



CCM Data & Business
Intelligence

Production and Market of SF₆ in China

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Executive summary

After years of development, China has become a major sulfur hexafluoride production base. During 2019–H1 2021, there were no new entrants to the industry in China. In fact, the number of producers reduced, as some quit the market.

As of H1 2021, there were about 12 sulfur hexafluoride producers with total capacity of nearly 50,000 t/a in China.

- Technical grade: the capacity totaled 28,000 t/a and the output was 12,200 tonnes in H1 2021.
- Electronic grade: the capacity rose to 20,700 t/a and the output was 9,400 tonnes in H1 2021.

In China, sulfur hexafluoride is mainly used in electric equipment, as well as for etching and cleaning flat panels, photovoltaic panels and semiconductor devices. In the next three years, production capacity for sulfur hexafluoride in China is estimated to slightly increase. However, the market position of sulfur hexafluoride is threatened by some substitutes, as it can cause greenhouse effect. As the world's semiconductor industry is shifting to China, domestic demand for electronic grade sulfur hexafluoride is increasing rapidly, and manufacturers will gradually shift to the production of high purity sulfur hexafluoride.

Introduction and methodology

Methodology

The report is based on data sourced by diverse methods, which are detailed as follows:

- Desk research

Desk research includes access to published magazines, journals, government statistics, industry statistics, customs statistics, association seminars as well as information on the Internet. Much work has gone into the compilation and analysis of the information obtained. Where necessary, information has been checked with Chinese sulfur hexafluoride participants regarding intelligence related to market structure and performance characteristics as key producers, key end users, production levels, end user demand and so on.

- Survey

CCM has conducted an extensive survey using telephone interviews in order to study the market of sulfur hexafluoride in China.

The interviewees included the following groups:

- Key producers
- Key end users
- Key traders
- Material suppliers
- Associations involved
- Industry experts

- Network search

CCM employs a network to contact industry participants by using B2B websites and software. CCM also obtains registration information via the network.

- Data processing and presentation

The data collected and compiled was variously sourced from:

- CCM's database
- Published articles from periodicals, magazines, journals and third party databases
- Statistics from governments and international institutes
- Telephone interviews with domestic producers, service suppliers and government agencies
- Third-party data providers
- Comments from industrial experts
- Professional databases
- Information from the Internet

The data has been combined and cross-checked to ensure that this report is as accurate and methodologically sound as possible. Throughout the process, a series of discussions were held within CCM to systematically analyze the data and draw appropriate conclusions.

Definition

Sulfur hexafluoride is manufactured by the reaction of fluorine (obtained by electrolysis) with sulfur, and those sulfur hexafluoride producers should have mastered the electrolysis technology for fluorine preparation. The specifications of sulfur hexafluoride in this report include technical grade and electronic grade.

Abbreviation

SF₆: sulfur hexafluoride

t/a: tonne/annum, tonne per year

1 Overview of SF₆ in China

As an important fluorinated gas, sulfur hexafluoride (SF₆) is widely used in power equipment, metal smelting, aviation, medical and other industries. It is also an ideal etching gas, mainly used in the manufacturing of semiconductor devices, flat panels and photovoltaic panels.

Generally, China has become a major sulfur hexafluoride production base; self-supply and surplus in international trade is achieved. The total capacity for sulfur hexafluoride increased from 12,000 t/a in 2010 to 45,700 t/a in 2020, at a CAGR of 14.3% in this period. Sulfur hexafluoride import to China was quite small, while the export volumes were 817 tonnes, 1,042 tonnes and 482 tonnes in 2019, 2020, and H1 2021 respectively.

Sulfur hexafluoride features two grades, namely technical grade and electronic grade. With rapid development of panel display industry and semiconductor industry, demand for electronic grade sulfur hexafluoride has grown fast and requirements have been increasingly raised for products with higher purity and quality. The capacity for electronic grade sulfur hexafluoride increased from 500 t/a in 2010 to 20,700 t/a in H1 2021. However, due to high purity requirements of electronic grade sulfur hexafluoride and strict requirements on the cleanliness of the production, only a few manufacturers in China can produce electronic grade sulfur hexafluoride.

Table 1-1 Application of sulfur hexafluoride at different grades

Grade	Purity	Application
Technical grade	≥99.9%	Sulfur hexafluoride breaker and gas insulated switchgear, sulfur hexafluoride load switch device, sulfur hexafluoride insulated transmission pipe line, sulfur hexafluoride transformer and insulated substation
Electronic grade	≥99.999%	Used in the manufacturing of semiconductor devices, flat panels and photovoltaic panels, etc.

Source: GB/T 12022-2014 & GB/T 18867-2014

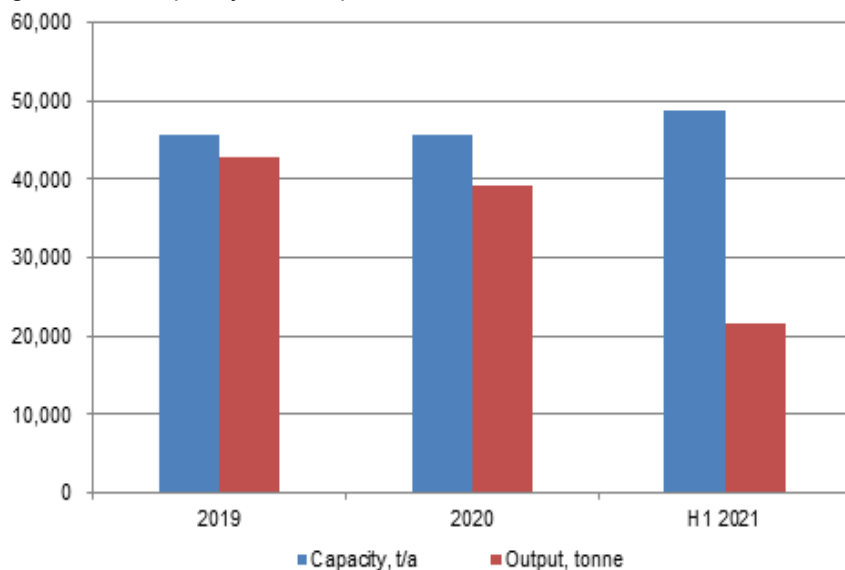
2 Production situation of SF₆

2.1 Production of SF₆ in China, 2019–H1 2021

As of H1 2021, there were about 12 sulfur hexafluoride manufacturers in China. During 2019–H1 2021, no new entrant entered the industry in China. In fact, the number of producers reduced, as some quit the market. But the total capacity increased slightly from 45,700 t/a in 2019 to 48,700 t/a in H1 2021, after one manufacturer expanded its capacity.

Operating rates of domestic manufacturers were generally high in 2019–H1 2021. The output of sulfur hexafluoride decreased from 42,800 tonnes in 2019 to 39,300 tonnes in 2020; in H1 2021, it was about 21,600 tonnes.

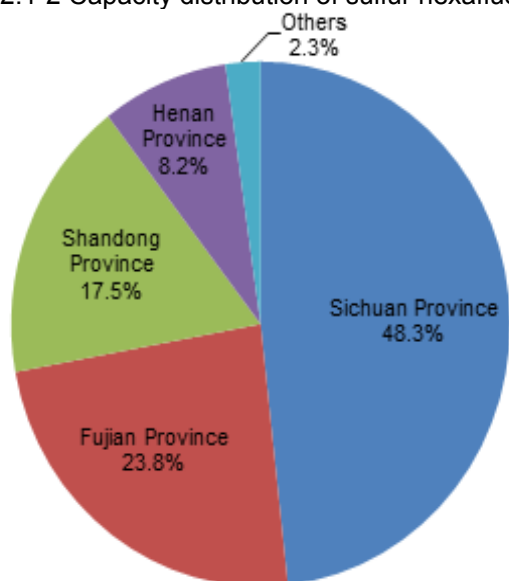
Figure 2.1-1 Capacity and output of sulfur hexafluoride in China, 2019–H1 2021



Source: CCM

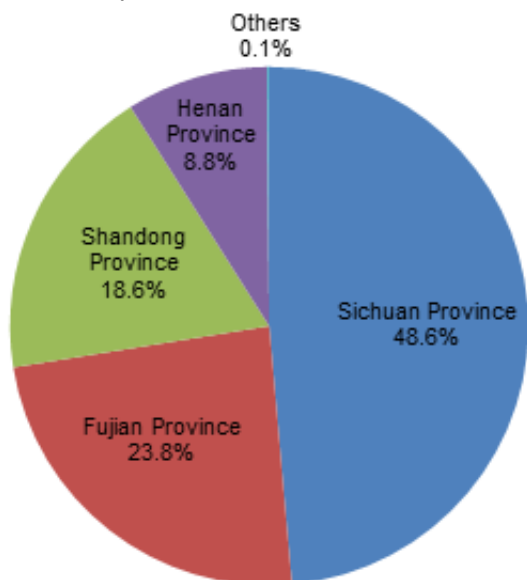
The capacity and output of sulfur hexafluoride is mainly concentrated in Sichuan Province. In H1 2021, Sichuan Province contributed the largest capacity and output, making up nearly 50% of the total capacity and output respectively, followed by Fujian Province and Shandong Province.

Figure 2.1-2 Capacity distribution of sulfur hexafluoride in China by region, H1 2021



Note: Due to rounding, the total may not equal 100.0%.
Source: CCM

Figure 2.1-3 Output distribution of sulfur hexafluoride in China by region, H1 2021



Note: Due to rounding, the total may not equal 100.0%.
Source: CCM

At present, more than half of the sulfur hexafluoride products produced in China are low in purity. But with rapid development of China's panel display industry, semiconductor industry and electricity industry, demand for electronic grade sulfur hexafluoride has increased in recent years. And the output of electronic grade sulfur hexafluoride will gradually exceed that of technical grade in response to that trend.

Table 2.1-1 Production of technical grade and electronic grade sulfur hexafluoride in China, 2019–H1 2021

Period	Technical grade		Electronic grade	
	Capacity, t/a	Output, tonne	Capacity, t/a	Output, tonne
2019	28,500	25,100	17,200	17,700
2020	28,500	22,900	17,200	16,400
H1 2021	28,000	12,200	20,700	9,400

Source: CCM

2.2 Producers of SF₆ in China, H1 2021

Among the 12 sulfur hexafluoride manufacturers in China, three are located in Shandong Province, and two in Henan and Fujian provinces each.

Capacity of these sulfur hexafluoride producers scarcely changed in the past few years, except that Chengdu Kemeite Special Gas Co., Ltd. expanded its production capacity for electronic grade sulfur hexafluoride to 12,000 t/a in H1 2021.

Table 2.2-1 Production of major active producer of sulfur hexafluoride in China, 2019–H1 2021

No.	Producer	Province	Capacity, t/a						Output, tonne					
			Technical grade			Electronic grade			Technical grade			Electronic grade		
			H1 2021	2020	2019	H1 2021	2020	2019	H1 2021	2020	2019	H1 2021	2020	2019
1	Chengdu Kemeite Special Gas Co., Ltd.	Sichuan	10,000	10,000	10,000	12,000	8,500	8,500	4,500	8,500	9,000	5,300	8,790	9,570
2	Fujian Deer Technology Co., Ltd.	Fujian	7,000	7,000	7,000	3,000	3,000	3,000	3,000	5,800	6,400	1,450	2,600	2,800
3	Shandong Feiyuan Gas Co., Ltd.	Shandong	3,500	3,500	3,500	2,000	2,000	2,000	1,800	2,600	3,100	980	1,900	1,960
4	Liming Research & Design Institute of Chemical Industry Co., Ltd.	Henan	2,500	2,500	2,500	1,000	1,000	1,000	1,200	2,200	2,400	460	900	980
5	Shandong Ruihua Fluoride Industry Co., Ltd.	Shandong	2,000	2,000	2,000	500	500	500	800	1,500	1,600	230	300	350
6	Fujian Yongjing Technology Co., Ltd.	Fujian	1,000	1,000	1,000	600	600	600	450	700	850	250	550	600
7	Shouguang Longhao Chemical Co., Ltd.	Shandong	500	500	500	0	0	0	200	400	460	/	/	/
8	Xinxiang Lifan Fluoride Industry Co., Ltd.	Henan	500	500	500	0	0	0	250	400	450	/	/	/

Source: CCM

In China, capacity and output of sulfur hexafluoride is mainly concentrated in some large companies, such as Chengdu Kemeite Special Gas Co., Ltd. (Chengdu Kemeite), Fujian Deer Technology Co., Ltd. (Fujian Deer), Shandong Feiyuan Gas Co., Ltd., and Liming Research & Design Institute of Chemical Industry Co., Ltd.

It is worth mentioning that Chengdu Kemeite is the largest sulfur hexafluoride supplier in China and the world. The company is a subsidiary of Jiangsu Yoke Technology Co., Ltd. (stock code: 002409). In H1 2021, its electronic grade sulfur hexafluoride capacity expanded to 12,000 t/a. After years of development, Chengdu Kemeite is in a leading position in the industry. Its sulfur hexafluoride products have been exported to many countries and regions and the quality has been recognized by many customers.

Four domestic sulfur hexafluoride manufacturers had capacity of over 3,000 t/a as H1 2021, their combined capacity reaching 41,000 t/a. In H1 2021, the output of the top four producers was about 18,690 tonnes, accounting for 86.5% of the total output.

Table 2.2-2 Concentration of sulfur hexafluoride production in China, H1 2021

Concentration	Capacity		Output	
	Volume, t/a	Proportion	Volume, tonne	Proportion
Top two	32,000	65.7%	14,250	66.0%
Top four	41,000	84.2%	18,690	86.5%
Total	48,700	/	21,600	/

Source: CCM

3 Forecast on Development of SF₆ in China

3.1 Drivers and Barriers

- Driver

- Domestic downstream market

Driven by the development of electricity industry, total amount of high-voltage electricity equipment has increased. At the same time, periodic maintenance and repair of related equipment will also bring the need for replacement, thereby driving the demand for sulfur hexafluoride. In addition, the world's semiconductor manufacturing industry is shifting to China, which will bolster the demand for electronic grade sulfur hexafluoride.

- Overseas market

The export volume of sulfur hexafluoride accounted for 2%–3% of the total output in the past two years. It is estimated that the demand from overseas market will increase slightly in the near future. But in the long run, the demand will be relatively stable.

- Barrier

- Policy restriction

Sulfur hexafluoride gas is one of the six greenhouse gases regulated under the *Kyoto Protocol*, with a high global warming potential. According to the *Guidance Catalogue for Industrial Structure Adjustment (2019 Edition)* issued by the National Development and Reform Commission, construction project of new sulfur hexafluoride production line is listed under restriction category, except for electronic grade sulfur hexafluoride. In addition, the Chinese government has focused on environmental protection and improved environmental standards, which has suppressed the expansion of sulfur hexafluoride capacity.

- Competition

Industry: The competition among existing manufacturers is fierce under great homogeneity of products. The capacity for sulfur hexafluoride is mainly concentrated in leading enterprises, and some small, uncompetitive enterprises with backward technology will inevitably be eliminated.

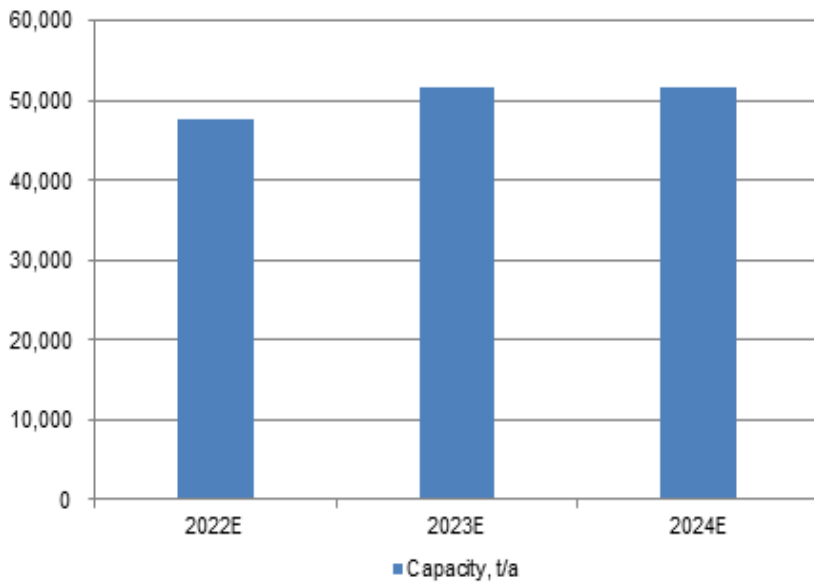
Substitute: In order to reduce the harm of sulfur hexafluoride gas, many Chinese companies have adopted solid insulation technology, vacuum circuit breakers and other non-sulfur hexafluoride insulation technologies to reduce the use of sulfur hexafluoride in high-voltage electrical products. For example, companies such as Beijing Shuangjie Electric Co., Ltd., Shanghai Pinggao Tianling Switch Co., Ltd., and Shenyang Haocen Electric Co., Ltd. have begun to adopt various measures such as solid insulation and mixed gas to improve product structure or develop low-carbon products.

3.2 Forecast on capacity of SF₆ in China, 2022–2024

At present, only Fujian Deer has a plan to build 4,000 t/a electronic grade sulfur hexafluoride production line. It is expected that in 2022–2024, the capacity for sulfur hexafluoride will increase slightly. By 2024, the capacity is expected to reach 51,700 t/a. With advancement of industrial integration, the industry concentration will further increase.

In China, electronic industry is developing rapidly, and the demand for electronic grade sulfur hexafluoride is ballooning. In contrast, capacity expansion of technical grade sulfur hexafluoride is limited, and its supply and demand will gradually recede.

Figure 3.2-1 Forecast on capacity for sulfur hexafluoride in China, 2022–2024



Source: CCM

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