

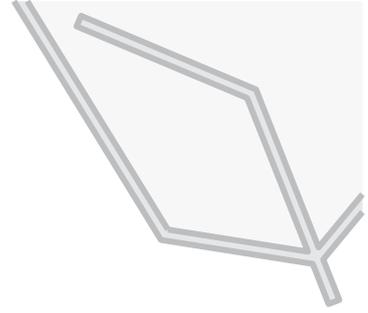
THEMATIC REPORT 13

VOCs Control and Monitoring Industry

Edited by China-Italy Chamber of Commerce



Camera di Commercio Italiana in Cina
中国意大利商会
China-Italy Chamber of Commerce



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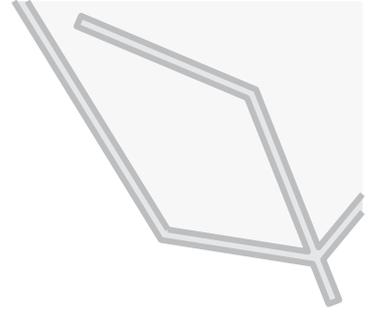


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1. Definition of VOCs Control Industry

VOCs, as the abbreviation for Volatile Organic Compounds, is the general designation of a group of organic chemicals. In China, it has been defined as "organic matters capable of taking part in atmospheric photochemical reactions."

Various countries made definitions for VOCs out of different considerations. Although there are some differences in the definitions of VOCs, it is generally believed that VOCs refer to a group of organic matters that have a saturated vapor pressure of more than 133.32 Pa and a boiling point less than 260 °C at the normal temperature, which generally exist in gaseous form in the air.

Country/Region	Definition
European Union (1999/13/EC) Directive	Defined VOCs as the organic compounds with a vapor pressure greater than or equal to 0.01 kPa at the temperature of 393.15K.
European Union (2004/42/EC) Directive	Defined VOCs as the volatile organics with a boiling point up to 250 °C under the pressure of 101.3kPa.
World Health Organization (WHO, 1989)	Defined the total volatile organic compounds (TVOCs) as the generic designation of volatile organic compounds with a melting point below room temperature and a boiling point between 50-260 °C.
The U.S. Environmental Protection Agency (EPA)	From the perspective of environmental protection, defined VOCs as carbon-containing compounds that take part in atmospheric photochemical reactions except for CO, CO ₂ , H ₂ CO ₃ , metal carbides, metal carbonates and ammonium carbonate.
China	Defined VOCs as the organic compounds that take part in atmospheric photochemical reactions.

*Table 1 Definitions of VOCs Made by Major Countries around the World.
Data source: GEP Research.*

2. Demand Analysis and Trends of Global VOCs Control Industry

According to the emission sources, VOCs could be divided into emissions from natural sources and anthropogenic sources. Among the natural sources, there are vegetation emissions, forest fires, wetland anaerobic processes and other similar sources. Although natural sources have a large emission volume, they are distributed widely, with complex processes and an emission concentration not so high within each region. It is difficult to effectively control them by appropriate means. For this reason, they do not yet fall into the artificially controllable scope. VOCs generated from large-scale human production processes could be referred to as emissions from anthropogenic sources. The emission volume from natural sources are far larger than the worldwide emission volume from anthropogenic sources.

According to GEP Research data, in 2018, the newly-increased market size of the industry related to global VOCs control was about RMB 30.8-33.8 billion. China accounted for 53-58% of the total market share, while the United States accounted for about 13-15%, and the European Union accounted for 15-16%. Drawing upon the experience and history of Europe and the United States, it would take 20-30 years to solve the current VOCs air quality problems in China. Therefore, it is expected that in the next 20-30 years, the global VOCs control market would remain a market centered on China.

3. Analysis of Policy Environment for the VOCs Control Industry in China

3.1. Macro Policies, Laws and Regulations

In recent years, China has introduced a number of relevant policies and regulations to facilitate VOCs control, and established a VOCs pollution prevention and control policy system. In 2010, the Ministry of Environmental Protection, the National Development and Reform Commission and the National Energy Administration, together with other six ministries and commissions, jointly issued *the Guiding Opinions on Promoting the Joint Prevention and Control of Air Pollution and Improving Regional Air Quality*. The document listed for the first time the VOCs as key control pollutants. In September 2017, the Ministry of Environmental Protection, the National Development and Reform Commission and the National Energy Administration, together with other three ministries and commissions, jointly issued the *13th Five-Year Plan for the Pollution Prevention and Control of Volatile Organic Compounds*. It set the first guideline to specifically make clear the priorities of VOCs control, and put forward the goal to achieve above 10% emissions reduction in key regions and industries by 2020. Moreover, in July 2018, the State Council issued the *Three-Year Action Plan for Winning the Blue Sky Defense Battle*. It further strengthened the policy support for VOCs control, and mentioned to achieve above 10% reduction in the total VOCs emissions, compared with 2015, by 2020.

Serial No.	Time	Institution	Policy Name	Main Content
1	June 2019	Ministry of Ecology and Environment	<i>Comprehensive VOCs Control Scheme for Key Industries</i>	It aims to vigorously promote source substitution, to comprehensively strengthen the control of fugitive emissions, to push forward the construction of suitable and efficient pollution control facilities, to deeply implement fine management and control, to carry out comprehensive VOCs control in the petrochemical, chemical, industrial coating, packaging and printing industries, as well as in the petroleum products storage, transportation and sales process, industrial parks and industrial clusters.
2	July 2018	The State Council	<i>Three-Year Action Plan for Winning the Blue Sky Defense Battle</i>	It implemented the special rectification plan for VOCs, formulated the comprehensive rectification plans for the key industries of VOCs emissions including the petrochemicals, chemicals, industrial coatings, packaging, printing and other industries, as well as for the storage, transportation and sales process of petroleum products, issued the standards for leak detection and repair, and compiled technical guidelines for VOCs control. By 2020, the total VOCs emission volume is planned to have an above 10% reduction compared to 2015.
3	October 2017	Ministry of Environmental Protection	<i>The 13th Five-Year Plan for the Pollution Prevention and Control</i>	It aimed to establish and improve the VOCs pollution prevention and control system by 2020, and achieve an above 10% emission reduction in

			<i>of Volatile Organic Compounds</i>	key regions and industries.
4	January 2017	The State Council	<i>The 13th Five-Year Comprehensive Work Plan for Energy Saving and Emission Reduction</i>	It included VOCs into emission reduction targets for the first time, and planned to achieve a 10% reduction in the total VOCs emission volume by 2020 compared to 2015, as well as an emission reduction volume of more than 2.5 million tons in 16 provinces and industries under total volume control.
5	October 2016	Ministry of Environmental Protection	<i>2016 National Advanced Pollution Control Technology Catalogue (VOCs Control Field)</i>	The technical catalogue covered 18 VOCs prevention and control technologies, including stationary organic waste gas regenerative combustion technology, rotary regenerative combustion and purification technology, regenerative catalytic combustion (RCO) technology and other technologies.
6	August 2015	The National People's Congress	<i>The Law of the PRC on the Prevention and Control of Atmospheric Pollution (New Version)</i>	It incorporated the Volatile Organic Compounds (VOCs) into supervision scope for the first time
7	May 2013	Ministry of Environmental Protection	<i>Volatile Organic Compounds (VOCs) Pollution Prevention and Control Technology Policy</i>	It proposed the pollution prevention and control strategies and methods for the production, storage, transportation, sales, use, consumption links of VOCs production materials and products containing VOC products.

Table 2 National Policies Concerning the VOCs Control Industry in China.
Data source: GEP Research.

3.2. Technical Policies for VOCs Control

At present, China has issued specific technical policy requirements for technology routes and principles, on-spec technology selection, engineering technology applications, as well as product technology applications for VOCs pollution prevention and control.

Implementation Date	Institution	Policy Name	Category
-	The Ministry of Environmental Protection	<i>Volatile Organic Compounds (VOCs) Pollution Control Technology Policy (2013 No. 31 Announcement of the Ministry of Environmental Protection Department of the PRC)</i>	Technical Routes and Principles for Pollution Prevention
-	-	<i>Technical Guide for Best Feasibility in Typical VOCs Industries</i>	On-Spec Technology Selection
July 2013	The Ministry of Environmental Protection	<i>Technical Specifications for Industrial Organic Waste Gas Treatment Project Applying Adsorption Method (HJ2026-2013)</i>	Engineering Technology Application Product Technology

			Application Technical Routes and Principles for Pollution Prevention
July 2013	The Ministry of Environmental Protection	<i>Technical Specifications for the Industrial Organic Waste Gas Treatment Project Applying Catalytic Combustion Method (HJ2027-2013)</i>	-
September 2018	Ministry of Ecology and Environment	<i>Technical Specifications for the Industrial Organic Waste Gas Treatment Project Applying Regenerative Combustion Method (Draft for Comments)</i>	-
March 2008	the Ministry of Environmental Protection	<i>Technical Requirements for Environmental Protection Products - Industrial Waste Gas Adsorption and Purification Device (HJ/T386-2007)</i>	On-Spec Technology Selection
March 2008	the Ministry of Environmental Protection	<i>Technical Requirements for Environmental Protection Products - Industrial Waste Gas Adsorption and Purification Device (HJ/T387-2007)</i>	-
March 2008	The State Environmental Protection Administration	<i>Technical Requirements for Environmental Protection Products - Industrial Waste Gas Catalysis and Purification Device (HJ/T389-2007)</i>	-

*Table 3 Guiding Technical Policies for the VOCs Control Industry.
Data source: GEP Research.*

4. Demand Analysis and Prospect Forecast for the VOCs Control Industry in China

4.1. Industrial Demands and Forecast of the VOCs Control Industry in China

The VOCs control industry in China has entered a rapid development stage, with focus on the control of VOCs from industrial sources. In 2018, the VOCs emission volume in China was 19.90 million tons, and it is estimated that, by 2020 and 2025, the VOCs emission volume would reach 20.30 million tons and 23.53 million tons, respectively.

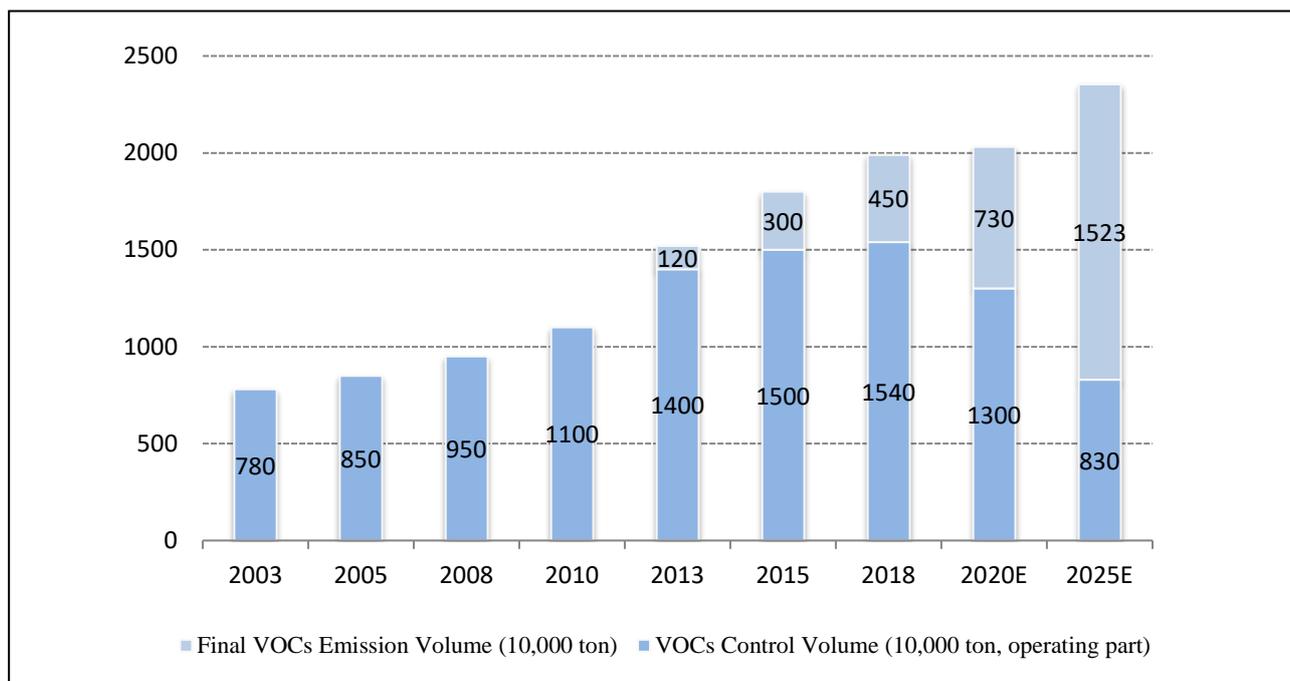


Figure 1 VOCs Emission Volume and Forecast in China (the VOCs emission volume in China = VOCs control volume + final VOCs emission volume).

Data source: GEP Research.

In 2018, the newly increased VOCs control capacity in China was about 900,000 tons per year, corresponding to a market size of about RMB 18 billion. The operating control capacity in China was about 4.5 million tons per year, corresponding to a market size of about RMB 31.5 billion, thus constituting a total market size of about RMB 49.5 billion. It is estimated that by 2020 the total market size of the VOCs control industry (including the operating part) in China would reach about RMB 74 billion. It is expected to exceed RMB 130 billion by 2025, with a compound growth rate of about 20% from 2018 to 2025.

4.2. Demand Structure Analysis

From the perspective of market demands in the downstream industries related to VOCs control, the petrochemical industry accounts for a market share of 35%, mainly covering oil and gas extraction, petroleum refining, rubber products, pharmaceuticals and various synthetic material markets. The surface coating industry accounts for a market share of about 25%. The main control focuses on the coating in the furniture and automobile manufacturing industries. The packaging and printing industry accounts for a market share of about 9%, while the electronics manufacturing industry for 5%. Finally, other industries

account for a market share of about 26%.

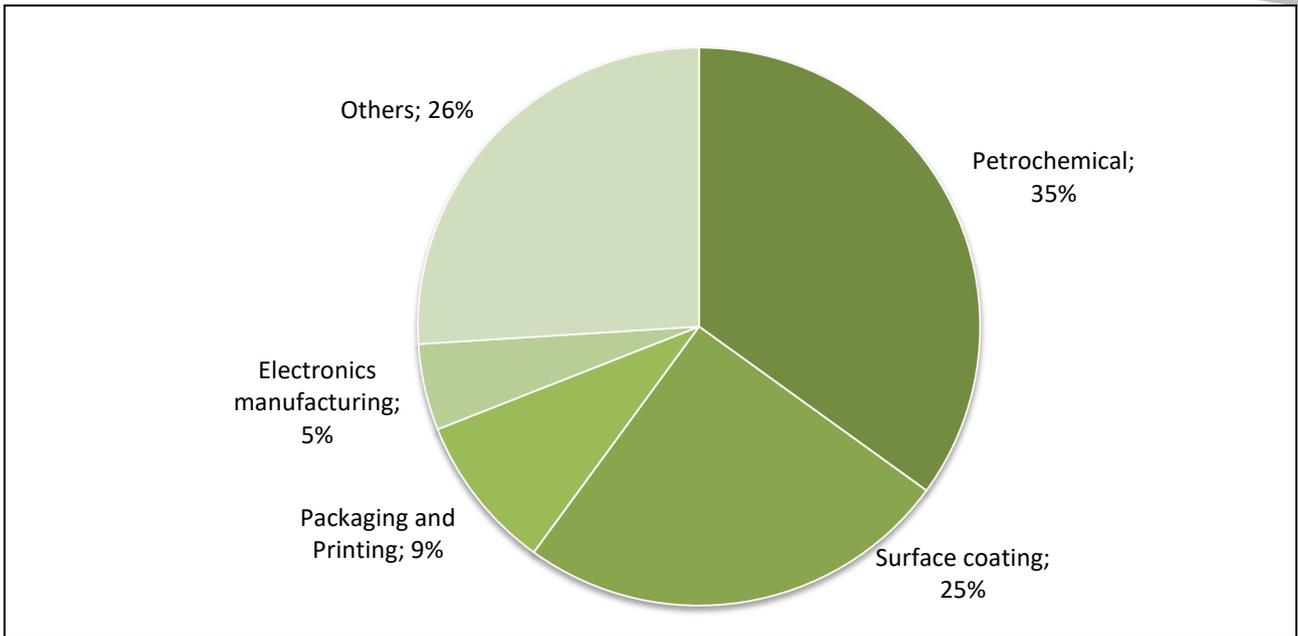


Figure 2 Market Demand Structure of the VOCs Control Industry in China.
Data source: GEP Research.

5. Analysis of Supply and Competition in the VOCs Control and Monitoring Industry in China

5.1. Analysis of Supply and Competition in the VOCs Control Industry in China

5.1.1. Supply Status in the VOCs Control Industry in China

In 2013, there were more than 140 companies engaged in VOCs control in China. In 2015, the number of the companies engaged in VOCs control increased to more than 800 companies nationwide. By 2018, this number was expected to be higher than 2000 (seeing from the entire industry chain) nationwide.

5.1.2. Competition Pattern of the VOCs Control Industry in China

At present, the scale of enterprises in the VOCs control industry in China is generally small with low concentration degree, and an industrial CR10 of less than 20%. Seibu Giken, Huashijie, Bayeco, Kaitian Environmental, Anguil, Garden, Sailhero Zhengyuan, as well as other enterprises, have a revenue of more than RMB 100 million in VOCs control business, with a certain representativeness in the market.

The main technical fields of control enterprises mainly adopt RCO/RTO combustion, zeolite roller adsorption and concentration technology, activated carbon adsorption and recovery technology, biotechnology, low-temperature plasma and other technologies. International companies have played a dominant role in the molecular sieve roller market in China.

5.1.3. Gross Margin of the VOCs Control Industry

The gross margin of the VOCs control industry in China is 20-50% with high profitability, while some companies are facing pressures on profitability decline.

5.2: Analysis of Supply and Competition in the VOCs Monitoring Industry in China

5.2.1. Supply Analysis of the VOCs Monitoring Industry in China

At present, there are more than 300 enterprises in the VOCs monitoring industry in China (excluding agency enterprises), providing over 300 kinds of VOCs monitoring products according to the 250 monitored sample enterprises.

After 2013, the number of new entrants in the VOCs monitoring industry has increased rapidly. Despite the decrease from 2016 to 2018, in 2018 the number of new entrants was still higher than the number of yearly new entrants before 2013.

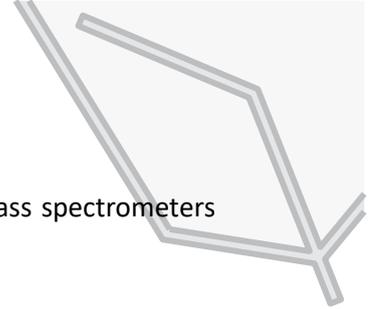
5.2.2. Competition Pattern of the VOCs Monitoring Industry in China

The VOCs monitoring industry in China is dominated by small businesses, with an industry CR10 of 40.5%, and relatively high industrial concentration degree. It is expected that the concentration degree would increase continuously.

5.2.3. Gross Margin of the VOCs Monitoring Industry

The gross margin of benchmark enterprises in the VOCs monitoring industry in China is about 40-50%, while

the gross margin on the sales of SPMS series VOCs monitoring products centered on mass spectrometers exceeds 60%, which is higher than the gross margin of benchmark enterprises.





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The high-level training program Sicab – Sino Italian Capacity Building for Environmental Protection is supported by IMELS – ITALIAN MINISTRY FOR THE ENVIRONMENT, LAND AND SEA.



Sicab is included within the SINO-ITALIAN COOPERATION PROGRAM FOR ENVIRONMENTAL PROTECTION (SICP). SICP was launched by IMELS – the Italian Ministry for the Environment, Land and Sea and MEE – the Chinese Ministry of Ecology and Environment.

Sicab consortium includes five partners: Politecnico di Milano (Lead Partner), Euro-Mediterranean Center on Climate Change, Italy China Foundation, Fondazione Politecnico di Milano, Sapienza University of Rome.



SAPIENZA
UNIVERSITÀ DI ROMA



 www.sicab.net

 sicab@fondazione.polimi.it

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