

c&en's GLOBAL TOP

50

Sales were up in a strong 2018, and the ranking has a new top company, DowDuPont

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For the global chemical industry, 2018 was another strong year, yet it showed signs of a slowdown, according to C&EN's annual survey of the Global Top 50 chemical companies. Sales rose healthily for the group during 2018, the fiscal year on which the survey is based. Excluding PetroChina, which reported chemical sales for only 2018, chemical companies in the top 50 combined for \$926.8 billion in chemical revenue, an increase of 13.4% from the same companies' sales the year before.

Earnings didn't increase as much, an indication, possibly, that the market might be losing its steam. For the 48 chemical firms posting comparable year-over-year results, chemical operating profits rose only 3.4%, to \$110.1 billion.

Twenty-three firms posted profit declines. Interestingly, six out of eight Japanese firms on the list reported a drop in earnings.

One factor that might explain the softening profitability is the petrochemical building cycle. Ethylene and polyethylene plants are coming on line in the US, putting a damper on profit margins globally. Petrochemical softening is always particularly acute in Asia, where profit margins are slim to begin with. Indeed, India's Reliance Industries reports that the new capacity was a business headwind all year.

Leading the Global Top 50 is a new company: DowDuPont, the result of the 2017 merger between Dow Chemical and DuPont. It ends BASF's 12-year reign as the largest chemical com-

pany in the world, but only temporarily. DowDuPont already split into three separate firms—Dow, DuPont, and Corteva Agriscience—earlier this year. Dow and DuPont will surely appear in next year's ranking a year from now.

The Global Top 50 lost two other firms to dealmaking this year. Linde AG and Praxair merged into a new firm called Linde plc. AkzoNobel sold its specialty chemical business, Nouryon, to the private equity firm the Carlyle Group and the Singapore sovereign wealth fund GIC, and Nouryon alone didn't make the cut.

Five new firms did make the cut. The largest is PetroChina, which is breaking out chemical sales for the first time. Nutrien is the result of the merger between Potash Corporation of Saskatchewan and Agrium. Platinum-group catalyst suppliers Umicore and Johnson Matthey are on the list. US chemical maker Celanese rounds it out at number 50, where it debuts.

1 DowDuPont

► **2018 chemical sales:** \$86.0 billion
DowDuPont has broken BASF's 12-year streak as the largest chemical maker in the world. But DowDuPont's reign at the top will be brief. The company, formed on Aug. 31, 2017, has already split up into three companies. The largest of these,



Dow's site in Seneffe, Belgium, where the firm makes silicone-based products

Dow, spun off on April 1, 2019. Just like the old Dow, it is headquartered in Midland, Michigan. But the new Dow is focused more on petrochemicals and polymers than Dow Chemical was before the merger with DuPont. Dow's \$48.8 billion in sales last year would have put it at 4th in this year's Global Top 50 ranking. The new DuPont, which contains the combined firms' specialties businesses, separated on June 3. It would have secured the 14th slot with \$22.6 billion in 2018 sales. Crop protection chemical and seed businesses from Dow and DuPont were combined into Corteva Agriscience, which also separated on June 3. With \$6.3 billion in chemical sales in 2018, it would not have made the Global Top 50. Both Dow and DuPont are emerging with plans to put cash into the pockets of their shareholders. Leaders at both companies say they will shun big spending on long-term R&D in favor of less-expensive, customer-focused projects. Both companies are also preaching modesty in capital spending. This is especially the case at Dow, which is ramping up big-ticket petrochemical plants on the US Gulf Coast as well as at its \$20 billion Sadara joint venture with Saudi Aramco.

2 BASF

► **2018 chemical sales:** \$74.1 billion
DowDuPont has dethroned BASF as the world's largest chemical maker. But given that DowDuPont has already split up into Dow, DuPont, and Corteva Agriscience, the German chemical maker looks sure to reclaim the top spot next year. BASF's

strategy has been to fine-tune its portfolio with medium-sized deals. The company has put its pigment business on the selling block and also wants to divest its construction chemical unit. BASF recently merged its paper chemical business with Solenis. The company's purchase of Solvay's nylon 6,6 business has received regulatory approval and is nearly completed. On the organic growth front, BASF is aggressively investing in China. Last July, the company announced plans for a \$10 billion integrated chemical complex in Guangdong Province in southern China. On top of that, it is doubling the capacity of its ethylene cracker joint venture in China with Sinopec. The investments come amid a rough 2019 so far for BASF. The company says it will cut 6,000 jobs by 2021, and it expects a 30% decline in earnings versus 2018 because of weak demand in agriculture and high-margin chemicals.

3 Sinopec

► **2018 chemical sales:** \$69.2 billion
It was another big year for Sinopec, with a 22% increase in chemical sales to nearly \$70 billion. The Chinese petrochemical giant should claim the number 2 spot in the Global Top 50 next year because of the breakup of DowDuPont into three separate companies. The new Dow, the largest of the three firms with \$48.8 billion



A naphtha tank at BASF-YPC, Sinopec's joint venture with BASF, in Nanjing, China

in sales, isn't nearly as large as Sinopec. The third-largest chemical maker in the world is deepening its relationship with the second largest. Sinopec and BASF last year announced plans to more than double the size of their ethylene cracker partnership in Nanjing, China. That joint venture, called BASF-YPC, opened a propionic acid plant earlier this year.

4 Sabic

► **2018 chemical sales:** \$42.1 billion
In the biggest chemical deal of 2019 so far, Saudi Aramco inked an agreement to

buy a 70% stake in Sabic from the Public Investment Fund of Saudi Arabia for \$69 billion. The deal should come as no surprise. State-owned Aramco has long said it wants to plunge deeper into chemicals to minimize the blow of an eventual decline in fuel demand globally. To that end, Aramco and Sabic were already planning a massive oil-to-chemical complex in Saudi Arabia. Sabic has been expanding overseas and is involving itself more deeply in specialty chemicals. It is moving forward on a \$10 billion ethylene cracker joint venture with ExxonMobil near Corpus Christi, Texas. It may also join a large methanol project in Louisiana. In China, it is considering building a cracker in Fujian. And last year, it bought a 25% stake in the Swiss specialty chemical maker Clariant for \$2.4 billion.

5 Ineos

► **2018 chemical sales:** \$37.0 billion
Ineos is increasingly complementing its habit of buying chemical assets from big companies with plans to build ones of its own. For example, the company announced last month that it will spend \$2 billion to build acrylonitrile, linear α -olefin, and poly- α -olefin plants in Jubail, Saudi Arabia, by 2025. In Europe, Ineos picked Antwerp, Belgium, as the location for the continent's first new ethylene cracker in 20 years. The \$3.4 billion project will also include a propane dehydrogenation plant. On its home turf, Ineos unveiled a \$1.3 billion spending plan for the UK. It includes a vinyl acetate plant in Hull, England, as well as infrastructure upgrades at its Grangemouth, Scotland, petrochemical complex. Of course, Ineos is still an opportunistic buyer. It is purchasing a titanium dioxide plant in Ashtabula, Ohio, from Tronox to help clear Tronox's merger with white pigment rival Cristal. And it's buying Ashland's composites business.

6 Formosa Plastics

► **2018 chemical sales:** \$36.9 billion
The action for Taiwan's Formosa Plastics has been at its US chemical arm, which is close to completing several large expansion projects on the Gulf Coast. The company's new ethylene cracker, its third at its Point Comfort, Texas, site, is scheduled to be completed later this year. The company will open low-density and high-density polyethylene plants as well. Next year, the company will complete a polypropylene unit at the site. In 2021, at its Baton Rouge, Louisiana, site, Formosa will complete a polyvinyl chloride expansion. Another Formosa Group company,

Formosa Petrochemical, is planning its own massive \$9.4 billion project in Louisiana.

7 ExxonMobil Chemical

► **2018 chemical sales:** \$32.4 billion ExxonMobil Chemical has a new president, Karen McKee, who formerly led ExxonMobil's basic chemicals business. Under her leadership, the company is moving forward with many big-ticket investments. It is planning a large ethylene cracker, along with downstream polymers plants, in Daya Bay, China. ExxonMobil has greenlit a \$10 billion joint venture with Sabic to build a similar complex near Corpus Christi, Texas. It also gave the go-ahead to \$2 billion in projects at its Baytown, Texas, complex. It started a cracker at the site just a year ago. There, ExxonMobil will now build an α -olefin plant, entering that business, as well as a plant to make its Vis-tamaxx propylene-ethylene copolymers. It is also planning a polypropylene plant for its Baton Rouge, Louisiana, site.

8 LyondellBasell Industries

► **2018 chemical sales:** \$30.8 billion LyondellBasell Industries ended talks last month to purchase a majority stake in rival Braskem from Braskem's controlling shareholder, the Brazilian conglomerate Odebrecht. With the purchase, Lyondell-Basell would have gotten a South American petrochemical maker much like itself. The reasons why LyondellBasell walked away from the deal are unclear. In February, LyondellBasell CEO Bob Patel told financial analysts that a change in Brazil's government was delaying the deal. The government controls the state oil company Petrobras, a Braskem minority shareholder. Patel has more than just acquisitions on his mind. He is a vice chairman of the Alliance to End Plastic Waste, which aims to spend \$1.5 billion on plastic waste reduction initiatives. "Our children are being taught in school that plastics are bad," Patel said at the IHS Markit World Petrochemical Conference in San Antonio this past spring. "If we don't do something about this waste issue, then perhaps their teachers are right."

9 Mitsubishi Chemical

► **2018 chemical sales:** \$28.7 billion Mitsubishi Chemical is bringing its concept of Kaiteki—"the sustainable well-being of people, society and our planet Earth"—to the US. The Japanese company is funding the Global Kaiteki Center, which will focus on sustainability, at

Arizona State University. Chemical engineering professor George Stephanopoulos will lead it. On the business front, Mitsubishi has been reserved, making mostly modest-sized acquisitions. Last year, for example, the company bought Cleanpart Group, a German provider of cleaning and coating services for semiconductor manufacturing equipment. Mitsubishi already offered similar services through its Shinryo subsidiary. In a larger transaction, Mitsubishi's industrial gas business, Taiyo Nippon Sanso, bought Praxair's European operations. Antitrust regulators required Praxair to make the divestiture before they would clear its merger with Linde.

10 LG Chem

► **2018 chemical sales:** \$25.6 billion Already a giant in display materials, LG Chem bought soluble organic light-emitting diode technology from DuPont. The display materials can be applied using inkjet technology as opposed to the vacuum thermal evaporation process more common today. In another hot market, LG Chem is suing its fellow South Korean chemical company SK Innovation over alleged theft of lithium-ion battery trade secrets. The suit says SK hired away 77 LG battery-division employees, some of whom allegedly brought proprietary information with them.

11 Reliance Industries

► **2018 chemical sales:** \$25.2 billion The Indian conglomerate's chemical business had a strong 2018, with sales increasing 37% and profits jumping more than 50%. Reliance credits strength in the polyester chain. Profit margins for polyethylene terephthalate (PET), used in beverage bottles, increased by 32%. The company says supplies have been tight because of plant outages in the US and Europe. Meanwhile, precursors for PET—namely, purified terephthalic acid and *p*-xylene—each saw profit margins increase by 38%. One drag on Reliance's profits has been polyolefins, for which markets have been slack because of new capacity in the US. But the US is bringing benefits to Reliance as well: the company has been importing ethane from the US to run its crackers in India.

12 PetroChina

► **2018 chemical sales:** \$24.8 billion The Chinese refiner and oil, gas, and petrochemical supplier PetroChina makes its debut in the Global Top 50 this year. After years of reporting chemical results together with its refining business, obscuring sales

figures, the company broke out chemicals in its annual report this year. Much like Sinopec, a larger Chinese rival in chemicals, PetroChina makes commodity petrochemicals for a country with a large and expanding manufacturing sector thirsty for basic intermediates and polymers. The company wants to transition. It aims to "accelerate research and development on new products needed by the market," wrote the company's chair, Wang Yilin, in his annual letter to shareholders in March.

13 Air Liquide

► **2018 chemical sales:** \$24.3 billion The French industrial gas maker is committed to an open-innovation strategy. Last month it launched Accelair at its Paris Innovation Campus. This incubator will host about 20 "deep tech" start-ups, which will be afforded experimental space as well as access to Air Liquide experts. They will work on technologies in energy, the environment, aerospace, agribusiness, and health care. In March, the company inaugurated its Tokyo Innovation Campus in Japan. It invested \$60 million in the space, where 200 employees will work in fields such as advanced materials and energy efficiency. Air Liquide has also invested \$20 million in the Canadian firm Hydrogenics, which specializes in electrolysis hydrogen production equipment. The companies will collaborate on proton-exchange membrane technologies.

14 Toray Industries

► **2018 chemical sales:** \$18.7 billion Toray Industries is a giant in a market that is booming: synthetic suede. The material, made from polyurethane and polyester, has taken off in recent years in markets such as high-end car interiors. The company makes the products in Japan, and an affiliate, Alcantara, makes them in Italy. "We position our materials as being in a category of their own, not a synthetic suede or an alternative to real leather," Yasuhiro Takagi, general manager of Toray's advanced fiber material division, told C&EN last year. This year the company is launching a version with 30% biobased content. It will contain polyurethane made with castor oil and polyester made with sugar-derived ethylene glycol. Related to this business, Toray has opened Automotive Center Europe in the suburbs of Munich.

15 Evonik Industries

► **2018 chemical sales:** \$17.8 billion As part of its strategy to focus less on

Global Top 50

After 12 years of BASF dominance, DowDuPont tops the ranking.

RANK		COMPANY	CHEMICAL SALES (\$ MILLIONS)	CHANGE FROM 2017	CHEMICAL SALES AS % OF TOTAL SALES	HEAD-QUARTERS	CHEMICAL OPERATING PROFIT ^b (\$ MILLIONS)	CHANGE FROM 2017	CHEMICAL OPERATING PROFIT AS % OF TOTAL OPERATING PROFIT	CHEMICAL OPERATING PROFIT MARGIN ^c	IDENTIFIABLE CHEMICAL ASSETS (\$ MILLIONS)	CHEMICAL ASSETS AS % OF TOTAL ASSETS	OPERATING RETURN ON CHEMICAL ASSETS ^d
2018	2017 ^a												
1	2	DowDuPont ^e	\$85,977	37.6%	100.0%	US	\$8,412	56.2%	100.0%	9.8%	\$188,030	100.0%	4.5%
2	1	BASF	74,066	2.4	100.0	Germany	7,462	-23.7	100.0	10.1	102,288	100.0	7.3
3	3	Sinopec	69,210	22.4	16.2	China	3,929	13.9	32.3	5.7	23,735	12.9	16.6
4	4	Sabco	42,120	12.0	93.4	Saudi Arabia	9,518	16.8	98.3	22.6	79,751	93.4	11.9
5	5	Ineos	36,970	2.1	100.0	UK	4,289	-9.3	100.0	11.6	n/a	n/a	n/a
6	6	Formosa Plastics ^f	36,891	13.8	63.9	Taiwan	4,022	-17.5	57.2	10.9	47,977	69.9	8.4
7	7	ExxonMobil Chemical	32,443	13.1	11.6	US	4,162	-24.9	13.7	12.8	36,035	10.4	11.5
8	8	LyondellBasell Industries	30,783	8.7	78.9	Netherlands	5,615	-6.1	99.8	18.2	n/a	n/a	n/a
9	9	Mitsubishi Chemical	28,747	7.1	80.9	Japan	2,382	-12.1	82.9	8.3	39,915	79.1	6.0
10	11	LG Chem	25,637	9.7	100.0	South Korea	2,043	-23.3	100.0	8.0	26,330	100.0	7.8
11	12	Reliance Industries	25,167	37.3	22.3	India	4,706	51.9	48.6	18.7	19,008	13.0	24.8
12	-	PetroChina	24,849	n/a	7.0	China	1,184	5.9	6.5	4.8	n/a	n/a	n/a
13	10	Air Liquide	24,322	2.8	98.0	France	2,379	5.9	101.1	9.8	45,312	96.9	5.2
14	14	Toray Industries	18,651	8.7	86.2	Japan	1,378	-7.5	90.2	7.4	n/a	n/a	n/a
15	15	Evonik Industries	17,755	4.2	100.0	Germany	2,078	10.2	100.0	11.7	23,968	100.0	8.7
16	16	Covestro	17,273	3.4	100.0	Germany	2,982	-7.3	100.0	17.3	13,099	100.0	22.8
17	27	Bayer ^e	16,859	49.0	36.0	Germany	3,708	154.1	80.2	22.0	90,769	60.8	4.1
18	18	Sumitomo Chemical	16,081	8.7	76.6	Japan	1,182	-23.3	63.9	7.4	18,576	64.7	6.4
19	20	Braskem	15,885	17.7	100.0	Brazil	2,250	-16.2	100.0	14.2	16,212	100.0	13.9
20	19	Lotte Chemical	15,051	4.2	100.0	South Korea	1,790	-32.8	100.0	11.9	18,921	100.0	9.5
21	24	Linde plc	14,900	30.3	100.0	UK	2,244	-10.2	100.0	15.1	93,386	100.0	2.4
22	21	Shin-Etsu Chemical ^g	14,439	10.6	100.0	Japan	3,657	19.9	100.0	25.3	27,525	100.0	13.3
23	23	Mitsui Chemicals	13,432	11.6	100.0	Japan	846	-9.7	100.0	6.3	13,597	100.0	6.2
24	22	Solvay	13,353	3.7	100.0	Belgium	1,606	0.0	100.0	12.0	25,999	100.0	6.2
25	26	Yara	12,928	13.8	100.0	Norway	402	-12.0	100.0	3.1	16,656	100.0	2.4
26	33	Chevron Phillips Chemical	11,310	24.8	100.0	US	n/a	n/a	n/a	n/a	16,610	100.0	n/a
27	28	DSM	10,951	7.4	100.0	Netherlands	1,446	43.3	100.0	13.2	16,120	100.0	9.0
28	35	Indorama	10,747	21.2	100.0	Thailand	903	35.6	100.0	8.4	11,739	100.0	7.7
29	29	Asahi Kasei	10,654	8.1	54.2	Japan	1,174	6.3	53.5	11.0	13,517	58.0	8.7
30	30	Arkema	10,418	5.9	100.0	France	1,171	10.5	100.0	11.2	11,949	100.0	9.8
31	32	Syngenta	10,413	12.6	77.0	Switzerland	n/a	n/a	n/a	n/a	n/a	n/a	n/a
32	31	Eastman Chemical	10,151	6.3	100.0	US	1,523	8.2	100.0	15.0	15,995	100.0	9.5
33	34	Borealis	9,852	10.2	100.0	Austria	558	-39.6	100.0	5.7	11,757	100.0	4.8
34	36	SK Innovation	9,719	14.4	19.6	South Korea	1,017	-18.9	52.8	10.5	n/a	n/a	n/a
35	45	Mosaic	9,587	29.4	100.0	US	1,157	113.7	100.0	12.1	20,119	100.0	5.8
36	37	Huntsman	9,379	12.2	100.0	US	1,043	19.9	100.0	11.1	7,953	100.0	13.1
37	41	Wanhua Chemical	9,172	14.1	100.0	China	2,434	-5.2	100.0	26.5	11,638	100.0	20.9
38	43	PTT Global Chemical	8,969	15.7	55.9	Thailand	1,034	3.1	85.7	11.5	10,169	70.0	10.2
39	39	Ecolab ^g	8,964	11.0	61.1	US	1,127	6.2	57.9	12.6	n/a	n/a	n/a
40	38	Air Products & Chemicals	8,930	9.1	100.0	US	1,915	15.0	100.0	21.4	19,178	100.0	10.0
41	40	Westlake Chemical	8,635	7.4	100.0	US	1,542	13.2	100.0	17.9	11,602	100.0	13.3
42	25	Lanxess	8,505	-25.5	100.0	Germany	689	-12.3	100.0	8.1	10,266	100.0	6.7
43	-	Nutrien	8,130	75.9	41.4	Canada	2,297	252.3	78.4	28.3	24,502	53.8	9.4
44	-	Umicore ^g	8,113	27.1	50.1	Belgium	488	59.0	83.7	6.0	6,822	95.4	7.2
45	42	Sasol	8,110	4.2	59.1	South Africa	663	-43.9	49.4	8.2	21,460	66.0	3.1
46	44	Tosoh	7,803	4.7	100.0	Japan	957	-19.1	100.0	12.3	7,955	100.0	12.0
47	-	Johnson Matthey ^g	7,579	16.1	52.8	UK	585	6.8	77.4	7.7	2,766	60.5	21.2
48	46	DIC	7,296	2.0	100.0	Japan	438	-14.3	100.0	6.0	7,296	100.0	6.0
49	47	Hanwha Chemical ^g	7,273	3.3	74.2	South Korea	324	-44.7	97.2	4.5	14,616	75.0	2.2
50	-	Celanese	7,155	16.5	100.0	US	1,354	43.7	100.0	18.9	9,313	100.0	14.5

Note: Some figures converted at 2018 average exchange rates of US\$1.00 = 3.6513 Brazilian reais, 6.609 Chinese yuan, 0.8462 euros, 68.37 Indian rupees, 110.1 Japanese yen, 1099.29 Korean won, 3.75 Saudi riyals, 13.2255 South African rand, 0.9784 Swiss francs, 30.129 New Taiwan dollars, and 32.303 Thai baht. n/a means not available. **a** Prior-year rankings have been revised from the July 30, 2018, 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** Chemical sales include a significant amount of nonchemical products. **f** C&EN estimates.



Evonik has developed filaments for 3-D printing personalized bioresorbable implants.

commodity chemicals and more on specialties, Evonik Industries agreed in March to sell its methacrylate business to Advent International for \$3.4 billion. The deal comes with the fabled Plexiglas name everywhere but the US, where it is an Arkema trademark. Advent is also getting CyPlus, which supplies sodium cyanide for refining gold. Evonik is also making acquisitions. In November, the company agreed to purchase the hydrogen peroxide and peracetic acid maker PeroxyChem for \$625 million. Tying up a loose end from its 2017 purchase of Air Products' specialty chemical business, Evonik agreed to purchase Air Products' Trexlertown, Pennsylvania, campus, which houses R&D labs. Evonik plans to invest \$50 million at the site. The company is increasingly getting involved with 3-D printing. Earlier this month it introduced a line of 3-D printing filaments for bioresorbable medical implants.

16 Covestro

► **2018 chemical sales:** \$17.3 billion
Covestro unveiled plans last year for its largest-ever investment: a \$1.7 billion methylene diphenyl diisocyanate (MDI) plant in Baytown, Texas. The plant will have 500,000 metric tons of annual capacity for the polyurethane raw material when it comes on line by 2024. The former Bayer business is also doubling capacity at its MDI plant in Brunsbüttel, Germany, and spending \$340 million on capacity for aniline, an MDI precursor, in Belgium. At the same time, Covestro is cutting back. Last November, the company disclosed it is eliminating about 900 jobs, more than 5% its workforce, as part of a program to slash \$400 million in costs. It is also selling its European polyurethane systems-house business to the private equity firm H.I.G. Capital for nearly \$100 million.

17 Bayer

► **2018 chemical sales:** \$16.9 billion
Bayer, which bought Monsanto last year, has a crisis on its hands. A California court awarded a couple a total of \$2 billion in a lawsuit alleging that their non-Hodgkin's lymphoma was linked to 40 years of using Monsanto's Roundup herbicide on their property. In earlier cases, plaintiffs won awards in the tens of millions of dollars. In all, Bayer faces 13,400 potential Roundup cases. The company's stock price has declined by about 40% since it bought Monsanto, and shareholders are in revolt. "Management infected a healthy Bayer with the Monsanto virus," one major



A Bayer researcher treating a grapevine with a fungicide in Monheim am Rhein, Germany

shareholder reportedly said at the company's annual meeting in April. Perhaps because of the pressure, the company recently announced that it will spend \$5.5 billion over the next decade on new herbicide technologies.

18 Sumitomo Chemical

► **2018 chemical sales:** \$16.1 billion
The past year has demonstrated that Sumitomo Chemical sees start-ups as a conduit to new technology. Earlier this summer, the Japanese company announced it will work with the French firm Isorg to develop organic photodetectors for use in camera and smartphone fingerprint sensors. Sumitomo also invested in a food and agriculture venture fund operated by Cultivian Sandbox Ventures, which raised \$135 million to invest in sustainable food start-ups such as animal-free-collagen maker Geltor. Sumitomo is collaborating with Zymergen, an industrial biotechnology start-up, on materials for use in consumer electronics. And in the largest of such relationships with start-ups, Sumitomo acquired a \$45 million stake in Jomed, a Japanese firm developing the world's first plant to produce electronic displays via printing.

19 Braskem

► **2018 chemical sales:** \$15.9 billion
Braskem has had a peculiar 2019 so far. The company's majority shareholder, the Brazilian industrial conglomerate Odebrecht, had been negotiating a sale of its stake in Braskem to LyondellBasell Industries. Odebrecht was a key player in a massive corruption scandal, as was Braskem's other major shareholder, Petrobras, and both are eager to sell off assets to raise cash. But more than a year of negotiations yielded no deal, and now Braskem is presumably in play again. Moreover, the Brazilian petrochemical maker is contending with a potential New York Stock Exchange delisting because it has yet to file its 2017 annual report with the US Securities and Exchange Commission. It also had to suspend some chlor-alkali operations in Brazil because its brine-extraction operations were linked to earthquakes.

20 Lotte Chemical

► **2018 chemical sales:** \$15.1 billion
The large South Korean chemical maker has completed its foray into the US market. With partner Westlake Chemical, it built a \$3.1 billion petrochemical complex in Lake Charles, Louisiana. Downstream from a new cracker, Lotte built a \$1.1 billion ethylene glycol plant of its own. Lotte has boasted that the project is the largest US project completed by a South Korean petrochemical maker. And, whereas many large Gulf Coast chemical projects headed by other companies are delayed, Lotte officials are proud that their project started up on time. "Not too many people can say that," Jim Rock, director of the site for Lotte, said in February.

21 Linde plc

► **2018 chemical sales:** \$14.9 billion
Linde AG merged with Praxair last October to become Linde plc. Since the industrial gas firms were together for just a couple of months of 2018, their sales of \$14.9 billion were only a modest increase from the \$11.4 billion that Praxair alone posted in 2017. But pro forma results—the sales the companies would have had if they had been merged all year—were \$29.8 billion, enough to make Linde number 9 in the Global Top 50. That's also more than enough to make Linde the largest industrial gas company in the world, ahead of Air Liquide at \$24.3 billion in annual sales. The parties had to make a lot of concessions to get the deal past antitrust regulators. They sold most of Linde's bulk gas business in

North America to a partnership of Messer and CVC Capital Partners. The companies agreed to sell Praxair's European industrial gas business to Taiyo Nippon Sanso.

22 Shin-Etsu Chemical

► **2018 chemical sales:** \$14.4 billion
The Japanese chemical maker has been

on an investing spree. Last July, Shin-Etsu Chemical announced a \$1.5 billion investment in its vinyl business in Plaquemine, Louisiana. Then in September, the company announced a \$1 billion investment in its silicone business. Just under half of the spending is on monomer expansions in Japan and Thailand. Shin-Etsu is also investing in plants making downstream silicone

products in six countries. Additionally, the firm is spending \$125 million to expand quartz photomask blanks in Japan.

23 Mitsui Chemicals

► **2018 chemical sales:** \$13.4 billion
Quiet on the merger and acquisition front, Mitsui Chemicals is instead rolling out a series of expansions across its businesses. In Singapore, the Japanese firm will build a plant to produce α -methylstyrene, used in making petroleum resins and as a performance modifier for acrylonitrile-butadiene-styrene plastics. Also in Singapore, Mitsui will expand production of its Tafmer elastomer by 10%. And at its plant in Ichihara, Japan, the company will increase production capacity for its Lucant hydrocarbon-based synthetic oil.

Spending

Most companies boosted capital and R&D spending.

	CHEMICAL CAPITAL SPENDING			CHEMICAL R&D SPENDING		
	2018 (\$ MILLIONS)	CHANGE FROM 2017	% OF CHEMICAL SALES	2018 (\$ MILLIONS)	CHANGE FROM 2017	% OF CHEMICAL SALES
Air Liquide	\$2,605	7.2%	10.7%	\$355	2.7%	1.5%
Air Products & Chemicals	1,568	50.8	17.6	65	12.0	0.7
Arkema	698	28.8	6.7	280	0.9	2.7
Asahi Kasei	785	44.8	7.4	306	5.0	2.9
BASF	4,602	-2.6	6.2	2,397	10.0	3.2
Bayer	1,217	53.7	7.2	2,304	67.2	13.7
Borealis	386	-28.0	3.9	151	-7.7	1.5
Braskem	741	19.1	4.7	55	19.3	0.3
Celanese	337	26.2	4.7	72	-1.4	1.0
Covestro	835	36.5	4.8	326	0.7	1.9
DIC	284	-2.6	3.9	117	4.0	1.6
DowDuPont	3,837	7.5	4.5	3,060	42.9	3.6
DSM	668	25.8	6.1	411	4.2	3.8
Eastman Chemical	528	-18.6	5.2	235	3.5	2.3
Evonik Industries	1,220	-0.8	6.9	542	0.2	3.1
ExxonMobil Chemical	1,494	-55.4	4.6	n/a	n/a	n/a
Hanwha Chemical	557	108.7	7.7	29	-17.0	0.4
Huntsman	313	11.0	3.3	152	10.1	1.6
Indorama	506	-17.3	4.7	12	-0.1	0.1
Johnson Matthey	269	55.8	3.5	n/a	n/a	n/a
Lanxess	587	-9.1	6.9	139	-18.6	1.6
LG Chem	3,838	87.3	15.0	917	15.8	3.6
Linde plc	1,883	43.6	12.6	113	21.5	0.8
Lotte Chemical	1,680	-8.6	11.2	84	0.7	0.6
LyondellBasell Industries	1,846	39.5	6.0	115	8.5	0.4
Mitsubishi Chemical	1,883	8.4	6.5	n/a	n/a	n/a
Mitsui Chemicals	482	7.3	3.6	324	7.2	2.4
Mosaic	955	16.4	10.0	n/a	n/a	n/a
Sabir	3,866	26.4	9.2	n/a	n/a	n/a
Sasol	3,000	-16.0	37.0	n/a	n/a	n/a
Shin-Etsu Chemical	2,054	39.7	14.2	511	9.1	3.5
Sinopec	2,962	-15.0	4.3	n/a	n/a	n/a
Solvay	817	-2.3	6.1	351	2.4	2.6
Sumitomo Chemical	1,171	7.0	7.3	n/a	n/a	n/a
Tosoh	587	64.1	7.5	150	7.1	1.9
Umicore	467	45.9	5.8	206	16.1	2.5
Wanhua Chemical	1,555	72.7	17.0	244	30.0	2.7
Westlake Chemical	702	21.7	8.1	n/a	n/a	n/a
Yara	1,336	-0.4	10.3	43	-4.4	0.3

Note: Figures are for companies on the Global Top 50 list reporting capital and/or R&D expenditures. n/a means not available.

24 Solvay

► **2018 chemical sales:** \$13.4 billion
The Belgian chemical maker has a new head, Ilham Kadri, who at the beginning of the year replaced Jean-Pierre Clamadieu as CEO. Formerly CEO of the hygiene services firm Diversey, Kadri inherits a strategy of divesting commodity chemical businesses to focus on specialties. To that end, Solvay has nearly completed the divestiture of its nylon 6,6 business to BASF for \$1.8 billion. However, worried about industry overconcentration, the European Commission is requiring that BASF divest some Solvay assets related to nylon 6,6 polymer and raw materials such as hexamethylenediamine.

More online

For an interactive graphic of the Global Top 50 data as well as 25 more company capsules, visit cenm.ag/2019globaltop50.

25 Yara

► **2018 chemical sales:** \$12.9 billion
Yara aims to be "the crop nutrition company for the future." To get there, the Norwegian company spent \$43 million on R&D in 2018, not a king's ransom, but a lot for a fertilizer company. One fruit of that R&D effort is a sensor that clips to farmers' mobile phones. It measures chlorophyll levels in wheat, rapeseed, corn, and barley and offers fertilizer dose recommendations. "Farmers are digital first movers, using sensors, big data, cloud solutions, and satellite-supported tools," says Yara CEO Svein Tore Holsether. It's also partnering with Engie to produce "green" ammonia from renewable hydrogen. ■