

an ethylene oxide and derivatives plant in Bayport, Texas, from LyondellBasell Industries. In December, it bought Eastman Chemical's acetic acid site in Texas City, Texas.

## 12 Air Liquide

**2023 chemical sales: \$29.4 billion**

Like many industrial gas makers, Air

Liquide has sharpened its focus on sustainability in recent years. The company plans to spend \$850 million to build four air separation units to supply oxygen and nitrogen to a low-carbon hydrogen and ammonia facility that ExxonMobil is building in Baytown, Texas. The French industrial gas maker says the air separation units will also be low carbon because of renewable energy purchases and

innovative design. Separately, Air Liquide plans to build plants in Holland Township, Michigan, and Center Township, Pennsylvania, that will make biomethane from manure in anaerobic digesters. Air Liquide already runs 26 biomethane plants around the world. The firm is also getting in on the US push to set up more domestic semiconductor manufacturing. It will build a \$250 million plant for ultrapure nitrogen and other gases that will serve a memory chip plant that Micron Technology is constructing in Idaho.

## Spending

**Most companies increased capital and R&D spending budgets in 2023.**

COMPANY	CHEMICAL CAPITAL SPENDING			CHEMICAL R&D SPENDING		
	2023 (\$ MILLIONS)	CHANGE FROM 2022	% OF CHEMICAL SALES	2023 (\$ MILLIONS)	CHANGE FROM 2022	% OF CHEMICAL SALES
Air Liquide	\$3,598	4.6%	12.2%	\$334	0.3%	1.1%
Air Products and Chemicals	4,626	58.1	36.7	106	2.6	0.8
Albemarle	2,149	70.4	22.3	86	19.0	0.9
Arkema	686	-10.3	6.7	297	1.9	2.9
Asahi Kasei	793	4.7	8.8	312	4.8	3.5
BASF	5,836	23.3	7.8	2,304	-7.3	3.1
Braskem	907	-6.6	6.4	77	2.3	0.5
Celanese	568	4.6	5.2	146	30.4	1.3
Covestro	827	-8.1	5.3	405	3.6	2.6
Dow	2,356	29.2	5.3	829	-2.6	1.9
DSM-Firmenich	600	9.7	5.2	705	121.0	6.1
DuPont	619	-16.7	5.1	508	-5.2	4.2
Eastman Chemical	828	35.5	9.0	239	-9.5	2.6
Evonik Industries	858	-8.3	5.2	479	-3.7	2.9
ExxonMobil	2,826	-4.4	6.9	n/a	n/a	n/a
Hanwha Solutions	1,681	190.4	18.8	47	-22.3	0.5
Hengli Petrochemical	n/a	n/a	n/a	194	15.7	0.9
Indorama Ventures	690	-6.3	4.4	38	-10.4	0.2
Ineos	2,153	4.5	7.3	75	-6.8	0.3
LG Chem	9,918	61.1	23.5	1,556	15.2	3.7
Linde	4,716	44.9	15.4	n/a	n/a	n/a
Lotte Chemical	2,786	40.4	18.2	92	17.5	0.6
LyondellBasell Industries	1,487	-18.7	4.7	130	4.8	0.4
Mitsubishi Chemical Group	1,931	11.0	7.3	n/a	n/a	n/a
Mitsui Chemicals	1,025	8.9	8.2	318	4.0	2.6
Mosaic	1,402	12.4	10.2	n/a	n/a	n/a
Resonac Holdings	620	-0.9	6.8	304	-9.3	3.3
Rongsheng Petrochemical	n/a	n/a	n/a	926	50.1	3.5
Sabic	2,789	3.4	7.4	505	2.0	1.3
Shin-Etsu Chemical	2,665	26.7	15.5	468	-2.2	2.7
Sinopec	7,773	-6.1	13.4	n/a	n/a	n/a
Sumitomo Chemical	887	9.4	6.1	n/a	n/a	n/a
Umicore	780	98.7	7.6	229	-14.0	2.2
Wanhua Chemical Group	n/a	n/a	n/a	576	19.3	2.3
Yara	1,139	23.0	7.4	113	18.9	0.7

**Sources:** Company documents, C&EN analysis.

**Note:** Figures are for companies on the top 50 list reporting capital or R&D expenditures or both. n/a means not available. Some figures were converted at 2023 average exchange rates listed with the Top 50 list. Comparisons with prior years are based on revised numbers that reflect restated prior-year results and changes in exchange rates.

## 13 Syngenta Group

**2023 chemical sales: \$26.8 billion**

In recent years, Syngenta Group, the crop protection arm of Sinochem Holdings, has emphasized collaboration with outside firms, such as start-ups, to develop crop protection chemicals and seed traits. In June, Syngenta said it would use an InstaDeep-created artificial intelligence model. InstaDeep has trained its model on trillions of nucleotides of crop species to understand their genetic codes. Syngenta also began working with the Israeli firm Lavie Bio to develop biological insecticides. Such collaborations can bear fruit. In January, Syngenta announced that it and Enko created new molecules for controlling fungal diseases in crops.

## 14 Rongsheng Petrochemical

**2023 chemical sales: \$26.8 billion**

Rongsheng Petrochemical has been one of the key players in transforming China's chemical industry with megaprojects that integrate large refineries and big-scale petrochemical production. Its subsidiary Zhejiang Petroleum and Chemical on Dayushan Island, with 40 million metric tons per year of total capacity, is the landmark project along these lines. Keen to place bets on this trend, Saudi Aramco bought a 10% stake in Rongsheng last year for \$3.4 billion. The deal came with a crude oil supply agreement. Deepening their relationship, Rongsheng agreed to acquire a 50% stake in the Saudi Aramco Jubail Refinery in Saudi Arabia. Aramco, in turn, will buy a 50% interest in Ningbo Zhongjin Petrochemical, a Rongsheng affiliate. Separately, Rongsheng plans to spend \$9.5 billion on a complex in Jintang, China, that will make polymers such as polytrimethylene terephthalate and polybutylene terephthalate as well as chemicals like phenol, acetone, bisphenol A, and propanediol.