Research on New Type of Plastic Inspection Well Industrialization under the Background of the Sponge City

Yihang Lv
Chengdu Neusoft University, Chengdu 611844, Sichuan, China

Abstract. Under the leadership of the Party Central Committee with General Secretary Xi at its core, the reform and opening up of China continue deepening. The rapid development of the economy attracts worldwide attention. Under the background of the sponge city, this paper is based on China's macro-environmental analysis, takes a plastic inspection well enterprise A with dominant position in the industry as an example, through this company's project research, this paper summarizes briefly related problems of developing plastic inspection wells under the background of the sponge city, thus summarizing the problems of industrialization development of China's new type of plastic inspection wells and proposes relevant suggestions.

Keywords: The sponge city; Plastic inspection well; Industrialization.

1. Introduction
Under the leadership of the Party Central Committee with General Secretary Xi at its core, China's reform and opening up continue deepening. The rapid development of the economy attracts worldwide attention. Under this environment, the concept of the sponge city emerges as the times require. Under the background of the sponge city, the development adjustment and change of related industries are becoming more rapid. Traditional complementary industries, such as inspection wells of precast cement pipes and precast cement, are cannot fit in with the construction of the sponge city. Under this environment, the development of the new type of plastic inspection well industry is particularly important. Under the background of the sponge city, this paper is based on the macro environmental analysis of our country, take a plastic inspection well enterprise A with dominant position in the industry as an example, through the project research of this company, this paper summarizes briefly related problems of developing plastic inspection wells under the background of the sponge city, thus summarizing the problems of industrialization development of China's new type of plastic inspection wells and proposes relevant suggestions.

2. Background Data
The sponge city is a new generation of urban rainfall flood management concept; it means that the city has a good "elasticity" in adapting to environmental changes and responding to natural disasters caused by rainwater, which can also be called "water elastic city". The internationally universal terminology is “building a rainwater system with low impact”. When it rains, it absorbs water, accumulates water, water seeps, and cleans water, when necessary; it "releases " and use the stored water. China's sponge city
originated from the "best management practices", "low-impact development", "green infrastructure" in the United Countrys, the "sustainable drainage system" in the United Kingdom, and the "water-sensitive urban design" in Australia and so on, but it is different from the concept of foreign countries, its connotation is broader and deeper. It can be said that the construction of China's sponge city is the integration and epitome of foreign experience. The developed countries in the urbanization process, there have been similar situations such as serious pollution of water bodies, frequent waterlogging disasters, and deterioration of ecological environment, these countries have effectively controlled or relieved the above problems by implementing integrated management of rainwater and reasonably controlling rainwater runoff. For example, the United Country proposed the concept of low-impact development in the early 1990s; it also called as low-impact development (LID), its basic principle is to reduce the impact and damage on natural ecosystems in the development and construction of artificial systems as far as possible. The Britain proposed the concept of sustainable drainage system, its basic principle is to imitate the natural process, save and then release the rainwater, promote the rainwater seepage, use design technology to filter pollutants, control the flow rate, and create a pleasant environment.

Under this background, there are more and more pilot sponge cities across the country, and more and more construction projects, this is a huge emerging market for building materials enterprises. This is also a huge challenge and opportunity for the plastic inspection wells, which are important supporting materials in the construction of the sponge city, but the requirements for the whole industry are getting higher and higher.

3. Macro Environmental Analysis

3.1. Politics

3.1.1. About the sponge city. General Secretary Xi Jinping clearly proposed at the 2013 Central Urbanization Work Conference: give priority to leaving the limited rainwater when upgrading the urban drainage system, give priority to more using natural forces drain off water, construct “the sponge city” that naturally accumulates, penetrates and purifies. On October 11, 2015, General Office of the Country Council of the People's Republic of China issued the "Guidance on Promoting the Construction of the Sponge City." on March 5, 2017, At the fifth session of the 12th National People's Congress of the People's Republic of China, Premier Li Keqiang's government work report mentioned: pool the construction of urban ground and underground, and then starting more than 2,000 kilometers construction of urban underground comprehensive pipe racks, the three-year campaign to eliminate the key areas of the city was launched, and the construction of the sponge city was promoted, so that the city has both “face” and “lizi”.

3.1.2. New type of plastic inspection well. The first step: the use of solid clay bricks is prohibited nationwide.

The Ministry of Construction stipulates that since July 1, 2003, solid clay bricks cannot be used for large and medium-sized cities in all independent municipalities and coastal areas, and new projects of large and medium-sized cities in all provinces where cultivated area per capita is less than 0.8 mu. The Country Council requires all cities to prohibit the use of solid clay bricks from 2010.

The second step: gradually prohibit the use of brick wells in Shenyang, Nanjing, Sichuan and other places.

In July 2004, the Shenyang Urban Construction Bureau issued a policy: from the second half of 2004, Shenyang City must use prefabricated cement concrete component assembly inspection wells or cast-in-place concrete cement inspection when building, expanding or rebuilding urban underground plastic inspection wells, and eliminate the use of brick inspection wells; in early 2006, the Nanjing Municipal Public Utilities Bureau and the Nanjing Municipal Construction Committee jointly issued "Notice on Gradually Eliminating Brick Well Inspection Wells In Municipal Road Construction", decided to
gradually eliminate brick inspection wells in the road project construction in the city from June 1, 2006, and require all construction, design and construction units to actively promote the use of cast-in-place reinforcing steel concrete inspection well, and prefabricated assembly reinforcing steel concrete inspection well and concrete modular inspection well with good overall stability, high strength and ideal good closed water, or other inspection wells constructed with reliable quality and advanced technology; at present, the cities that publish the forbidden brick documents are: Beijing, Shanghai, Chongqing, Sichuan, Hebei, Shandong, Shanxi, Jiangxi, etc.

The third Step: The Ministry of Construction clearly promotes plastic inspection wells

On March 18, 2004, the Ministry of Construction announced the “Use Technology Promotion, Application and Restriction of the Ministry of Construction” (No.218 announcement of the Ministry of Construction), the urban drainage plastic pipe system and plastic inspection wells were clearly promoted in the announcement. The announcement is specifically described as follows: the diameter of the tubing adopts inner diameter series pipe, and the inspection wells use plastic inspection wells as far as possible. At the 2005 National Polyethylene Pipeline Production and Application Seminar, the Ministry of Construction hoped that domestic manufacturers could develop plastic inspection wells suitable for China's national conditions; on July 25, 2006, the Ministry of Construction issued the “Plastic Inspection Wells for Building Village Drainage” industry standard (CJ/T233-2006), and in early 2007, proposed the priority to use plastic inspection wells in the "Eleventh Five-Year Technical Bulletin". At present, plastic inspection wells have been gradually used in Shanghai, Henan, Sichuan and other places, and some regions have introduced corresponding policies to actively promote plastic inspection wells.

3.2. Economy

In the past 15 years, China's economy has achieved rapid development. According to GDP per capita data of the World Bank's, in US dollars at the current exchange rate, in 2017, China's GDP per capita was US$8,827, close to the United Country, Germany, France, Japan in the late 1970s, the United Kingdom in the 1980s, and the early 1990s. Korea. In contrast, China's GDP per capita in 2003 was $1,288; it is close to France, the United Kingdom in the late 1950s, Japan in the late 1960s, and South Korea in the late 1970s.

During this period, China's economic development was equivalent to France from the late 1950s to the late 1970s, the United Kingdom from the late 1950s to 1980s, Japan from the late 1960s to the late 1970s, and Korea from the late 1970s and early 1990s, during this period, China's economic development speed was basically the same as that of Japan and South Korea at that time, but faster than France and the United Kingdom, China's economic growth in the past 15 years, France and the United Kingdom spent 20 years. At the same time, China's development speed is faster than the global average level, and the gap is gradually narrowing. In 2015, China's GDP per capita (US$8,069) was higher than that of middle and high-income countries for the first time (US$7,695). In 2017, the gap between China's GDP per capita and the world's GDP per capita (US$10,714) was further narrowed; it is closest to the world average level in 2007. However, China's 2003 level is only close to the global average level in the early 1970s, in these 15 years, China's economy has developed faster than the global average level. Since China established the reform goal of the socialist market economic system in 1992, China's GDP per capita growth speed has far exceeded the world average speed. According to statistics of the World Bank, since 2015, the GDP per capita speed of the higher, middle higher and middle income countries has slowed down or even declined. However, China's GDP per capita has continued to maintain 5% and 1% speed in 2015 and 2016.

3.3. Society

With the continuous deepening and development of China's reforms and the increasing economic level, various pollutions inevitably happen, such as fog and haze, pollution of drinking water, and lack of groundwater. Under this environment, people's awareness and attention to environmental protection has gradually increased. Environmental protection and greening have also become the development direction of various industries.
3.4. Technology
The production of plastic inspection wells are mainly composed of two parts, injection machine and modified plastics. As Germany first proposed the Industry 4.0 National Strategy and China's market continues to improve the performance requirements of injection machine products, the technical level of the domestic injection machine manufacturing industry is also steadily increasing. At present, through independent innovation and the introduction of advanced technology, the domestic injection machine industry has made great progress in technology and is gradually narrowing the gap with advanced foreign manufacturing technology. However, the gap between domestic injection machines is still large in high-end products, if domestic enterprises want to keep footing in the fierce competition and compete with imported products, they must adapt to market development and accelerate product structure adjustment. In addition, continuing to improve the control and automation level of injection machines and reducing energy consumption, it should be developed in the combination series direction according to market changes, for example, the same type of injection machine can be equipped with three types of injection devices: large, medium and small, and assembly standard and combined types, improve the supporting capabilities and flexibility of accessory equipment, and expand the use scope.

With the sustained and prosperous development of China's economy, the technology of the modified plastic industry has been gradually improved, and the gap on internationally developed countries is gradually narrowing, and some aspects have reached the advanced level of the world.

3.5. Brief summary
It can be seen that under the background of the sponge city, the new type of plastic inspection well industry is strongly supported and encouraged from the political level to the national leaders and down to the local government. China has the strength to realize the environmental protection and greening of this industry from economic angle; it has greatly support and promotion to the development of the industry from the social and technical level.

4. Case Analysis--Take Company A as an Example

4.1. Company Survey
Company A is a large-scale environmental protection building material enterprise that produces and sells plastic inspection wells and supporting materials for the sponge city construction, which has two invention patents, many utility type and design patents. The new type of plastic inspection well series production developed by the company has been highly evaluated in the market for its excellent design and good quality, it is the first domestic manufacturer to innovate and modify materials for plastic inspection wells. After concept of the sponge city was proposed by the country, the company actively responded to the national policy call to improve the traditional inspection wells, invested and built SMC whisker modified high-density polyethylene plastic inspection wells industrialization project with 125 thousand sets of annual output.

4.2. Condition of new type of plastic inspection well project

4.2.1. Product scheme. The target product of the project is SMC whisker modified high-density polyethylene plastic inspection well; the product manhole cover connecting piece, main well seat parts adopt high polymer resin for one-time injection molding, the product assembly size is accurate; the interface is equipped with high-performance rubber to ensure no leakage; the overall structural combination of the product is convenient and flexible; the same size fittings of the manhole cover adopt cylindrical structure to enhance the effect of bearing circumferential stress, the process equipment is complete and advanced, it has the characteristics of saving land resources, preventing settlement, no leakage, anti-aging, rapid construction and long service life, it is an environmentally-friendly drainage product that is promoted and used by the country. The traditional inspection wells mainly use brick well and reinforcing bar concrete, after the plastic pipe replaces the cement pipe, the plastic pipe and the
brick well have poor sealing performance, uneven settlement, and serious leakage, result in two pollution of groundwater secondary pollution, seriously increased post-maintenance and sewage treatment fees. The plastic inspection well adopts high polymer resin as a raw material for one-time injection molding, and use separate combination, drain pipe adopts advanced flexible connection, which effectively solves the problem of uneven settlement caused by the connection of traditional brick and plastic pipes, under the current situation of building a “conservative and environmentally-friendly” society, plastic inspection well with no leakage, anti-settlement, good drainage effect, anti-aging, fast construction, improved the quality of urban water supply and drainage, increased water supply and drainage efficiency, and conform to the needs of national development policies.

4.2.2. Construction content. The project construction site is Mianyang Hebei-Pingwu Industrial Park, the total investment is 120 million Yuan, the construction of factory buildings (including production areas, living areas and business districts) is 33,852.08 m2, and 346 sets of equipment are newly increased, after establishment, the annual output is 125,000, achieve annual production of 125,000 sets of SMC whisker modified high-density polyethylene plastic inspection well industrialization, promote and apply to a wide range of municipal administration and architectural village.

4.2.3. Benefit analysis. I. Economic benefits: after the completion of the project, the sales revenue of plastic inspection wells and their supporting facilities will reach 250 million Yuan/year; the normal annual value-added tax, additional tax and income tax of the project are estimated to be 52.5 million Yuan/year; the total annual profit of the project will is 50 million Yuan / year.

Some financial data are as follows:
(1) The internal rate of return is 33.67%.
(2) Investment profit rate (average): 35.42%
(3) Static investment recovery period: 3.5 years (including construction period)
(4) Net profit margin (average): 16.39%
(5) Profit margin of own funds investment (average): 62.64%

Second, social benefits: the company adopts diversified management ways, and cooperates with high polymer materials research institutes to form an innovative alliance, and builds intelligent plastic inspection wells through advanced technologies such as modified research of raw material, product structure design, and intelligent detection, and lead China's plastic inspection wells into a new era with reliability, convenience, economy and environmental protection. The whole plant adopts a cyclical process for recycling, Reduce energy consumption and waste emissions. The plastic inspection wells adopt the overall prefabricated type, and its self-sealing performance is very good, it is convenient and reliable to connect with the plastic pipe and is not easy to leak, therefore, the leakage problem is completely solved, and the rainwater and sewage resources can be effectively utilized to achieve the effect of water saving. The inner wall is equipped with a guiding groove, which is smooth, and the dirt is not easy to stay, which reduces the possibility of blocking, has excellent drainage performance, and the discharge rate of rain and sewage is 1 to 3 times the conventional inspection well. This project strictly implements the relevant national environmental protection laws and regulations, and the construction project implements the “three simultaneous” principle of “main engineering simultaneously design, simultaneous construction and simultaneous use of the main project”. Environmental protection adheres to the strategy of combining prevention with treatment, and prevention first. Adhere to the up-to-standard discharge and total control, comprehensively improve environmental management level, and handle the relationship between environment and economic benefits.

4.3. Brief summary
After country proposed the concept of the sponge city, the company A focused on creating a new type of plastic inspection well project. Through the implementation of the project, Company A has achieved good economic and social benefits.
5. Suggestions on Developing New Type of Plastic Inspection Well Industry under the Background of the Sponge City

Since the country proposed the concept of the sponge city, relevant industries should adapt to the development of policies and society. As plastic inspection well industry for the sponge city construction, it is necessary to innovate and transform products and technologies as early as possible. It can be seen from the case of company A in the article that the early adaptation to the policy of the sponge city and the creation of new type of plastic inspection well project can obtain better economic and social benefits.

The strategies for developing a new type of plastic inspection well industry are as follows:

First, strengthen organizational standardization and technical standardization work. Although the case of company A in the text put into production of new type of plastic inspection wells and has achieved good economic and social benefits. But if other enterprises also produce their own products, this will bring various products. This situation is unfavorable for the construction of the sponge city. Only industry standards and product standards are unified. The products produced by various enterprises are standardized, which is conducive to the development of industries and enterprises. Standardization is an important guarantee for plastic inspection well products. At present, the industry has just started, and more attention should be paid to standardization.

Second, integrate the plastic inspection well industry value chain, improve the allocation of resources and optimize the utilization efficiency in the chain. The new kind of plastic inspection well industry value chain is enterprise group with the ultimate goal of plastic inspection wells and interrelated value-added activities.

Third, expand the financing channels and ensure that there is sufficient capital investment. It can be seen from the case of company A in the paper that the capital required for the enterprise investment and construction project is huge, and it is not realistic to rely solely on the enterprises' own funds. More social capital needs to be entered, including the involvement of country support funds, such as low interest rates of banks and even interest-free loans, and subsidies for various projects. Only get the support of the country and society, the new type of plastic inspection well industry will develop rapidly.

Fourth, further develop relevant policies that are conducive to the development of new type of plastic inspection wells under the background of the sponge city. Although the country has issued relevant guidance for the sponge city, relevant policies for inspection wells has been issued as well. However, the existing policies are still slightly lacking in the support strength. It is necessary for the country to vigorously encourage the development of this industry, formulate more detailed policies and strictly require various regions to implement and supervise.

Fifth, increase the innovative strength, the main is talent training. Regardless of the sponge city or the new type of plastic inspection well, they are all newer concepts. No matter whether industry practitioner or personnel engaged in industry research, they are extremely lacking. For this reason, we must focus on cultivation, introduce foreign professionals, and train high-level management talents who have the sponge city thinking and can promote the industrialization of new type of plastic inspection wells.

6. Conclusion

Compared with the traditional building materials industry, the plastic inspection well industry under the background of the sponge city is an emerging market with unlimited potential, it can be known from the implementation condition of the case of company A in this paper. Under the background of the sponge city, this paper is based on China's macro-environmental analysis, takes a plastic inspection well enterprise A with dominant position in the industry as an example, through this company's project research, this paper summarizes briefly related problems of developing plastic inspection wells under the background of the sponge city, thus summarizing the problems of industrialization development of China's new type of plastic inspection wells and proposes relevant suggestions.
Acknowledgements
Achievements in 2018 Humanities and Social Sciences Key Project of Education Department of Sichuan Province, Project Number: 18SA0005.

References
[1] Peng Haiyang, Zhan Shengze, Guo Yingyuan. New Exploration of Cooperation between Fujian FTA and Taiwan with Xiamen as Frontier[J]. China Soft Science, 2015(08)
[2] Yu Kongjian. Three Key Strategies to Achieve A Sponge City:Retention, Slow Down and Adaptation[J]. South Architecture. 2015(03).
[3] Wu Lianfeng, Wang Ning. Practice and Thinking on Program Preparation of Construction of Xiamen Sponge City[J]. Water & Wastewater Engineering, 2015(06).
[4] Sponge City. Ignacio F Bunster-Ossa. Resilience in Ecology and Urban Design: Linking Theory and Practice for Sustainable Cities. 2013.
[5] Building Sponge City: Redesigning LA for Long-Term Drought. Amy Standen. Morning Edition (NPR), 2015.