

Research on old industrial zone renewal and reconstruction strategy -- Take the urban design of Shougang Industrial Zone as an example

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Abstract: With the continuous advancement of new urbanization construction in China, cities are constantly undergoing structural adjustment and industrial transformation, and some industrial land located in urban areas is gradually facing renewal and transformation. In the renovation of these old industrial plants, most cities choose the simple and crude "demolishing and rebuilding" method, which not only consumes a lot of manpower and material resources, but also wastes urban resources, destroys the historical culture left by the old industrial zone, and erases the memory and sense of belonging of urban residents to the industrial plants. Shougang Park is located in the capital of Beijing, with social attention, policy support and rare scale and energy level that other industrial heritage renewal projects can hardly match, which determines that its renewal has a strong meaning of urban rejuvenation, and makes great contributions to promoting industrial upgrading and social integration in urban areas and wider urban areas.

Keywords: Old industrial area; Transformation and renewal; Shougang Group

1. Location overview

With the development of economy and the adjustment of industrial structure, the theoretical process of spatial cycle of urbanization is urbanization, suburban urbanization, counter-urbanization, and re-urbanization. The renovation of Shougang Park is an important manifestation of re-urbanization.

Shougang Industrial Zone was founded in 1919 as Shijingshan Iron and Steel Company, one of the largest steel enterprises in China at that time. The Shougang Old Industrial Zone is located in the southwest of Shijingshan District, Beijing, adjacent to the Yongding River and at the junction of Chang 'an Avenue extending to the west. On the north side, there are Bajiao residential area, Special steel, Mokou historical protection block, Shijingshan thermal power plant and ancient city residential area. 8.63 square kilometers of land stretch naturally along the Yongding River, with superior natural conditions.

Shougang Old Industrial Zone is located at the intersection of Shijingshan, Mentougou New City and Fengtai Hexi area. It is located at the junction of the western development belt of Beijing City and the central city, and has the advantageous location conditions based on the central city and radiating the western New city.

From the perspective of Beijing city, Shougang is located in the west of Chang 'an Avenue extension line, which carries the important functions of relieving the urban development pressure in the central urban area of Beijing, releasing the space in the western part of the city and driving the development of the western part of Beijing.

Shougang is located in the western development belt, the main goal of the transformation is to introduce high and new technology development, develop tourism, develop commercial logistics and so on. The southwest region of Beijing is mainly dominated by chemical industry and manufacturing industry, while the northwest region is mainly dominated by leisure and high-tech industry. In terms of the overall western region, there is a significant difference in industrial development between the north and the south, with the north developing faster and the south relatively backward.

The renewal and development of Shougang in regional space, transportation, environment and other aspects are related to Beijing's urban construction and regional cooperation. Shougang is located in an

important position in the western node and is an important area to ensure the full development of the western space.

2. Evolution of Shougang Industrial Zone

Shougang Industrial Zone was founded in 1919 and is one of the top ten steel companies in China, initially covering an area of only about 1 square kilometer. After 1949, after several large-scale expansions, Shougang has become a large steel enterprise group with mining, smelting and rolling capabilities, and its area has gradually expanded from 1 square kilometers to 7 square kilometers^[1], becoming the largest industrial plant area in the central urban area of Beijing.

Shougang Industrial Zone used to produce steel with a total building area of about 2 million square meters, with more than 200 industrial buildings and structures. The existing buildings and structures mainly include various production houses, living houses and equipment houses of different historical periods.

The important historical relics of Shougang Industrial Zone are divided according to different construction periods:

2.1. Before the construction of Shougang

Before the construction of Shougang Industrial Zone, some parts of Shijingshan and its surroundings within the scope of the current factory were retained in the Ming and Qing dynasties

Some of the historical relics, including Shijingshan Binyan Ancient Well, Yongzheng Imperial stele Pavilion^[2], Bixia Yuanjun Temple, etc., have been listed as district-level cultural relics protection units.

The number of historical relics in this period is small, and the distribution is scattered, mostly stone structures or wood buildings (figure 1, figure 2).

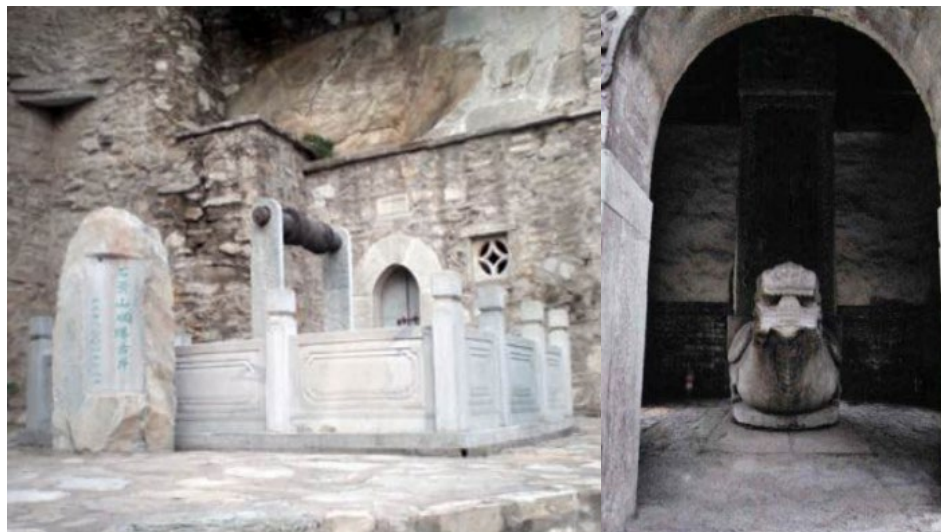


Figure 1: Shijingshan eyes ancient well map (self-drawn) Figure 2: Yongzheng imperial tablet pavilion picture (self-drawn)

2.2. Between 1919 and 1949

At this time, the factory history exhibition hall and the two coke oven witnessed the start of Shougang. The factory History Exhibition Hall was originally built in 1919 as a stone office building with a double slope roof, using Qingshan stone extracted by Shougang for the construction of blast furnace base^[3]. The second coke oven was built in 1943, using the architectural foundation left over from the Japanese Puppet period. As the first generation of coke oven in China, it has been put into production for 42 years, and has become the coke oven with the longest furnace life^[4] (figure 3, figure 4).



Figure 3: Factory history exhibition hall (self-drawn) Figure 4: Two coke oven diagram (self-drawn)

2.3. From 1949 to present

Since the founding of the People's Republic of China, the economic development of Beijing has been confirmed in Shougang Industrial Zone. During this period, Shougang built buildings and structures with various functions and diversified architectural features, including the Red Building Guesthouse, a sintering workshop, various workshops, blast furnaces, silos, etc [5].

Located at the foot of Shijingshan Mountain, the Red House Welcome Hotel was built in the 1950s to receive experts from the former Soviet Union and was the first building in the Shougang Industrial Zone. The main building of the Red House Hotel is a brick-concrete structure built of red brick materials, and the adjacent white building is a concrete structure. The building structure is intact, and the architectural form is solemn and simple. A sintering workshop was built in 1958, using the technology of the former Soviet Union, which witnessed the special historical period of the former Soviet Union's assistance in the expansion of Shougang. Blast furnace and silo are the important production houses of Shougang Industrial zone, and the design features of its curved shape are the important embodiment of the urban features of Shougang Industrial zone.

Shougang Industrial Zone has a long history of 91 years. The restoration and reuse of a large number of factory construction and production equipment left over from Shougang's old industrial zone, the preservation of the industrial culture of the old industrial zone and the improvement of the ecological environment of the old industrial zone have become major problems in coordinating the economic, cultural and social development of the western Beijing region [6].

From the aspect of urban construction, the industrialization construction of Shougang has made great contributions to the urban modernization of Beijing. From the perspective of industry development, Shougang has developed into one of the largest production bases in China's iron and steel industry; From the perspective of technology research and development, Shougang has created China's first oxygen top-blown converter and oxygen generator, as well as automatic blast furnaces, representing the advanced productivity of the country. Therefore, Shougang records the glorious industrial development history of Beijing, and is also a microcosm of the country's political, economic, social and cultural development, with high industrial heritage value (Figure 5, Figure 6, Figure 7, Figure 8).





Figure 5: Red House welcome hotel (self-drawn) Figure 6: A sintering workshop diagram (self-drawn)
Figure 7: Blast furnace drawing (self-drawn) Figure 8: Silo plan (self-drawn)

3. Analysis of Shougang Industrial zone before transformation

The renovation of Shougang is faced with many problems such as economy, culture, environment and society, which is representative and typical in many old industrial plant renovation projects in China. This kind of old industrial zone located in the center of the city of Shougang should be renovated to make its value play again and continue to contribute to the development of the city.

In Shougang industrial zone, according to the process of steel production, a number of functional zones are formed, and the space, buildings and structures of each functional zone have clear functions and distinct characteristics. At the same time, the connection between each zone is established through road traffic or special industrial facilities.

According to the construction texture of Shougang Industrial zone, the quality of construction is mostly "good" or "medium", the building quality of the plant is prominent, and the overall building quality is good.

The functional divisions of Shougang's old industrial plant are complex and diverse, including industrial chain, power facilities, storage and production

Service facilities, production industries, etc., the spatial and architectural features of each functional area are unique and have the potential to become an industrial landscape (figure 9).



Figure 9: Shougang Industrial zone building texture map (self-drawn)

4. Shougang Park analyzed after the transformation of Shougang Industrial Zone

The design and reconstruction methods of physical environment include "urban acupuncture", which triggers the renewal of the surrounding area with points and surfaces in a small scale and short period; "urban link", which uses specific spatial clues to sort out and string the material remains of the original urban value; and "urban darning", which combines the characteristics of "acupuncture" and "link" to sew up the broken, missing and broken areas of texture to make up the white [7]. The renewal of Shouiron and Steel Park selects a revival mode combining various forms, and uses various techniques in the important nodes of the space or event counterpoint relationship to make the regeneration of the physical environment more holistic and organic, presenting a renewal picture of

multi-strategy and multi-technique co-governance.

Eight groups of "urban acupuncture" anchor buildings in the "West Fourth and East Fourth" of the North District of Shougang Park complete the framework of the renewal planning backbone of the North District through the "urban link".

On the west side of the North, "Winter Olympic Square, Three Blast Furnace Museum, Winter Training Center and Snowboard Jumping Platform" are linked through "Two Lakes Green Ridge" and "Binhu High Line Park". First of all, the plan is based on the two lakes to construct a huge longitudinal ridge belt green corridor. This ridge space links the Winter training center, Shougang No. 3 Blast Hall Museum, and the three anchor buildings of the Winter Olympics Square from the south to the north. At the same time, it also connects the adjacent commercial Center, the Wuyi Theater, the Starbucks Coffee Winter Olympics Park and the Shougang Workshop Holiday Intelligent Hotel and other important buildings. The "Binhu High Line Park" along the north side of Qunming Lake joins the "Two Lakes Green Ridge" and links the snowboard big jump, power plant and cooling tower to the west to transform Shangri-La Hotel to form the Z-shaped core structure of the West (figure 10, figure 11).



Figure 10: Three blast furnaces before and after renovation (self-drawn) Figure 11: Showpond before and after renovation (self-drawn)



Figure 12: Shougang Park north road network structure (self-drawn) Figure 13: Shougang Park south road network structure (self-drawn)

The "one and two blast furnaces, four blast furnaces, desulfurization workshop and New Shougang

Building" in the east area of the North District are linked through the central green axis and the High Line Park. After connecting with the northeast Jinanqiao transportation hub of the base, it accesses the High Line Park system through the N4-4 transfer station in the center of the region. From north to south, it passes through the junction of blast furnace 1 and 2, then passes through the central green axis to the desulfurization workshop of the Park Exhibition Center at the south end through blast furnace 4, and then enters the urban Chuangxin Darning Factory in the east and finally arrives at the new Shougang Building, the brain of New Shougang. This group of C-shaped planned high line system crosses the east Road of the drying pond and the west Z-shaped structure at two points of the desulfurization workshop and the N4-3 transfer station, forming two links linking east and west. Driven by the renewal of urban links, the re-engineering interface of the physical environment of the park quickly enters the Qunming Lake area from north to south from Xiuchi area, realizing the regional leap-forward renewal (figure 12, figure 13).

5. Conclusion

The old industrial factory in the city is an important part of the city, and it is the memory of industrial civilization that cannot be ignored in the city. China's awareness of the protection of these waste industrial plants needs to be improved. In most of the renovation projects, the renewal method of "demolishing and rebuilding" is adopted, which not only ignores the value of industrial culture and destroys the memory of urban residents about industrial culture, but also ignores the potential development value of the location, culture, economy, ecology and other aspects of the old industrial plants. Resulting in a great waste of resources.

Shougang Park is located in the capital of Beijing, with social attention, policy support and rare scale and energy level that other industrial heritage renewal projects can hardly match, which determines that its renewal has a strong meaning of urban rejuvenation, and makes great contributions to promoting industrial upgrading and social integration in urban areas and wider urban areas. Correspondingly, in the general sense, most industrial relic renewal cases focus on the functional transformation of production areas, while little is involved in the mixing of micro-level residence and the reconstruction of social space, which is difficult to benefit the city in the field of social integration.

In recent years, in the renewal of industrial relics, the "re-urbanization" of new village-type residence in industrial enterprises has gradually entered people's vision. In addition to updating the original factory, the developer and design team also projected their vision on the new workers' village that is adjacent to the factory. In view of aging, homogenization, hollowing out, spatial decay and other problems, the strategy of local placement and systematic upgrading can be selected to sort out and consolidate existing residential buildings, improve thermal performance and residential comfort, retain the texture and vegetation characteristics of the original new village, and maintain the physical space carrier of "acquaintance society". At the same time, opening up the channel connecting with the city changes the old appearance of the community and introduces new "social people". The comprehensive improvement of open space and supporting facilities not only benefits the indigenous people, but also actively introduces rich urban activities and business forms, completing the process of "re-urbanization" with the attitude of integrating into the city.

References

- [1] Li Tong, Wang Hao. Introduction of urban planning and design Collection Scheme for the New Core Shougang Industrial Zone Transformation Start-up Area in the west of Beijing by Seizing the opportunity of Shougang Relocation [J]. *Beijing Planning and Construction*, 2011, (03):195-199.
- [2] Liu Boying, Li Kuang. Research on protection and reuse of Industrial heritage resources in Shougang Industrial Zone [J]. *Architectural Creation*, 2006, 09:36-51.
- [3] Liu Boying, Li Kuang. Protection and reuse of industrial heritage resources: A case study of Shougang Industrial Zone [J]. *Beijing Planning and Construction*, 2007, 02:28-31.
- [4] Liu Boying, Li Kuang. Shougang Industrial Heritage conservation planning and renovation design [J]. *Architectural Journal*, 2012, 01:30-35.
- [5] Huo Qifeng. Research on protection and limited design of Shougang Industrial Site [D]. Beijing: Capital Normal University, 2013.
- [6] Zhang Y. Research on the problems and strategies faced by the renovation of Shougang Old Industrial Zone [J]. *Urban Development Research*, 2015, 05:12-17.
- [7] Shougang Park urban landscape project -- Project Report, 2015, 11