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Research and analysis on the development of intelligent toilet

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Abstract: Intelligent toilet, also known as "electronic toilet" or "smart toilet", was first invented by the Americans in 1964, and then introduced to Japan by Japanese businessmen. After the product is optimized in design, it began to be popularized in Japan in the 1980s and 1990s. In the early 1990s, Japanese businessmen have introduced intelligent toilet into China, so far, opened the domestic. The development of domestic intelligent toilet can be roughly divided into three stages: the first stage of domestic intelligent toilet development is 1990-1995, also known as the birth period of Chinese intelligent toilet, domestic intelligent toilet experienced the first stage of the cradle period, began to enter its growth period 1995-2015; 2015 is a special and unusual year in the history of China's intelligent toilet. After 2015, domestic intelligent toilet enters its third stage of development.

1. Introduction

With the rapid development of technology, smart sanitary ware products have emerged. Different from traditional sanitary products, smart sanitary products integrate ceramic production, electronic control and automation technology in many fields to enhance the experience of sanitary products. Among the many smart bathroom products, the smart toilet product [1] is the most representative. Its appearance has brought a major product reform feast to the bathroom industry.

In layman's terms, intelligent toilets are also called "electronic toilets" or "smart toilets" [2]. From the perspective of professional terms, the smart toilet refers to a toilet that is controlled by an electromechanical system or program to complete more than one basic intelligent function. The basic intelligent functions cover the buttocks washing function and the female suction function. In addition, it also has auxiliary intelligent functions and extended intelligent functions. The auxiliary functions are mainly used to improve the health and hygiene performance of the product, and the extended intelligent functions are mainly used to improve the additional functions of the product comfort. In general, smart toilets are classified according to materials, heating methods, and structures. Among them, according to the structure classification is the most common, can be divided into split type and integrated type, split type intelligent toilet and integrated type intelligent toilet as shown in figure 1.





Figure 1 The split type intelligent toilet and integrated type intelligent toilet

2. History of the development of smart toilets

2.1. The origin of smart toilet

When it comes to smart toilets, people first think of Japan. Once, our relatives and friends have more or less experience of going to Japan to carry the cover of a smart toilet. Therefore, most people think that the smart toilet originated in Japan and was invented by the Japanese. However, this is not the case, American Aronld Cohen invented the world's first smart toilet in 1964. Aronld Cohen's original intention was not for commercial profit, but for filial piety and for the "convenience" of his father who has been sick for many years. This smart toilet "originator" that took Aronld Cohen for nearly two years is a foot-operated integrated machine with two functions of washing and drying.

After Aronld Cohen improved and applied for a patent for the first smart toilet, he formed a smart toilet production company for mass production. However, due to the inherent concept of the Americans, Aronld Cohen's products have not been recognized by the American people. According to the "New York Times " report[3], Aronld Cohen's company sold only 200,000 products in the 45 years since its establishment. Faced with such a dilemma, Aronld Cohen was forced to license the patent of the smart toilet to Japan's TOTO company. Unexpectedly, after TOTO's improvement, smart toilets have gained a new life in Japan. At present, the penetration rate of smart toilets in Japan exceeds 80%. Even some special occasions such as public toilets are also equipped with smart toilets. The reason is Mainly because of Japanese traditional cultural concepts, smart toilets have prospered in Japan. Japan is one of the few countries in the world that values toileting and even worships "toilet gods". Japanese folks believe that worshipping "toilet gods" can contribute to fertility and family prosperity.

2.2. Development and popularization of smart toilets

After TOTO introduced the smart toilet to Japan, it improved the washing and drying functions, and added functions such as seat heating. Later, the smart toilet became popular in Japan. In the early 1990s, TOTO introduced smart toilets to China, thus opening the chapter of smart toilets in China. In 1995, the first smart toilet cover produced by the Chinese was successfully rolled off the production line in Taizhou, Zhejiang, marking the beginning of the era of domestic smart toilets. Domestic smart toilets have roughly experienced three stages of development.

The first stage (1990-1995)

The first stage of the development of domestic smart toilets was 1990-1995, also known as the "birth period of China's smart toilets". In the third year after TOTO introduced smart toilets to China in 1990, in 1992, electronic sanitary ware manufacturers in Taizhou began to develop related technologies for smart toilets, and China's local smart toilet manufacturing started from this. After three years of toddler business, in 1995, the first domestically produced smart toilet was born. The electronic components of the products during this period depended on Japanese imports. This period was the initial stage of domestic smart toilets, so few manufacturers were involved, large-scale

production areas were not formed, and product output was very limited, and the market share was almost negligible.

The second stage (1995-2015)

Domestic smart toilets have experienced the cradle of the first stage and began to enter its growth period from 1995 to 2015. In the mid-to-late 1990s, with the rapid development of the domestic economy, especially after 1998, the social capital environment and industry preparations became more and more mature. The domestic smart toilet industry had an unprecedented opportunity to develop rapidly, and social capital was more accurate. It is said that the gradual filling of "hot money" has caused many private entrepreneurs to target the emerging industry of smart toilets. At the same time, the professional talents and technology in this industry are becoming more and more abundant, creating a group of pioneers in the research and development of domestic smart toilets, becoming the backbone of domestic smart toilet production and manufacturing at that time. The technology sector has made outstanding contributions to China's smart toilet manufacturing. From 1995 to 2014, according to statistics, domestic smart toilet products reached an average annual sales of more than 100,000 units, with an annual turnover of nearly 2 billion yuan. Manufacturers also developed from several previous companies to dozens of companies. This period It laid a good foundation for the further development of domestic smart bathroom products.

The third stage (2015-2020)

2015 was a special and unusual year in the history of Chinese smart toilets. This year, an article by Xiaobo Wu entitled "going to Japan to buy a toilet cover" "boosted" the sanitary ware industry, and then "going to Japan to buy a smart toilet cover" became a hot topic at the two sessions. The Prime Minister was even right. This phenomenon carries on The statement emphasized that "manufacturing e

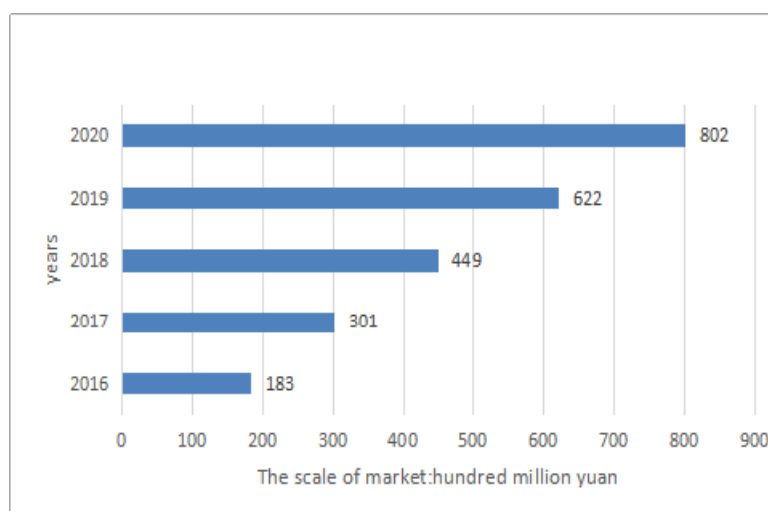


Figure 2 The scale of China's smart toilet market from 2016 to 2020

-nterprises should upgrade[4], if domestic products of the same quality are also available, they should be more competitive". At the same time, relevant government agencies and industry experts successively expressed their views on this phenomenon, which made the incident end. A great moment

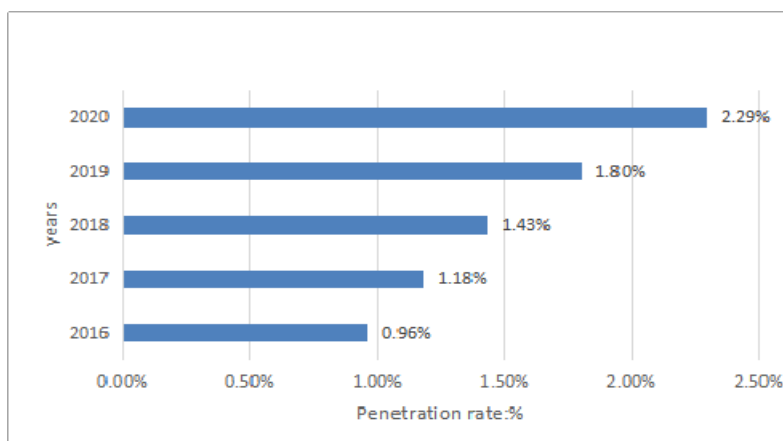


Figure 3 The analysis of the penetration rate of smart toilets in my country from 2016 to 2020

-um. After this incident, the domestic production of smart toilets has developed rapidly. At present, the number of smart toilet manufacturers in my country has reached nearly 200, mainly distributed in Zhejiang, Jiangsu, Fujian, Guangdong and other places. From 2016 to 2020, the market scale and prevalence rate of smart toilets increase year by year. The scale of China's smart toilet market from 2016 to 2020 is shown in figure 2. The analysis of the penetration rate of smart toilets in my country from 2016 to 2020 is shown in figure 3. At the same time, according to the results of the national supervision and random inspection of smart toilet products by the General Administration of Quality Supervision, Inspection and Quarantine for five consecutive years from 2015 to 2019, it can be seen that the quality of domestic smart toilet products has been improving year by year. In 2015-2019, smart toilet products were randomly inspected, the statistical table is shown in table 1.

Table 1 The statistical table of inspected smart toilet products

Serial number	Years	Number of samples	Number of qualified inspections	Pass rate(%)
1	2015	45	27	60
2	2016	68	56	82.4
3	2017	91	83	91.2
4	2018	70	66	94.3
5	2019	75	72	96

3. Conclusion

After nearly 30 years of technology research and development, the domestic smart toilet manufacturing technology has become mature. However, as of the end of 2019, the penetration rate of domestic smart toilets was less than 2%[5]. Among them, the penetration rates in first-tier cities such as Shanghai and Beijing were only 5% and 8%, while the penetration rate of third- and fourth-tier cities were 0%, and the penetration rate of Japan's smart toilet reached 76% as early as 2013. This kind of domestic market retention also reflects from another aspect that smart toilets have a huge market to be tapped in the country.

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