The information and statistics set forth in this section and elsewhere in this document have been derived from the F&S Report, commissioned by us and independently prepared by F&S, in connection with the ***[REDACTED]****. In addition, certain information is based on, or derived or extracted from, among other sources, publications of government authorities and internal organisations, market data providers, communications with various PRC government agencies or other independent third-party sources unless otherwise indicated. We believe that the sources of such information and statistics are appropriate and have taken reasonable care in extracting and reproducing such information. We have no reason to believe that such information and statistics are false or misleading in any material respect or that any fact has been omitted that would render such information and statistics false or misleading. Our Directors confirm that, after taking reasonable care, they are not aware of any adverse change in market information since the date of the F&S report which may qualify, contradict or adversely impact the quality of the information in this section. The information from official government sources has not been independently verified by our Company, or the Sole Sponsor,* ***[REDACTED]****, any of their respective directors and advisers, or any other persons or parties involved in the* ***[REDACTED]****, and no representation is given as to its accuracy.*

SOURCE AND RELIABILITY OF INFORMATION

We have commissioned Frost & Sullivan, an Independent market research and consulting firm, to conduct an analysis of, and to prepare a report on China's petroleum refinery and petrochemical equipment market. We agreed to pay Frost & Sullivan a fee of RMB1,782,000 for the preparation of the F&S Report, and our Directors consider that such fee reflects market rates and are of the view that the payment of such fee does not affect the fairness of conclusions drawn in the F&S Report. Founded in 1961, Frost & Sullivan has over 40 global offices and offers industry research and market strategies and provides growth consulting and corporate training.

RESEARCH METHODOLOGY

The methodology used by Frost & Sullivan in gathering the relevant market data in compiling the F&S Report included primary interviews and secondary research. Primary interviews are conducted with industry insiders, competitors, downstream customers and recognised third-party industry associations to obtain objective and factual data and prospective predictions. Secondary research involves information integration of data and publication from publicly available resources, including official data and announcements from PRC government departments, and market research on industry and enterprise player information issued by our chief competitors.

BASES AND ASSUMPTIONS

The F&S Report was compiled based on independent market assessment through both primary and secondary research and the following assumptions: (i) China's economy is likely to maintain steady growth in the next decade; (ii) China's social, economic, and political environment is likely to remain stable from 2024 to 2028; and (iii) market drivers like growing macro economy, rising urbanization process are likely to drive the growth of China's petroleum refinery and petrochemical equipment industry.

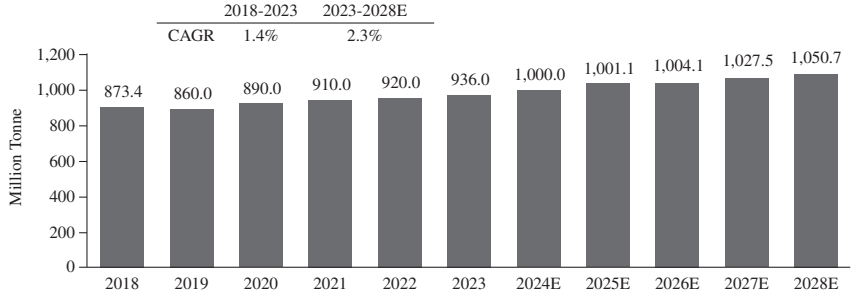
Our Directors confirmed that, as at the Latest Practical Date, after taking reasonable care, there had been no adverse change in the market information since the date of the F&S Report which may qualify, contradict or have an impact on the information in this section.

Except as otherwise noted, all of the data and forecasts contained in this section are derived from F&S Report.

OVERVIEW OF PETROLEUM REFINERY AND PETROCHEMICAL INDUSTRY IN CHINA

According to OPEC (Organization of the Petroleum Exporting Countries), the refinery capacity of China has increased from 873.4 million tonnes in 2018 to 936.0 million tonnes in 2023, representing a CAGR of approximately 1.4%. According to the Action Plan for Carbon Dioxide Peaking Before 2030 (《2030年前二氧化碳達峰行動計劃》) issued by the State Council, China's petroleum refinery capacity is expected to reach 1,000 million tonnes a year by 2025. Going forward, driven by the strong domestic demand, the petroleum refinery capacity is forecast to grow to 1,050.7 million tonnes in 2028, with a rise of over 100 million tonnes from 2023.

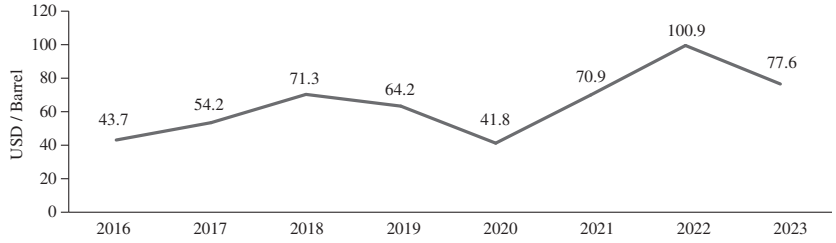
Petroleum Refinery Capacity (China), 2018–2028E



Source: OPEC, Ministry of Commerce of China, Frost & Sullivan Analysis

Despite brent oil price experienced a sharp drop of approximately 34.9% from USD64.2 per barrel in 2019 to USD41.8 per barrel in 2020, the petroleum refinery capacity increased by approximately 3.5% in the same year, indicating that the fluctuations of oil prices does not have direct correlation to the petroleum refinery capacity in China.

Brent Oil Price , 2016–2023



Source: Intercontinental Exchange, Frost & Sullivan Analysis

In the past several decades, the main concepts of petroleum refinery in China were safety, health and environmental protection, with the ideas of recycle economy and sustainable development. While currently, alone with the transformation and upgrade of domestic refinery and petrochemical industry, the main concepts have been changed to integrated, large-scale, clean, high value-added, and intelligent. The development of petroleum refinery and petrochemical industry in China are as follows:

Structural Transformation and Integration: The domestic petroleum refinery industry has been transformed and upgraded in recent years. "The 14th Five-Year Plan for Raw Materials Industry Development" (《"十四五"原材料工業發展規劃》) issued by the Ministry of Industry and Information Technology in December 2021 emphasized the transformation of quality, and efficiency for the petrochemical industry, promoting the development of the petrochemical industry. Though the domestic refinery capacity is rather large, the technology and equipment are spotty. Some of the refineries, especially small local refineries, are not able to fulfil the latest standards of energy consumption or gas emission. Outdated refinery capacity and plants with low efficiency are being replaced by large integrated advanced technologies gradually. Despite the replacement cycle of petroleum refinery and petrochemical equipment ranging from 10 to 20 years, it is estimated that around 5% to 10% of the existing capacity of the petroleum refinery will be updated in each year, thus, generating approximately over 40 million tonnes in each year with sustained and additional demand for petroleum refinery and petrochemical equipment. The transformation of petroleum refinery industry and the replacement of existing equipment ensures the continuous demand for petroleum refinery and petrochemical equipment.

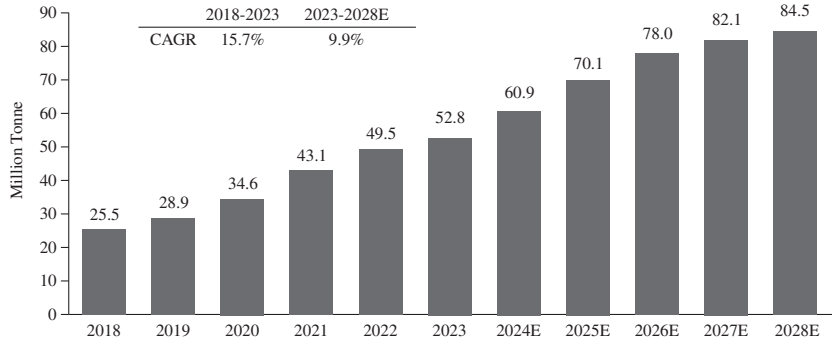
Additionally, alternative energy may possibly affect the demand for oil consumption as energy source, but the value chain of petroleum refinery and petrochemical industry is long and the demand for downstream petrochemicals has limited threat from alternative energy. To face the challenge from alternative energy, petroleum refinery projects who has limited production capacity of petrochemical would also actively seek opportunity to further extend its value chain to establish its own production capacity of petrochemicals such as ethylene, which may bring higher margin than refined oil products. According to public information, there are at least over 70 million tonnes of petroleum refinery capacity to be implemented by 2025 and the production capacity of ethylene is expected to reach approximately 85 million tonnes by 2028. Many of these projects were integrated projects including both petroleum refinery capacity and capacity of petrochemicals such as ethylene, which would have additional demand for petroleum refinery and petrochemical equipment comparing to the projects which only have petroleum refinery capacity. The following table set forth key refinery and petrochemical integration projects from 2023 to 2026:

Project	Scale	Year of commencement	Total investment
Shandong Yulong Island refining and chemical integration project (phase I) (裕龍島煉化一體化項目) (一期)	Petroleum refinery capacity: 20 million tonnes Ethylene capacity: 3 million tonnes	2023	RMB127.4 billion
Zhenhai Refining & Chemical oil refining and high-end synthetic new material projects (鎮海煉化煉油和高端合成新材料項目)	Petroleum refinery capacity: 11 million tonnes	2023	RMB14.5 billion

Project	Scale	Year of commencement	Total investment
Fine chemicals and raw material engineering projects (精油化工及原料工程項目)	Petroleum refinery capacity: 15 million tonnes Ethylene capacity: 1.63 million tonnes	2024	RMB83.7 billion
Daxie Petrochemical reconstruction and expansion project (phase V) (大榭石化改建及擴充項目) (五期)	Petroleum refinery capacity: 6 million tonnes	2024	Not disclosed
Inner Mongolia Baofeng Coal Chemical Project (內蒙古寶豐煤化工項目)	Coal to olefins capacity: 2.6 million tonnes	2024	RMB47.8 billion
Gulei refining and chemical integration project (phase II) (古雷煉化一體化項目) (二期)	Petroleum refinery capacity: 16 million tonnes Ethylene capacity: 1.2 million tonnes	2025	RMB73.3 billion
Huizhou Phase III Refining and Chemical Integration Project (惠州三期煉化一體化項目)	Petroleum refinery capacity: 6.5 million tonnes Ethylene capacity: 1.6 million tonnes	2026	RMB52.1 billion

Development of Petrochemical Industry: Ordinary saying, technical level and output of ethylene production indicates the development level of petrochemical industry. The ethylene industry is the core of the petrochemical industry and ethylene is one of the most basic raw materials used in the petrochemical industry. It is used to produce a wide variety of downstream petrochemical products, including, among others, polyethylene, polyvinyl chloride, polystyrene and ethylene glycol. Ethylene products account for more than 75% of petrochemical products with an important position in the national economy. The world has taken ethylene production as one of the important symbols to measure the development level of a country's petrochemical industry.

Production Capacity of Ethylene (China), 2018–2028E



Source: OPEC, Frost & Sullivan Analysis

The rapid development of the PRC economy in recent years has led to a strong growth in the demand for ethylene. Between 2018 and 2023, the demand of ethylene in the PRC increased from 47.2 million tonnes to 69.4 million tonnes, representing a CAGR of approximately 8.0%; the production of ethylene in the PRC also increased from 23.5 million tonnes to 46.8 million tonne for the same period, representing a CAGR of approximately 14.8%. The strong growth in demand and supply has driven the investments in the ethylene industry. The PRC has become the world's second largest ethylene producer behind the United States. According to the statistics of authorities, the self-sufficient rate of ethylene in the PRC is approximately 67.4% in 2023 which is lower than that of the United States of 100%. The domestic petrochemical industry has fallen far behind those in developed countries. Considering that petrochemical industry is one the major fundamental industries with market size exceed trillion in RMB. From 2018 to 2023, the production capacity of ethylene increased from 25.5 million tonnes to 52.8 million tonnes. Looking forward, the demand of ethylene is expected to increase to 90.8 million tonnes by 2028, representing a CAGR of approximately 5.5% from 2023 to 2028. In order to fulfil the accelerating demand of downstream industries in the future, the production capacity of ethylene is expected to have a further rise with a CAGR around 9.9%, reaching approximately over 84 million tonnes by 2028, bringing about rising demand for corresponding equipment. The production of other petrochemical products such as propylene is also expected to grow as well. In order to reduce costs of production and raw material, diversify output items and respond flexibly to changes in demand, refineries are transforming to integrated refinery-petrochemical production, providing a huge potential market for petroleum refinery and petrochemical equipment industry.

OVERVIEW OF PETROLEUM REFINERY AND PETROCHEMICAL EQUIPMENT INDUSTRY IN CHINA

Petroleum refinery and petrochemical equipment include process equipment and equipment for public utilities and auxiliary utilities. Process equipment include static equipment such as furnaces with process burners, heat exchangers, columns, reactors and others, and rotating equipment such as pumps impellers, shafts and others. Equipment for public utilities and auxiliary utilities include SRU (Sulfur recovery unit) and VOCs (Volatile organic compounds) incineration equipment, feed water and drainage system and others. Major equipment includes but not limited to:

SRU and VOCs incineration equipment: SRU refers to the equipment that operate the conversion of hydrogen sulfide to elemental sulfur. VOCs incineration equipment is used to eliminate VOCs. Both are used in auxiliary utilities to protect the environment.

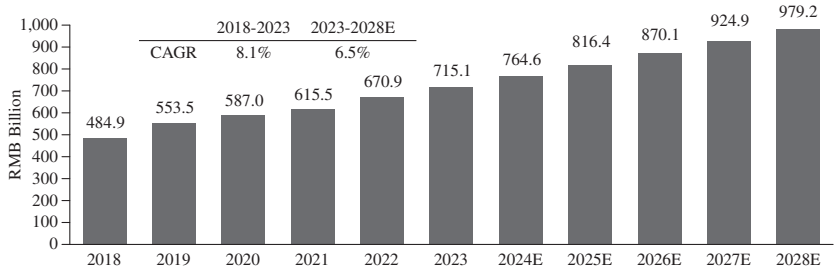
Catalytic cracking equipment: Catalytic cracking equipment are used in petroleum refinery process or methanol to olefin (MTO) reactions to catalyze the procedures.

Process burners: Process burner operates in heaters and furnaces to generate heat energy in the refining, petrochemical and chemical processes. Low NOx Burner are now required in many regions considering environmental issues.

Waste heat recovery unit (WHRU): an energy recovery heat exchanger that transfers heat from process outputs at high temperature to another part of the process. It makes industrial processes more efficient by capturing and re-using heat energy.

The market of petroleum refinery and petrochemical equipment in China is a large market, including various static and rotating equipment. The market size of petroleum refinery and petrochemical equipment in China increased from RMB484.9 billion in 2018 to RMB715.1 billion in 2023, representing a CAGR of approximately 8.1%. With the growing petroleum refinery capacity and rapid development of petrochemical industry in China, the market is forecast to grow at a CAGR of approximately 6.5% from 2023 to 2028, reaching RMB979.2 billion in 2028.

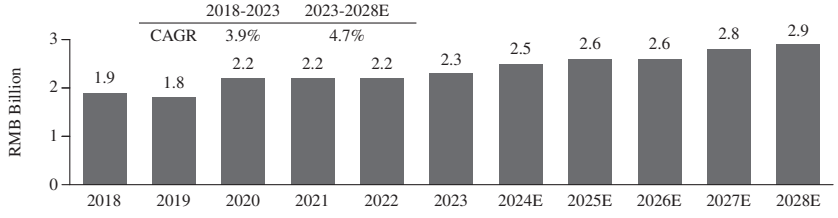
Petroleum Refinery and Petrochemical Equipment (China), 2018–2028E



Source: National Bureau of Statistics of China, Frost & Sullivan Analysis

SRU and VOCs incineration equipment used in petroleum refinery and petrochemical operation increased from RMB1.9 billion in 2018 to RMB2.3 billion in 2023. The market is mainly driven by the expanded refinery capacity, the replacement of small inefficient capacity by large advanced equipment of petroleum refinery and the development of domestic petrochemical industry. The market is expected to grow to RMB2.9 billion in 2028, with a CAGR of approximately 4.7% from 2023 to 2028.

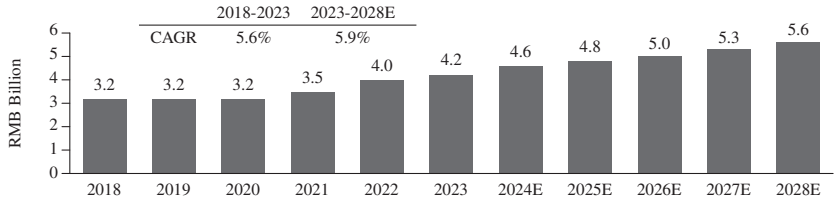
SRU and VOCs Incineration Equipment used in Petroleum Refinery and Petrochemical Operation (China), 2018–2028E



Source: Ministry of Ecology and Environment of China, Frost & Sullivan Analysis

Methanol to Olefins (MTO) refers to the process used to convert methanol to products such as olefins and gasoline. Catalytic cracking equipment are used to catalyse the process of petroleum refinery or MTO reaction. MTO capacity is regarded as the backup of crude oil due to the consideration of national energy security. MTO equipment is a relatively ascent market in China and is the major driver of catalytic cracking equipment. The market size of catalytic cracking equipment is RMB4.2 billion in 2023, almost half of the market is contributed by MTO equipment.

Catalytic Cracking Equipment used in Petroleum Refinery and Petrochemical Operation (China), 2018–2028E

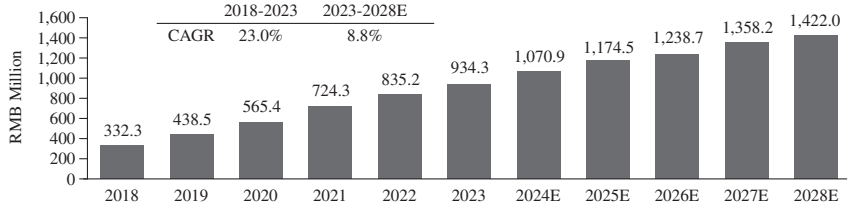


Source: Sinopec Research Institute, Frost & Sullivan Analysis

The market size of process burner for petroleum refinery and petrochemical operation increased from RMB332.3 million in 2018 to RMB934.3 million in 2023, representing a CAGR of approximately 23.0% from 2018 to 2023. The market is highly relevant to the growth of petroleum refinery capacity and petrochemical production capacity. The major driving force was the fast growing capacity of domestic ethylene production.

Going forward, with the growing petroleum refining capacity and rapid development of petrochemical industry in China, the market of process burner is likely to grow to RMB1,422.0 million in 2028, representing a CAGR of approximately 8.8% from 2023 to 2028.

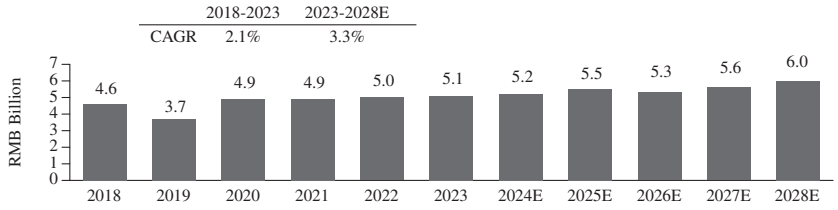
Process Burner used in Petroleum Refinery and Petrochemical Operation (China), 2018–2028E



Source: National Development and Reform Commission of China, Frost & Sullivan Analysis

Heat exchanger is a main equipment in WHRU. The market increased from RMB4.6 billion in 2018 to RMB5.1 billion in 2023, and is forecasted to be stable in the next several years due to the steady growth of petroleum refinery and petrochemical industry.

Heat Exchanger used in Petroleum Refinery and Petrochemical Operation (China), 2018–2028E



Source: China Petroleum and Chemical Industry Federation, Frost & Sullivan Analysis

Market Drivers of China's Petroleum Refinery and Petrochemical Equipment Industry Market

Favorable Policy Environment: To ensure a sound development of the petroleum refinery and petrochemical industry, the Chinese government has issued several policies and regulations, such as the Plan for Petrochemical and Chemical Industry from 2016 to 2020 (《石化和化學工業發展規劃(2016–2020年)》) released by the Ministry of Industry and Information Technology, the Announcement on Implementing the Catalogue for Guiding Industry Restructuring (2019 Version) (《產業結構調整指導目錄(2019年本)》) issued by National Development and Reform Commission in 2019, the Guiding Opinion on Promoting High-quality Development of the Petrochemical Industry during the 14th Five-Year Plan Period (《"十四五"推動石化化工行業高質量發展的指導意見》) in 2022 issued by six departments, including the Ministry of Industry and Information Technology, the National Development and Reform Commission, the Ministry of Science and Technology, the Ministry of Ecology and Environment and the Emergency Response Department and the National Energy Administration, and the Guiding Opinion of the National Development and Reform Commission and Other Departments on Promoting Green Innovation and High-quality Development of the Petroleum Refinery Industry (《國家發展改革委等部門關於促進煉油行業綠色創新高質量發展的指導意見》) (collectively "**Guiding Opinions**"), in 2023.

The Guiding Opinions aim to drive the growth of China's petroleum refinery and petrochemical equipment industry market from the following aspects:

(i) **Technological innovation and facilities upgrade:** emphasizes on the needs for technological innovation and facilities upgrade, which encourages the gradual replacement of outdated refinery capacity and plants with low efficiency by large integrated advanced technologies. For example, atmospheric pressure vessels with a capacity of 2 million tons per year or below are required to phase out and replaced by advanced facilities.

(ii) **Optimization of industrial layout:** emphasizes on the optimization of the layout of petroleum refinery capacity and the promotion of an orderly concentration of new petroleum refinery projects into petroleum refinery and petrochemical industry bases. In response to this directive, the Shandong Yulong Island Refining and Chemical Integration Project (裕龍島煉化一體化項目) is under construction with an estimated investment of approximately RMB127.4 billion. It involves the construction of petroleum refinery capacity of 20 million tons per year and ethylene capacity of 3 million tons per year.

(iii) **Green and low-carbon development:** It is expected that the energy consumption and carbon emissions per unit of bulk products will be significantly reduced, and the total emission of volatile organic compounds will be reduced by more than 10% by 2025. In response to this directive, it requires the installation of advanced pollution control equipment like flue gas desulfurization systems or catalytic converters, creating market opportunities for manufacturers of such equipment. Also, the government has increased the environmental administrative penalty over the past few years. The average fines per environmental administrative penalty had increased from RMB38.1 thousand in 2014 to RMB84.3 thousand in 2022, according to the data from the Ministry of Ecology and Environment of China.

Overall, the implementation of the Guiding Opinions stimulates demand for advanced equipment, green technologies and environmental protection measures, which in turn encourages investments in upgrading existing facilities and the development of new infrastructures, driving market growth and providing opportunities for equipment manufacturers and suppliers in the industry.

While the Guiding Opinions set out the overall direction for the industry's development, the specific details of financial support, tax incentive and other forms of assistance are generally be implemented at the local or regional level based on the local policies and regulations. The local governments and authorities in China often have the flexibility to design and implement supporting measures that align with the broader national policy objectives. The PRC government generally provides support by offering (i) subsidies and grants; (ii) tax incentives and exemptions, or reduction on corporate income tax; (iii) funding for research and development activities; and (iv) land and infrastructure supports, such as offering assistance in securing suitable land in designated chemical parks at favourable terms. Overally, the PRC government's financial support aims to alleviate the costs and encourage enterprises to comply with the policies objective outlined in the Guiding Opinions. For instance, Tianjin Development and Reform Commission issued notice on "Several Policies and Measures to Support the High-Quality Development of the Green Petrochemical Industry Chain" ("關於支持綠色石化產業鏈高質量發展待若干政策措施"的通知) in March 2023, stating to increase financial support to the transformation and upgrade of petrochemical industry chain.

Growing Petrochemical Industry: Petrochemical products are widely used in various downstream applications such as packaging, textile, household appliance, automobile, architecture, etc. The stable growth of China's macroeconomy, the increasing disposable income and the upgrading consumption level of domestic residents have spurred the downstream manufacturing industries and boomed the upstream petrochemical industry, which ensure the demand and growth of petrochemical equipment.

Higher Preference of Domestic Brands: According to Frost & Sullivan's analysis, the market size of petroleum refinery and petrochemical equipment industry had increased from RMB484.9 billion in 2018 to RMB715.1 billion in 2023. With sufficient investment in research and development, the quality of domestic brands have been largely improved. Products of domestic brands have caught up with foreign products in terms of the quality and technology applied. With high cost performance, domestic products are now gaining higher preference among downstream customers.

Industry Tends to Increase Concentration: The future market concentration of the petroleum refinery and petrochemical equipment industry in China is expected to undergo changes in the coming years. As the demand for energy continues to rise, the industry is likely to become more consolidated as larger companies acquire smaller ones in order to gain access to new technologies, markets, and resources. As the market develops and changes, consumers tend to purchase products from larger and well-known brands, as these brands have higher reliability and credibility. This also makes it easier for larger companies to gain more market share, thus increasing market concentration. Therefore, these factors have led to the increasing concentration of the petroleum refinery and petrochemical equipment industry, with more market share being occupied by larger companies.

Opportunities, Threats and Challenges of China's Petroleum Refinery and Petrochemical Equipment Industry

Growing Awareness of Environment Protection: As environment issues has become an ever-serious concern in China, the PRC government and consumers have gained a higher awareness of environment protection. In March 2018, the Ministry of Finance released the Report on the Execution of the Central and Local Budgets for 2018 and on the Draft Central and Local Budgets for 2019 (《關於2018年中央和地方預算執行情況與2019年中央和地方預算草案的報告》) and emphasized the promotion of pollution-free heating in Northern area. The promotion of clean energy and pollution-free heating system may accelerate the application of equipment, which has long been used for environment protection in thermal power plant, petroleum refinery and petrochemical industry.

Expanding Domestic Market and Growing Overseas Demand: National strategies such as "One Belt, One Road" Initiative is aimed to increase economic co-operation and manufacturing and infrastructure investments among countries along the Silk Road Economic Belt and the 21st Century Maritime Silk Road that connect Asia, Europe and Africa. The Belt and Road countries have been continuously strengthening industrial investments and cooperation with China. In the future, the demand for petroleum refinery and petrochemical equipment in the countries and regions along the Belt and Road is expected to increase, which provides huge market space for China petroleum refinery and petrochemical equipment manufacturing industry and bring, oversea opportunities to domestic manufacturers.

Stricter Supervision: The supervision of environmental issues has become stricter since the adoption of the Environmental Protection Law of the People's Republic of China (2014 Revision) (《中華人民共和國環境保護法(2014修訂)》). According to the data from the Ministry of Ecology and Environment of China, the average fines per environmental administrative penalty had increased from RMB38.1 thousand to RMB84.3 thousand from 2014 to 2022. In order to fulfil the requirements of environmental compliance, domestic manufacturers must invest heavily in the innovation, which might result in the withdraw of small, inefficient, less environment-friendly, and technical backwardness players, sparing the market share to those players with more sustainable competitiveness.

The Impact of Renewable Energy Sources: Chinese government is encouraging the development of renewable energy source in recent years. Although the trend of renewable energy sources replacing traditional crude oil presents challenges for the petroleum refinery and petrochemical equipment industry, crude oil will still occupy an important portion of the energy market in the foreseeable future. Therefore, there is still market space for petroleum refinery and petrochemical equipment manufacturers. Manufacturers can adapt to these challenges by transforming and diversifying, innovating

technologically, seizing opportunities in long-term energy demand and growth in the natural gas market, as well as collaborating and forming alliances with other energy industries. In this way, petroleum refinery and petrochemical equipment manufacturers still have the opportunity to adapt to market changes and enhance their competitive position through transformation, innovation, and cooperation.

Competitive Landscape of Petroleum Refinery and Petrochemical Equipment Industry

China's overall petroleum refinery and petrochemical equipment market is fragmented with over 40,000 petroleum refinery and petrochemical equipment manufacturers in the market in 2022 and there is over a hundred types of petroleum refinery and petrochemical equipment. The market share of each of the Group's product categories represented a relatively small subset of the overall petroleum refinery and petrochemical equipment in the PRC.

The market of SRU and VOCs incineration equipment manufacturers in petroleum refinery and petrochemical operation in China is fragmented, with top five market players accounted for approximately 15.2% of the total market in term of revenue. There are around 1,000 players in the market. The Group ranked at the second place and accounted for approximately 3.1% of the market in 2022.

Top 5 SRU and VOCs Incineration Equipment Manufacturers in Petroleum Refinery and Petrochemical Operation in China by Revenue, 2022

Ranking	Company name	Company type	Listed? *(Yes/No)*	Market share *(%)*
1	Company A	Foreign-invested	No	5.9
2	Our Group	Privately-owned	N/A	3.1
3	Company B	Privately-owned	No	3.0
4	Company C	Privately-owned	No	1.8
5	Company D	Foreign-invested	No	1.4
Top 5				**15.2**
Others				**84.8**
Total				**100.0**

Source: The data of the Group comes from the Group, industry specialist interview, Frost & Sullivan

Frost & Sullivan has conducted primary market research, including but not limited to, interviews with leading industry participants. The Company was advised by Frost & Sullivan that in accordance with the guidelines set out by the European Society for Opinion and Market Research (ESOMAR), a global association for research industry, any disclosure without the subject's consent might breach the confidentiality between parties. Frost & Sullivan also advised the Company that it is maintaining third-party independency and that it is common industry practice for industry consultants not to disclose the identities of competitors in ranking tables. The Company has been further advised by Frost & Sullivan that the information could not be disclosed as the interviewees did not give consent for such disclosure.

Notes:

(1) Company A is an international company founded in 1979 with headquartered in Oklahoma, the United States. It provides products and services of burners, furnaces and other combustion and environmental solutions. This company has more than 2,000 employees.

(2) Company B is a privately-owned company belonging to China Aerospace Science and Technology Corporation. The company was founded in 1991, and is mainly engaged in services and product manufacturing of gasifier burners, ejectors, industrial burners, special valves, etc. This company has approximately 5,000 employees.

(3) Company C is a private local manufacturer founded in 2006 and located in Jiangsu province, the PRC. The major products of the company includes process burners, furnaces and other auxiliary equipment. This company has nearly 2,000 employees.

(4) Company D is an international company founded in 1919 and located in Netherland. This company is specialized in process combustion solutions. Their roots have remained firmly embedded in the petrochemical sector. This company has over 100 employees.

The market of catalytic cracking equipment manufacturers in petroleum refinery and petrochemical operation in China is fragmented, with top five market players accounted for approximately 32.0% of the total market in term of revenue. There are around 1,000 players in the market. The Group accounted for approximately 6.3% of the market in 2022, ranking at third place.

Top 5 Catalytic Cracking Equipment Manufacturers in Petroleum Refinery and Petrochemical Operation in China by Revenue, 2022

Ranking	Company name	Company type	Listed? *(Yes/No)*	Market share *(%)*
1	Company E	Stated-owned	No	8.5
2	Company F	Privately-owned	No	6.9
3	Our Group	Privately-owned	N/A	6.3
4	Company G	Privately-owned	No	6.0
5	Company H	Sino-foreign joint venture	No	4.3
Top 5				**32.0**
Others				**68.0**
Total				**100.0**

Source: The data of the Group comes from the Group, industry specialist interview, Frost & Sullivan

Notes:

(1) Company E was established with Lanzhou Refinery Plant and was founded in 1960s and is located in Gansu province, the PRC. It focuses on the manufacturing of flue gas turbines, special valves and other professional equipment. This company has nearly 700 employees.

(2) Company F was founded in 1998 and is located in Liaoning province, the PRC. The major products of the company include FCC (Fluid Catalytic Cracking) and related equipment, including triple cyclone, small cyclone and external heat collector. This company has nearly 800 employees.

(3) Company G was founded in 2001 and is located in Jiangsu province, the PRC. This company manufactures columns, heating exchangers, reactors, tanks, cyclone separators, and other pressure vessels, and conducts businesses across worldwide. This company has over 300 employees.

(4) Company H is a joint venture founded in 2003 and located in Zhejiang province, the PRC. This company's line of business includes the manufacturing of hydraulic and pneumatic fluid power pumps and motors. This company has over 400 employees.

The market of process burner manufacturers in petroleum refinery and petrochemical operation in China is relatively concentrated, with top 5 five market players accounted for approximately 37.0% of the total market in term of revenue. There are around 200 players in the market. The Group ranked at the third place with a market share of approximately 6.1% in 2022.

Top 5 Process Burner Manufacturers in Petroleum Refinery and Petrochemical Operation in China by Revenue, 2022

Ranking	Company name	Company type	Listed? *(Yes/No)*	Market Share *(%)*
1	Honeywell International Inc.	Foreign-invested	Yes	14.8
2	Company C	Privately-owned	No	7.2
3	Our Group	Privately-owned	N/A	6.1
4	Company A	Foreign-invested	No	4.9
5	Company J	Foreign-invested	No	4.0
Top 5				**37.0**
Others				**63.0**
Total				**100.0**

Source: The data of the Group comes from the Group, annual report, Frost & Sullivan

Notes:

(1) Honeywell International Inc. is an international listed company founded in 1906 and headquartered in North Carolina, the United States. It primarily operates in aerospace, building technologies, performance materials and technologies, and safety and productivity solutions. This company has approximately 110 thousand employees worldwide. In 2022, the company's revenue reached USD35.5 billion.

(2) Company J is a private company founded in 2016 and located in Hunan province, the PRC. It provides process burners, furnaces and other equipment. This company has approximately 100 employees.

The market of heat exchanger manufacturers in petroleum refinery and petrochemical operation in China is relatively concentrated, with top five market players accounted for approximately 58.1% of the total market. The Group accounted for approximately 1.0% of the market in 2022.

Top 5 Heat Exchanger Manufacturers in Petroleum Refinery and Petrochemical Operation in China by Revenue, 2022

Ranking	Company name	Company type	Listed? *(Yes/No)*	Market share *(%)*
1	Lanzhou Ls Heavy Equipment Co., Ltd.	Stated-owned	Yes	26.1
2	Company L	Sino-foreign joint venture	No	14.0
3	Gansu Lanke Petrochemical Hi-Tech Equipment Co., Ltd.	Stated-owned	Yes	8.0
4	Alfa Laval Inc.	Sino-foreign joint venture	Yes	6.0
5	Company O	Privately-owned	No	4.0
Top 5				**58.1**
Others				**41.9**
Total				**100.0**

Source: The data of the Group comes from the Group, annual report, Frost & Sullivan

Notes:

(1) Lanzhou Ls Heavy Equipment Co., Ltd. was founded in 2001 and went public in 2014. The company is located in Gansu province, the PRC. Its major businesses include the manufacturing of petrochemical equipment, new energy equipment and industrial intelligent equipment such as industrial robot. This company has nearly 4,000 employees. In 2022, the company's revenue reached RMB5.0 billion.

(2) Company L was founded in 1986 and is located in Jilin province, the PRC. It focuses on the manufacturing of heat exchangers and providing heat exchangers solutions in China's cleantech industry. This company has approximately 500 employees.

(3) Gansu Lanke Petrochemical Hi-Tech Equipment Co., Ltd. was founded in 1960 and is located in Gansu province, the PRC. Its major products include surface evaporative air coolers, heat exchangers, bimetallic composite corrugated fin tubes, flanging open nozzles, etc. This company has over 1,000 employees. In 2022, the company's revenue reached RMB0.87 billion.

(4) Alfa Laval Inc. is a Swedish company founded in 1883. The company is a global supplier of products and solutions for heat transfer, separation and fluid handling through heat exchangers, separators, pumps and valves. This company has approximately 18,000 employees worldwide.

(5) Company O was founded in 1963 and is located in Jilin province, the PRC. It focuses on the manufacturing of heat exchangers and pressure vessel products. This company has over 450 employees.

Entry Barriers Analysis

Technical Barrier: The petroleum refinery and petrochemical equipment market is highly technology-intensive. Due to the stricter supervision, the petroleum refinery and petrochemical enterprises are requiring efficient and environmental friendly equipment with high quality. Advanced professional equipment and technology are needed in order to meet the requirements. It is difficult for new entrants to construct perfect technical system and recruit sufficient technical personnel in a short period.

Capital Requirement: Leading and large market players in the petroleum refinery and petrochemical equipment market usually have strong capital strength. As petroleum refinery and petrochemical equipment is generally large-sized and high-technical equipment, companies in the market should have enough capital base to support the establishment of factories as well as daily operation. New entrants with weak capital strength is hard to compete with market leaders and support the operation.

Good Relationships with Customers: Leading players generally have established stable and wide customer network. Downstream customers such as petroleum refineries and petrochemical products manufacturers are more likely to keep long cooperation relationships with leading and well-known manufacturers with high quality products and services. The experienced and well-trained marketing teams are also specialized in business development in the market, especially in the overseas market. It is difficult for new entrants to compete with existing players with good customer relationships.

Market Reputation: Petroleum refinery and petrochemical equipment is important in the industries of petroleum refinery and petrochemical manufacturing. Therefore, to ensure the safety of operation, clients are more willing to cooperate with the brands with higher awareness and good business experience. Existing leading players generally have established well-known names through long-term production practice. It is rather difficult for new entrants to build brand recognition in a short time. At

the same time, with the development of the industry, higher after-sales service are demanded for customers, making it more difficult for new players to compete with existing ones with design capability and full-life services.

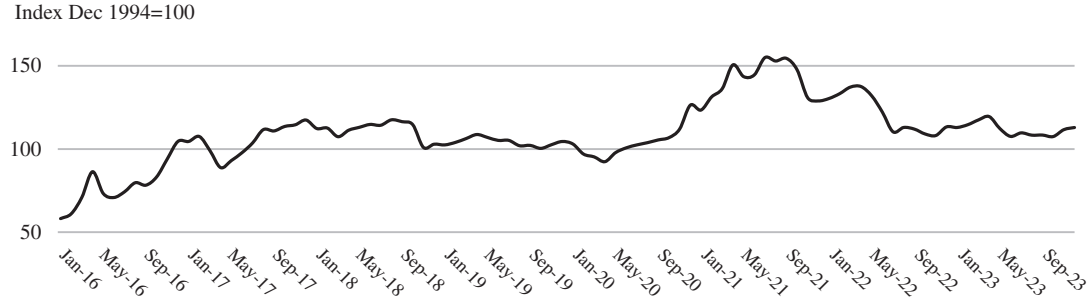
Major Cost Analysis of Petroleum Refinery and Petrochemical Equipment Market

Steel materials

Steel plate is the major materials used for production of petroleum refinery and petrochemical equipment. The price of primary steel products is decided by its manufacture cost, the cost breakdown includes iron ore, coking coal, power, etc., among which, the contribution of iron ore is over 80%. Other factors might include macroeconomy, supply and demand dynamic, international trading activities, etc. After the upward trend from January 2016 to September 2021, the steel price slightly drop from October 2021. There are several reasons for the significant increase in price index of overall steel plate in 2021, (i) affected by the sharp rise in the prices of raw materials such as iron ore and coking coal, the price of steel increased rapidly; (ii) along with the economy's recovery, the construction industry has begun to resume, and the steel demand has gradually recovered. In particular, driven by the rapid increase in demand for various infrastructures, the price of steel has gradually increased; (iii) in April 2021, the State Council of Adjusting the Customs Tariff Commission of the State Council stated that the import and export of steel tariff adjustment policy were implemented, aiming to guide the steel industry to reduce crude steel production. In May 2021, the Measures for the Implementation of the Replacement of Production Capacity in the Steel Industry (《鋼鐵行業產能置換實施辦法》) was issued by the Ministry of Industry and Information Technology. The proportion of steel production capacity replacement has been significantly decreased. The reasons for the decrease in the steel price from October 2021 are the supply of steel plate had been resumed and the demand has become more stable.

Going forward, in line with the development of the macro economy and relevant industry, the price index of overall steel plate is likely to maintain at a stable level in the next years.

Price Index of Overall Steel Plate (China), 2016–2023



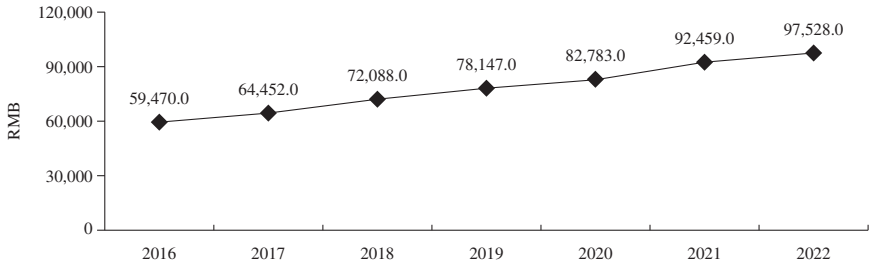
Source: China Iron & Steel Association

Wages

China's petroleum refinery and petrochemical equipment industry has a strong demand for manufacturing talents. Average wage of employed persons in manufacturing industry in China had increased from approximately RMB59,470.0 per year in 2016 to approximately RMB97,528.0 in 2022 at a CAGR of 8.6% in China.

Going forward, in line with the development of macro economy and manufacturing industry, the average annual salary of employees is likely to keep growing in the next few years.

Average Wages of Urban Employees in Manufacturing Industry (China), 2016–2022



Source: The National Bureau of Statistics of China

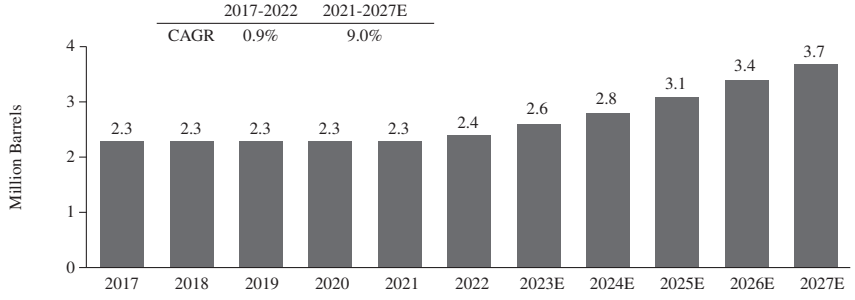
Oversea market

The world oil refinery capacity increased from 99.1 million b/d (barrel/day) in 2017 to 101.8 million b/d in 2022, representing a CAGR of approximately 0.5% during the period, according to OPEC. The PRC government's "One Belt, One Road" Initiative, which aims to help and build infrastructure in participating countries and encourage international trade, is expected to have positive impact on the PRC's manufacturing industry in general and bring overseas opportunities to PRC manufacturers. The oil refinery capacity of "One Belt, One Road" countries increased from 30.2 million b/d in 2017 to 33.0 million b/d in 2022, with a CAGR of 1.8% and is expected to reach 35.7 million b/d in 2027, at a CAGR of 1.6% since 2022.

Brazil market

Brazil's refining capacity in 2022 was 2.4 million barrels per day, far below its crude oil production of 3.1 million barrels per day in the same year. This forced Brazil to import refined products to meet its domestic demand. However, Brazil has taken some measures to expand its oil refining capacity and reduce its reliance on imported fuels. These measures will also enhance its trade balance and efficiency and competitiveness in the oil and gas sector. For instance, Brazil's 2021–2031 Energy Expansion Plan anticipates that the country's oil production will soar to 5.2 million barrels of oil per day by 2031. Furthermore, Petrobras launched the Refinery Divestment Program in 2019, following an agreement with the antitrust authority Cade. This program aims to sell some of Petrobras' refineries and foster a more competitive and dynamic market for refining in Brazil. These developments indicate that Brazil's oil refining market has a bright future. The petroleum refinery and petrochemical equipment market is relatively fragmented.

Petroleum Refinery Capacity (Brazil), 2017–2027E



Source: Bnamericas, Frost & Sullivan Analysis