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Primary Exploration of the Protection and Reuse of “Abandoned Machines” in Industrial Heritage

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Abstract. During the rapid development of a city, it is inevitable to expand and abandon some space, so industrial heritage that cannot bear the production function is regarded as a symbol of waste, decline and decay. Only the city where the old and new coexists is a real sense of city. In this paper, through the analysis on the current situation of “abandoned machines” in the contemporary industrial heritage, the innovative strategies for the protection and reuse of “abandoned machines” in the industrial heritage are generalized and expounded by taking into account the existing problems, referring to relevant cases and summing up experience.

1. Status of “Abandoned Machines” - Industrial Heritage

When countries around the world are embracing the golden age of industrial heritage reuse, for our country, the industrial heritage has witnessed the journey of our country from “made in China” to “created in China”, and has very significant commemoration for China’s industrial era. Inheriting industrial culture is one of our methods to build a strong country. As shown in Fig.1 and Fig.2, the industrial heritage in the first and second batch of “China’s Industrial Heritage Protection List” published by the Ministry of Industry and Information Technology in January 2018 and April 2019 were located in various provinces throughout the country, and has a variety of categories. With regard to the protection of industrial heritage, there is the reuse of “abandoned machines” at the micro level in addition to the protection, transformation and reuse of space at the macro level. Only by handling the protection and innovative reuse of the abandoned machines well can the historical value, cultural value, economic value and aesthetic value of industrial heritage be brought into play.



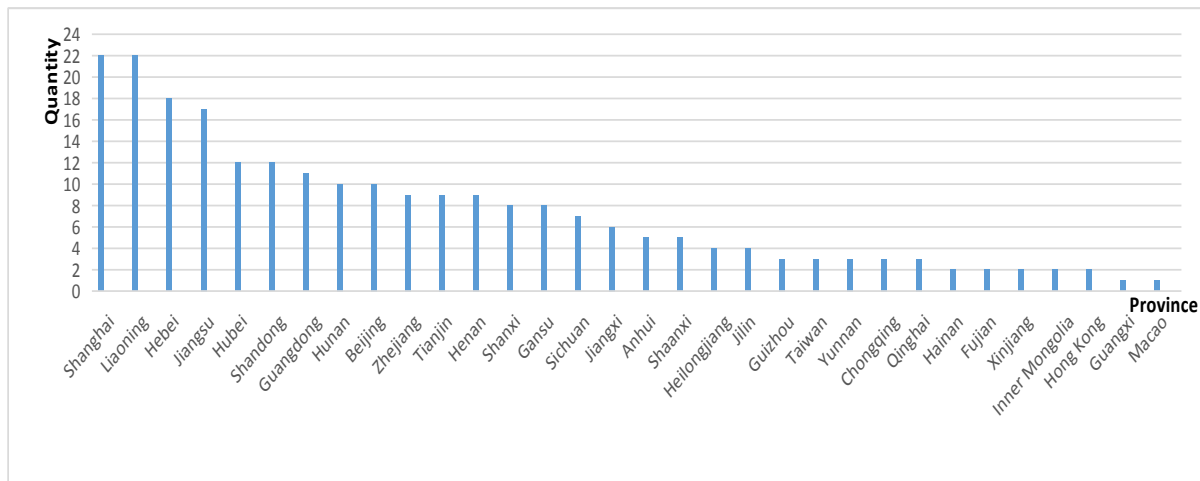


Fig.1 Statistical Graph of Geographical Distribution of the Heritage in the First and Second Batch of “China’s Industrial Heritage Protection List”, with Some Industrial Heritages Spanning Multiple Regions (Drawn by the Author)

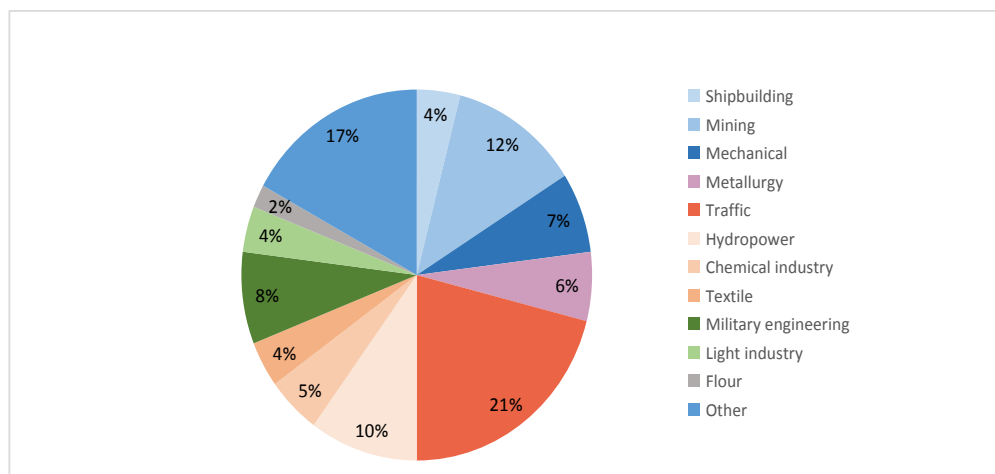









Fig.2 Statistical Graph of Industry Distribution of the Heritage in the First and Second Batch of “China’s Industrial Heritage Protection List” (Drawn by the Author)

The *Nizhny Tagil Charter* adopted by TICCIIH in July 2003 defined the industrial heritage, and pointed out that industrial heritage not only includes buildings, machinery and equipment, workshops, manufacturing plants, mines and processing & refining sites, warehouses and storerooms, places for the production, transmission and utilization of energy, transportation and all related infrastructure; but also includes places of social activities related to industry. The abandoned machines in the industrial heritage include all the instruments and equipment used in the production, the structures in the industrial heritage space, the traces left by the production activities and other residual objects. The specific types and characteristics are as follows:

Table 1 Types and Characteristics Analysis of Abandoned Machines in Industrial Heritage (Drawn by the Author)

Type	Example	Image	Features
Structure	Independent structures in the environment	 Chimney, Water tower	<ol style="list-style-type: none"> 1. Strong fixation; 2. special form; 3. strong identification; 4. High degree of correlation with architecture and space
	Limiting factors in the space	 Building wall	
Production equipment	Such as: production tools, related processing equipment, machine tools, etc.	 Production	<ol style="list-style-type: none"> 1. Easy to be damaged; 2. Technical; 3. Movable; 4. Strong identification
		 Processing	
Traces of production activity	Such as production slogans, construction traces, etc.	 Production	<ol style="list-style-type: none"> 1. Sense of time; 2. Political significance; 3. Direct display of the spirit of the place
Other residual items	Such as: pipes, pipelines, materials and parts left over from products, etc.	 Pipes	<ol style="list-style-type: none"> 1. Relatively dispersed; 2. movable, separable and combinable ; 3. Unrestricted by original position
		 Production	

Almost all industrial heritages are buildings with a long history since their construction. Their structures have long lacked stability and the security required for the space is also lacking. The large-scale demolition and reconstruction of industrial heritage will inevitably lead to large economic consumption, but also generate a lot of waste of resources and air pollution. Therefore, the reuse of industrial heritage is discussed through the micro level of “abandoned machines”, and measures are taken to different objects combined with their varying classifications and characteristics, so that these forgotten objects are reborn and revitalized.

2. Problems in the Protection of “Abandoned Machines”

2.1 Assimilation of contents are excessive pursuit of economic benefits unilaterally

With the acceleration of urbanization, the application of real estate becomes more and more urgent, so many old industrial plots have become one of the common demands of developers and residents,

and the high demand for resources and land use has led to people's pursuit of economic benefits from the reuse of industrial heritage land.

As we all know, the 798 Art Park in Beijing is comparable to other art districts in terms of geographical location, spatial environment and architectural characteristics relying on its convenient geographical location and large-scale modern Bauhaus-style buildings. It is precisely such successful industrial transformation cases that have been imitated by similar industrial transformation in all provinces and regions of our country, thus forming the assimilation in the content, and leading to a rigid and single planning strategy. In order to pursue economic benefits, without local market research, a large number of industrial heritage sites in most areas have been developed into tourism and cultural area, creative art parks, etc., which can only temporarily bring economic benefits, result in insignificant effects in the long run, and also cause the waste of buildings, resources and so on to a certain extent.

2.2 Instrumentalization of the culture and the excessive departure from the true local characteristics

Due to the shortage of construction land resources and the urgency of economic pursuits, the regional modernization of space, site and facilities has been resulted in during the utilization of the old industrial base, which lacks the cultural flavor of the industrial period, and fails to make full use of each detail and each abandoned machines on the one hand; and on the other hand, the excessive enrichment of the culture fails to grasp the degree of utilization in the long run, and the method of promoting the economic development of a city by the means of reusing industrial heritages will of course have short-term results, but the interpretation and understanding of the industrial culture in it is the long-term effect.

3. Mode and Method of the Protection and Reuse of "Abandoned Machines"

The protection and reuse of industrial heritage needs to take a series of measures from different types. One of the main topics discussed in this paper is the protection of the industrial heritage on the material level, including the large-scale equipment, machinery, products and so forth left over from the industry. The protection and reuse of this part may adopt the static installations, exhibitions or a combination of modern materials and functions to present a new look and achieve certain economic benefits. The second is the protection of non-material products derived from the industrial work process, including the representative spirit of the factory, and the psychological and visual hint are mainly used to achieve the inheritance and development of industrial culture.

3.1 Reconstruction Mode and "Functional Transformation" Method

3.1.1 Mode and Method of Artistic Transformation

The mode of artistic transformation is mainly based on industrial culture, and supplemented by other arts and culture. Through the joint creation of artists from different fields, the abandoned machines are transformed into works of art. The machines abandoned by the gray industry are the raw materials. After artistic transformation, they form cultural and creative products and are given new functions and cultures to transmit different industrial spirits, and set off the industrial interest of space, making industry and art perfectly integrated.

Functionality Transformed to Artwork. Starting from the more detailed industrial waste, the abandoned machinery facilities in the industrial plant area can be made full use of as sculptures in the

space. For example, the sculpture at the entrance of the Memory Performing Arts center in the eastern suburb of Chengdu adopted the combination of small gears and screws of industrial waste machines as the musical sculptures that work in concert with the function of the place, making them not only play the role of guide symbol but also carry on the theme of industrial culture of the whole place. (As shown in Figure 3) Of course, adding artistic paintings, variation in modeling, etc. to the reorganization of small components left over from the industrial heritage is both of ornamental value and can be used for tourists' purchase of souvenirs, and realizes both the reuse of industrial heritage and economic benefits.

3.2 Space Display Mode and Method

It is difficult to reconstruct and make use of some fixed and large-scale abandoned machines, but the industrial memory carried by them cannot be erased. Therefore, this part of abandoned equipment can be simply repaired, and used as the furnishing in the space or classified for exhibition, so as to achieve the protection of the part of abandoned equipment in industrial heritage.

3.2.1 Functionality Transformed to Landscape Installation

The first step of the specific implementation method is to abandon the original production functions of the machine, and clean the surface and use it as a landscape sculpture without reservation on the basis of respecting the original form of the abandoned machine, thus increasing the industrial color in the space. For example, the "Huaqing College of Xi'an University of Architecture and Technology", which was transformed from the former Shaanxi steel mill area, has adopted such techniques in its exhibition, architecture articles, landscape accessories. Some of the structures in its original factory, such as the chimney, water tower, storage pool and so on, retained the abandoned chimney, which not only increases the sense of marking and guidance of the road and building, but also is of great significance to the continuation of culture and history.

In addition, for scattered industrial parts, an assembly-type structure method can be adopted to assemble parts of abandoned parts of different sizes randomly and dimensionally, thus forming buildings of different shapes. Therefore, they optimize the space, attract people and achieve sustainable economic development.

3.2.2 Functionality Transformed to Interior Furnishings

As abandoned machines are different in the size, not all types of abandoned machines can become a member of the outdoor landscape. Some relatively small ones can be used in the interior decoration, or to bear certain use function. Of course, with this kind of use, they will highlight the aesthetic sense by combining with new materials, so that they are better integrated with the space. As shown in Figure 4, an iron gird is added to the interior of the abandoned machine to decompose it into different spaces for placing decorative objects, or for storing objects. The upper part is covered with the glass made of new materials, so that the surface becomes a parallel plane, which realizes the two-way use of the display and storage function of industrial waste equipment; as shown in Figure 5, the service counter in Taoxichuan, Jingde Town, which was transformed from a generator, also cleverly applies the industrial waste gas equipment in the interior furnishing. With the combination of new materials, the materials of "waste machinery" have been made full use of, which reduces the economic input without lacking the performance of industrial culture.



Figure 3



Figure 4



Figure 5

Figure 3: Sculpture at the entrance of the Performing Arts Center (Source: self-photographed by the author)

Figure 4: Exhibition Equipment (Source: self-photographed by the author)

Figure 5: Taoxichuan Service Counter Transformed from a Generator (Source: self-photographed by the author)

3.3 Modes and Methods of Public Facilities

In addition to the original machinery and equipment in the industrial heritage, there are many obvious details of industrial traces, which can be collected and displayed in the space with a harmonious theme style to add the industrial memory of the space, so as to transmit the industrial spirit and industrial culture. The abandoned industrial machines are repaired and transformed, so that they can serve a certain function in public space and become public use facilities.

3.3.1 Functionality Transformed to Public Facilities

The materials and components left over from the production, combined with the original structural system, are set in public spaces such as corridors and exhibition halls of different scale after refurbishment to become a small landscape with unified functions and style in public places while providing the use function for the public. For example, the springs were transformed into a public seat in the “heritage transformation of Shenyang Tiexi Industrial Buildings” (as shown in Figure 6).



Figure 6



Figure 7

Figure 6: Public Seats Transformed from Screws and Springs (Source: self-photographed by the author)

Figure 7: Beijing 798 Art Garden (Source: self-photographed by the author)

3.4 The “Cultural Symbiosis” Method

The abandoned machines in industrial heritage can be reused in the way of cultural symbiosis besides functional correspondence transformation, and are suitable for almost all functional spaces. Their signs are mainly traces left by production activities, such as banners, slogans and factory spirit, all of which are important carriers of industrial culture. As shown in Figure 7, the obvious characters left by the industry on the wall in the space of Beijing 798 Art Park have a strong sense of the times, fully reflecting the political and cultural characteristics of the era at that time, and setting off the local

industrial and cultural characteristics. This approach is also the most prominent way of cultural hints.

3.4.1 Symbiosis of different times. In the reuse of abandoned machines, different components, materials, equipment, styles, textures, colors, etc. are skillfully merged to make the strong contrast between the old and new. As a result, those who are in it can truly experience the collision between history and modernity, so as to awaken the sleeping memories of the factory that was in a hubbub of voices and in full swing in the past, and realize the continuation of the industrial age, making the industrial culture and industrial spirit illuminate the development road in the future.

3.4.2 The continuation of industrial culture and the sense of belonging. The traces left by production activities and the vicissitudes of the old industry in abandoned machines are preserved, and the original industrial spirit of the abandoned machines are respected, arousing people's nostalgia for the old industrial period. The protection and reuse of abandoned machines in the industrial heritage is not only to give new value to the abandoned objects, but also to make people find the old memories from them, and retain people's excellent quality of unity, simplicity and hard-working in the industrial period, thus achieving the inheritance and continuation of industrial culture.

4. Conclusion

Industrial heritage is an emerging type of heritage. To protect and reuse the "abandoned machines" in industrial heritage, the targeted innovative use of abandoned machines of different types and forms shall be performed, so as to enable them to give play to diverse functions and realize the economic, cultural and historical value of industrial heritage. The strategies for the protection and reuse of abandoned machines in industrial heritage in this paper are mainly summarized to three modes, namely, the artistic transformation mode, space display mode and public facility mode. There are various methods of functional transformation and cultural symbiosis, which are not limited to the protection and reuse method of "abandoned machines" in industrial heritage. Through the combination of modes and methods, the value of abandoned machines can be brought into full play, and the industrial cultural spirit represented by abandoned machines is retained and inherited.

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