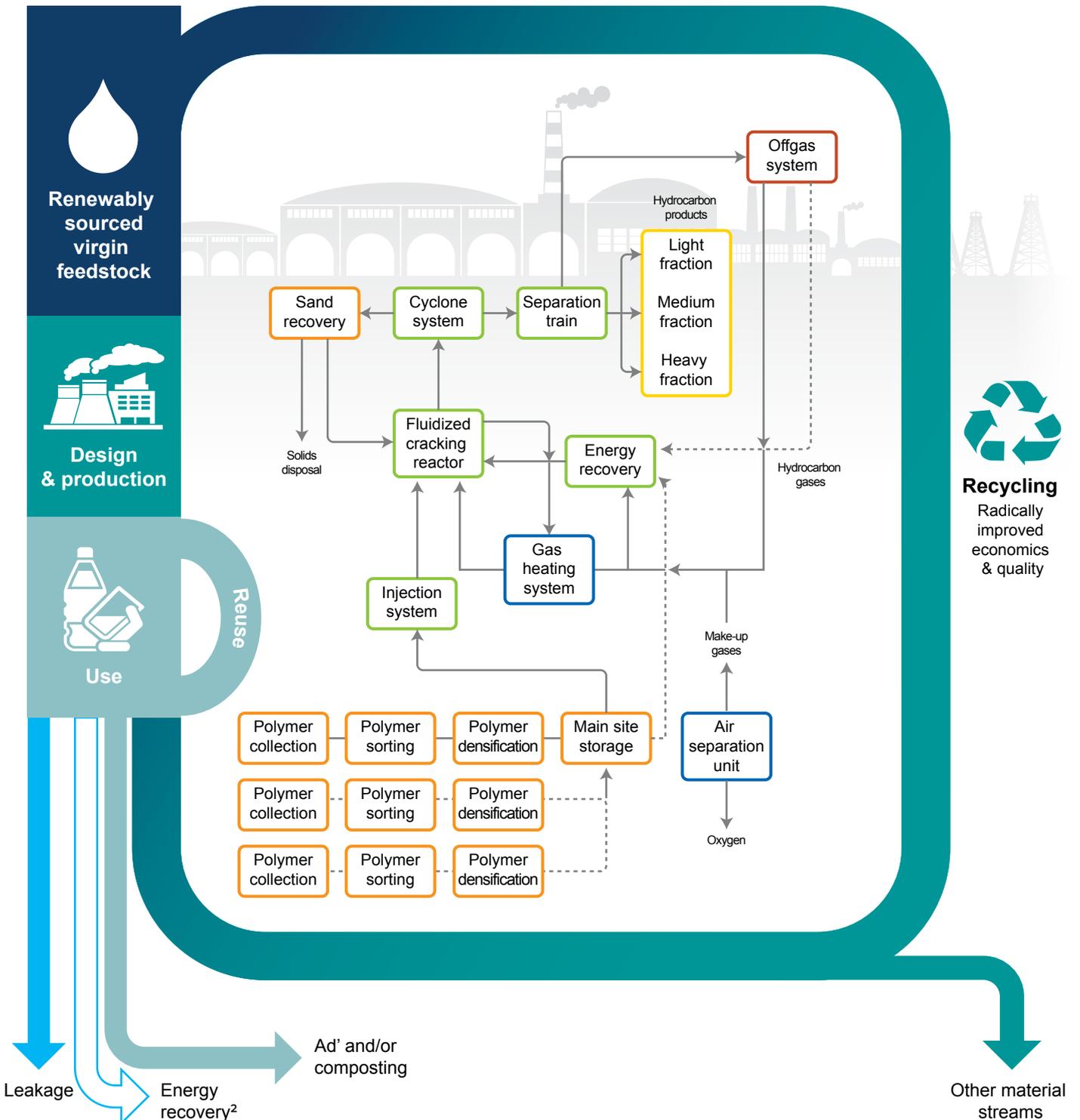
In summary, many producers and consumers of polymers have endorsed the work of the Ellen MacArthur Foundations and its pursuit of promoting the Circular Economy. All players along the polymer value chain need to collaborate to make this happen from resin producer, compounder, processor and end-user to develop resins and systems that facilitate reuse and recycle. The ideals of the CEC in the polymers industry indicates that more needs to be done to reduce polymer leakage into the environment and economically enhance recycling beyond the low levels of today.

The Waste and Resources Action Programme (which operates as WRAP) is a registered UK Charity No. 1159512 and registered as a Company limited by guarantee in England & Wales No. 4125764.

**1** Create an effective after-use plastics economy

**2** Drastically reduce the leakage of plastics into natural systems & other negative externalities

**3** Decouple plastics from fossil feedstocks



Source: Overall CEC concept developed by the Ellen MacArthur Foundation. The process flowsheet is loosely based on US patent 5,364,995 attributed to BP Chemicals.

# Developing the refining sector critical to maintain Iran's remarkable return to oil markets



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➤ **18 months after the removal of international sanctions against Iran**, the country has made a remarkable return to international oil markets. Its crude oil exports are estimated to have grown 77% year-on-year to reach 1.9MMb/d in 2016, with both Europe and Asia featuring prominently in Iran's plans to regain crude market shares. Similarly, Iran has also been successful in re-establishing export markets for its product surpluses. While some countries continued to import small volumes of Iranian oil products, the government-controlled National Iranian Oil Refining and Distribution Company (NIORDC) generally had great difficulty in marketing these surpluses under sanctions. In 2015 the country exported 514,600 b/d of products, all of which went to Asia – accounting for 5% of Asia's total oil product imports. By comparison, in 2016, Iran's total product exports, still entirely directed to Asia, reached 889,400 b/d, making Iran the largest exporter to the region among OPEC countries with a 26% market share of total OPEC oil product exports, a level surpassing the estimated 734,000 b/d that Saudi Arabia sent to Asia in 2016.

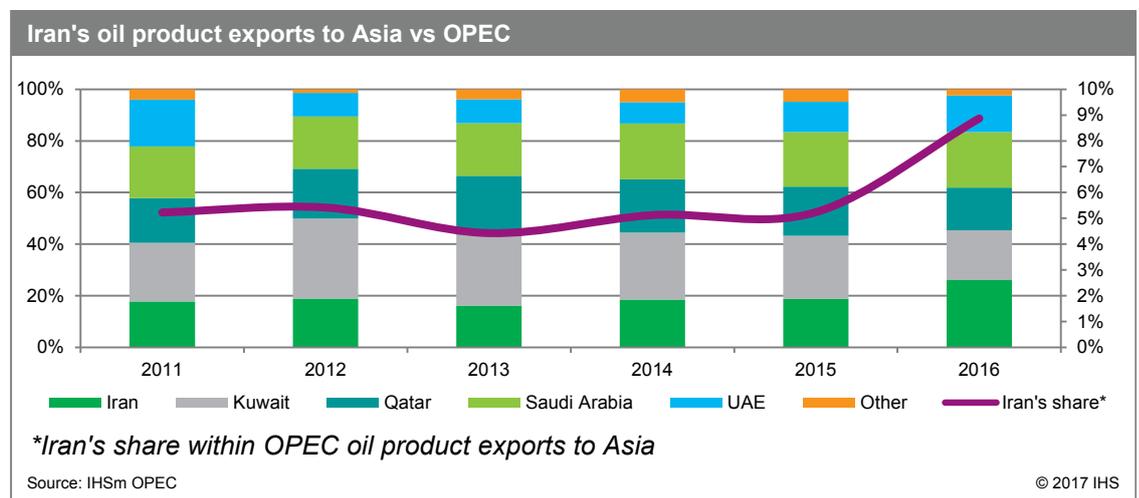
However, while Iran did succeed in regaining market share, oil product exports in 2016 would have been significantly lower if the country had not accumulated significant quantities of fuel oil in floating storage during the sanction years. With these volumes successfully cleared, product exports should be lower in

2017. Consequently, Iran's future export growth will depend heavily on the country's ability to deliver on its plans to build new refineries and upgrade existing plants.

## Plans to modernize Iran's ageing refining sector gaining traction

Iran's refining sector, encompassing nine refineries with a combined distillation capacity of 1.8 MM b/d, is in dire need of investment after years of insufficient maintenance due to restricted access to technology, equipment and funds. Most of the country's refineries are antiquated and of relatively low complexity leading to a national average Nelson Complexity Index of only four. This results in large fuel oil and high-sulfur gasoil production and leaves refining output misaligned with both domestic and external market requirements. NIORDC has sought to initiate numerous refining upgrade projects over the past decade, and since the removal of sanctions, the government has multiplied calls for foreign investment and reportedly advanced talks with international companies, mostly from Japan, China and South Korea for planned modernization work at five existing refineries.

In early-2016, a significant upgrade project was completed at Iran's largest refinery in Isfahan that included the installation of isomerization and reforming units. The 370,000 b/d refinery is also earmarked for



further investment for which a contract was granted to South Korea's Daelim. However, the country is still facing challenges despite the removal of sanctions, primarily related to financing in the low oil price environment, an issue that has stalled enhancement work at three refineries, namely the Tabriz refinery for which Iran was reportedly in talks with Italy's Saipem, the Abadan refinery about which NIORDC has held discussions with unnamed Chinese companies, and the Tehran refinery project that was announced in 2015 for which the prospects for materialization in the medium term is viewed to be low.

With gasoline accounting for just 20% of total refining output, maximizing gasoline yields is at the heart of plans to modernize the country's refineries. Iran has historically been highly dependent on gasoline imports; when the country was unable to procure gasoline from international markets under sanctions, it was forced to command the large-scale production of highly sulfurous gasoline at its petrochemical plants. While gasoline production in petrochemicals facilities is likely to cease due to high costs, environmental concerns, and the maximization of high-value petrochemicals exports, Iran's total gasoline output is expected to increase following the completion of upgrades and the streaming of the first phase of the greenfield Persian Gulf Star refinery by end-2017. Nevertheless, sustained demand growth will leave Iran a net gasoline importer. Iran's deficit is predicted to resume growth in 2018, highlighting the need for further upgrades.

The International Maritime Organization's (IMO) decision to reduce the maximum sulfur content of marine bunker fuel from 3.5% to 0.5% by 2020 will also require additional changes in Iran's refining sector. The regulation will result in an estimated ~500,000 b/d of demand destruction for HFO in 2020. While exhaust gas scrubbers are expected to be the solution of choice over the long term, investments are unlikely to be in place before the 2020 implementation date. In the meantime, refiners will need to make changes in order to meet growing demand for low-sulfur bunker fuels and avoid unwanted residue.

In the case of Iranian refineries, residual fuel oil is estimated to account for about 63% of oil product export capacity in 2017, much of it high in sulfur. Investments in conversion capacity to transform high-sulfur fuel oil into lighter streams, which can be more easily desulfurized, are therefore all the more critical for Iran's oil product export capacity.

### Iran's long-term refining expansion strategy still on hold but critical to secure crude outlets

Driven by both a need to ensure adequate supply for growing domestic consumption levels and a grander ambition to become a significant exporter of oil

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products, Iran is planning to build eight new greenfield crude and condensate refineries that would increase its refining capacity by more than 1.5MMb/d. Despite the country's renewed focus on its downstream sector, a majority of the numerous projects to build greenfield refineries that have been in the cards for some time are still on hold, with no official deal signed. The 360,000 b/d Persian Gulf Star Project, designed to process South Pars Condensate, is the only project that has made some progress, although it remains far from full completion as only the first phase of the project that will add 120,000 b/d of refining capacity is predicted to be streamed by end-2017.

The need to secure a long-term outlet for its crude, against the backdrop of rising global supply and weak demand growth in major export markets, as well as a desire to add value to its crude and to create employment for the local population, will also drive Iran's downstream push. Iran will attempt to replicate the strategy implemented by its regional rival, Saudi Arabia, which has substantially expanded its refining capabilities in recent years, becoming a refiner of significant global importance. Iran has also clearly stated that it wants to attract foreign partners to help develop its projects, as domestic companies lack the expertise and technological capabilities to build sophisticated, complex refineries. A significant expansion of the Iranian refining sector remains a long-term goal for now, as government priorities will be first geared toward developing the country's oil and gas fields and revamping its existing refineries. Nevertheless, this is a goal that Iran is likely to continue to pursue with renewed vigor, as it remains critical for the country to establish a strong global oil product export role and add value to its crude in a more competitive oil market.

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# European Olefins: Epilogue or Prologue?



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➤ **The past decade has been a challenging one for** European petrochemical players with the main building block of the industry, the steam cracker, coming under pressure. The period following the financial crisis of 2008 had been one of not just dealing with an unprecedented collapse in demand but also one of coming to terms with a loss of competitive position relative to a changing global industry.

Cost competition was not something new to European players, but the magnitude of capacity based on advantaged feedstock was growing with Middle Eastern developments, and a huge shift in fortune for the US with the advent of fracking, and a sharp downward move in US feedstock costs. Changes in demand would be absorbed by operators across a smaller proportion of global capacity whilst Europe was indirectly competing with Asian operators.

The pressure that resulted on European producers, from the combination of demand weakness and a loss of cost competitiveness resulted in nearly 10 years of debate around the prospect of capacity rationalisation in the region.

Rationalisation is not a new concept for the industry; the ever increasing scale and efficiency of petrochemical assets leaves older units disadvantaged and at risk of closure. The problem of aging assets is not unique to Europe but other regional players have been better placed to close down uncompetitive units in weak market conditions, particularly in the US. Social pressure, environmental clean-up costs and governmental involvement have made shutting assets down in Europe considerably more difficult.

However, with a sharp and sustained downturn in demand, European producers were forced to work

through the painful and costly process to close down older and uncompetitive units. Since the start of 2008, 2 million metric tons of ethylene capacity has been shut down in Europe, roughly 8 percent of the industry. The same developments have been seen, and even magnified, in derivative capacity. The reduction in European capacity was primarily completed by 2015.

The year of 2015 will not be one that is soon forgotten by the industry. The period since the financial crisis had ensured that steam crackers were optimised to control costs and change maximising to improve reliability and change output to maximising output had not been high on the agenda when prioritising maintenance programmes. With a decline in capability to supply, the sudden increase in demand left petrochemical players badly placed to meet this. A high number of unplanned outages, which only put greater pressure on the industry to run harder, led to further problems and outages. If the situation had been isolated to Europe alone, imports would have rushed to fill the gap. However, the shift to a tighter global balance and similar reliability challenges elsewhere left Europe short of product, prices and margins responded reaching record levels. Even when normalising long term historical margin figures for the inflationary impact of capital costs, 2015 was comparable to the boom year of 1995.

The natural response to a tight market is for all the participants to make changes to their businesses to mitigate the risk of a repeat. Sellers who had lost out through poor operational reliability increased maintenance budgets, buyers looked to shift to a higher level of inventory, downstream users also started to shift from the 'just in time' inventory management approach to something closer to a 'just in case' approach.

As a result, 2016 was a year of markedly improved reliability for petrochemical producers who were able to benefit from extremely robust demand. The market balance remained relatively tight through 2016, supported by a similarly tight Asian market. Export flows of excess ethylene and derivatives ensured that operating rates returned to levels not seen since 2007 on a set of asset arguably far less well equipped to fulfil that demand. Another supporting factor was the lower cost environment. No doubt, had oil remained above \$100/bbl, margins in 2015 and 2016 would have been strong, but not as strong. Lower costs allowed these exceptional margins to be maintained even though consumers were seeing prices unchanged from 2011-2014 levels.

West and Central Europe Olefin and Derivative Imports Portion of



Source: IHS Markit

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Two record margin years and an unprecedented capital return in this period has reset the European olefin mind-set. No longer is the question of ‘who will close?’ being asked but ‘who will invest?’ Such a shift in thinking in a such a short period of time gives some indication of how good the times have been since 2015.

Nevertheless, the rationale for investment in Europe is supported by more than just a temporary boom in earnings. Europe has returned to growth and the modest levels of GDP increases achieved in recent years has shifted the market from contraction to expansion. The combined West and Central European trade position for olefins and olefins derivatives is gradually shifting from balance to shortness. Though growth is modest, in comparison to China or Southeast Asia for instance, it is positive and this introduces the opportunity for local investment to meet at least part of the increased consumer need.

A number of projects have been announced that are focussed on meeting this demand growth. As is usually the case, potential investors are generally looking at opportunities to optimise what they currently have rather than investing in new and costly assets. In effect, the recent surge in earnings and the improved cash position are giving the European industry an opportunity to deal with the imbalances in their systems through investment in new capacity. Ineos’ announcement for a project to increase ethylene capacity by 0.9 million metric tons within its system is a move to reduce its large merchant exposure as a buyer. Orlen is constructing a metathesis unit in Poland, optimising refinery output to meet petrochemical demand.

There is also another focus for investors which is somewhat more defensive. The recent change in feedstocks from LPG and naphtha to ethane has left Europe short of propylene. In such a situation, 3 or 4 years ago the market would have moved to close derivative capacity. However, the approach is now a



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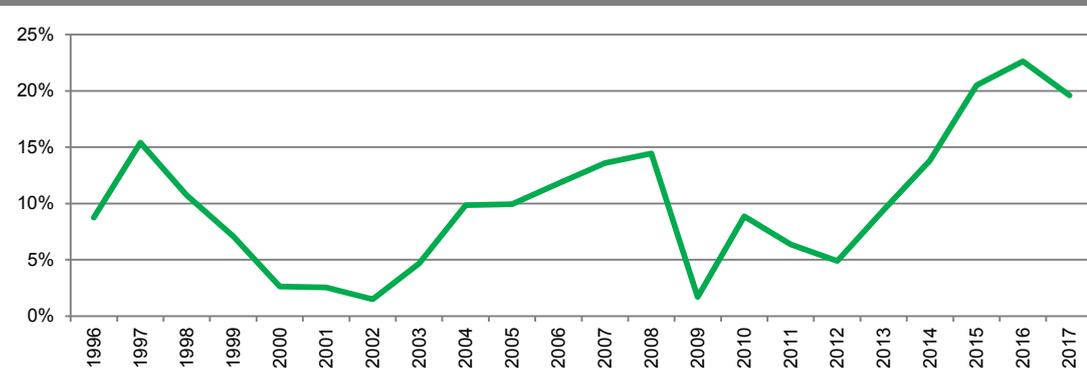
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more positive one and investments to fill the supply gap are being considered. Two large propylene buyers, Borealis and Ineos, are both looking to an investment in propane dehydrogenation assets. These investments would allow them to ensure long term propylene supply as well as open up the opportunity for derivative capacity expansions. Grupa Azoty are also looking at a propane dehydrogenation investment and have recently added polypropylene to the project escalating capital requirements.

There is no shortage of other opportunities for Europe to invest, and with strong balance sheets and a shift to structural importer of olefins and derivatives, further announcements should be expected and many of these projects may well be realised. There may even be the possibility of an investment in a world-scale grass roots cracker, the first since 1994.

Matthew Thaelke is the leading IHS expert on the olefins markets in Europe, the Middle East and Africa with nearly 20 years’ experience consulting in petrochemicals and the olefins markets.

**Integrated Steam Cracker-Polyethylene Return On Investment West Europe typical Cost**



Source: IHS Markit

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## **GLOBAL CHLOR-ALKALI CONFERENCE**

Antwerp, Belgium - September 13, 2017

Come and learn about the next steps for the industry in Europe and globally in terms of investment, technology, supply, demand, and trade. Delegates will receive a comprehensive, integrated picture of the global chlor-alkali industry available nowhere else.

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Chicago, Illinois, USA - October 11-13, 2017

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## **ACRYLONITRILE, DERIVATIVES & FIBRES CONFERENCE 2017**

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Now in its 7th year, this is a unique conference providing a comprehensive view of the petrochemical industry in Latin America within a global context across the entire supply chain.