

European Petrochemicals 2019





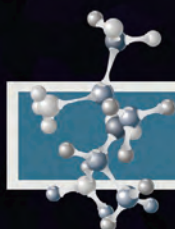
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COMMENTARY

WILL BEACHAM LONDON
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“From 2020 China will take over as the main driver of PE capacity expansion, adding 4.81m tonnes of capacity that year”

Europe's petrochemical industry faces a period of unparalleled short and longer-term challenges. So it's quite apt that organisers of this year's European Petrochemical Association (EPCA) annual meeting have chosen as a key theme: “Writing together the next chapter of the European petrochemical industry.”

Perhaps most importantly, sustainability and circular economy are driving the industry towards transformational change. What might have seemed like a side issue just a few years ago is now top of boardroom agendas, driven by widespread anger over waste plastic in the environment. For the petrochemical industry this presents some interesting topics for debate. As single use plastic bans come into force in major economies this is bound to depress demand growth for polymers, particularly high density polyethylene (HDPE). Yet in the US there is currently a wave of shale-based crackers and downstream plants coming onstream, and from 2020 China will take over as the main driver of PE capacity expansion, adding 4.81m tonnes of capacity that year, according to ICIS forecasts.

With a PE price war already under way, European chemicals CEOs may choose to accelerate investment into the recycling sector, since this will likely offer more opportunities than virgin PE for the foreseeable future. Whilst mechanical recycling is well-established in polyethylene terephthalate (PET), many see chemical recycling as the best way forward as it can deal with mixed plastics by breaking them back down into feedstocks such as naphtha. But doing this on a large scale presents huge technical and supply chain challenges.

Even in the recycled PET (R-PET) market, which is well-developed in Europe, it will be a challenge to meet regulatory targets. Growing demand for R-PET has pushed the price of recycled material way above virgin. With the additional pressure caused by the US-China trade war and Brexit, now is the perfect time to plan for change.



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Europe faces tough macro environment

The region's petrochemical sector faces multiple challenges with the trade war hitting consumer confidence and global economic growth, plus a slowdown in important end-use markets such as automotive

TOM BROWN LONDON

Coming into 2019, nobody expected it to be a good year for the European chemicals industry.

A rally that started with the US corporate tax cuts at the end of 2017 and a sharp rebound in European economic perfor-

mance through the first half of last year quickly lost momentum, culminating in a second half slump that industry body Cefic characterised as "more severe than expected".

Long-running rallies for key commodity chemicals chains including polyurethanes and methacrylates evaporated toward the end of 2018, leaving TDI/MDI specialist Covestro

guiding for a earnings drop of up to 50% - an estimate that may have been conservative based on first-half financial statements – and Germany's Evonik moving to offload its methacrylates business to private equity.

"I think that's the biggest surprise this year, seeing our customers' businesses be a little choppier than we would have guessed," said



Automotive sector has been a drag on EU petrochemicals this year and fuelled a significant decline in German industrial production in Q1

Charlie Shaver, CEO of former AkzoNobel unit Nouryon.

Political upheaval had been palpable through much of 2018, but that failed to translate into a slide in stock markets. Sanctions and tariffs formed a vicious cycle with the slowing economic growth, leading global economic forecasts to weaken as the year went on. The International Monetary Fund in late July cut its expectation for global economic growth this year to 3.2% from expectations of 3.5% in January, slamming what it termed “self-inflicted” damage to the financial system.

The OECD also slashed its 2019 growth expectations for 2019 to 3.2% compared to 3.6% in 2018, attributing the slowdown primarily to trade tensions and the knock-on impact on manufacturing.

Dwindling expectations for a rally in the second half of the year led the European Commission to cut its expectations for eurozone growth in 2020 to 1.4%, only a modest improvement on the dismal 1.2% expansion projected for the bloc in 2019.

While trade uncertainty continues to cloud the growth outlook, the US-China trade war has highlighted the interconnectedness of global trade, the European Commission said.

“We feared this might happen but followed the general opinion of a reasonable settlement within 2019,” said BASF CEO Martin Brudermüller. “We now expect a settlement of the trade conflicts during 2020 at the earliest.”

AUTOMOTIVE CHALLENGES

Automotive sector weakness, both locally and internationally, has been more pronounced and longer-lasting than anticipated, which has had a substantial impact on sector growth for nearly a year now.

The sector fuelled a precipitous economic decline in German industrial production during the first quarter of the year, with Pantheon Macroeconomics economist Claus Vistesén dubbing a 4.2% month on month decline in German industrial production in February as a “mini review of the horror-show in 2008”.

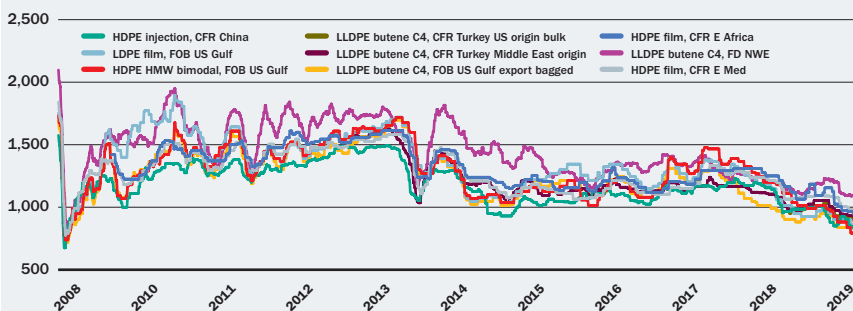
The industry is in the process of rebounding after a weaker than expected close to 2018, according to the trade group, but that conceals a deeper malaise, with productivity for nearly all sub-sectors of the industry declining year on year through most of 2018 and into this year.

BASF projects that the global auto sector will decline by 4.5% year on year. “The automotive industry... will not recover this year,” Brudermüller said, speaking in late July.

The issue for the sector, as is the case for most of European industry, is that the macroeconomic decline has been much steeper than expected, with the IMF and OECD both cutting their economic projections multiple times as the year wore on.

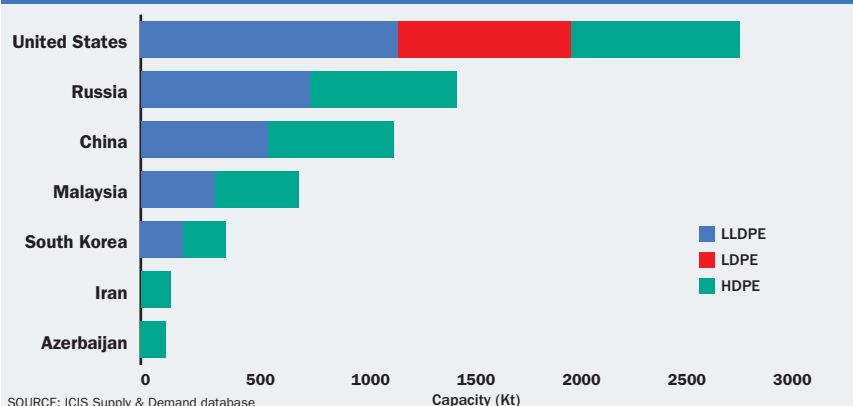
GLOBAL PE PRICES FALL TO MULTI-YEAR LOWS

\$/tonne, spot



SOURCE: ICIS

US WILL ADD 2.8M TONNES OF PE CAPACITY IN 2019 ('000 TONNES)



SOURCE: ICIS Supply & Demand database

Numerous economic metrics during the year harked back to the period of the global economic downturn. Manufacturing sector purchasing managers' index (PMI) remaining firmly in contraction for the eurozone in July at 46.4. Service sector demand has been stronger - less comfort to the manufacturing-oriented chemicals sector - and pushing the composite index level up to 51.2, but still representing a fall compared to June and the weakest level in three months.

Even the composite level, which breaches the 50.0 level denoting expansion, remains tepid, with the extent of the economic growth indicated barely keeping up with inflation over the same period, and the divergence between manufacturing and services again reminiscent of the 2009 post-collapse period.

MARC SCHULLER
President, EPCA

“We will probably need to think ‘outside the box’ and develop a more service-driven and solution-oriented approach”



Local manufacturing sector malaise, coupled with the slowdown in China, itself the key engine of Asia Pacific regional growth, has reverberated through the European petrochemicals sector, with productivity and pricing both falling in the first four months of the year.

This also extends to client industries for chemicals producers.

“Where people might have said ‘We’re going to grow 3-4%’, I think in some cases we’re seeing 1-2%,” Shaver said.

The declines and volatility in client company growth projections mean that it is more difficult than ever for companies to gauge when or whether new capacity is needed, meaning that in the longer term markets could be hit with extended supply overcapacity or tightness as companies watch the market and eye their capital expenditure.

“I think we have to be really careful in this environment as we make investments because our customer’s visibility in some cases may not be as good as it was three or four years ago,” said Shaver.

“As we make incremental capacity in cases and work with customers on new products, is the market really going to be there at the level they thought?” he added.

Even companies that are performing more

» strongly, such as AkzoNobel, which posted a 60% increase in operating profit year on year in the second quarter, are likely to miss even relatively modest revenue growth guidance of 2% for the year as a whole.

Analysts had projected that some more specialised sectors that had suffered from raw material price inflation would see trends turn positive in the latter half of the year may not benefit from the windfall expected. Akzo has seen feedstock costs increase €900m between 2017 and the first half of 2019, but the company is guiding for neutral raw material pricing rather than positive.

"There were some categories where there is cost deflation, but many oil related [costs] are still going up, so we take a flat environment for raw materials" said AkzoNobel CEO Thierry Vanlancker.

CRUDE OIL DYNAMICS

Oil pricing has also been volatile amid the spate of attacks on tankers in the Strait of Hormuz but has remained in the \$60s/bbl through most of the year. Despite OPEC cuts, the drop in Iranian exports, and the collapse in the Venezuelan oil industry adding an equivalent of an additional Saudi Arabia to the production curtailments, the market has remained in a surplus despite investor expectations.

Weaker China demand and the overall slowdown has kept demand subdued, and the meteoric rise in US shale-derived crude production has helped to offset OPEC's attempts to balance the market, but conditions are improving, according to Konstantinos Venetis, senior economist at TS Lombard.

"Growth in GDP terms is driven by emerging markets, so what EM currencies do is very important," he said. "Middle Eastern currencies bottomed out in middle of September [2018], but in [mis-2019], they have been going up. If you see those currencies stabilize at higher levels, this is a positive sign for oil demand."

A key accelerating factor in the European chemicals sector decline was when BASF issued a profit warning for the year, forecasting that EBIT could decline by as much as 30% as opposed to remaining stable to positive year on year.

The extent of the investor backlash may have been driven in part by the sudden shift from projecting strong to stable growth for the



Steeper than expected global macroeconomic decline hurt the auto industry

year to a decline of that extent. The warning, based on lower-than-expected global growth and limited scope for improvement through the second half of the year, sent shockwaves through the rest of the sector, with shares in several firms dropping by as much as 4% that day, prompting LANXESS to issue a statement reaffirming its own outlook for stable to slightly improved earnings this year.

"I think the good proxy evidence [of the chemicals downturn] is actually the profit warning from BASF and the reasons behind it," said Martin Bastian, head of European chemicals at M&A advisory Houlihan Lokey. "I think everybody who has exposure to automotive in particular in Germany and China is having issues."

News that US President Donald Trump intends to extend the tariffs on China from September to cover \$500bn-worth of goods in total, practically every product sold by China into the country, indicates that the trade war may be set to intensify rather than abate, after negotiations broke down once more.

OLEFINS AND POLYOLEFINS

The dispute also has wider implications for olefins and polyolefins chains globally, due to the sheer scale of capacity that has come on-stream on the US Gulf Coast to capitalise on cheap shale-derived ethane in recent years.

Producers added around 4m tonnes of annual new ethylene capacity on the Gulf coast last year, with similar levels projected for

MARTIN BRUDERMULLER
CEO, BASF

"Further capacities are coming on stream, while domestic consumption is slowing. This increases the pressure to export"



2019. With US demand levels already met, the plan for the flagship new cracker complexes was to export competitively-priced product to the rest of the world, particularly Asia.

With China closed as a destination until the détente is resolved, margins in North America are being hollowed out, with LyondellBasell reporting a \$190m year-on-year weakening in second-quarter polyethylene spreads in the Americas wiping out a \$150m uplift in ethylene values on lower feedstock costs.

With values slipping and the key market for basic chemicals shut out, this could see increasing flows of cheap US polymers into Europe, according to BASF.

"Further capacities are coming on stream, while domestic consumption is slowing. This increases the pressure to export, a challenge in view of the ongoing trade conflicts," Brudermuller said.

"This also leads to increasing margin pressure on global derivatives, such as ethylene glycol [EG], in Asia and Europe. We do not

CHARLIE SHAVER
CEO, Nouryon

"Where people might have said 'We're going to grow 3-4%', I think in some cases we're seeing 1-2%"





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expect this development to revert any time soon," he added.

Despite the weak economic outlook and an increasing gap in competitiveness between Europe and the rest of the world on the back of feedstock, labour, energy and regulatory costs, company valuations have remained high for chemical companies in M&A transactions.

Chemicals producers are largely seen as safe plays with diversified end markets, and years of interventionist central bank policy in Europe has left money cheap.

Nevertheless, valuations have started to come down from the highs seen in years earlier, which had reached levels where analyst Bernstein had warned that purchases could be value destroying.

"We've seen valuations coming down for some of the more commodity cyclical portfolios including the diversified companies that still have cyclical businesses in their portfolio," Bastian said. "Take Arkema, they're trad-

MARTIN BASTIAN

Head of European chemicals,
Houlihan Lokey

"We may be seeing the [investment] cycle ending, and private equity firms wanting to dispose of assets before they miss the window"



QUESTION AND ANSWER

EPCA PRESIDENT SEES CHALLENGING 2019 WITH NEW BUSINESS MODELS OFFERING OPPORTUNITIES

WHAT IS THE CURRENT OUTLOOK FOR THE SECTOR?

I think it is clear that a slowdown is now underway in the European and global economies. Until recently, our industry's growth has been based on growth in world trade, and so the current slowdown in this area is bound to impact us. Key areas for the chemical industry such as autos and electronics are showing weakness. China's growth has recently not been as strong as in the past. But we do need to remember that we have seen a long period of strong performance, and that adjustments are inevitable.

Similarly, we may also be seeing a shift in relative profitability within the value chain, which might rebalance margins away from feedstock suppliers to the benefit of companies operating closer to the market. This shifting landscape emphasizes that one key lesson from the past is that it is critical to continue to invest in innovation, and to focus on the areas that are

likely to see growth in the future. We are facing a lack of visibility, but I am confident that some areas will continue to do well, particularly those focused on market-led innovation in areas such as new molecules, new business models and sustainability.

HAVE CONDITIONS EASED AS 2019 MOVED FORWARD?

Underlying demand should continue to be challenging. Nevertheless, we may hope to have less destocking down the value chain, which may ease the comparison base with last year. At the beginning of the year, many of us had hoped that we might just be passing through a temporary blip, and that H2 would see a more stable outlook again. Clearly this has proved to be wishful thinking.

I said last year that I thought we were coming to the end of "business as usual" in the sense that the level of uncertainty was rising not only due to geo-politics and trade wars, but also in areas such

as the outlook for feedstocks and end-user demand. One sign of this is that buyers are often just looking ahead to the end of the month, rather than feeling confident about committing longer-term.

HOW CAN PLAYERS ADAPT TO THESE CHANGING MARKET CONDITIONS?

We can no longer expect the economy to develop in a straight line. And so our planning processes need to be based on a scenario approach, accepting that quite different outcomes are possible over the next 2-3 years.

I believe that a number of major new markets are starting to appear – connected to areas such as the environment, demographics, recycling, lower energy consumption – and I am confident they will prove very profitable over the new few decades. But to be really successful, we will probably need to think 'outside the box' and develop a more service-driven and solution-oriented approach, alongside our traditional focus on products. ■

ing at the low end of the diversified industrial companies, 5-6x EBITDA. It is difficult to justify that discount other than that they still have some cyclical businesses in their portfolio."

Even more specialist producers such as fragrance and ingredient manufacturers, occupying extremely niche high-value segments with steep barriers to entry, may have seen valuations climb to the point where a correction could be inevitable.

"If you look at the developments for analyst recommendations on some of these higher valued companies [such as flavours and fragrance companies], they feel like this has gone too far and can only go one way from a valuation perspective. Investors have become more cautious," Bastian added.

Under the weight of political and economic uncertainty and the near-bottom cycle pricing for various key commodity chemicals, the outlook across much of the world remains bleak, with one key exception.

While US growth has also slowed and may

be set to slow further, the pace of economic growth remains strong relative to the rest of the world, with a number of acquisition targets likely to come on the market over the next year. As private equity firms reach the end of their hold cycles, more European companies may look to increase growth above local demand levels by strengthening foot-holds in North America.

"The US is a very good destination to look for relatively better market fundamentals from a chemicals perspective right now, and there are likely to be businesses coming up for sale in the next 12 months," Bastian said. "We may be seeing the [investment] cycle ending, and private equity firms wanting to dispose of assets before they miss the window."

"It's still a question of if and when the window will close, and we've been hearing about that for the last year or two, but it feels like we're getting closer to it now and that's also one of the reasons why European companies are looking to the US for M&A," he added. ■



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Although PET bottles are widely recycled, and recycling rates are high in Europe, this market faces many supply chain challenges

Petrochemicals are going to waste!

How changing attitudes toward circularity are transforming supply chains, and the barriers to fully recyclable plastic caused by technical and supply chain challenges

MARK VICTORY ICIS

Recycling and the circular economy can no longer be treated as a fringe issue for the petrochemicals market. Shifting consumer attitudes to plastics, and the increased regulatory attention this is directly causing, dictate that it becomes ever more central to how companies operate.

Plastic bottle sales in Europe fell by up to 8% year on year across the first half of 2019, according to market estimates, in part be-

cause of shifting consumer attitudes to single-use plastics, although lower than average temperatures were also a contributing factor.

LEGISLATIVE AND SOCIAL PUSH

A public mandate has caused the EU Commission to focus on plastics legislation rather than other materials, Michiel de Smet, policy officer at the European Commission, which acts as the EU's executive body, confirmed during a speech at the ICIS PET Value Chain conference in Amsterdam on 13 March 2019,

and this is expected to continue.

"Society and the legislators are defining the environment in which we operate and the licence to operate," said Richard Roudeix, Senior Vice President, Olefins & Polyolefins Europe, Asia & International, at LyondellBasell, and EPCA board member.

The European Commission has set a 50% recovery target for municipal waste by 2020, under the Waste Framework Directive, expanded recently to 55% by 2025 and 65% by 2035. There is a separate target for plastic »

» packaging, 55% of which must be recycled and 100% recyclable by 2030.

The EU Council has also adopted a 90% separate collection target for plastic bottles by 2029, and 77% by 2025. Polyethylene terephthalate (PET) plastic bottles – which the bulk of on-the-go drinks bottles are made from – will need to include a minimum 25% recycled PET (R-PET) by 2025, and 30% by 2030.

A ban on single-use plastic products for which market alternatives exist will come in to effect by June 2021. Other governments have moved further, with France looking to ban single-use plastics and other forms of common waste, such as cotton buds, by 2020.

Extended producer responsibility schemes covering the clean-up costs for products such as fishing gear and tobacco filters will be introduced between January 2023 and 31 December 2024, depending on product.

The EU has also backed bans on intentionally added microplastics in cosmetics and detergents by 2020 and on oxo-degradable plastics that break down into small pieces and contribute to ocean pollution.

These legislative measures are presently driving firms throughout the petrochemical industry, and the packaging sector in particular, to adopt increasingly ambitious sustainability targets.

Because current consumer demand has already begun to shift away from single-use plastics, these often go beyond EU mandated minimums.

Many plastic bottle manufacturers, for example, are targeting to reach at least 50% recycled material by 2030, or shifting to other materials such as bio-based or non-plastic alternatives.

“We’ve been working recently in Wesseling in Germany to use a waste and bio-based feedstock stream... that produced prime polymer material and I think we’ll see more and more those activities,” Roudeix said.

According to LyondellBasell, although the overall performance at EU level is good, the challenge lays in the implementation of the EU’s waste rules at a national level with such country-by-country gaps needing to be swiftly addressed if Europe wants to speed up the transition to a circular economy.

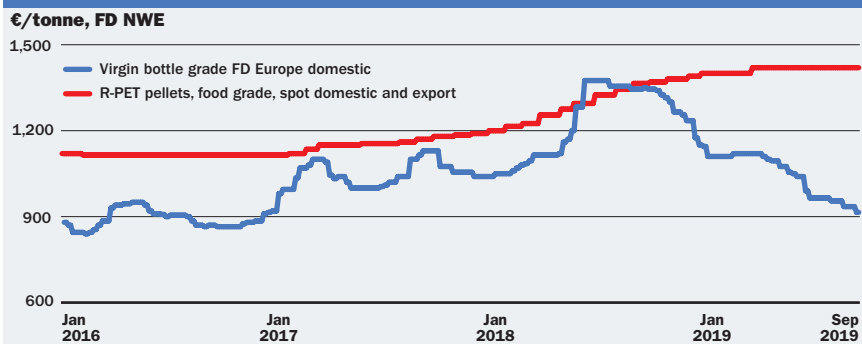
RICHARD ROUDEIX,

Senior Vice President, Olefins & Polyolefins Europe, Asia & International, at LyondellBasell, and EPCA board member

“We have engaged converters, brand owners, waste management, retailers because all of them will be required to get results.”



RECYCLED/VIRGIN PET PRICE GAP IS NOW HUGE



“There’s huge differences in European countries on recycling rates. We see plastic as a valuable component... We have a target for zero landfill, and if you look at the data it’s the countries with zero landfill that have higher recycling,” Roudeix said.

Unilateral action by member states, for example the National Plastic Pacts, can put the EU single market at risk and create market uncertainty, because the level of ambition and objectives vary at national level, LyondellBasell added.

COLLECTION RATE CHALLENGE

It would require a significant increase in European collection rates and techniques in order to reach current regulatory and branded sustainability goals.

The R-PET chain is perhaps the key example of this because it is currently the most widely recycled plastic in Europe, and has the most developed market and infrastructure.

The 2018 ICIS study, the latest year for which data is available, showed a 63% collection rate of post-consumer PET across Europe, with 2.07m tonnes collected (rounded to two decimal places) versus 3.29m tonnes of PET bottles consumed.

Actual collection rates, though, vary greatly from country to country from Bulgaria at just 21.0%, to Germany at 96.2%. The EU Commission has identified 14 countries as at risk of missing 2020 recycling targets.

Because of contamination rates, mixed-coloured material typically is not suitable for R-PET end-use packaging applications.

The breakdown between mixed-coloured and colourless post-consumer bottles varies from country to country.

However, the average split across Europe is approximately 65-70% colourless material, according to market estimates.

Assuming the high-end of this estimate, that would give approximately 1.4m tonnes of colourless material available across Europe. Because of cross-contamination from other plastics and losses due to the mechanical process, average wastage rates across Eu-

rope – which also vary country to country – are at around 30-35% according to market estimates.

Again taking the most optimistic figures, this would leave approximately 1m tonnes of reprocessed material usable for packaging under these conditions.

Total European PET demand across all packaging applications is approximately 4.35m tonnes/year according to ICIS analytics. This would leave a theoretical maximum of 23.31% R-PET content across the packaging industry, if they managed to reach a 100% share of the R-PET market.

The bottle and sheet industry currently command a 67% share of total R-PET supply, which equates to 697,515 tonnes of reprocessed material, enough for an average 16.03% R-PET content across the packaging industry. Coupled with this, other sectors such as fibres and chemical recycling projects are increasingly seeking a higher share of post-consumer PET waste.

Packaging producers using materials such as polyethylene (PE), polypropylene (PP), polystyrene (PS) and polyvinyl chloride (PVC) are also investigating a switch to other materials including PET because of the perception, caused by the headline collection rates, that R-PET material – particularly food-grade material – is in abundant supply.

An additional limit for the plastic bottle market is the lack of food-grade pellet production, which currently stands at around 300,000 tonnes/year in Europe, or around 9% of overall PET plastic bottle demand.

Coupled with this, to achieve European Food Standards Agency (EFSA) approval, recycled material must contain less than 5% contaminants (including from other plastics), 98% of the material used in reprocessing must have been sources from food-contact applications, and there must be full and provable traceability throughout the chain.

For R-PET the major feedstock is used plastic drinks bottles and reaching the 98% threshold is not currently a challenge, but for other recycled material such as recycled pol-

yethylene (R-PE), recycled polypropylene (PP) and recycled polystyrene (R-PS) where multiple forms of waste are collected in curb-side schemes, proving provenance of material to reach the 98% content threshold is prohibitive.

For R-PE, for example, the only post-consumer-derived source of food grade pellets is the UK where milk bottles provide an easily separated stream of waste.

UK milk bottles are manufactured from high density polyethylene (HDPE) whereas across the majority of the rest of Europe they are manufactured from PET, but the volume of material collected is limited to around 100,000 tonnes/year, and is only available for HDPE. R-PP, R-PS and R-PVC also face similar challenges to provide food-grade material because of the 98% threshold.

“As a society we need to take care of this problem so individuals need to sort. We’re hiding the problem if we’re throwing into one bin... Sorting at the source is the most effective way to ensure we have quality standards,” Roudeix said.

The structural undersupply of food-grade pellets at a time when significant commitments to minimum recycled content levels are being made is the leading cause of R-PET food-grade pellet prices reaching a record high spread with virgin PET spot prices of 46-48% in June 2019.

“Let’s try to define standards for waste. At the moment it’s a city or country decision which is leading to a lot of different quality waste and making recycling very challenging. What as an industry we’re good at is managing volume and scale up, to achieve that we need significant access and quantities of good quality waste,” Roudeix said.

CHEMICAL RECYCLING THE FUTURE?

Structural shortages of material, along with technical limitations such as opacity of material and loss of tensile strength, have led companies to explore other avenues for reaching sustainability commitments such as chemical recycling or bio-based materials.

Chemical recycling allows waste such as multi-layer PET trays from food packaging and textiles, which are currently difficult to recycle, to be depolymerised back to monomer chemical.

Traditional mechanical recycling methods lower the tensile strength of material, meaning that after multiple times through the recycling chain it becomes unusable, whereas

chemical recycling does not lower its tensile strength.

Coupled with this, contamination levels, colouration, EU consumer standards and traceability mean that not all post-consumer waste collected is suitable for use in applications such as food-contact.

Material produced from depolymerised waste, meanwhile, has the same properties as virgin material.

Because of this, many chemical companies see depolymerisation as the holy grail of recycling. Different methods of chemical recycling allow post-consumer product to be taken all the way back to crude.

“Mechanical Recycling itself won’t be able to define a circular economy because there’s a lot of applications if you think of food, hygiene, medical that are not achievable with mechanical recycling so the game changer is chemical recycling. To achieve a true circular economy the true enabler will be chemical recycling and we as an industry need to tackle this,” Roudeix said.

MARK VICTORY
Senior Editor, Recycling, ICIS

“While in previous decades recycling was seen as a fringe issue for the petrochemical market, it’s now taking centre stage”



An additional advantage is that because chemically recycled product can be used identically to virgin material it limits capital expenditure as assets can be integrated with existing petrochemical infrastructure, shortening time-to-market once technical barriers have been solved.

“Those technologies are developing so it’s difficult to say what will be the final solution, but if we’re able to recycle waste to a feed-stock it’ll be quick to implement because the assets are already there and the capex will be limited. Not only will the capex will be limited but also the time to market because you don’t need to rebuild a [capital-intensive] industry,” Roudeix said.

Nevertheless, typical concerns around chemically recycled material include the cost of the process and yield.

Coupled with this, industry expectations suggest that it will take at least five to 10

KEY FACTS

EUROPE RECYCLING TARGETS

- 50% recovery target for municipal waste by 2020, 55% by 2025, 65% by 2035
- EU says 14 member states at risk of missing 2020 target
- Plastic packaging – 55% must be recycled by 2030
- 100% of plastic packaging must be recyclable by 2030
- Commission proposes €0.80/kg tax on non-recycled plastic production
- European Chemicals Agency proposes bans on microplastics

years for chemical recycling to reach an industrial scale – too late to hit European legislative targets.

Major cost elements of chemical recycling include the cost of post-consumer waste and transportation. Another major barrier is, as with recycling, waste collection.

In areas where mechanical recycling already exists chemical recycling will be directly competing for volumes, making cost-basis ever more crucial, while for products where mechanical recycling is immature, supply chains will need to be developed.

REDESIGN THE CHAIN

At the other end of the chain, EU legislation around recyclability is also pushing the redesign of packaging. For example, Coca-Cola has recently announced the shift of its Sprite brand from green to clear packaging to ease its recyclability.

In recent years, the increasing complexity of packaging and sorting technology’s ability to keep pace has been a driving factor in increased wastage rates along with lower quality material previously exported to Asia being reintegrated into the chain following China’s ban on imported waste at the start of 2018. R-PET wastage rates, for example have risen from around 25% in 2009 to their current rate of 30-35%.

While in previous decades recycling was seen as a fringe issue for the petrochemical market and was not generally a focus in packaging demand, it is now taking centre stage. As a result, companies are coming together to try to help solve circularity changes throughout the chain.

“We have engaged converters, brand owners, waste management, retailers because all of them will be required to get results. This is where the business model is changing and getting more complex and to really have an impact we need to involve the chain. Before it was rather one to one,” Roudeix said. ■

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Prospects for recycling polyolefins

The drive towards a circular economy, with reduced plastics waste and more recycling, will inevitably have an impact on polymer producers, in terms of demand, costs and feedstocks

FABRIZIO GALIÈ & LORENZO MEAZZA, ICIS

In recent times, we have witnessed a strong rise in public awareness of the implications of plastic waste leakage in the environment. The sense of urgency for solving the issue has rapidly developed into what some observers have described as a “plastic panic”.

Noticeably, concern has not been limited geographically to those countries where the general spending power of people is relatively large, and where access to more expensive alternatives is generally considered feasible, if not necessary. Consumers do not fully understand the real implications in terms of costs and materials availability.

With no doubt, Europe is at the forefront of the process of fighting plastic waste and excessive consumption of plastics. Polyethylene (PE) and polypropylene (PP), as well as other polymers, are coming under pressure as the whole industry moves towards the circular economy.

As yet, many actors in the industry, especially those that operate in local or isolated markets, or in segments that are perceived as niche, are not implementing significant changes to their traditional ways of doing business.

Nonetheless, awareness is rising that changes will be necessary for more or less everybody, and that these can potentially have significant implications. What is less clear to most people is the extent of these changes; when, how and why they will happen; and what it will entail for the future of the plastics sector.

For polyolefins suppliers in Europe, the matter looks even more pressing now, because

overall demand has weakened significantly in the backdrop of general economic woes, and changes to customer behaviour downstream can further hurt business growth rates.

PE consumption in Europe increased by a mere 1.1% in 2018, according to ICIS analytics, and the corresponding PP rate was even lower at 0.7%. And while the global business climate still looks gloomy, pressure from recycling seems to have no limits.

CIRCULAR ECONOMY: WHAT DOES IT MEAN?

According to the definition by the Ellen MacArthur Foundation, the circular economy “entails gradually decoupling economic activity from the consumption of finite resources, and designing waste out of the system”. For the plastics industry, the concept entails two major consequences.

Polyethylene (PE) and polypropylene (PP), as well as other polymers, are coming under pressure as the whole industry moves towards the circular economy

First, the direct implication is linked to the management of waste, and sourcing it back to the production process as a substitute for traditional feedstocks. Second, the indirect implication is a push towards de-coupling from fossil fuels, which can certainly alter the cost structure.

This is the theory, and the main engine is the final consumers, who are becoming more and more dedicated to preserving the environment. The concept is translated into reali-



ty via the regulators, who define the ways and the rules that will change the business.

The legislators, in particular the EU and the single governments that will impose the regulations, are acting by supporting, and imposing, the collection and management of plastic waste; encouraging re-use; and defining limits to specific uses, including bans.

The stakeholders in the plastics industry, which include not only the polymer producers but also processors, “big brands” that use and distribute processed plastics through their products, traders and distributors, will all have to adapt their strategies to respond to growing requirements.

Most of them show determination to develop solutions first, meeting the favourable opinion of the market. Announcements in Europe (but not limited to Europe) are made almost weekly of new investments, agreements and technical developments, around the use of recycled plastic, including polyolefins.

IMPLICATIONS FOR THE PE/PP BUSINESS IN EUROPE

The effect of the circular economy on business will be on volumes and costs. Regarding volumes, the recycling efforts will lead to the progressive substitution of growing portions of the virgin resin market size.

This trend will result from both the development of recycling capacity, and the parallel limitation on the growth of polymers demand overall. Demand will grow less because consumers’ behaviour will move to both re-use



Concern about the marine environment is driving targets for plastics recycling

Shutterstock

and switch to using alternative materials to plastics. In addition, specific products and sectors will increasingly be affected by bans and other limitations imposed by law.

In March, the EU Parliament approved a ban on specific single-use plastic cutlery, plates and straws, plastic cotton bud sticks, plastic balloon sticks, oxo-degradable plastics, food containers, and expanded polystyrene (PS) cups by 2021.

However, ICIS analysts estimate that the impact on PE and PP will be minimal, principally because the product scope looks quite modest and only accounts for minor shares of the polyolefins downstream market. Some HDPE volumes are used in rigid disposable products, and a bit more of PP.

The products most “exposed” to the ban seem to be PS and expandable PS (EPS), which are largely used for plates, straws and cups. Up to approximately 5% of EPS demand in the EU goes into cups and takeaway containers.

This does not mean that more restrictions will not occur in the future, and have stronger implications for polyolefins. This happened in the recent past with the progressive introduction of limitations on the use of plastic bags – a sector that represents about 7% of total low density PE (LDPE) and linear low density PE (LLDPE).

Pressure on volumes will also come from developments on the supply side, especially as new product solutions are developed that allow product quality with lower volumes, allowing a

“do more with less” attitude to prevail.

This is going to be one of the reasons behind the current and expected penetration of metallocene PE grades into the traditional PE market in Europe. MLLDPE capacity has grown dramatically in recent years, not only in the US but also in China and Asia. Indeed, imports are set to grow for MLLDPE grades, especially from the new production in the US.

Downgauging is the main attractive feature that connects the penetration of MLLDPE into PE markets to the sustainability goals for packaging. The possibility to use less plastic material without affecting the technical features of products is a key driver.

The large capacity expansion is leading to lower prices for metallocenes, and hence a progressive commoditisation of these products and their use in wider applications, such as PE pipes.

One additional point to underline is the peculiarity of Europe regarding the penetration of MLLDPE into the PE market. Europe is still the region where substitution of LDPE with LLDPE (of any grade and type) is proceeding slowly. This means that LLDPE polymers made via metallocene/single site catalysts will have to fight not only against the “traditional” LLDPE grades but also versus the mature LDPE market, whose consumption volumes were only overtaken by LLDPE in 2018.

Recyclability will be another determinant

behind the potential survival of plastic products. One of the growing questions regarding PE is about the future trends of multi-layer packaging films. To some extent, there has been growing attention in recent years on single-layer packaging versus multi-layer, with regards to the easier post-consumer management. However, it is ICIS analysts’ opinion that the development of new recycling technologies will very likely support multi-layer PE recycling, including delamination.

Recyclability can also set the product preference into some applications, leading to inter-polymer substitution. For example, growing substitution of PS with PP is forecast in a number of common applications – although this is also linked to the lower volatility of some price components.

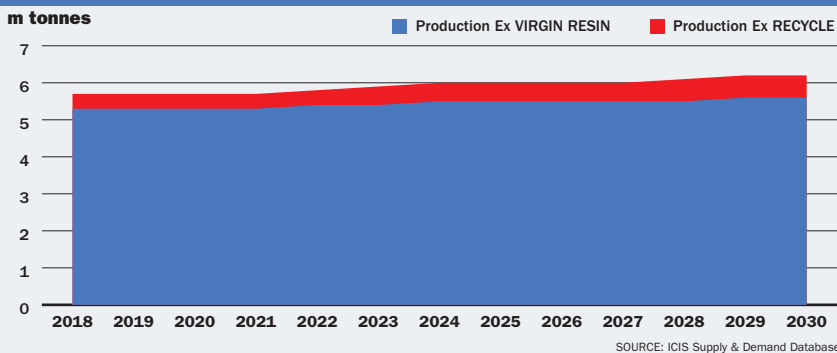
Finally and quite obviously, the development of recycling will come with costs, not only associated to R&D for the elaboration of new products, new processes and solutions, but also to securing the necessary feedstock and logistics, meaning the cost of collecting, transferring and sorting waste.

FORECASTING THE VOLUMES

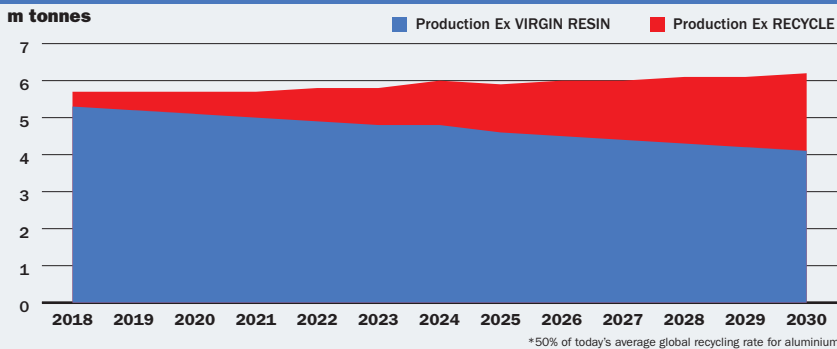
Taking into account the factors discussed, ICIS analysts’ base-case scenario does not foresee dramatic changes to the current PE and PP balances in the short or mid-term. However, the continuous uptrend of recycling



EUROPE HDPE BASE CASE FORECAST RECYCLED VERSUS VIRGIN BY 2030



EUROPE HDPE RECYCLED PRODUCTION AT 33.5%* OF TOTAL PRODUCTION BY 2030



» is confirmed, with Europe as the spearhead of this global recycling revolution.

Much stronger dynamics are expected to emerge in the long term. A good indicator is the share of total post-consumer recycling volumes versus regional consumption. The share is expected to almost double for PE and more than double for PP in the next 20 years or so.

Looking in more detail, ICIS data showed the share of PE reaching about 11% by 2040, and the corresponding number for PP close to 9% by the same year. Clearly, the actual penetration of recycled material into the final markets downstream will also depend on how imports and exports evolve.

Looking at the recycling share over the total forecast production, the expected penetration is even higher, with PE moving from 6.5% in 2018 to over 13.5% by 2040 and PP from 3.7% to 10.5%. LLDPE will show the highest share by that time with R-LLDPE accounting for almost 19% of LLDPE made in Europe.

DISRUPTIVE FACTORS

It should be noted that this is a conservative scenario, where the process is seen as evolutionary rather than revolutionary. On top of this, “disruptive factors” such as new technologies that are economically scalable can

always occur and result in recycling numbers far above these levels.

This could occur, for example, with the development of a chemical recycling process that is both effective and economically scalable. Chemical recycling for polyolefins is a difficult task and its possible impact will depend on the final applications of the polymer.

Our alternative scenario means average operating rates of HDPE plants dropping from 85% to 63% or, in other words, a serious threat to the existing polyolefin assets. Something worth thinking about.

As far as PE is concerned, the main application that would benefit from chemical recycling is food packaging, where required quality and safety standards are very high, representing an additional barrier to mechanical recycling. Thus, recycling penetration into the PE business could considerably vary between LLDPE and HDPE because of the different spectrum of applications for the two product types.

To evaluate a possible alternative scenario coming from this or other events, we can take

as a reference the current recycling shares of alternative materials, such as aluminium, steel and glass, and imagine that technological developments will allow recycling rates for polyolefins to reach 50% of that share, say by 2030.

If we take HDPE as an example, this would mean that the volume of R-HDPE produced in Europe would reach 33.5% of the total HDPE produced in the region by that year, instead of the 10% coming from ICIS base-case scenario.

The result of this game would be that European production of virgin HDPE becomes 26% lower by 2030, if we keep the total forecast output for the region in 2030 as fixed. It means average operating rates of HDPE plants dropping from 85% to 63% or, in other words, a serious threat to the existing polyolefin assets. Something worth thinking about. ■

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Digitization could transform many aspects of the chemical industry

Digitization, slow but steady progress

The supply chain in the chemical industry stands to benefit tremendously from the adoption of digital technology and blockchain, and already examples are emerging

HEIDI FINCH ICIS

The supply chain in the chemical industry is a complicated one, with multiple channels, dedicated transport for certain products, hazardous chemical labelling requirements, freight, duties and transportation across regions and varied distances being just some of the considerations.

On top of this, there are the growing demands from the consumer industry for real-time updates and detailed trackability and traceability of product sourcing – in line with increasing sustainability requirements. Efficient order processing and invoicing, for buyers and sellers alike, and other types of process and product innovation, are “other wants” in the chemical industry.

The chemical industry would therefore benefit greatly from an automated and trans-

parent digital system that can track and trace throughout the supply chain; automate order processing and invoicing through blockchain technology; and provide digital modelling and simulation tools.

“[Blockchain technology] is for me like an electronic notary. It shows in real time what the parties in the chain have done and when. If somebody has manipulated the data, it becomes clear, it is so obvious and transparent,” says Wolfgang Falter, global chemicals sector leader and a partner at Deloitte.

Some chemical companies are on the way to discovering the benefits of blockchain technology to automate processes, track their socio- and environmental footprint, optimise efficiency in the supply chain, reduce costs and ensure product authentication.

Even if you have the right label on the container, it can be manipulated; but digital

solutions can secure the supply chain, remarks Falter.

This view is also held by David Cahn, director of global marketing at Elemica, a digital supply chain network and solutions provider. Cahn talks of a trend in the chemical industry using blockchain to ensure traceability and product authentication.

“Through the use of transactions posted in a journal entry in a distributed ledger, product authenticity can be validated,” explains Cahn, who adds “this can dramatically decrease the amount of counterfeiting going on in the chemicals and downstream industries like pharmaceuticals, medical devices and electronics.”

Chemical producer Repsol has invested in blockchain technology from software innovation group Finboot, which will improve the certification of chemical products, therefore

» boosting supply chain efficiency. This blockchain solution is estimated to save €400,000/year, even with a limited rollout, according to a Finboot press release.

“We [Finboot] are committed to facilitating the adoption of blockchain technology for enterprises. We are certain that certification and traceability can introduce tremendous efficiencies to processes in the chemical industry, and blockchain is a key enabling technology to make this happen,” said Juan Miguel Perez, CEO and co-founder of Finboot.

Traceability is increasingly important in various industries. Automotive OEMs (original equipment manufacturers) are also sensitive to the socio- and environmental footprint and quality of the materials used in automotive batteries, with lithium and cobalt two of the critical, but scarce, components, according to an industry specialist.

This is where blockchain technology and transparency in the supply chain and sourcing come to the fore, the specialist added, noting that automotive OEMs are keen to track key battery components to make sure that the products are sourced from ethically run mines in parts of the world where the working conditions meet the required standards.

BLOCKCHAIN SOLUTIONS

It is also important for the automotive OEMs to know where the battery-critical ingredients are sourced from, because there is certain differing quality and performance from the ores from certain mines, said the same industry specialist.

Blockchain solutions are also being used to meet traceability and sustainability requirements in the textiles industry. Key fibres manufacturer Lenzing is using blockchain technology to meet its consumers' transparency and sustainability needs, by using the digital platform to track the journey/origin of the company's bio-based fibre from the point of origin, the cellulose wood source, through to the retail sale.

“Together with [Hong Kong-based technology company] TextileGenesis we aim to create an unmatched level of transparency for brands and consumers. With this step, Lenzing will further help to green up the textile industry,” said Stefan Doboczky, CEO of the Lenzing Group in a press release in early June 2019.

Digital solutions are also being used to increase supply chain visibility in the chemical sector. A prime example of this is how chemical major Dow keeps track of its railcar movements. The company keeps an eye on its 20,000 railcars in the North America rail network system through radio frequency identification (RFID) tags detected by automatic equipment identification (AEI) readers.

In Europe, Dow uses regional GPS technology to monitor its 1,500 railcars. These digital



sensors combined with analytics help to provide real-time locations and estimated arrival times, and allow railcars to be re-routed to avoid delays.

This digital information can provide proactive notifications to customers, which helps buyers and sellers alike in the planning of their shipment, according to Dow.

“While there is not one common global technology on the market today that can be used to track [railcar]/truck visibility,” says Tracy Johnson, associate director of visibility, transportation management and road and warehouse mode technology at Dow, “we are moving in the direction of building ‘one smart hub’, a centralised platform that can integrate all regional supply chain visibility technologies.”

DAVID CAHN
Director of global marketing, Elemica

“Through the use of transactions posted in a journal entry in a distributed ledger, product authenticity can be validated”



Increasing marine supply chain visibility has also been a focus with the IBM and Maersk blockchain solution – TradeLens, formerly known as Global Trade Digitization. This platform integrates trade data from shipping partners in a secure real-time network, where all shipping partners involved in the shipping transaction have access to end-to-end supply chain information, according to the TradeLens website.

Aside from increasing supply chain visibility, digital solutions are being used by chemical players in other downstream areas.

SUPERPOWER COMPUTER

Chemical major BASF, which won the title of Digital Transformer of the Year in 2018 in Germany has recently developed a high-performance superpower computer – dubbed Quiriosity – with a computing power of 1.75 petaflops/second, equivalent to the computing power of around 50,000 laptops.

Quiriosity is being used to drive digitization to calculate new molecular chemical compounds in a short space of time and to simulate chemical processes that were previously considered impossible theoretically or on a laboratory scale, according to BASF.



"We have found products we would not have been discovered otherwise," says Stephan Schenk, the team lead of high-performance computing and databases at BASF.

For instance, BASF used Quiriosity to identify a specific active agent for a crop protection product from a large number of potential options, which generated possible suggestions for experiments, with the best of those tested in the laboratory. The digital process was "not merely faster, but also more successful," says Schenk.

The digital options of Quiriosity will also allow BASF to scale-up production quicker in the future, by using complex computer simulations to see how chemicals will react in a production environment and not just in the laboratory. This can eliminate the additional costs associated with a pilot plant, explains Schenk.

BASF is also using digital modelling solutions in the EU SPHERE project to improve energy efficiency in buildings. The SPHERE project involves developing a software-based digital twin using Building Information Modelling (BIM), which replicates buildings virtually in order to boost energy efficiency, improve lifecycle and lower costs, according to BASF.

The "virtual twin" uses a wide range of data based on construction method, design, production of construction materials, process and structural elements, according to BASF.

"For us, virtual building models represent a key technology for the future conception and design of built structures," says Philipp Kley, senior vice president of construction chemicals Europe at BASF. "We want to leverage innovative software technologies to play a leading role with regard to Industry 4.0 in the construction industry."

Early in 2019, BASF set up a new global digital centre in Spain to underpin and propel the company's digital transformation and develop innovative IT solutions.

Also in early 2019, Elemica completed a successful blockchain pilot project with crossinx, a German fintech company and provider of cloud-based services for the financial supply chain. This could lead to automation of document exchange between leading global chemical manufacturers, according to Elemica.

The benefits of this blockchain project include auto-ordering based on internet of things (IoT) information, automated order confirmations and auto-matching of payments and invoices, according to Elemica.

"Similar to any new technology, there is a period of learning and evolution before adoption," says Arun Samuga, CTO of Elemica. "We like what we see so far and are identifying areas of clear applicability of the technology."

"Our goal is to use the blockchain to automate document exchange along the supply chain and make it more transparent. This is the basis for our Supply Chain Finance solutions," explains crossinx CEO and founder Marcus Laube.

INTERCONNECTED APPROACH

In April 2019, Elemica partnered with German blockchain start-up company Centrifuge to provide blockchain visibility and finance offerings to the supply chain industry.

This partnership provides third parties with the option to benefit from the technology to build, host and use their own blockchain applications and smart contracts in blockchain, which is beneficial to all users of the Elemica digital network.

"The process manufacturing industry is evolving by seeking an interconnected approach between blockchain technology and its current focus on Industry 4.0 and digital transformation initiatives," notes Samuga.

He adds that different participants in the supply chain can be involved in blockchain solutions through distributed ledgers and smart contracts. "This makes supply chains more efficient and more resilient to risk by enabling end-to-end visibility."

Elemica has incorporated the traditional Total Quality Management (TQM) concepts

and methods in manufacturing in its digital network throughout the entire supply chain. This includes statistical process controls and other quality measurements.

This helps provide corrective action plans to improve processes of delivery and throughput from suppliers and output to customers, according to Elemica's Cahn.

Cahn highlights how blockchain solutions are helping to streamline the order-to-cash and procure-to-pay cycles by eliminating many approval processes through an automated "smart contract" logic, so that transactions can occur quicker.

WOLFGANG FALTER

Global chemicals sector leader and a partner at Deloitte

"[Blockchain technology] is for me like an electronic notary. It shows in real time what the parties in the chain have done and when"



Blockchain technology is already being used in various industries to improve process efficiency and foster transparency. In the music industry, for instance, blockchain technology is being used to connect artists with their fans, by allowing listeners to make micropayments to listen to the artists' songs directly, according to Cahn.

Certain car manufacturers are also turning to blockchain solutions to curb identity fraud costs and to provide car unlock options via an app and easier automated payment systems, he adds.

The insurance industry is also benefitting from the automated verification process made possible by blockchain technology, and the quicker and easier reference to past claims in order to mitigate risk.

While the chemical industry and other industries acknowledge that blockchain and digitization is the key to helping them keep pace with consumer and wider requirements, the adoption of these solutions can be a gradual process.

"It is a nice vision. We are a bit away from [blockchain technology usage], but the customer is benefitting from it, [although] some forces in the [chemical sector] chain want to keep the intransparency, so I don't think it will be a rapid adoption of this technology," says Deloitte's Falter.

He goes on to say, "Smart and clever regulation could help to get it applied for the sake of the customer," adding that tracking carbon footprint and reducing carbon dioxide (CO₂) emissions are possible regulatory drivers for more uptake in the chemical sector. ■

Power of argument

EPCA will again host the finals of the European Youth Debating Competition at its 53rd Annual Meeting in Berlin

TOM BROWN ICIS

Twenty-one teenagers from across the EU have won places at the finals of the European Youth Debating Competition (EYDC) after national heats were held throughout summer in seven countries.

EYDC is a joint project between EPCA and PlasticsEurope, facilitated by Germany's young leaders GmbH. It is designed to promote the importance of science, technology, engineering and mathematics (STEM) education to young students (16 to 19 years old), and to empower them with soft skills and encourage them to discover and discuss the contribution of petrochemistry and plastics in today's society.

The debates each attracted up to 80 students, many of whom had never taken part in a debating class before. This is the fourth year the industry bodies have run the debating competition. Heats took place in Belgium for a joint Benelux contest, as well as the UK, Spain, Germany, Italy, Poland and France. Students convened for the final heat in Paris on 27 September, with the European final set to take place at this year's EPCA Annual Meeting in Berlin on 7 October. The top five out of 10 winners will be presented with their awards during the closing lunch on 9 October.

RETHINK, REUSE, RECYCLE...

In the UK, more than 70 students from 13 schools across the country gathered in a lecture theatre in King's College, London, to argue for and against the 2019 theme: "Rethink, Reuse, Recycle: how would you shape a sustainable future with plastics and petrochemicals?"

The subject has been foremost in the mind of both the petrochemicals industry and policy-makers in recent years as governments and the private sector start to make the push towards a circular economy, the most seismic reform to the working of the sector since its inception.

The topic has dominated the agendas of large international gatherings such as the Cefic general assembly and the Helsinki Chemicals Forum, but the students at the debating challenges brought a fresh perspective to the issues,



Winners of the 2019 UK EYDC youth debate finals in London with the jury members

arguing incredibly sophisticated points about the challenge of reforming the sector.

The day started with a session explaining the form of the debate to the contestants, and splitting them into the "pro", "con" and free speaker factions. After students had familiarised themselves with the rigours of the discussion and formulated their positions, the judges entered the hall.

Industry representatives from Dow and Shell, from the media (ICIS News) and from EPCA itself formed the jury tasked with evaluating the arguments of the day.

The students needed no encouragement, with every moment of the discussion time filled with rebuttals and interjections, and the maximum number of challenges permissible in each round used.

RULES

- At each of the national events, two opening statements are presented by experts – one for and one against the motion.
- Five chosen youth speakers for each side then alternately present their "pro" and "con" arguments.
- Free speakers from the rest of the youth participants represent the public and evaluate the arguments and pose questions.
- A jury determines three winners and three runners-up from the chosen speakers and the free speakers.
- The criteria are knowledge, ability of expression, persuasiveness and the ability to interact with others.

Students were motivated by the discussion, with aspects of the issue ranging from objects used day to day and the necessity of affordable, durable materials for medical devices, to the overarching issues of politics, the environment and the economy.

Even those on the "con" side grounded their arguments in the importance of plastics and petrochemicals, focusing on the need for stronger regulation and the need to shift to more responsible usage, particularly for single-use packaging materials.

FRESH THINKING

"These youngsters bring new ideas on how to boost sustainability. They are digital natives who see opportunities where others don't. I am impressed with their fresh thinking and I believe it has the potential to boost positive change in our society," said Oonagh McArdle, EMEA sustainability manager at Dow.

Judges then retired to a separate room to deliberate. Jurors had been taking notes throughout the debate on the quality of each debater's arguments, how quick they were to respond to challenges, and the quality of their points when forced to depart from prepared remarks.

After nearly an hour of intense discussion, the jurors settled on students from five schools. Sam Thomas, 17 years, and Alex Hook 16 years, both of Ibstock Place School in Roehampton, southwest London; and Lilien Gyabaah, 16 years from Brampton Manor Academy, East Ham, east London were named the winners and moved forward to the final. Runners-up were Yasmine Amirouch, Charlotte Copeman, Jason-Thomas Antwi-Dicson were worthy runners-up. ■

Europe's evolving feedstock slate

Chemical producers in Europe are responding to global trends by seeking to diversify their feedstocks to take advantage of cheap US ethane plus bio and recycled raw materials



Europe's chemical sites are looking for more feedstock flexibility

JANE GIBSON LONDON

The feedstock and raw material slate of the European petrochemical industry continues to evolve as economic and circular economy targets lead chemical producers to seek alternatives to more traditional upstream options.

The US cracker wave spurred on by the shale gas boom has led to a reawakening in US chemicals and Europe is increasingly looking to imported ethane and propane as a cheap feedstock. INEOS began importing ethane from the US in 2015 to fuel its Grangemouth cracker and has now announced the €3bn Project One investment in Antwerp, Belgium, which consists of an ethane

cracker (the first to be built in Europe in 20 years) and a propane dehydrogenation (PDH) unit.

John McNally, CEO at INEOS Project One and an EPCA board member says: "Most crackers in Europe run on naphtha – a light grade of material that is easily moved around the world. But a problem has been that you make a broad range of products, grades C1-C6, and you are stuck with those products. Now we have on-purpose propylene and ethylene – it was a decisive step for INEOS to move away from naphtha. Grangemouth and Rafnes run on ethane – that is two out of five of our European crackers – and now we have Project One coming to Antwerp."

JOHN MCNALLY
CEO, INEOS Project One

"It needs to be a cracker by the sea. If it's inland then logistically you can't get the ethane there – it's not cost efficient"

The cracker will produce 1.25m tonnes of ethylene and 750,000 tonnes of propylene. The ethylene is to be produced from imported ethane sourced from the US through INEOS' 'virtual pipeline'. Imported propane from the North Sea and the US will arrive in a liquefied form in special ships and be transformed into propylene in the PDH unit. »

» Ethane is a relatively inexpensive side product of petroleum refining and was previously flared or burnt. McNally points out that when the oil price is moving around, the ethane economics work for INEOS and he adds that cheaper oil does not mean economic growth.

“It is worth the effort to purify and liquefy ethane,” says McNally. “A big ethane cracker in Europe makes sense, it gives us a cost advantage. We are pretty tight-lipped on the economics, but we have been encouraged by what we have done before enough to be ready to make a big investment.” He adds that the transportation of liquid petroleum gas (LPG) used for propane production is well-established and is moved around more easily than ethane.

MASSIVE INVESTMENT

Importing ethane was a massive investment for INEOS, but it ultimately saved the Grangemouth site. Grangemouth was at the end of the pipeline that went into the North Sea, but North Sea oil was on the decline. “We had a big cracker running at half rates, which meant we had all the fixed costs over half the product,” says McNally.

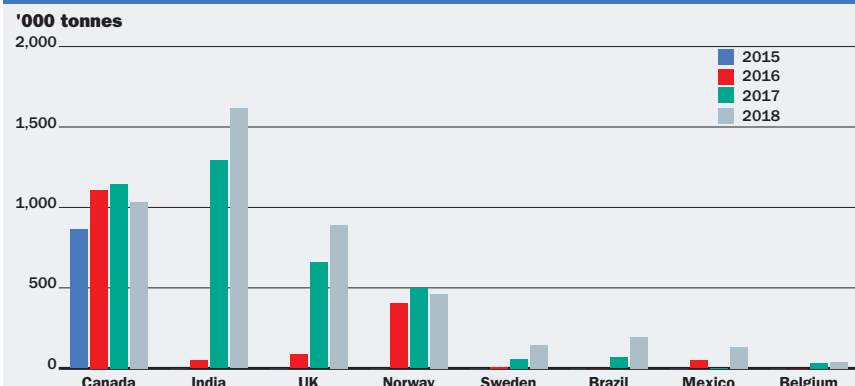
INEOS has created a ‘virtual pipeline’ to bring in NGLs from the US. “In three years we have had ethane ships and terminals built. But it needs to be a cracker by the sea. If it’s inland then logistically you can’t get the ethane there – it’s not cost efficient.”

ExxonMobil, Borealis and SABIC also have ethane-based production in Europe and Total’s Antwerp cracker also has the capability to run on it. Significant investment has been made to allow crackers to accept ethane shipments, but the costs have been less than building a new plant. There are also existing PDH units, with more projects announced (see tables).

Hartwig Michels, president of the petrochemicals division at BASF and an EPCA board member, says there are several drivers for the ongoing shifts in feedstocks. “Refineries are looking for new markets, China and other countries in Asia-Pacific are stopping the import of post-consumer plastic waste from Europe, and there is a rising awareness of climate change and its risks in society.”

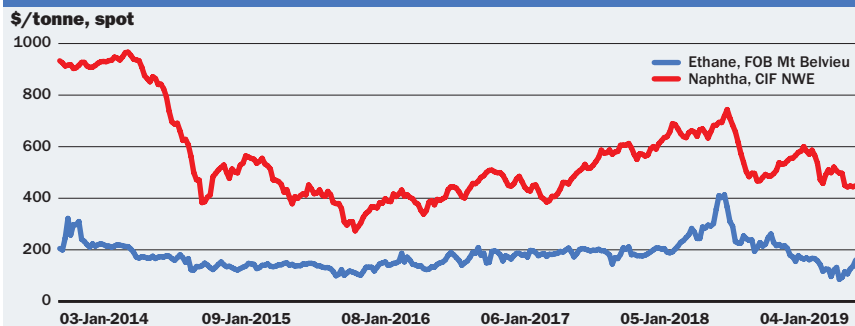
He adds that the shale gas boom in North America means the supply/demand balance

US ETHANE EXPORT DESTINATIONS



SOURCE: ICIS Analytics

US ETHANE PRICES COMPETITIVE VERSUS NAPHTHA



SOURCE: ICIS

es of NGLs like ethane, propane and butane have moved to an oversupply position and depressed prices. “The use of light feedstocks in European steam crackers leads to improved cost positions and to remaining globally competitive.”

The latest data from the US Energy Information Administration (EIA) reveal that field production of natural gas liquids hit 4.838m bbl/day in May. This is an all-time high and is placing pressure on storage and prices – ethane fell to a record low at the end of July, ICIS data showed.

McNally says that given the cost advantage, INEOS is naturally still looking at fracking in the UK to allow direct access to competitive feedstock, as are other companies, but regulations and concerns from the public are current barriers.

“We carry out fracking in the North Sea and nobody even thinks about it – and we could get fracked gas from on land sources in the UK to feed Grangemouth. We need a couple of first movers who have state of the art technology and are environmentally friendly. We have some of the best technologists for extracting oil and gas in the world.”

In terms of the new cracker’s environmental footprint, McNally says it is clear that while technology has improved, a cracker

complex won’t be carbon neutral. He says, “Jim [Ratcliffe, the INEOS chairman] was clear that we need to invest in new technologies and this reduces carbon emissions too. The 2m tonnes of new olefins will have the most environmentally friendly footprint for us. We don’t think that having a lower environmental footprint and making money are incongruent.

CIRCULAR ECONOMY

“We will be under a lot of scrutiny with this investment in Europe and we need to make the case that we can be environmentally friendly. And if product is imported from elsewhere, other than the US, then they won’t necessarily fulfil this criteria”.

Chemical companies are increasingly putting the circular economy high on their agendas as public awareness around the industry’s carbon footprint and plastic waste issues increases. Across the globe, new ways of obtaining products from recycled materials, waste products and natural materials are being explored and invested in.

“There is an increased search for alternative non-fossil raw materials,” says Michels. “A number of new biorefineries have started up, increasing the availability of renewable feedstocks, for example bio-naphtha. The

JOHN MCNALLY
CEO, INEOS Project One

“We don’t think that having a lower environmental footprint and making money are incongruent”



production of bio-methane in Europe is going to increase further.

“The use of alternative non-fossil raw materials has two advantages. On the one hand, recycled raw materials as well as renewable raw materials could contribute to making the EU industry more independent of raw material imports. On the other hand, it can help to achieve climate targets. These are the main drivers for the EU Commission to foster the development towards a circular economy.”

BASF started to introduce bio-based feedstocks into its value chain several years ago. “We are expanding our activities and are considering also residues and waste feedstock,” says Michels. “In 2018, for example, we initiated a chemical recycling pilot project, called ChemCycling, with the aim of replacing some fossil resources with secondary raw material obtained from plastic waste.”

BASF has also created a biomass balance method, whereby bio-based oils or natural gas (biogas) is co-fed into production in parallel with fossil fuels, and mixed together. “The biomass balance allows us to allocate bio-based feedstocks to products based on the demand of our customers. We combine the advantage of renewable feedstock with the advantage of our chemical Verbund sites, increasing the overall sustainability.

PRICE PREMIUM

“Due to the higher raw material cost for renewable feedstocks, this currently requires a premium on the price compared to the conventional feedstock base. We see an increased customer interest in areas where end-consumers are willing to pay the premium for a product that is based on renewable raw materials. In an industry environment that is slowly transitioning from fossil-based to bio-based, the advantage of biomass balance is clearly that we can use existing plant equipment and don’t have to invest into parallel bio-based plants and processes.”

UPCOMING EUROPEAN PDH PROJECTS

| Company | Location | Propylene capacity ('000 tonnes/year) | Start-up |
|------------|------------------|---------------------------------------|----------|
| Borealis | Kallo, Belgium | 740 | 2022 |
| INEOS | Antwerp, Belgium | 750 | 2023 |
| PDH Polska | Police, Poland | 400 | 2023 |

SOURCE: ICIS Analytics

UPCOMING EUROPEAN ETHANE CRACKER PROJECTS

| Company | Location | Project type | Ethylene capacity '000 tonnes/year | Start-up |
|---------|------------------|--------------|------------------------------------|----------|
| INEOS | Grangemouth, UK | Expansion | +130 to 830 | 2021 |
| INEOS | Antwerp, Belgium | New unit | 1,250 | 2023 |

SOURCE: ICIS Analytics

HARTWIG MICHELS

President, petrochemicals division, BASF

“The use of light feedstocks in European steam crackers leads to improved cost positions and to remaining globally competitive.”



Michels says that green alone is not a criterion for BASF. “It is sustainability which matters. For example, we need to be sure via reliable certification that the bio-based feedstock is not produced by damaging the ecosystem or releasing even more CO₂ than the fossil feedstock would do.”

According to Michels, the use of oil and gas from fossil and bio-based sources to produce chemicals plays only a minor role in overall consumption compared with the transportation fuel sector. He says that bigger changes can be expected once e-mobility gains a significant share of the automotive fleet.

In terms of recycling to obtain feedstock, he points out that chemical recycling is still under development, while mechanical recycling faces several limitations. With chemical recycling – plastics and other chemicals are broken down via pyrolysis or other technologies to recreate fuels, chemical feedstocks like naphtha, or base chemicals. Mechanical recycling meanwhile sorts, shreds and reprocesses waste polymers directly back into polymers. Meanwhile, routes to bio-based chemicals production has increased.

SEEK EFFICIENCIES

All the plastic INEOS currently produces can be recycled. But McNally says that the industry needs to look at how plastic products can be recycled more effectively.

He says: “There are a couple of different angles to this. Products actually need to be recyclable, but some plastic products are composite materials that are made up of different layers. How do you have units that can separate and recycle? You need to be able to break it back down to the raw materials.”

A recent EU Parliament ban by 2021 on specific single-use plastics is expected to hit the polystyrene and downstream expandable polystyrene (EPS) market in particular.

In Europe, INEOS Styrolution recently announced a collaboration with Belgium-

based waste management firm Indaver to advance chemical recycling for PS. The aim is to align the output of Indaver’s depolymerisation process with raw material specifications of INEOS Styrolution’s polymerisation process.

The company has also announced that it is to work with dairy producer Theo Muller on a circular solution to develop PS based on chemical recycling and plans to make recyclable PS for yoghurt pots. Product should be commercially available by 2022.

Within Europe, Michels says there is a constant flow of ideas and many interesting and promising green initiatives.

He believes that the response to the call for commitments under the EU Commission’s plastic strategy shows how active the industry is.

“Studies commissioned by Cefic and [German chemical producers’ trade group] VCI [Verband der Chemischen Industrie] have shown that there is a need for change and the industry is constructively dealing with the challenges ahead of us.”

JOHN MCNALLY

CEO, INEOS Project One

“Some Europeans are still wondering if we are serious about the Project One investment. We think that it will make money for INEOS”

Michels says that while the chemical industry in Europe is still very successful globally and leading at least in terms of export volumes, he points out that Europe has lost market share and China will soon account for close to 50% of global chemical production. He adds that the threat of slower economic growth is a concern, especially in terms of investment.

“It will be essential that we retain the power to innovate,” says Michels. “The EU and our national governments can support us to this end. Innovation will be the soil for Europe’s future prosperity.”

McNally says that the European chemical industry has stagnated, with statistics showing that the EU contribution to world chemicals halved between 2007 and 2017. However, he is confident that INEOS is well-hedged in terms of global projects and adds that with the Project One Investment, the company is investing in 30-40 years of growth – growth that attracts GDP.

“Some Europeans are still wondering if we are serious about the Project One investment. They want to see further progress. We think that it will make money for INEOS and we think that others will follow suit – and then we will have renewal in the industry. ■

Trade optimists put on the back foot

Donald Trump's negative attitude to free trade is causing headaches for Europe and its chemical industry, which has benefitted from the opening up of global trade in the past. Analysts say prospects for trade could worsen before they improve

JONATHAN LOPEZ ICIS

New free-trade agreements (FTAs) between the EU and other countries or trading blocs are unlikely to bring a bonanza for Europe's chemicals industry. And the US-China trade war resolution could turn the tariffs spotlight on to key end markets for chemicals in the region.

The automobile industry has been signalled by US President Donald Trump as a potential tariff target as he tries to revive the country's car manufacturing industry.

Trade flows from and to the EU have remained mostly stable in the last two years of the US-China trade war, but shifting trade patterns for the long term are underway in a world where the big economic trading blocs are set to sharply reduce trade among themselves.

At least, that is the forecast of the European chemicals industry, as explained in the EU's chemicals trade group Cefic's Mid-Century Report, which tries to imagine what the sector will look like in the region by 2050.

Trading blocs turning inwards would ultimately affect the export-oriented European chemicals industry. The day after Trump's victory in 2016, Cefic said that the industry would need to get ready for a "completely different" world.

The belief came true soon after and the US-China trade war confirmed Trump was ready to upend the system his own country had helped establish, one where US companies

have generally held the upper hand, helping them expand their markets.

COULD GET WORSE

While EU chemicals companies have not yet suffered any seismic change due to the US' trade spats with several countries, a trade expert from Cefic and a chemicals analyst at

London-based consultancy Oxford Economics agree that the situation could get worse before it gets better.

"To work on trade policy you need to be an optimist, but right now I see a very dark sky," says Rene van Sloten, Cefic's executive director for industrial policy and trade.

"2019 is becoming a very turbulent year for

Europe is heavily export oriented and stands to lose if free trade diminishes



RENE VAN SLOTEN

Executive director for industrial policy and trade, Cefic

"To work on trade policy you need to be an optimist, but right now I see a very dark sky"



global trade. Right now, there is a truce in place between the US and China, but the trade war could get worse before it gets better – that is at least the thinking in Brussels. I could be overtaken by events tomorrow given the volatility of this situation, but I honestly don't see any improvement happening soon."

POTENTIAL TARGET

Although the EU's statistical agency Eurostat released in July figures showing the 28-country bloc's exports to China had increased during 2019, Van Sloten does not think the trade war is benefitting European chemicals.

The industry is already export-oriented, with trade flows well established, and many European chemicals majors have long been key players in the Chinese industry.

Current trends, however, do not bode well for the future of the region's industry. Since President Trump pointed to the EU's automobile industry as a potential target for tariffs, the region's chemicals industry fears a sudden tweet-turned-policy any time, especially if the US and China manage to agree a deal which allows the US to turn its attention elsewhere.

"I fear the EU-US spat about trade tariffs in

AMIT SHARDA

Chemicals analyst, Oxford Economics

"The EU will do their best to ensure that they agree FTAs with as many countries as possible. It's in Europe's interest"



context of aluminum and steel and the Boeing-Airbus trade dispute could quickly move on to the automobile industry, where EU chemicals have a major end consumer. If we add to that a potential hard Brexit, we would have a pretty bad second half of 2019 coming up," said van Sloten.

Amit Sharda, chemicals analyst at Oxford Economics, thinks that, while Eurostat's figures showed an increase in EU exports to China, the longer-term trends are set to diminish European chemicals' global market share.

In his view, European chemicals have for decades been faced with gloomy prospects due to inherent factors that dent its global competitiveness, factors that are set to persist or even worsen: lack of affordable feedstock, costly and stringent regulation, and an ageing population set to reduce its consumption for goods.

EU, THE LONE FREE TRADER

This backdrop of pessimism comes at a time when several chemicals companies are reporting sharply lower earnings, and the mini-boom registered in 2016-2017 is giving way to a more sombre mood.

Moreover, new projects announced when the industry was riding high have been slashed. US chemicals major Dow said in July it was cancelling a large polyolefins expansion in Europe.

The EU thinks it could be the new reference in free trade globally, and has been busy implementing free trade agreements (FTA) with several countries or trading blocks.

Weather the European chemicals industry can gain global market share remains to be seen. Chemicals trade between countries the EU has signed FTAs with – like Canada or Japan – is not significant and the benefits for the industry are set to be limited.

The newly signed FTA with Mercosur – a 260m-strong Latin American trade bloc including Argentina, Brazil, Paraguay, and Uruguay – could be the only one that in the long-term benefits European chemicals. Venezuela is a member of Mercosur but its membership was suspended in 2016.

Mercosur's current tariffs on EU chemicals can be as high as 18%, and the newly signed FTA could sharply lower those costs for companies. An exception to the rule is the bioethanol industry, which fears for its survival if

the EU opens its door to Brazilian product, a sector that the country is a leader in thanks to its agricultural prowess.

The EU's chemicals and pharmaceuticals exports to Mercosur makes 24% of the total for that sector. Exports to the Latin American bloc in other chemicals-intensive sectors like machinery or transport equipment account for 29% and 13% of the total, respectively.

According to Oxford Economics' Sharda, it is in the EU's own interest to continue pursuing a free trade policy that allows its manufacturers – faced with similar problems than the chemicals industry – to increase market share and ultimately allows for their survival.

"The EU will do their best to ensure that they agree FTAs with as many countries as possible – it is in Europe's benefit to do that, as they have their own challenges with regards to losing competitiveness at a global scale," said Sharda.

"Globally, the current wave of protectionism is hampering the chemicals sector even more. In the US, they gained from the shale gas revolution, but they are seeing that advantage being eroded by trade barriers. And this is something that members at the ACC [American Chemistry Council] say themselves."

While Sharda thinks that the EU will press on with free trade policies in the medium term, if the feared US tariffs on automobile comes to pass, the EU would likely respond in kind.

A new, uncharted territory in Transatlantic trade would be open.

"Most of the US' focus is now on China, or the newly signed deal with Canada and Mexico, but the uncertainty regarding Europe's automobile tariffs will persist, and that will continue haunting the European chemicals industry."

BEACONS OF LIGHT BEFORE THE STORM

Cefic's pro-FTAs policy is a feature that has remained unchanged for years. Most of its corporate members are chemicals majors with production facilities worldwide, who tend to see any sort of trade barrier as an impediment to their business performance.

The EU will have a new executive body – the European Commission – from November and the free trade policy it has so far pursued is unlikely to change.

However, it may be overrun by events that could force the bloc to change course.

"The outgoing Commission has a good track record on delivering on free trade, benefiting EU chemicals companies because we are a major exporting region," said Cefic's Van Sloten.

"In that sense, the EU's FTAs with Japan, Mercosur, or Vietnam, among others, are glimmers of hope, beacons of light in a world where a big storm is gathering pace." ■





Investments in sustainability present a huge opportunity, but also big challenge for the sector

Europe's investment challenge

Sustainability, security of feedstock supply and operational efficiency are driving investments in Europe's chemical industry

ELAINE BURRIDGE LONDON

Sustainability is a major driver of investment in Europe's petrochemical industry. That sustainability can take several forms – the reliable and secure supply of feedstocks, operational/technological efficiency or the environmentally friendly nature of end-products to name a few.

But sustainability, and of course investment, comes at a cost, which may prove a huge hurdle for companies this year as Q2 earnings slumped on slowing demand and falling prices.

Many have now adjusted downward their earnings outlook for 2019 overall and this will

undoubtedly have an effect on capital expenditures going forward.

Take major producer Dow, for example. On 25 July, Dow postponed its 450,000 tonne/year polyethylene (PE) expansion project in western Europe, also announcing plans to cut capital expenditure by \$500m to \$2bn this year in respond to a more challenging macro-economic outlook.

Originally announced in May 2017 as part of a five-year investment campaign, the PE plant had been expected to start up in the first half of 2022.

"This is not the time to invest in a major greenfield project," said CEO Jim Fitterling during Dow's Q2 earnings conference call.

BASF too has seen its Q2 earnings before interest and tax (EBIT) nearly halve year on year and warned that full-year profits would fall up to 30% below 2018 levels. It also cut its expectations for global chemicals production growth in 2019 to 1.5% from 2.7% previously.

BASF STICKS TO ITS PLANS

Despite its gloomy predictions, the German giant did not apply the brakes on its European expansion plans. The company has several projects planned in Ludwigshafen, Germany, and Antwerp, Belgium – these are all incremental expansions rather than grassroots investments. At Ludwigshafen, BASF is planning a 50% expansion of 1,6 hexanediol capacity for 2021, a 20% hike in alkylethanolamines output by 2020, as well as a 65% production increase in methane sulfonic acid for late 2021.

At its Antwerp site, the company is looking at a "significant" expansion of its ethylene oxide (EO) and derivatives complex in order to "further strengthen its backward integration" into EO and "support continued growth of its customers in downstream markets". BASF expects to make a final investment decision in 2019.

While BASF invests to meet growing customer demand, it is also focussing on sustainability and climate protection, bundling many activities in this area into its Carbon Management Programme.

PAUL HODGES

Chairman, International eChem

"If you have significant output of plastics for single use, you need to rethink your strategy."



Stefan Altwasser, BASF's head of new technologies & licensing, responsible for chemical catalysts, says the company is currently involved in several projects and partnerships where it believes it can make step changes to improve existing or develop new processes. These may relate to improving selectivity, maximising energy or process efficiencies, or optimising process sustainability, for example minimising carbon dioxide (CO₂) output or using CO₂ as a feedstock.

Altwasser says BASF takes a broad approach, working with technology providers and engineering companies: BASF does the catalyst development while its partners work on the actual process.

"The target is to have a step-change technology combination of a new process and the right catalyst," says Altwasser.

A recent success is the development of a process to produce methanol without releasing any CO₂ emissions. BASF has tested the

technology at pilot-scale and says if it successfully implements the process at industrial scale, the entire production route from synthesis gas (syngas) to pure methanol will no longer release CO₂.

"We are optimistic that our climate-friendly approach will better adapt methanol synthesis to the requirements of the 21st century," says project manager Maximilian Vicari from BASF's Intermediates division. Vicari expects it will be around 10 years before the new process is carried out at an industrial-scale plant.

Another area of success relates to the conversion of syngas to dimethyl ether (DME), work that it is undertaking with Linde Engineering. The two German companies have developed a one-step conversion process, which Altwasser says has a higher yield, enhanced energy efficiency and an improved CO₂ footprint compared with the conventional two-step route.

A methanol equivalent, DME can be used as an intermediate to produce olefins such as ethylene and propylene.

BASF has signed a Memorandum of Understanding with China's Sichuan Lutianhua to co-develop a pilot plant using the process, with start-up planned in 2020. Altwasser expects commercialisation in 2022 or 2023. Germany's BSE Engineering is also working with BASF, which will provide tailored catalyst, for converting CO₂ and excess energy in small-scale decentralised production units into methanol.

Another of BASF's aims is to create the world's first electrical heating concept for steam crackers within the next five years. It notes that if the energy required for a cracker to break down naphtha into olefins and aromatics came from renewable electricity instead of natural gas, CO₂ emissions could be cut by as much as 90%.

Altwasser says his team is currently working on 20 projects at different stages, noting that BASF will continue to engage in joint development programmes with external companies if there is a "good catalyst business opportunity".

HUGE CAPEX BY INEOS

It would be amiss to write about chemicals investment without mentioning INEOS, which has announced a plethora of projects in Europe during 2018 and 2019 so far. Underpinning its spending spree is a move to ensure a sustainable, secure and reliable supply of feedstocks – the UK-based group is a major buyer of ethylene and propylene in Europe.

The biggest of the announcements is the gas cracker and propane dehydrogenation (PDH) plant to be built in Antwerp, Belgium. INEOS says the €3bn investment is the largest it has ever made and the cracker will be first new such facility in Europe in 20 years.

INEOS CEO and chairman James Ratcliffe says the investment will "reverse years of decline in the European chemicals sector" while

STEFAN ALTWASSER
Head of new technologies
& licensing, BASF

"The target is to have a step-change technology combination of a new process and the right catalyst"



Rob Ingram, CEO of INEOS Olefins & Polymers Europe, says the highly energy efficient assets will give the company a "competitive and sustainable cost base" and "significantly strengthen the whole of the ethylene and propylene derivative chains within INEOS".

The plants, to be located directly adjacent to INEOS' existing polymerisation lines at Lillo in Antwerp harbour, will use ethane and propane gas feedstock imported from the US, delivering the low-cost economics derived from shale gas through to INEOS' olefins and derivative plants in Europe.

The 750,000 tonne/year PDH plant is due to start up in 2023 and will use Clariant's Catofin technology. Clariant says for a typical 600,000 tonne/year PDH unit, operators can benefit from increased productivity of up to \$20m over the lifetime of the Catofin 311 catalyst. The 1.25m tonne/year cracker is expected to go on line in 2024. In the UK, INEOS is spending £60m in Grangemouth to add a 10th furnace to the KG ethylene plant, improving efficiency and raising capacity. This project goes hand in hand with another ethylene expansion in Rafnes, Norway, with an additional 1m tonnes/year to be added across both plants.

The company will also spend £150m in Hull to build a new 300,000 tonne/year vinyl acetate monomer (VAM) plant, having decided in 2013 to close the original facility there, which it bought from BP in 2008. At the time, INEOS cited a difficult trading environment

and cheap imports from the US and Saudi Arabia for its decision.

And finally, after a couple of years in the planning, INEOS Phenol confirmed in July that it would proceed with a world-scale cumene plant in Marl, Germany. Based on Badger technology, the facility will have a capacity of 750,000 tonnes/year and be ready to go on stream in 2021. The location at Marl means the plant will use existing pipeline connections between INEOS' phenol and acetate site in Gladbeck, Evonik's Chemiepark in Marl and BP's refinery and cracker complex in Gelsenkirchen. INEOS says this will optimise efficiency by integrating raw materials from BP's complex and secure feedstock supply to its phenol and acetone plants, both in Gladbeck and Antwerp "for decades to come".

BOREALIS FOCUSES ON PDH

Borealis too is building a PDH plant in Belgium, at its existing site in Kallo, which is connected via pipeline to the main propylene suppliers and consumers in the Benelux area. The Austrian-headquartered group is spending €1bn on the facility, which will produce 744,000 tonnes/year of propylene to meet growing demand as well as for Borealis' internal use for downstream PP production. Start-up is expected in the second quarter of 2022.

Propylene supply is declining as steam crackers are shifting to light feedstocks and there is lower gasoline demand from refineries, says Borealis CEO Alfred Stern. At the same time, demand for propylene is rising due to an expanding market for PP.

"Investments are needed to ensure a reliable and competitive platform for existing and continuous growth in propylene and its derivatives in Europe. We also want to strengthen our security of supply," Stern says.

Borealis also has plans to hike PP capacity at its Beringen site in Belgium by around 280,000 tonnes/year, by retrofitting its Borstar



EUROPEAN OLEFIN PROJECTS

| Company | Location | Product | Unit* | Capacity, 000 tonnes/year | On-stream |
|--------------------------|-----------------------------|-----------|---------------|---------------------------|-----------|
| Borealis | Antwerp, Belgium | Propylene | PDH | 750 | 2022 |
| INA | Rijeka, Croatia | Propylene | FCC | 85 | 2020 |
| INEOS | Grangemouth, UK | Ethylene | Steam cracker | +130 to 830 | 2021 |
| INEOS | Antwerp, Belgium | Ethylene | Steam cracker | 1,250 | 2023 |
| INEOS | Antwerp, Belgium | Propylene | PDH | 750 | 2024 |
| MOL | Szazhalombatta, Hungary | Propylene | FCC | +65 to 165 | 2021 |
| MOL | Tiszaújváros, Hungary | Ethylene | Steam cracker | +75 to 365 | 2022 |
| | | Propylene | | +60 to 215 | |
| OMV | Burghausen, Germany | Ethylene | Steam cracker | +150 to 600 | 2021 |
| | | Propylene | | +70 to 280 | |
| Slovnaft | Bratislava, Slovak Republic | Ethylene | Steam cracker | +60 to 300 | 2022 |
| | | Propylene | | +30 to 150 | |
| Zakłady Chemiczne Police | Police, Poland | Propylene | PDH | 425 | 2023 |

» technology. The project is currently in the front end engineering design phase with start-up scheduled for the third quarter of 2022. The additional capacity will meet rising demand in flexible and rigid packaging applications as well as to support the automotive industry, for which Borealis says PP is the fastest-growing polymer material. Plastics such as PP are substituting metal in various car parts to enable lightweighting, increase efficiency and reduce CO2 emissions.

In March 2018, Borealis signed a joint development agreement with Kazakhstan's United Chemical Co (UCC) to develop an ethylene/PE complex. The project is expected to comprise an ethane cracker with an ethylene capacity of 1.17m tonnes/year and two 625,000 tonne/year Borstar PE plants. A final investment decision is expected in 2020 and the complex could be up and running in the fourth quarter of 2025.

Borealis says the project would significantly strengthen its position in the CIS markets, which are growing at higher rates than those in western Europe and hold great potential for building its business for advanced PE grades.

Given the push towards recycling, Borealis has also been investing in recycling facilities in Europe in anticipation of substantial growth in

this part of the market. The company has acquired two leading mechanical plastics recyclers – mtm plastics in 2016 and Ecoplast in 2018. In addition, Borealis is co-operating with OMV to scale up and advance a chemical recycling process for post-consumer plastic waste. The OMV ReOil pilot plant, which is fully integrated into its refinery at Schwechat, Austria, recycles plastic waste into synthetic crude, which can be reused in the refinery or used as a plastics feedstock, creating a closed loop. One more scale-up step of the plant is planned before reaching final industrial-scale capacity.

AN OPPORTUNITY AND CHALLENGE

Undoubtedly, petrochemical investments will continue in Europe to secure sustainable business in the future. Recycled polymers will play a big role here, especially given that EU targets dictate that all plastic packaging must be recyclable or recycled in the region by 2025, with a ban on single-use plastics going into effect by 2021. It is a huge opportunity for companies, but also a big challenge for those who are still operating on a “business-as-usual” scenario, says Paul Hodges, chairman of consultancy International eChem.

He comments: “We have to rethink the business model for the petrochemical and

ALFRED STERN
CEO, Borealis

“Investments are needed to ensure a reliable and competitive platform for existing and continuous growth in propylene and its derivatives in Europe”



polymer industry. Half of all global PE output is single use and a quarter of PP is single use, which equates to substantial volumes.”

While Hodges concedes that there are going to be a lot of plastics investments that are not destined for single-use applications, he notes that some senior industry managers have still not fully grasped yet that this part of the market will disappear.

“The future is not going to come from virgin plastics. If you have significant output of plastics for single-use, you need to rethink your strategy. Companies need to develop circular economy objectives and focus on the opportunity to develop recycled plastics.”

Key advice, as not investing for a sustainable future – whatever form that takes – means your business may not survive the years to come. ■

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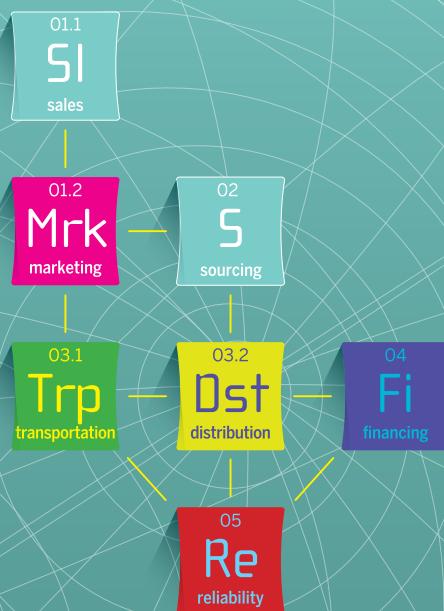


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