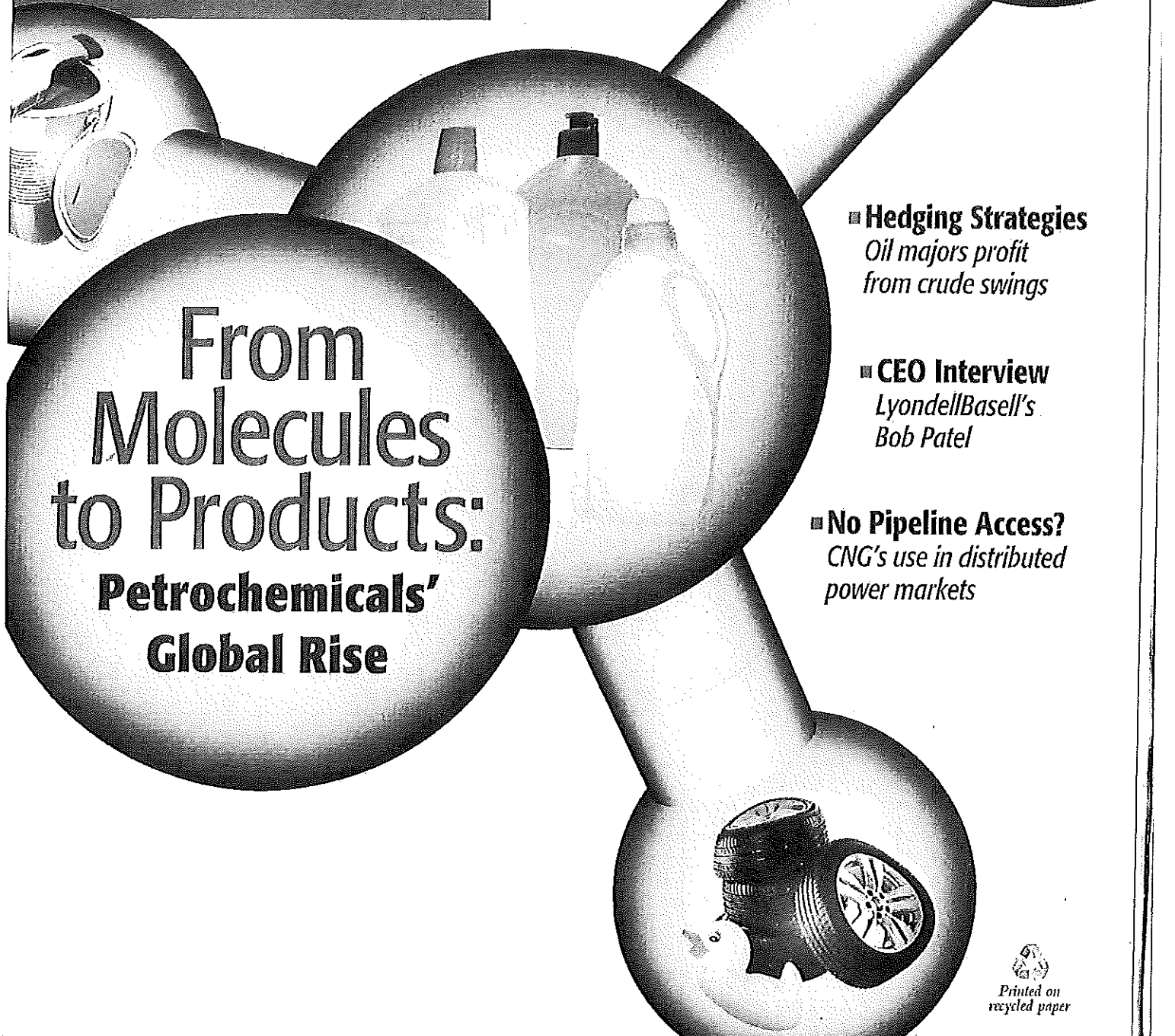


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FUEL

The Global Business of Fuels



From Molecules to Products: Petrochemicals' Global Rise

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"LyondellBasell has taken a different approach to growth than many of our peers, choosing our investments through the expansion of existing ethylene production facilities, rather than through the construction of large, new assets. This approach has allowed us to add incremental ethylene capacity ahead of our peers."

— Bob Patel, CEO and chairman, LyondellBasell

He noted that the surge in ethane and propane feedstocks from North America is expected to dramatically reduce production costs of ethylene and propylene. These products could likely overtake the market of naphtha-based ones in Asia. However, the decision to shift feedstocks will be a difficult one for producers to make heading into 2016.

Meanwhile, Houston-based energy research firm Wood Mackenzie sees lower oil prices translating to lower naphtha prices at levels that will allow it to be competitive against coal and ethane-based supply. Although the CTO route will still bring a new wave of supply by 2020, this will be delayed due to the near-term slowdown of some projects.

Ethylene demand growth is expected to remain despite China's economic transition. Therefore, with decelerated CTO supply growth and resilient demand, a longer window of opportunity for improved profitability has emerged for Asia's naphtha-based producers, according to the firm.

"Wood Mackenzie does not expect oil prices to remain at current levels for the long term. However, while [CTO] supply was previously expected to account for 27% of China's ethylene production by 2020—growing from a proportion of only 5% in 2014—this time frame has a greater degree of uncertainty," Stephen Zinger, vice president of chemicals at Wood Mackenzie, was quoted as saying earlier this year.

"The longer the delay due to issues with project financing related to the low-oil price environment, the later production would come online," Zinger said, noting that naphtha is priced in direct relation to crude oil; therefore, oil prices have made it more competitive for olefin production vs. coal in the near term.

Like the U.S., China is also committed to investments in building out on-purpose propylene production units. Instead of utilizing propane like U.S. producers to make propylene, China producers seek to use coal and/or methanol as their primary feedstocks.

"They [China] is going to be almost 90% self-sufficient by 2018 or 2019, and that's coming from a position of maybe being less than 50% self-sufficient," Eramo said.

"We [the U.S.] are going to swing the balance of trade in propylene around the world because China is making massive investments in on-purpose propylene technology because of their growing consumption in the country," he noted.

KPMG's Shannon agrees with Eramo's assessment of China's prospects for being an emerging olefin producer and consumer, which could potentially trigger broader market impacts on the petrochemical landscape.

"I'm very bullish on China," he said. "I think the big question is: where's the next growth and expansion from a market perspective?"

Other global markets

Petrochemical outlooks from other established and emerging regions and countries examined for this report are experiencing growth and competition despite lower commodity prices and unique challenges.

Europe

The European chemical industry is expected to take relative benefit from the positive development in EU manufacturing, but the improvement in 2015 is still relatively modest because of higher energy and feedstock prices in the 28-member bloc, according to Dorothee Arns, executive director of petrochemicals and plastic additives for the European Chemical Industry Council (Cefic).

"It is wrong to conclude that the lower oil prices of the past couple of months have solved the competitive-ness issue of the petrochemical and chemical industry in Europe," Arns told *FUEL*.

"The structural issues facing the European industry remain: high feedstock costs, high energy costs, high regulatory costs and complexity. Even after the recent decline in oil prices the production costs of the basic chemical building block ethylene remains twice as high in Europe as in the U.S., and this competitiveness gap is well



"Low-cost producers sell lower prices because the guys who set the prices on the high end of the cost curve are seeing lower costs because crude fell and, therefore, naphtha fell, and so prices have come down. In other words, the high-cost guys just got some breathing room."

— Mark Eramo, vice president, Chemical Market Insights, IHS Chemical

reflected by trade data on petrochemicals, which underline that Europe is experiencing a significant decrease in exports to the rest of the world," Arns said.

It's not all doom and gloom for Europe, Arns said, noting opportunities for a high level of production integration, large domestic markets with strong nearby industry clusters, an established infrastructure and a skilled workforce will remain the backbone for the continent's growth prospects ahead.

"Additionally, a huge part of our [chemical] output is based on base chemicals other than ethylene, such as propylene, benzene and four-carbon streams [such as butadiene], which is not the case elsewhere," according to Arns.

"This wider portfolio range, together with the traditionally strong innovation efforts in Europe, will certainly help to generate new growth clusters to solve the upcom-

ing societal megachallenges, such as energy-efficient uses or new materials," Arns noted.

Cefic's latest "Chemicals Trends Report" noted that European chemical output grew just 0.1% during the first two months of 2015 compared to the same period in 2014, while producer prices fell 6.8% year-on-year.

Meanwhile, Europe's GDP is forecast to grow by 1.65% in 2015, up from 1.3% in 2014, according to Cefic's report.

"This implies that the European economy is even doing better than expected," Arns told *FUEL*.

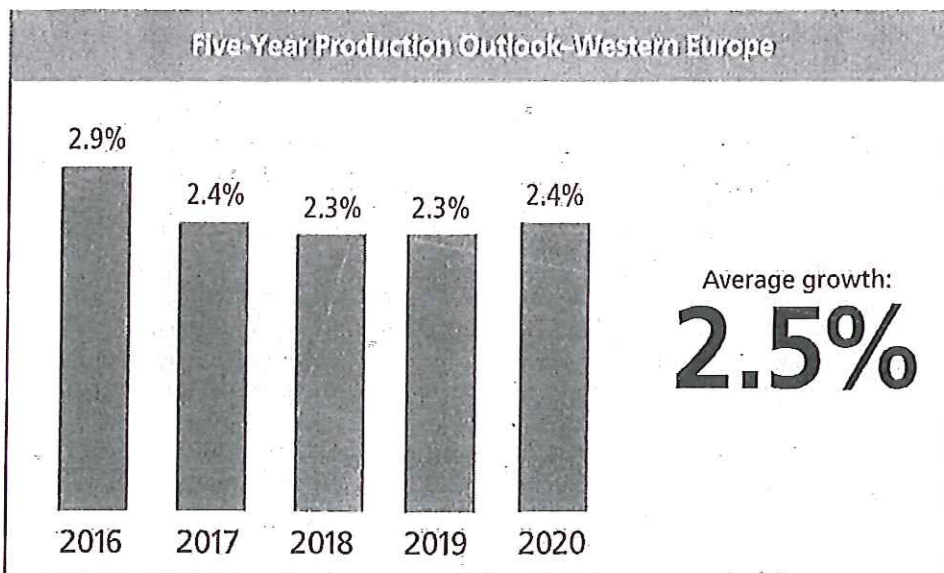
"The lower oil prices are supporting people's purchasing power and consumption in major economies and, hence, GDP growth. From today's point-of-view, GDP growth in EU-28 is estimated to be 1.8% in 2016," she said.

The U.S.-based ACC is more optimistic than Cefic on the outlook for Europe's chemical production in 2015. It forecasts overall output growth for Western Europe of 1.9% this year, rising to 2.1% in 2016.

With respect to individual countries in the 28-member bloc, some envision improved production and demand prospects this year heading into 2016.

For example, most companies in the U.K.'s £50-billion (US\$77.9 billion) chemical industry predict they will increase sales and exports this year, according to a survey conducted in April by the U.K.'s Chemical Industries Association (CIA).

The trade body found that nearly 60% of companies expect sales and export growth, while nearly 50% of businesses intend to increase capital expenditure and grow employment numbers.



Source: American Chemistry Council

Not as many U.K.-based chemical businesses expect their margins to increase as a result of higher sales; 25% of respondents expect margins to increase whereas 18% expect margins to fall. The majority expect their profit margins to stay the same, the CIA found.

In Germany, chemical production is forecast to increase 1.5% this year, according to the German Chemical Industry Association; however, margins are forecast to remain compressed in the short term with prices for chemical products expected to fall by 2%.

Canada

In Canada, producers of industrial chemicals are projecting sales volumes and profits to slightly decline in 2015, according to a survey of members by the Chemistry Industry Association of Canada (CIAC).

CIAC's members expect overall sales to drop 7% this year, to CA\$23.7 billion (US\$20.1 billion), mainly on lower global commodity prices. They also forecast small declines in exports, profits and employment.

Profitability will remain strong by historical terms; however, operating profits are expected to reach CA\$3.86 billion (US\$2.9 billion), nearly flat with 2014 levels, while capital investment is expected to increase 30% to CA\$3.4 billion (US\$2.7 billion) in 2015, which, if achieved, would be the second-most profitable year on record.

Meanwhile, the Bank of Canada projects GDP growth of 2.4% in 2015.

"This bullish outlook reinforces the message that companies in Canada are ready to take advantage of the attractive investment climate that currently exists," according to the CIAC.

Middle East

The Middle East region's petrochemical industry is facing a host of challenges, including a dwindling supply of advantaged gas feedstock, competition from many shale gas-based projects in the U.S. and the explosive growth of China's coal-to-chemicals industry.

Growth in the petrochemical industry in the six Gulf Cooperation Council (GCC) countries is projected to slow to 7.1% year-over-year (y-o-y) through 2020 compared with 11% y-o-y in the last 10 years, according to the Gulf Petrochemical and Chemical Association (GPCA), which represents the downstream hydrocarbon industry in the Arabian Gulf.

In 2014, petrochemical production in the GCC rose by 4.5%, the second-highest growth region in the world, the GPCA noted.

Regional growth in chemicals production was largely attributed to a surge in plastic production, which grew by 6% in 2014, nearly twice the world-wide average. Meanwhile, global production of chemicals rose by 2.8% last year; a similar figure seen in 2013, according to the GPCA.

New US Chemical Production Projects Thanks To Shale Gas

More than 215 new chemical production projects valued at more than \$135 billion have been announced for development through 2015 due to advantaged shale gas feedstock:

- BASF is planning its most expensive plant ever, a propylene facility on the U.S. Gulf Coast. In addition to the U.S. Gulf Coast propylene plant, BASF expanded a Texas ethylene facility it owns with France-based Total SA.
- Chevron Phillips Chemical has announced the construction of a petrochemical facility in Baytown, Texas. The U.S. Gulf Coast project includes a 1.5-million-metric-ton-per-year (MMmt/y) ethane cracker and two 500,000 mt/y capacity polyethylene facilities.
- ExxonMobil Corp. is planning an ethane cracker in Baytown, 25 miles east of Houston. The facility will have an annual capacity of up to 1.5 million tons of ethylene feedstock from ethane. Its two polyethylene processing units, now under construction near Houston, are capable of producing 650,000 tons per year of the plastics components. This is the chemical company's largest U.S. investment.
- Formosa Plastics is developing a 1.2-MMmt/y ethylene plant in Point Comfort, Texas. The facility is expected to cost around \$3 billion and include units producing 1.2 MMmt/y of ethylene, 600,000 mt/y of propylene and 400,000 mt/y of high-density polyethylene and is estimated to become fully operational in 2017.
- South Africa-based Sasol approved construction of an \$8.1-billion plant in the U.S. that will convert natural gas into plastics and other products from shale gas. The plant converts ethane into ethylene, which is used to make chemicals such as glycol and ethylene oxide. The cracker will have a capacity of 1.5 MMmt/y.
- Total Petrochemicals & Refining USA filed environmental permit applications to build an ethane cracker on the U.S. Gulf Coast. The plant will have a maximum capacity of 1 MMmt/y of ethylene. ■

Source: KPMG

"This development is a testament to the ambitious growth plans of the Arabian Gulf's chemicals industry is based on solid fundamentals," Abdulwahab Al-Sadoun, secretary general of the GPCA, was quoted as saying.

"The region has grown nearly 60% over the global average, an achievement that is made all the more significant when you consider that this progress was made despite continuing economic uncertainty in Europe and a recent slowdown in China," Al-Sadoun said.

Saudi Arabia continues to be the GCC's most dynamic petrochemicals market, with new fertilizer and plastic projects coming online, as well as innovative research centers being launched by companies like Saudi Basic Industries Corp. (SABIC), Rabigh Refining and Petrochemical Co., Sadara Chemical Co., Saudi International Petrochemical Co. and Tasnee.



"It's been kind of a growing and expanding industry and now with all the money being invested back here in North America to take advantage of shale I think we run the risk of having a lot more cyclical. Companies need to think about further developing out their supply chain because we're going to have to export chemical molecules in one shape or form."

— Michael Shannon, global head of chemicals and performance technologies, KPMG

"While production growth is certainly a positive development, GCC chemicals producers must not rest on their laurels. The petrochemicals sector is tied into global economic trends and demographic demand, meaning that we in the Arabian Gulf could be affected by developments from around the world," Al-Sadoun said.

"However, what we are seeing in the GCC is that local producers are not only expanding capacities, but also capturing value-added opportunities—Safco's new fertilizer plant, for example, is capable of capturing 850,000 million tons of carbon dioxide per year, enabling this SABIC affiliate to be the operator of one of the largest carbon capture and utilization facilities in the world.

"Moving forward, the picture looks positive," Al-Sadoun continued. "As Sadara [joint venture between Dow Chemical Co. and Saudi Aramco] formally comes onstream this year, 14 of the 26 units operated by the company will manufacture products that have never been produced in the Arabian Gulf, signaling that an era of diversification is imminent."

India

Growing at a compounded annual growth rate (CAGR) of about 14%, the petrochemicals industry in India is forecast to reach 100 billion (US\$1.58 billion) by 2020 from the current size of around 40 billion (US\$630.6 million), according to an April study released by the Associated Chambers of Commerce and Industry of India (ASSOCHAM).

"Petrochemicals currently contribute about 30% to India's 120 billion [US\$1.9 billion] chemical industry, which is likely to grow at a CAGR of 11% over the next few years and touch 250 billion [US\$3.94 billion] by 2020," according to the study.

"The petrochemicals sector is one of the fastest-growing segments with a growth rate of 13%, which is more than twice the growth of India's gross domestic prod-

uct and also the global growth rate in the petrochemical space, which is stagnant at 6%."

Securing feedstock, the right product mix and mergers and acquisition opportunities are key imperatives for India's petrochemical industry, ASSOCHAM pointed out in the study.

Compared to the U.S. and China, ASSOCHAM indicated that India's per-capita consumption of polymers is still relatively nascent; however, opportunity exists to reach out to a large population and sustain current economic growth, which would drive the country's polymer consumption.

The organization further highlighted lucrative opportunities in segments like specialty chemicals and specialty polymers, as well as an emerging manufacturing hub, as key factors for advancing the sector ahead. ■

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