Perspective Directions of Renovation of Industrial Enterprises on the Example of Khabarovsk City

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Abstract. The article is devoted to the problems of renovation and functional re-profiling of industrial facilities of the Soviet industrialization period. On the example of the city of Khabarovsk, the possibility of revitalizing the territories of the Dalenergomash, Daldizel, Splav and Amurkabel factories, which at one time were the largest industrial enterprises in the region, is considered. An excursion into the history of these enterprises is given, their current state is considered, promising directions for the development of these objects and their territories are identified. Special attention is pays to the study of Russian and foreign experience in the renovation of industrial enterprises, which can be used in the Far East. As a result, the authors propose recommendations for possible renovation of industrial heritage sites in the city of Khabarovsk, taking into account the existing urban planning and economic situation.

1. Introduction

The Soviet period in the history of the Russian state left behind a large-scale industrial heritage. However, nowadays, not all enterprises have retained their production capacity, and many of them have completely lost their efficiency. On the territory of Russia and the post-soviet countries there are many industrial objects that have lost their primary functional purpose. The abandonment of such facilities most often has negative consequences for several reasons at once. Firstly, business owners incur significant material losses; secondly, the city is losing potential workplaces and gets vast unused, depressed territories. In addition, the surrounding areas have problems with the development of infrastructure, an increase in crime, as a result the quality of life of citizens and the economic attractiveness of urban areas decreases.

In Khabarovsk, this problem is as relevant as for any other city in the Russian Federation. There are four large industrial enterprises on its territory: Dalenergomash, Daldizel, Splav and Amurkabel plants, which have now ceased to exist. The only exception is the Dalenergomash plant, which still has not lost its main production function, however, its production capacity has been reduced many times, and most of the territory is not used or is given over to the location of trade and logistics facilities\textsuperscript{[1]}. The rest of the enterprises were closed, their territories are currently not used, and workshops and other technical buildings and structures are in a dilapidated or dilapidated state. Undoubtedly, these fragments of the urban environment need updating, updating production or including other functions.
The purpose of this research is to study modern directions for the renovation of industrial facilities and develop proposals for the reconstruction, functional re-profiling and revitalization of abandoned industrial enterprises in the city of Khabarovsk period the Soviet industrialization.

2. Materials and methods of research
The main method of this research was a comprehensive study of scientific literature and Internet resources, affecting modern trends in the revitalization of industrial areas, as well as considering the Russian and foreign experience of reconstruction, renovation and functional re-profiling of industrial facilities. The authors carried out an urban planning analysis, which made it possible to identify a range of problems and identify promising directions for the development of the three largest industrial enterprises in the city of Khabarovsk – Dalenergomash, Daldizel, Splav and Amurkabel plants.

3. Results

3.1. Russian and foreign experience in redevelopment or renovation of industrial enterprises territories
In the course of the study, the authors considered modern methods and approaches for the renovation of industrial territories used in the central part of Russia [2-6], as well as foreign experience [7-9], including Estonia and Norway, which also have a number of abandoned industrial facilities. The analysis made it possible to identify two main directions of renovation of objects this type:
- complete dismantling of existing buildings and the design of a new planning structure for the formed territory;
- preservation of existing buildings, restoration and re-profiling of industrial facilities, in world practice there are many examples of this type, because in most cases of renovation, historical buildings are of particular value. However, to compact the existing buildings or if it is impossible to preserve and restore the object, the historical architecture is combined with the modern.

As a rule, the second option is most preferred. It is more economically profitable since it does not require capital expenditures for new construction. Also, it allows to preserve the aesthetic component of objects, which affects the visual appearance of the area, and, warehouse and industrial buildings have potential for redevelopment and variability of use. Let's consider the most successful examples of such renovation.

District "Rotermann" in Tallinn. In 1849, Christian Rotermann built a trading house near Viru Square, around which a new industrial quarter of the Rotermann family of companies, engaged in the production and sale of building materials, soon grew, and later, at the beginning of the 20th century, new enterprises appeared here: pasta and starch factories, a distillery, a sawmill, a bakery, mills and a salt warehouse. After the Second World War, the area fell into disrepair due to constant bombing. Until the beginning of the 70s, only grain production remained in the quarter. The reconstruction of this area began in 1991. In 1996, the salt warehouse was reconstructed in the Rotermann quarter, and the Estonian Museum of Architecture was opened there. At the beginning of the XXI century, the quarter was recognized as a historical building, the maximum height for buildings was set at 24 meters (the height of the existing grain elevator). Due to the combination of old industrial buildings and modern architecture in the development, the quarter received a stylistic variety and partially retained the aesthetic appearance of the industrial area [10].

Vulkan district in Oslo. Since the 19th century, it has accommodated the workshops of the heavy foundry industry, whose specialization was the production of bridge elements. When production in the city ceased, the eponymous development company Vulkan took over the quarter, which created an entire area, and in 2014 opened a large indoor market Mathallen. The developer did not confine himself to creating sites for small businesses, but also over time began the construction of residential buildings, educational institutions, cultural and entertainment facilities. In the development of this area, the principles of a comfortable and environmentally friendly urban environment were also used -
car traffic within the territory is limited, and alternative energy sources (geothermal source and solar collectors) are used. Owing to the use of the existing building stock, the district retains the appearance of an industrial zone, however, during the restoration of objects, modern solutions were introduced - this stylistic combination looks original and distinctive [11].

3.2. Reconstruction of the territories of Khabarovsk

3.2.1. Circle of problems

Due to the Soviet heritage, in Khabarovsk, as in many other cities of our country, many industrial enterprises for various purposes were created, but today almost all of them have ceased to exist or have reduced their production rates to minimum values. In this regard, the redevelopment of abandoned areas of character is attractive, the city cannot develop freely, having "spots" in the planning structure. The city administration, giving non-functioning buildings and adjacent territories to a private owner, receives taxable economic zones, as well as newly improved fragments of the urban environment and exploited buildings, which are no longer a “black spot” on the functional city map.

After analyzing the examples of the conversion of industrial facilities in the city of Khabarovsk, we can say that there is a tendency to equip workshop and warehouse premises for a trading function. An example is the former building of the main building of a garment factory, which has been a shopping center for many years. Some objects belonging to the Dalenergomash, Daldizel and Splav plants were reconstructed in the same way. The Amurkabel plant in this case is an exception, since the plant was preserved recently in 2014.

3.2.2. Dalenergomash plant

Dalenergomash – one of the largest enterprises in Khabarovsk, appeared in 1932 at the intersection of Lenina and Leningradskaya streets. The territory of the plant accommodated 21 workshops and auxiliary facilities. Dalenergomash provided work for about four thousand people, which contributed to the placement of residential buildings for workers near the enterprise. New conditions and political and economic changes led to the closure of the factory, which resulted to changes in the use of the territory. The closure of the machine-building enterprise and the use of its facilities for a new purpose allowed to drastically reduce harmful emissions into the urban environment and reduce the sanitary protection zone. In general, this gives the city the opportunity for new multifunctional development [12].

Currently, a vast area of the plant, nearby to the street. Leningradskaya and Rabochiy Gorodok streets was redesigned into a retail space. On this territory, in the former workshop buildings, there are two large shopping centers "EcoDom" and "Maxi Mall", as well as a number of small stores. The main territory of the plant has not been renovated, most of the technical buildings and structures are abandoned, and some are even destroyed. The plant itself is currently operating at only 1 percent of its former capacity.

In the future, the land on the territory of the plant needs cleaning and rehabilitation after many years of technogenic use. It is also necessary to comprehensively develop retail outlets, with an analysis of the infrastructure (the existing transport scheme cannot meet safety and bandwidth requirements due to an increase in the flow of cars and pedestrians), the architectural appearance of buildings (this is necessary for the aesthetic consistency of shopping center facades with the surrounding urban environment, for improving its quality).

3.2.3. Daldiesel plant

The Daldizel plant was opened in 1902 as a district artillery workshop. In 1908 it was renamed into the Arsenal plant. In June 1918, the Ussurysk Front was created, for which the Arsenal workers built two armored trains armed with guns from the ships of the Amur military flotilla. By January 1920, a complex repair of firearms was mastered and the production of ammunition began.
Later, from the mid-1920s, the plant began to produce complex machines and mechanisms, as well as metal products. In the 1930s, in the course of industrialization, it was reconstructed, and also again changed its name to "Dalselmash". Since 1959 the company has specialized in the production of marine diesel engines and diesel generators, which later gave the plant a new name - "Daldizel" [13].

In 2007, due to the complicated economic situation, the company was declared bankrupt. In 2019, the company's emergency buildings began to be demolished, but a small part of the leased plant structures were repaired at the expense of private investors. A grocery store "Svetofor" and a sports school are open in the main building.

The territory of the enterprise is located near the coastline, and is separated from it only by a forested area, on which the Arsenal hotel and the stadium are located. In the future, the territory of the plant can be reformed taking into account these conditions, as a tourist complex, with various sports facilities, hotels, shopping and entertainment centers, as well as a recreational area.

3.2.4. Splav plant
The Splav plant was put into operation in 1983, the main profile of the enterprise was the development and production of electronic products according to the established nomenclature, non-standard equipment and goods for cultural and household purposes. In April 1994, it was decided to close the direction of integrated microelectronics. And the equipment, tools, fixed and circulating assets, as well as documentation for the production of civilian and special-purpose products were transferred to the enterprise of the Novosibirsk Semiconductor Device Plant. In the same 1994, the plant was renamed "Dalelectron" and began to specialize in the production of electronic products. Since 1998 the enterprise has ceased to exist [14].

Today, the plant's facilities have been redesigned for retail and warehouse space, and the administrative building has been disbanded for office space. In the immediate vicinity there are residential buildings and cottage villages. The territory of the enterprise itself has lost the integrity of the structure - the objects are distributed among different owners, due to which partial transport and pedestrian accessibility remains.

The territory needs further improvement, the development of transport and pedestrian schemes in and around the territory, and the buildings in the facade reconstruction, the development of a single design code. In the long term, this object could become a multi-purpose shopping center, there is a demand for this, because the former enterprise is located in an actively developing residential area, far from the city center.

3.2.5. Amurkabel plant
In 1956, the Amurcable plant was built as a universal production to meet the needs of the defense complex and the national economy of Eastern Siberia and the Far East with cable products. After the collapse of the Soviet Union, the entire territory of the Russian Federation, as well as neighboring countries, became the market for the products manufactured by the enterprise. In 2014, the company was declared bankrupt and closed, and subsequently mothballed. However, in the years preceding this - 2007-2010. the plant actively switched to new foreign equipment. Thus, the enterprise can resume work and start production at any time [15].

Prospects for the development of this territory are in the resumption of production of the enterprise, taking into account new technologies to reduce the impact on the environment. Since the enterprise is located within the city of Khabarovsk, it is necessary to develop a project proposal for adapting the territory of the enterprise in the urban environment, since industrial facilities affect the perception of the urban environment, a possible solution would be a partial improvement of the territory near the street. Pavel-Morozov, reconstruction of the facades of the main administrative building, as well as the creation of a recreational zone, on a vacant lot near the territory of the enterprise. This solution will create an additional sanitary protection zone and increase the attractiveness of this remote area of the city.
3.3. Development prospects

The study made it possible to identify the most promising directions and approaches in the field of renovation of industrial territories that are relevant for Khabarovsk:

- An integrated approach to the renovation of territories. This practice is widely used abroad, as can be seen from the examples given in the text. However, in Russia, the integrated development of abandoned industrial facilities by a single development company is not so developed, although this approach allows us to determine the prospects for the projected space, identify existing problems and submit proposals.

- Preservation of historical buildings. Although in the examples of the renovation of industrial facilities in Khabarovsk, industrial facilities are abandoned and reconstructed, it cannot be fully said that the historical context and image of the industrial area remains unchanged. In this case, designers need to focus on creating a unique historical environment, with the characteristic features of a particular industrial facility and its original aesthetics.

- Creation of transport and pedestrian schemes. This design stage will lay the foundation for the creation of infrastructure, adapt it to the fabric of the city, increase traffic, as well as transport accessibility.

For industries continuing their work, the following will become relevant:

- Introduction of new production methods, reduction of industrial impact of enterprises on the environment and improvement of their environmental friendliness. This solution will help in the development and increase the attractiveness of nearby residential areas, improve the comfort of their lives.

- Adaptation of industrial facilities in the urban environment. A common problem in factories is their depressive perception. Competent proposals for the improvement and change of the facades of these objects will help in improving the quality of the nearby urban environment.

A number of these proposals could be useful in carrying out restoration work and projects for the re-profiling of industrial areas in the city of Khabarovsk.

4. Conclusion

Based on international experience, we can say that the development and re-profiling of such territories is a labor-intensive and gradual process that requires a detailed analysis of the territory, sufficient funding, as well as an integrated approach to renovation. Particular attention should be paid to creating conditions for organizing catering facilities, cultural, entertainment and sports centers, facilities of a modern and comfortable urban environment, and other centers of social development that can become places of attraction for people. Such measures will reduce the pendulum migration of newly formed areas and give them a new life. It can be noted that the world experience in the renovation of industrial facilities is richer, this allows you to be based on it and avoid previously made mistakes.

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