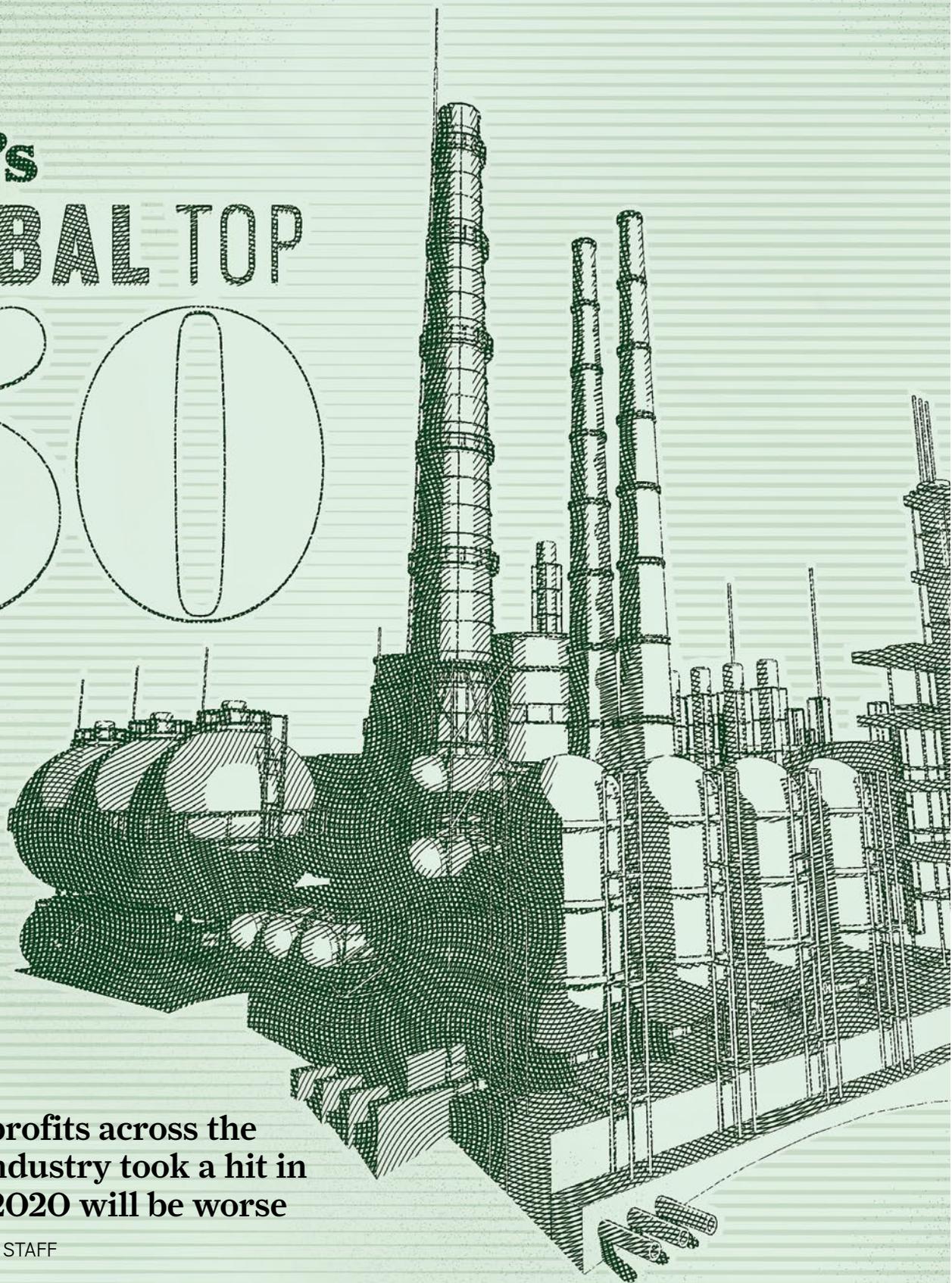


# c&en's GLOBAL TOP

# 50



**Sales and profits across the chemical industry took a hit in 2019, and 2020 will be worse**

ALEX TULLO, C&EN STAFF

# It's no secret that the COVID-19 pandemic has thrown the global economy into the deepest recession in decades, wrecking big chemical end markets such as automotive, aerospace, and oil exploration.

But as evidenced by C&EN's latest Global Top 50 survey of chemical producers, which is based on data from the 2019 fiscal year, economic activity was slowing down before anyone had heard of the novel coronavirus.

The group of 50 firms posted \$855.6 billion in chemical revenues for 2019, a 5.0% decline versus the year before.

Earnings posted an even stronger drop. The 46 companies that state operating income reported a combined \$71.5 billion in profits, 28.2% below 2018. One firm, Sasol, reported a loss, something the largest chemical firms haven't done in years.

Explaining the reasons for the poor 2019 performance, executives cited trade tensions between the US and China, China's slowing economy, and sluggishness in key markets such as auto manufacturing.

These companies most certainly have a deeper downturn ahead of them this year. Because of COVID-19, the auto industry ground to a complete halt during the second quarter, oil prices collapsed, and the consumer economy has been decimated in the new stay-at-home world.

Predictions for 2020 are dour. The American Chemistry Council expects a 4.6% contraction in global gross domestic product this year and a 6.0% decline in the US. The trade group's base case is that US chemical volumes will drop by 9.3% in 2020.

The management consulting firm Deloitte expects a 15% decline in US chemical revenue. The credit ratings agency Moody's forecasts a 20% decline in profits for US chemical makers.

The German trade group, VCI, reported some good news in May: a 3.2% increase in German chemical production for the first quarter of 2020. But it noted that 75% of members expect European sales to decline for the full year.

Even with all the volatility, there weren't many big changes in C&EN's ranking this year. Last year's top company, DowDuPont, broke up into Dow, DuPont, and Corteva Agriscience. Of those three, Dow and DuPont both make the ranking, returning at numbers 3 and 14, respectively. BASF

reclaims the top spot. And China's Sinopec is now second.

Hengli Petrochemical, which has grown precipitously, is another newcomer, debuting at a hefty 26th.

Dropping out of the pack are Huntsman, which recently spun off its pigments business and sold its intermediates unit, and Celanese, which didn't have enough sales to make the cut.

## 1 BASF

► **2019 chemical sales:** \$66.4 billion  
With the breakup last year of DowDuPont, BASF reclaimed its spot at the head of C&EN's Global Top 50 ranking. Perhaps, though, the German giant should be looking over its shoulder: sales at China's Sinopec are less than \$5 billion behind. And lately, BASF has been engaging in portfolio tightening that includes the divestment of some midsize businesses. Last summer, BASF agreed to sell its pigment unit to the Japanese chemical maker DIC, shedding sales of about \$1.1 billion in organic and inorganic pigments. In late December, BASF inked a deal to sell its construction chemicals business, with annual sales of about \$2.8 billion, to the private equity firm Lone Star. In the plus column, BASF made a modest acquisition earlier this

**BASF chairman Martin Brudermüller, speaking at the company's virtual annual shareholders' meeting last month**



year when it purchased Solvay's nylon 6,6 business for \$1.4 billion. And in a major organic growth initiative, the company began work on a \$10 billion chemical complex—to be the firm's third-largest globally—in Zhanjiang, China. The first unit to start up, in 2022, will be an engineering plastics compounding plant. Operations at the rest of the facility will commence over the remainder of the decade.

## 2 Sinopec

► **2019 chemical sales:** \$61.6 billion  
Sinopec's sales slipped by about 7% in 2019, but owing to the breakup of DowDuPont, the Chinese firm still moved up one spot in C&EN's survey and is now the second-largest chemical company in the world. Early 2020 was tough on Sinopec due to the COVID-19 pandemic. With operations mostly in China, Sinopec experienced the impacts before many companies did. "We believe that as the control and prevention of outbreak continues to improve domestically, the domestic demand for petroleum and petrochemical products that was suppressed and frozen will rebound quickly," chairman Zhang Yuzhou wrote at the end of March. The company launched a major project with LyondellBasell Industries late last year when the two companies committed to build a propylene oxide/styrene plant in Zhenhai, China.

## 3 Dow

► **2019 chemical sales:** \$43.0 billion  
Dow—just Dow now, no longer Dow Chemical—split off last April from the firm that topped the previous C&EN survey, DowDuPont. The new Dow rejoins the ranking at number 3. The company is smaller than it was pre-DowDuPont, having sent its agrochemical business to Corteva Agriscience and several specialty chemical businesses, such as electronic and building materials, to the new DuPont. Dow is now more tightly focused on petrochemicals and plastics, and its big moves have been in this area. For example, it is expanding its Freeport, Texas, ethylene cracker complex. And it is installing propane dehydrogenation technology at an ethylene cracker in Louisiana. Although demand for Dow resins used in food packaging has held up during the COVID-19 pandemic, Dow had to throttle back polymer output due to slowness in other markets. It idled three polyethylene and two elastomers plants for more than 30 days. The plants—in the US and Argentina—represent about

10% of Dow's total capacity. Dow hopes to achieve carbon neutrality by 2050 through projects such as processing recycled plastics back into chemicals. It also has an agreement with Shell to develop technology to use heat from renewable electricity, instead of fossil fuel combustion, to make ethylene.

## 4 Sabic

► **2019 chemical sales:** \$34.4 billion  
Last month, Saudi Aramco completed the purchase of a 70% stake in Sabic for \$69 billion. Both companies are owned by the Saudi government, so the change in control is perhaps academic. But now one of the largest petrochemical companies and one of the largest oil companies will be under one roof. The move is a centerpiece of Aramco's strategy to plunge deeper into petrochemicals because it projects that they will be the fastest-growing market for oil and gas. "The strategic integration of our upstream production and downstream chemicals feedstock production with Sabic's chemicals platform is expected to create opportunities," Aramco CEO Amin Nasser says in a statement. Beyond the Sabic purchase, Aramco is investing tens of billions of dollars in its own chemical projects. Meanwhile, Sabic is making investments of its own. It plans to increase its stake in the Swiss specialty chemical maker Clariant from 25% to more than 31%, and it is building a \$10 billion petrochemical complex in Texas with ExxonMobil.

## 5 Ineos

► **2019 chemical sales:** \$32.0 billion  
Ineos was born in 1998 with the purchase of an ethylene oxide facility in Antwerp, Belgium. In the subsequent 20 years it grew to become the fifth-largest chemical company in the world. It did so through ambitious acquisitions of chemical businesses that large oil and chemical companies no longer wanted. It continues with that tradition, signing a \$5 billion deal last month to acquire BP's purified terephthalic acid and acetyls businesses. Ineos bought BP's polyolefin business back in 2005. And it was BP that originally owned that first ethylene oxide plant. Like many large chemical makers, Ineos has been rolling out sustainability initiatives. In cooperation with the start-up Agilyx, Ineos's Styrolution unit will build a plant in Illinois that breaks down postconsumer polystyrene into styrene. With another start-up, Plastic Energy, Ineos will build a pyrolysis plant that converts mixed plastic

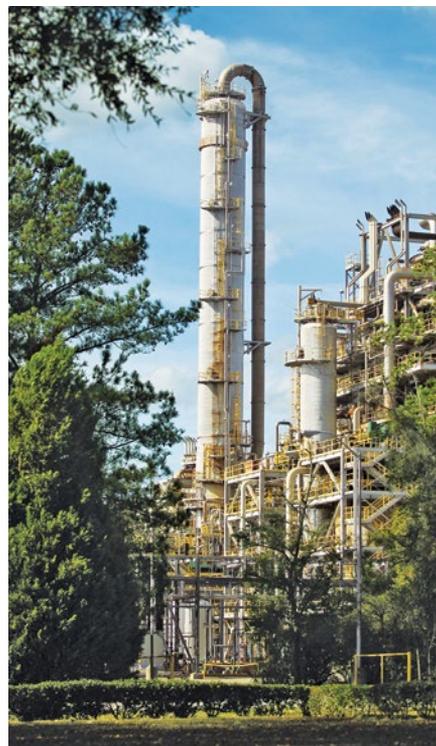
waste into a feedstock that Ineos will convert into new plastic.

## 6 Formosa Plastics

► **2019 chemical sales:** \$31.4 billion  
Formosa Plastics started up an ethylene cracker at its Point Comfort, Texas, site, late last year. It is now commissioning units downstream from the cracker, including a low-density polyethylene plant. Meanwhile, an affiliate, Formosa Petrochemical, is conducting site preparation work on the so-called Sunshine Project, a \$9.4 billion petrochemical cracker complex in St. James Parish, Louisiana. The plant faces community opposition. One organization, RISE St. James, asked Formosa for permission to conduct a Juneteenth ceremony at an area of the site where human remains were discovered. Formosa declined, citing "safety concerns on an active construction site."

## 7 ExxonMobil Chemical

► **2019 chemical sales:** \$27.4 billion  
COVID-19 has strained the finances of ExxonMobil, the largest American oil company. Oil prices cratered in 2020 due to lack of demand because people were staying home. In the first quarter of this year, ExxonMobil's earnings swung to a loss. As a result, the company is uncharacteristi-



The dehydration tower at BP's South Carolina purified terephthalic acid plant

cally pulling back on capital spending projects. ExxonMobil has many chemical projects that could be impacted. For example, the firm is planning an ethylene cracker in Daya Bay, China. It is also rumored to be considering an ethylene cracker project in Appalachia in the eastern US. Already underway are a \$10 billion chemical complex in Texas with Sabic and  $\alpha$ -olefins, propylene-ethylene copolymer, and polypropylene facilities at other US locations.

## 8 Mitsubishi Chemical

► **2019 chemical sales:** \$27.4 billion  
Mitsubishi Chemical was an active investor over the past year. It is buying Morrisville, Pennsylvania-based Gelest, a small maker of silicon chemicals, methacrylates, and metal-organic compounds. Mitsubishi will also acquire Minger Group, a Swiss recycler of high-end polymers such as polyether ether ketone and polyvinylidene difluoride. Among capital projects, Mitsubishi is dusting off plans to build a large methyl methacrylate (MMA) plant in the US based on the firm's Alpha technology, which derives MMA from ethylene, methanol, and carbon monoxide. It is an alternative to the more traditional acetone cyanohydrin process, which is based on hydrogen cyanide and acetone. The Japanese company has been kicking around the project since at least 2014.

## 9 LyondellBasell Industries

► **2019 chemical sales:** \$27.1 billion  
LyondellBasell is making a major push into China. The company has formed a joint venture with Liaoning Bora Enterprise Group for a petrochemical project in Panjin that will feature an ethylene cracker as well as a polyethylene unit and a pair of polypropylene plants. The Chinese news agency Xinhua said the first phase of the project will cost \$2.5 billion and that the partners envisage spending a total of \$12 billion. Separately, LyondellBasell and Sinopec are planning a propylene oxide/styrene plant in Zhenhai, China, by 2022. LyondellBasell continues to invest in plastic recycling. It is building a pilot plant in Ferrara, Italy, to test a pyrolysis-based recycling technology that breaks down mixed plastic waste into a chemical feedstock. Despite brisk sales of resins for food packaging, LyondellBasell took a hit from the COVID-19 pandemic. It temporarily put major projects on hold, including a massive propylene oxide/*tert*-butyl alcohol plant it is building in Texas.

# Global Top 50

With last year's number 1—DowDuPont—gone, BASF regains the top of the ranking, with Sinopec close behind.

| RANK |                   | COMPANY                           | CHEMICAL SALES (\$ MILLIONS) | CHANGE FROM 2018 | CHEMICAL SALES AS % OF TOTAL SALES | HEAD-QUARTERS | CHEMICAL OPERATING PROFIT <sup>b</sup> (\$ MILLIONS) | CHANGE FROM 2018 | CHEMICAL OPERATING PROFIT AS % OF TOTAL OPERATING PROFIT | CHEMICAL OPERATING PROFIT MARGIN <sup>c</sup> | IDENTIFIABLE CHEMICAL ASSETS (\$ MILLIONS) | CHEMICAL ASSETS AS % OF TOTAL ASSETS | OPERATING RETURN ON CHEMICAL ASSETS <sup>d</sup> |
|------|-------------------|-----------------------------------|------------------------------|------------------|------------------------------------|---------------|--|------------------|--|---|--|--------------------------------------|--|
| 2019 | 2018 <sup>a</sup> |                                   |                              |                  |                                    |               |  |                  |  |   |  |                                      |  |
| 1    | 1                 | BASF                              | \$66,401                     | -5.4%            | 100.0%                             | Germany       | \$5,457  | -22.8%           | 100.0%   | 8.2%  | \$97,336                                   | 100.0%                               | 5.6%   |
| 2    | 2                 | Sinopec                           | 61,596                       | -7.0             | 14.7                               | China         | 2,402  | -36.1            | 19.2   | 3.9   | 25,461                                     | 12.2                                 | 9.4  |
| 3    | —                 | Dow                               | 42,951                       | -13.4            | 100.0                              | US            | 3,520  | -35.8            | 100.0  | 8.2   | 60,524                                     | 100.0                                | 5.8  |
| 4    | 4                 | Sabic                             | 34,420                       | -18.3            | 92.4                               | Saudi Arabia  | 4,277  | -55.1            | 106.9  | 12.4  | 78,100                                     | 94.3                                 | 5.5  |
| 5    | 6                 | Ineos                             | 32,009                       | -8.6             | 100.0                              | UK            | 2,477  | -39.0            | 100.0  | 7.7   | n/a  | n/a                                  | n/a  |
| 6    | 5                 | Formosa Plastics <sup>e</sup>     | 31,425                       | -16.5            | 66.7                               | Taiwan        | n/a  | n/a              | n/a  | n/a   | n/a  | n/a                                  | n/a  |
| 7    | 7                 | ExxonMobil Chemical               | 27,416                       | -15.5            | 10.7                               | US            | 955  | -77.1            | 4.9  | 3.5   | 36,920                                     | 10.2                                 | 2.6  |
| 8    | 9                 | Mitsubishi Chemical               | 27,353                       | -6.0             | 83.3                               | Japan         | 1,659  | -31.2            | 92.9   | 6.1   | 37,826                                     | 80.4                                 | 4.4  |
| 9    | 8                 | LyondellBasell Industries         | 27,128                       | -11.9            | 78.1                               | US            | 4,613  | -17.8            | 105.3  | 17.0  | n/a  | n/a                                  | n/a  |
| 10   | 21                | Linde                             | 25,429                       | 76.9             | 90.1                               | UK            | 4,898  | 65.4             | 92.6   | 19.3  | n/a  | n/a                                  | n/a  |
| 11   | 11                | LG Chem                           | 24,554                       | 1.6              | 100.0                              | South Korea   | 768  | -60.1            | 100.0  | 3.1   | 29,185                                     | 100.0                                | 2.6  |
| 12   | 13                | Air Liquide                       | 24,171                       | 4.9              | 98.5                               | France        | 2,260  | 0.3              | 100.9  | 9.4   | 45,889                                     | 97.4                                 | 4.9  |
| 13   | 12                | PetroChina                        | 22,733                       | -4.4             | 6.2                                | China         | 496  | -56.2            | 2.8  | 2.2   | n/a  | n/a                                  | n/a  |
| 14   | —                 | DuPont                            | 21,512                       | -4.8             | 100.0                              | US            | 2,788  | 29.7             | 100.0  | 13.0  | 69,396                                     | 100.0                                | 4.0  |
| 15   | 10                | Reliance Industries               | 20,640                       | -15.6            | 22.0                               | India         | 3,630  | -20.6            | 44.0   | 17.6  | 18,594                                     | 11.2                                 | 19.5   |
| 16   | 15                | Toray Industries                  | 17,344                       | -8.2             | 85.4                               | Japan         | 1,288  | -7.7             | 89.6   | 7.4   | n/a  | n/a                                  | n/a  |
| 17   | 18                | Sumitomo Chemical                 | 15,231                       | -6.5             | 76.3                               | Japan         | 569  | -52.5            | 45.2   | 3.7   | 19,039                                     | 61.3                                 | 3.0  |
| 18   | 16                | Evonik Industries                 | 14,674                       | -12.8            | 100.0                              | Germany       | 1,330  | -32.4            | 100.0  | 9.1   | 24,654                                     | 100.0                                | 5.4  |
| 19   | 20                | Shin-Etsu Chemical <sup>f</sup>   | 14,158                       | -3.2             | 100.0                              | Japan         | 3,724  | 0.6              | 100.0  | 26.3  | 29,632                                     | 100.0                                | 12.6   |
| 20   | 17                | Covestro                          | 13,895                       | -15.1            | 100.0                              | Germany       | 824  | -70.8            | 100.0  | 5.9   | 12,894                                     | 100.0                                | 6.4  |
| 21   | 19                | Braskem                           | 13,267                       | -9.8             | 100.0                              | Brazil        | 555  | -71.7            | 100.0  | 4.2   | 17,274                                     | 100.0                                | 3.2  |
| 22   | 22                | Lotte Chemical                    | 12,973                       | -8.6             | 100.0                              | South Korea   | 950  | -43.7            | 100.0  | 7.3   | 17,193                                     | 100.0                                | 5.5  |
| 23   | 24                | Yara                              | 12,858                       | -0.5             | 100.0                              | Norway        | 989  | 146.0            | 100.0  | 7.7   | 16,725                                     | 100.0                                | 5.9  |
| 24   | 25                | Solvay                            | 12,568                       | -0.6             | 100.0                              | Belgium       | 1,488  | -2.2             | 100.0  | 11.8  | 23,852                                     | 100.0                                | 6.2  |
| 25   | 23                | Mitsui Chemicals                  | 12,282                       | -9.7             | 100.0                              | Japan         | 657  | -23.3            | 100.0  | 5.4   | 13,576                                     | 100.0                                | 4.8  |
| 26   | —                 | Hengli Petrochemical <sup>g</sup> | 11,839                       | 67.8             | 81.2                               | China         | n/a  | n/a              | n/a  | n/a   | n/a  | n/a                                  | n/a  |
| 27   | 32                | Bayer                             | 11,482                       | 15.3             | 23.6                               | Germany       | n/a  | n/a              | n/a  | n/a   | n/a  | n/a                                  | n/a  |
| 28   | 27                | Indorama                          | 11,362                       | 1.6              | 100.0                              | Thailand      | 294  | -68.7            | 100.0  | 2.6   | 12,260                                     | 100.0                                | 2.4  |
| 29   | 29                | Syngenta                          | 10,588                       | 1.7              | 78.0                               | Switzerland   | 2,199  | 8.8              | 97.1   | 20.8  | n/a  | n/a                                  | n/a  |
| 30   | 30                | DSM                               | 10,086                       | -2.8             | 100.0                              | Netherlands   | 1,025  | -25.2            | 100.0  | 10.2  | 15,049                                     | 100.0                                | 6.8  |
| 31   | 28                | Asahi Kasei                       | 10,027                       | -7.1             | 50.8                               | Japan         | 847  | -28.7            | 43.6   | 8.4   | 13,586                                     | 53.0                                 | 6.2  |
| 32   | 40                | Wanhua Chemical                   | 9,851                        | 12.3             | 100.0                              | China         | 1,745  | -25.1            | 100.0  | 17.7  | 14,022                                     | 100.0                                | 12.4   |
| 33   | 33                | Arkema                            | 9,782                        | -0.9             | 100.0                              | France        | 984  | -11.3            | 100.0  | 10.1  | 12,288                                     | 100.0                                | 8.0  |
| 34   | 26                | Chevron Phillips Chemical         | 9,333                        | -17.5            | 100.0                              | US            | n/a  | n/a              | n/a  | n/a   | 16,868                                     | 100.0                                | n/a  |
| 35   | 31                | Eastman Chemical                  | 9,273                        | -8.6             | 100.0                              | US            | 1,309  | -14.1            | 100.0  | 14.1  | 16,008                                     | 100.0                                | 8.2  |
| 36   | 35                | Borealis                          | 9,071                        | -2.8             | 100.0                              | Austria       | 676  | 27.8             | 100.0  | 7.5   | 11,327                                     | 100.0                                | 6.0  |
| 37   | 39                | Air Products & Chemicals          | 8,919                        | -0.1             | 100.0                              | US            | 2,121  | 10.7             | 100.0  | 23.8  | 18,943                                     | 100.0                                | 11.2   |
| 38   | 34                | Mosaic                            | 8,906                        | -7.1             | 100.0                              | US            | 543  | -53.1            | 100.0  | 6.1   | 19,299                                     | 100.0                                | 2.8  |
| 39   | 38                | Ecolab <sup>f</sup>               | 8,904                        | -0.7             | 59.2                               | US            | 1,234  | 9.5              | 60.7   | 13.9  | n/a  | n/a                                  | n/a  |
| 40   | 48                | Johnson Matthey <sup>f</sup>      | 8,819                        | 21.8             | 47.4                               | UK            | 410  | -26.7            | 59.6   | 4.6   | 2,703                                      | 57.0                                 | 15.2   |
| 41   | 50                | Hanwha Solutions <sup>f</sup>     | 8,569                        | 25.0             | 79.0                               | South Korea   | 342  | 11.8             | 95.9   | 4.0   | 15,129                                     | 77.7                                 | 2.3  |
| 42   | 45                | Umicore <sup>f</sup>              | 8,196                        | 6.6              | 41.9                               | Belgium       | 406  | -12.2            | 72.8   | 4.9   | 7,310                                      | 93.0                                 | 5.6  |
| 43   | 37                | SK Innovation                     | 8,186                        | -10.7            | 19.1                               | South Korea   | 605  | -36.9            | 55.6   | 7.4   | n/a  | n/a                                  | n/a  |
| 44   | 41                | Westlake Chemical                 | 8,118                        | -6.0             | 100.0                              | US            | 693  | -51.9            | 100.0  | 8.5   | 13,261                                     | 100.0                                | 5.2  |
| 45   | 46                | Sasol                             | 7,995                        | 7.7              | 56.7                               | South Africa  | -586   | def              | def  | def   | 21,637                                     | 68.0                                 | def  |
| 46   | 42                | Nutrien                           | 7,729                        | -4.9             | 38.6                               | Canada        | 2,129  | -7.3             | 84.1   | 27.5  | 24,885                                     | 53.2                                 | 8.6  |
| 47   | 36                | PTT Global Chemical               | 7,660                        | -17.9            | 57.6                               | Thailand      | 195  | -81.8            | 73.2   | 2.6   | 9,829                                      | 67.4                                 | 2.0  |
| 48   | 43                | Lanxess                           | 7,614                        | -5.5             | 100.0                              | Germany       | 626  | -4.1             | 100.0  | 8.2   | 9,734                                      | 100.0                                | 6.4  |
| 49   | 44                | Tosoh                             | 7,211                        | -8.8             | 100.0                              | Japan         | 749  | -22.7            | 100.0  | 10.4  | 8,132                                      | 100.0                                | 9.2  |
| 50   | 47                | DIC                               | 7,050                        | -4.6             | 100.0                              | Japan         | 379  | -14.6            | 100.0  | 5.4   | 7,366                                      | 100.0                                | 5.1  |

**Note:** Some figures converted at 2019 average exchange rates of US\$1.00 = 3.944 Brazilian reais, 6.9081 Chinese renminbi, 0.8933 euros, 70.38 Indian rupees, 109.02 Japanese yen, 3.75 Saudi riyals, 14.4475 South African rand, 1165.8 South Korean won, 0.9937 Swiss francs, 30.906 New Taiwan dollars, and 31.042 Thai baht. **def** means deficit. **n/a** means not available. **a** Prior-year rankings have been revised from the July 29, 2019, issue of C&EN to reflect restated prior-year results and changes in exchange rates. **b** Chemical sales less administrative expenses and cost of sales. **c** Chemical operating profit as a percentage of chemical sales. **d** Chemical operating profit as a percentage of identifiable chemical assets. **e** C&EN estimates. **f** Sales include a significant amount of nonchemical products.

## 10 Linde

► **2019 chemical sales:** \$25.4 billion  
Last year was Linde's first full year since its merger with Praxair to form an industrial gas giant. The company's \$25.4 billion in sales puts it at number 10 in C&EN's ranking this year. It also edged out Air Liquide to become the largest industrial gas producer in the world. Linde's moves since the merger have been modest. With Hyosung, it is spending \$245 million to build the world's largest liquid hydrogen facility in Ulsan, South Korea, by 2022. The companies aim to supply the fuel to

seeing 30% annual growth in nanotubes, driven mostly by sales to makers of electric-vehicle batteries. With the agricultural giant Archer Daniels Midland, LG is developing a biobased route to acrylic acid. LG already makes petrochemical-based acrylic acid.

## 12 Air Liquide

► **2019 chemical sales:** \$24.2 billion  
Air Liquide is no longer the world's largest industrial gas maker after being edged out by Linde, which merged with Praxair

sales slide by 4% last year due to a slowing economy, even before COVID-19 hit the country. PetroChina's profits, following a trend among large petrochemical makers, dropped a mighty 56% in 2019. Undeterred, the company is building a slate of petrochemical projects. It is expanding capacity to make the polymer acrylonitrile-butadiene-styrene in Jieyang, China. There, it's also using Honeywell technology to build the largest single-train *p*-xylene plant in the world. And PetroChina is planning facilities in China to make ethylene out of ethane.

## 14 DuPont

► **2019 chemical sales:** \$21.5 billion  
After DuPont split off from DowDuPont last June, it soon became clear that the company was by no means done with its portfolio reshuffling. By December, DuPont had inked a deal to merge its nutrition and biosciences unit—which had \$6.1 billion in sales last year from products like enzymes and probiotics—with International Flavors & Fragrances. DuPont is divesting \$2 billion worth of smaller units, including its DuPont Sustainable Solutions consulting business. In February, DuPont's board ousted CEO Marc Doyle and replaced him with chairman and former CEO Ed Breen. The company blamed disappointing performance, but Wall Street saw the move as a harbinger of more aggressive divestitures to come. The company's electronic materials unit is often cited as a business ripe for a sale. "With no clear successor following the departure of CEO Marc Doyle, it is more likely, in our view, that Mr. Breen ultimately sells or fully breaks up DuPont," Deutsche Bank stock analyst David Begleiter wrote to clients in February.

## 15 Reliance Industries

► **2019 chemical sales:** \$20.6 billion  
Saudi Aramco's acquisition of Sabic isn't the only large deal meant to turn Aramco into a major player in petrochemicals. The Saudi national oil company has been negotiating to buy a 20% stake in Reliance Industries' petrochemical and refining business for \$15 billion. The Saudi and Indian firms have a deep relationship, as Aramco has long been a crude oil supplier to Reliance's refinery, the world's largest, in Jamnagar, India. However, the deal hasn't been completed due to COVID-19-related uncertainty in energy markets. Reliance may spin off the business as a means of easing into a partnership with Aramco.



A Linde hydrogen trailer in Unterschleissheim, Germany

passenger vehicles. With BASF, Linde has been working on a method to separate helium from natural gas. The technology uses a polyimide hollow-fiber separation membrane from Evonik Industries as an alternative to the customary—and expensive—cryogenic method of recovering the noble gas.

## 11 LG Chem

► **2019 chemical sales:** \$24.6 billion  
LG Chem's polystyrene plant in Visakhapatnam, India, was the site of a tragedy earlier this year when a styrene leak killed 12 people and injured hundreds more. The plant was restarting after being shut down due to COVID-19 restrictions. Officials are looking into whether operators were following proper procedures. Elsewhere, the company is investing more than \$50 million to triple its carbon nanotube capacity in South Korea. LG says it is

toward the end of 2018. However, barely \$1 billion separates the two companies, so their positions could very well flip again in the future. Air Liquide seems determined to catch up. The French firm is spending \$270 million to build a pair of air separation units on the US Gulf Coast, in part to support Methanex's methanol project in Geismar, Louisiana. It is also investing about \$220 million in facilities in Tainan and Hsinchu, Taiwan, that will supply high-purity gases to three new semiconductor plants. Air Liquide is also involved in green chemistry projects. It is supplying carbon dioxide to Solidia, which is launching a process to use the greenhouse gas to cure concrete.

## 13 PetroChina

► **2019 chemical sales:** \$22.7 billion  
The chemical business of PetroChina, one of China's largest oil companies, saw its

## 16 Toray Industries

► **2019 chemical sales:** \$17.3 billion  
 COVID-19 has not been kind to Toray. The Japanese company's carbon fiber and composites unit, which sells to aerospace applications, had been one of its strongest performers. The business' sales grew by 9.7% and its profits swelled by 81.6% during the fiscal year that ended March 31.

But with the pandemic hitting aerospace harder than most other industries, Toray Composite Materials America was recently forced to shut down a plant in Spartanburg, South Carolina, and reduce capacity in Tacoma, Washington. About a quarter of the businesses' workforce was affected. The company expects the poor sales to last another 3–5 years.

## 17 Sumitomo Chemical

► **2019 chemical sales:** \$15.2 billion  
 Sumitomo Chemical and another Japanese chemical firm, DIC, didn't like the credit ratings they were getting from US-based Moody's, so they recently dropped the service and went exclusively with Japan Credit Rating Agency. In many places, such a move would be seen as changing referees because the calls aren't going your way. Sumitomo has another perspective: "A gap in ratings between Moody's and Japanese rating companies tends to confuse investors," an investor relations representative tells C&EN. Sumitomo had a tough fiscal year—it saw sales decline by 6.5% and profit fall by 52.5%—but it wasn't an outlier among chemical firms. Sumitomo made a sizable acquisition this year when it bought the South American crop protection chemical and seed treatment business of Australia's Nufarm for nearly \$1.2 billion.

## Spending

Most companies increased capital and R&D spending in 2019.

|                           | CHEMICAL CAPITAL SPENDING |                     |                           | CHEMICAL R&D SPENDING |                     |                           |
|---------------------------|---------------------------|---------------------|---------------------------|-----------------------|---------------------|---------------------------|
|                           | 2019<br>(\$ MILLIONS)     | CHANGE<br>FROM 2018 | % OF<br>CHEMICAL<br>SALES | 2019<br>(\$ MILLIONS) | CHANGE<br>FROM 2018 | % OF<br>CHEMICAL<br>SALES |
| Air Liquide               | \$2,913                   | 18.0%               | 12.1%                     | \$355                 | 5.7%                | 1.5%                      |
| Air Products & Chemicals  | 1,990                     | 26.9                | 22.3                      | 73                    | 13.0                | 0.8                       |
| Arkema                    | 711                       | 7.4                 | 7.3                       | 279                   | 5.1                 | 2.8                       |
| Asahi Kasei               | 958                       | 20.6                | 9.6                       | n/a                   | n/a                 | n/a                       |
| BASF                      | 4,281                     | -1.8                | 6.4                       | 2,416                 | 6.4                 | 3.6                       |
| Borealis                  | 421                       | 15.2                | 4.6                       | 162                   | 13.2                | 1.8                       |
| Braskem                   | 680                       | -0.9                | 5.1                       | 63                    | 13.0                | 0.5                       |
| Covestro                  | 1,019                     | 28.7                | 7.3                       | 298                   | -3.6                | 2.1                       |
| DIC                       | 312                       | 8.6                 | 4.4                       | 115                   | -3.2                | 1.6                       |
| Dow                       | 1,961                     | -6.2                | 4.6                       | 765                   | -4.4                | 1.8                       |
| DSM                       | 582                       | -8.0                | 5.8                       | 391                   | 0.3                 | 3.9                       |
| DuPont                    | 2,472                     | -35.6               | 11.5                      | 955                   | -10.7               | 4.4                       |
| Eastman Chemical          | 425                       | -19.5               | 4.6                       | 234                   | -0.4                | 2.5                       |
| Evonik Industries         | 985                       | -14.7               | 6.7                       | 479                   | -6.8                | 3.3                       |
| ExxonMobil Chemical       | 1,933                     | 29.4                | 7.1                       | n/a                   | n/a                 | n/a                       |
| Hanwha Solutions          | 802                       | 52.7                | 9.4                       | 45                    | 61.4                | 0.5                       |
| Indorama                  | 537                       | 2.0                 | 4.7                       | 13                    | 2.6                 | 0.1                       |
| Johnson Matthey           | 364                       | 41.8                | 4.1                       | 254                   | 4.7                 | 2.9                       |
| Lanxess                   | 569                       | 2.2                 | 7.5                       | n/a                   | -3.4                | 1.7                       |
| LG Chem                   | 5,351                     | 47.8                | 21.8                      | 940                   | 8.7                 | 3.8                       |
| Linde                     | 3,828                     | 103.5               | 15.1                      | n/a                   | n/a                 | n/a                       |
| Lotte Chemical            | 765                       | -51.7               | 5.9                       | 73                    | -8.4                | 0.6                       |
| LyondellBasell Industries | 2,529                     | 37.0                | 9.3                       | 111                   | -3.5                | 0.4                       |
| Mitsubishi Chemical       | 1,914                     | 0.4                 | 7.0                       | n/a                   | n/a                 | n/a                       |
| Mitsui Chemicals          | 659                       | 35.2                | 5.4                       | 334                   | 1.7                 | 2.7                       |
| Mosaic                    | 1,272                     | 33.3                | 14.3                      | n/a                   | n/a                 | n/a                       |
| Reliance Industries       | 1,038                     | 378.5               | 5.0                       | n/a                   | n/a                 | n/a                       |
| Sabic                     | 5,323                     | 37.7                | 15.5                      | n/a                   | n/a                 | n/a                       |
| Sasol                     | 3,009                     | 9.5                 | 37.6                      | n/a                   | n/a                 | n/a                       |
| Shin-Etsu Chemical        | 2,462                     | 18.3                | 17.4                      | 445                   | -14.0               | 3.1                       |
| Sinopec                   | 3,248                     | 14.6                | 5.3                       | n/a                   | n/a                 | n/a                       |
| Solvay                    | 841                       | 8.7                 | 6.7                       | 362                   | 8.8                 | 2.9                       |
| Sumitomo Chemical         | 793                       | -33.1               | 5.2                       | n/a                   | n/a                 | n/a                       |
| Syngenta                  | n/a                       | n/a                 | n/a                       | 546                   | -26.9               | 5.2                       |
| Tosoh                     | 560                       | -5.7                | 7.8                       | 167                   | 9.6                 | 2.3                       |
| Umicore                   | 506                       | 14.5                | 6.2                       | 215                   | 10.2                | 2.6                       |
| Wanhua Chemical           | n/a                       | n/a                 | n/a                       | 247                   | 5.9                 | 2.5                       |
| Westlake Chemical         | 787                       | 12.1                | 9.7                       | n/a                   | n/a                 | n/a                       |
| Yara                      | 1,066                     | -20.2               | 8.3                       | 60                    | 39.5                | 0.5                       |

**Note:** Figures are for companies reporting capital and/or R&D expenditures. n/a means not available.

## 18 Evonik Industries

► **2019 chemical sales:** \$14.7 billion  
 Evonik continues its streak of portfolio moves meant to increase its focus on specialty chemicals. In February, the company closed its \$640 million purchase of PeroxyChem, a US maker of hydrogen peroxide and peracetic acid. Last August, Evonik sold its methacrylates business to the private equity firm Advent International for \$3.4 billion. The business was renamed Röhm after acrylic pioneer Otto Röhm. Evonik has also been busy in the laboratory. For example, Creavis, its innovation unit, developed an anion-exchange membrane for electrolyzing water into oxygen and hydrogen more efficiently than traditional electrolysis. Chemical companies hope to use renewable energy and cheap electrolysis to derive chemicals from water and carbon dioxide rather than hydrocarbons. In that vein, the German firm and Siemens are building a test facility for technology that makes industrial chemicals from CO<sub>2</sub> and water.

## 19 Shin-Etsu Chemical

► **2019 chemical sales:** \$14.2 billion  
 Shin-Etsu had a better 2019 than most Japanese firms, posting a modest 3.2% decline in sales and a slight increase in profits. Bright spots for the company were its silicones and semiconductor silicon businesses. Only Shin-Etsu's polyvinyl chloride (PVC) unit showed a significant drop in sales and profits, following the trend across the commodity chemical industry. PVC profitability may improve now

that Shin-Etsu has started up an ethylene cracker in Plaquemine, Louisiana. Back-integrating into PVC raw materials is a long-held goal for the company.

## 20 Covestro

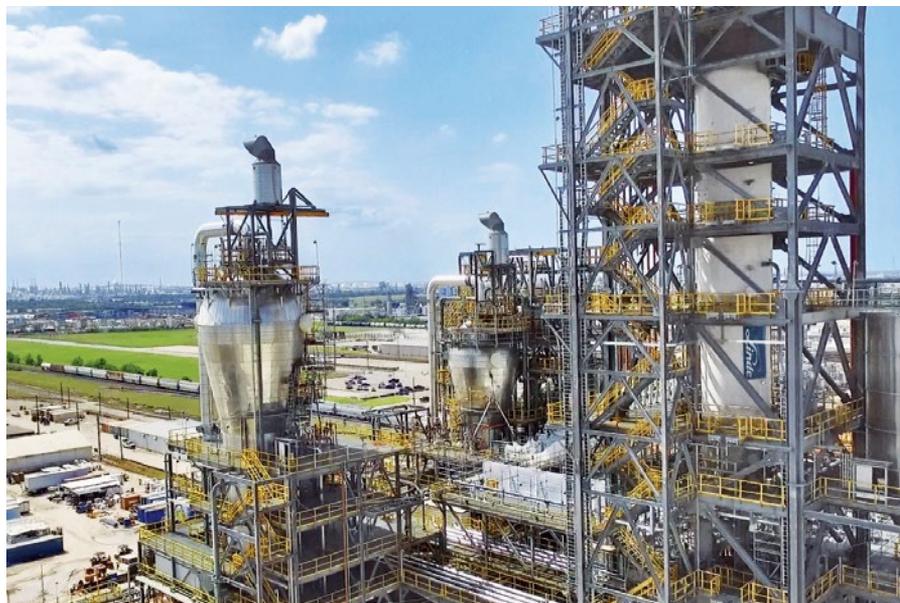
► **2019 chemical sales:** \$13.9 billion  
Even before COVID-19, Covestro, a German polyurethane and polycarbonate maker, was facing obstacles. In January, due to what it called “challenging global market conditions,” the company announced an 18–24-month delay of its methylene diphenyl diisocyanate (MDI) project in Baytown, Texas. The \$1.7 billion investment in the polyurethane raw material—Covestro’s largest ever—was originally planned for completion in 2024. The company has had sunnier news on the environmental front. It secured a \$240 million loan from the European Investment Bank to fund sustainability R&D projects, such as finding better ways to recycle plastic waste. And Covestro is introducing a polycarbonate film in which more than 50% of the carbon content comes from plant-based raw materials supplied by the Finnish firm Neste.

## 21 Braskem

► **2019 chemical sales:** \$13.3 billion  
Braskem fetched some really positive headlines earlier this year. When the COVID-19 pandemic threatened the firm’s polypropylene operations in the US, workers volunteered to live at plants in West Virginia and Pennsylvania so they could keep making materials used for nonwoven fabrics for face masks. This was more than they had to do. Most chemical companies merely followed the social distancing and safety guidelines issued by the US government. Despite the pandemic, the Brazilian company managed to put the final touches on a polypropylene plant in La Porte, Texas, the first such facility to be built in North America since 2003. Braskem has been conducting test runs at the plant this month.

## 22 Lotte Chemical

► **2019 chemical sales:** \$13.0 billion  
Lotte got a toehold in the US market through an ethylene cracker complex in Louisiana that it built with the US firm Westlake Chemical. The South Korean chemical maker erected its own ethylene glycol plant downstream from the joint venture. Late last year, it tweaked the partnership by selling a 35% interest in the cracker to Westlake for \$800 million.



Braskem’s new polypropylene plant in La Porte, Texas

Separately, it sold a polyethylene terephthalate plant in England to Mexico’s Alpek. At home, Lotte secured an agreement to buy purified terephthalic acid (PTA) from Hanwha General Chemical, allowing it to convert its own PTA facility in Ulsan, South Korea, into a purified isophthalic acid plant.

## 23 Yara

► **2019 chemical sales:** \$12.9 billion  
Farmers want their fertilizers cheap, so for producers the name of the game is low-cost production and logistics. Yara is an outlier among fertilizer companies in emphasizing technology. For example, the Norwegian firm recently invested \$3 million in Boost Biomes, a start-up developing microbial products that assist in crop-nutrient uptake. Yara is conducting a feasibility study for electricity-derived hydrogen for its ammonia plant in Pilbara, Australia. It is investigating digital farming with IBM and is trying to develop autonomous ships for fertilizer delivery. The company even took home a Silver Dolphin award in International Communications at the Cannes Film Festival for its film *From Earth to Table*.

## 24 Solvay

► **2019 chemical sales:** \$12.6 billion  
While the COVID-19 pandemic has hit most chemical firms hard, it has absolutely crushed Solvay because of its

exposure to aerospace, automotive, and oil and gas—three of the most impacted industries. The Belgian firm’s sales for April and May in these sectors dropped 40%. Other Solvay businesses merely saw a 20% decline. Things are so bad that Solvay took a \$1.7 billion write off, mostly related to its 2015 purchase of the aerospace-composites specialist Cytec Industries. Even before COVID-19, the business was troubled, as Boeing cut output of its 737 Max airplanes. Amidst the difficulties, Solvay sold its nylon 6,6 business to BASF. It is also spending about \$200 million to expand a soda ash plant in Wyoming in response to burgeoning demand for the glass ingredient in the developing world.

## 25 Mitsui Chemicals

► **2019 chemical sales:** \$12.3 billion  
Mitsui Chemicals has a new CEO, 33-year company veteran Osamu Hashimoto. He took over on April 1 from Tsutomu Tanonawa, who moved into the chairman role. Hashimoto assumes the helm at a challenging time. COVID-19 deeply impacted Mitsui in the fiscal year that ended March 31, helping push its sales down by 9.7% and its profits by 23.3%. The outlook for the 2020 fiscal year is dim as well. Hashimoto recently said he expects sales to the auto industry to decline 20% year-over-year. And he promised an “in-depth” restructuring of Mitsui’s basic materials business. ■

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