Opportunities for integrating the historical industrial enterprises into the modern urban environment in Rostov-on-Don

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Abstract. Today, historical industrial facilities and their territory, located earlier on the outskirts, industrial enterprises with the growth and development of cities, were included in their architectural and planning structure. There is currently a clear tendency to orient the historical industrial heritage objects to urban public spaces using the re-functionalization methods in the historical industrial heritage reconstruction in our country and foreign design practice. The relevance of the industrial facilities’ reconstruction in Rostov-on-Don is due to the presence of irrationally used urban areas and the need to create the universal modern spaces for work, leisure and entertainment in the central residential quarters of the city. The study examined two industrial heritage sites and presented the design solutions for them.

Introduction
Currently, the urgent problem of historically developed mixed industrial and residential areas in the Rostov-on-Don city is the renovation of the large industrial facilities formed in the XIX - XX centuries, which currently do not function and their long front impede the city development. Meanwhile, these territories are especially valuable for the residential and public areas development.

Starting from the XVIII century, there was an increase in industrial production, in most states which led to the scientific and industrial revolution and the emergence of large industrial facilities and territories. Such objects and territories are the historical evidence of the population skills’ development in a particular territory. That is why today the world community recognizes the importance of such objects, as evidenced by the appearance in 1999 of TICCIH - the International Committee for the Conservation of Industrial Heritage [1]. In the documents of the Committee, it is determined that the industrial heritage consists of the industrial culture remnants that have historical, technological, social, architectural or scientific value. These residues consist of buildings and machinery, workshops, mills and factories, mines and sites for processing and refining, warehouses and storage facilities, places where energy is generated, transferred and used, transport and its entire infrastructure, as well as such places used for social activities related to industries as housing, religious worship or education” [1]. The material evidence of these profound changes is of universal value, and the importance of studying and preserving these evidences should be recognized.

One of the important measures to improve the urban living environment is the obsolete and harmful industries’ removal from the city residential areas to the peripheral industrial areas. And if the objects
before industrial purposes have architectural and historical value, the question of their renovation inevitably arises. However, often the old layout of historical industrial buildings, the lack of a holistic view of their use, the inconsistency with modern safety standards and a number of other factors do not allow the full use of this valuable area in many respects, which is also located in the central areas of the city. As a rule, low-rise residential buildings of various styles and time of construction prevail in the surrounding residential quarters, the population living in it is deprived of full infrastructure and forced to move to the district center to receive various services. Therefore, after the task of preserving and renovating these objects, the issue of re-functionalization and determining the optimal set of functions that can and should be located in the transformed territories becomes a priority [2,3].

Goals, tasks, research methods
The purpose of the study is the study, retrospective analysis, the features’ identification and the search for the principles of the industrial architecture rational use.

To achieve this goal, the following research tasks were set:

- To introduce the existing industrial heritage sites;
- To identify the basic methods of working with industrial heritage;
- To present various design solutions.
- To determine the most demanded cultural and social functions for the selected territory, taking into account the sustainable architecture principles.

The research methodology is based on a comprehensive study of the industrial territories’ adaptation process development in the context of changing the sociocultural priorities [2,3].

The research methods include an integrated approach, involving the analysis of historical, urban, spatial, functional and technological features of industrial facilities and industrial territories through the study of design materials, field examination and photographic recording.

Design decisions
One of the fundamental principles in the objects’ renovation should be the industrial buildings complex architectural and planning organization conformity for the necessary functions and all these factors should be considered in the complex, both space-planning, functional, and compositional and artistic design aspects. The development of such sites makes it possible to create new centers of attraction and functional content in the existing residential areas. Currently, there are various methods of renovating the industrial facilities, but, unfortunately, the most radical is complete demolition, and this is the main problem of renovation, since there is a loss of unique industrial structures of architectural and historical value.

The analysis of foreign and domestic experience in renovating historically valuable industrial objects of architectural heritage makes it possible to identify various approaches to their adaptation to the conditions of modern cities and the needs of their residents [4].

Today, several major methods of working with industrial heritage are used in the world and Russian practice. If an industrial object is of historical architectural and artistic value, then, if possible, they try to maintain the function of this object with the production modernization under modern conditions or the restoration of such objects is carried out, followed by the museum creation and obtaining a museum within the boundaries of the city territories. Another method is partial use, i.e. adaptation of industrial heritage while retaining a partial function or partial museum creation. And the most cost-effective is the method of re-functionalization.

There are several significant objects and territories of industrial heritage both in terms of area and architectural and artistic value on the territory of the Rostov-on-Don city. Let us consider two of them: Flour Mill No. 2 and Radiator Plant named after I. D. Chentsov.

Today, the re-functionalization of the objects and territories of industrial heritage assumes the following functions [5,6]:

- Residential function (Apartments, hotels, hostels)
• Business function (Business centers, design bureaus, coworking)
• Commercial function (Shopping centers, restaurants, show rooms)
• Cultural and leisure function (Cultural centers, libraries, creative studios, rehearsal facilities, clubs)
• Museum and exhibition function (Museums, galleries, exhibition centers)
• Sports function (Sports schools, fitness clubs, sections)

The objects
Today, the significant areas of industrial heritage sites can be the basis for the urban environment’s development and expansion. The unprofitability of these facilities today with proper use can lead to economic growth, both for the owners of these territories, and for the city as a whole.

Flour mill No. 2
The site is located in the Proletarsky district of Rostov-on-Don. From the north it is limited to Podvoisky lane, from the west LCD “City by the River” under construction, from the east 29th line street, from the south by the Don river. According to the city master plan, it refers to the public-business zone new construction site (Figure 1).

Figure 1. Topographic map and the site layout.

The Flour Mill as one of the first industrial enterprises in the city was founded in 1883. One of the first references to the mill in Nakhichevan is found in the reference book “The entire Region of the Don Army” for 1899: Partnership of the Nakhichevan South Russian Roller Mill, on the banks of the Don river. From 1905 to 1915, according to the city reference books and the assessment documents, on the banks of the Don river in Nakhichevan, on the 29th line street, the mill of the Paramonov Brothers Trading House was located. The buildings were built in the characteristic architectural style of the time (Figure 2).

Figure 2. Grain elevator and transition to the right bank of the Don river. The administrative building of the plant 1976-1978.

During the Second World War, the plant did not perform its direct functions, the Rostovites defended the city from German troops close to the building. There were no serious damages, and already after the war the plant was fully operational.
After bankruptcy at the beginning of the 2000s, it was acquired by a Moscow grain company. It is currently completely abandoned (Figure 3).

![Figure 3. Modern photofixation](image)

Radiator Plant named after I. D. Chentsov.

The site is located in the Proletarsky district, within the boundaries of Nalbandyan str., Kayani str., Chentsova str., the 2-line str. There are production buildings, administrative buildings and utility buildings on the territory. According to the master plan of the city, this territory is intended for multi-apartment construction (Figure 4).

![Figure 4. Topographic map and layout of the site](image)

The Rostov Radiator Plant appeared on the basis of forge-cast-iron foundries, built by the German specialists Grünfeld and Kailich in 1895. In 1902, Grünfeld and Kailich sold the workshops to the Russian merchant M.F. Dutikov, the owner of the sarpin factory located next to them. In 1912, the workshops were renamed and got the title “Leli & K” Cast Iron Foundry. The new owner re-equipped the workshops and started the production of oven casting, cast iron cookware. In 1920, the plant was nationalized, it was named after I. Chentsov. In 1927, the plant started producing radiators and became known as the “Radiator Plant named after Chentsov” (Figure 5).
Figure 5. Administrative building photo 1953, production building 1944

During the occupation of Rostov-on-Don by Nazi invaders, the plant was badly damaged. In 1975, in connection with the conversion, Radiator Plant is part of the “Rostovsantekhnika” production association. In 1991, a closed joint-stock company for the production of sanitary fittings for residential and industrial buildings was established, which is the legal successor. Today the production is transferred out of the city territory (Figure 6).

Figure 6. Modern photo fixation

The problems of industrial facilities’ renovation and their solutions attract architects and researchers around the world. Research laboratories in the field of the industrial heritage renovation in Rostov-on-Don have been conducting the research laboratories at the Academy of Architecture and Arts of the Southern Federal University for more than a decade. As a part of the course and diploma design, the specific solutions that are quite competitive in terms of their implementation are proposed (Figure 7, 8).

Figure 7. Design proposal of the Southern Federal University Academy of Architecture and Art student Lyashova V., supervisor N. Kostenko
Figure 8. Design proposal of the Southern Federal University Academy of Architecture and Art students Polady I., supervisor Mokina Al. Yu.

The project proposal’s purpose is to give the historical buildings of industrial areas a new function, which can save the unique industrial facilities, their character, save the urban environment from the destructive development, turning it into a public zone with versatile functions, such as exhibition and sports centers, congress halls, laboratories, cafes, restaurants, etc. [7, 8]. In the first project, multifunctionality was applied when adapting: exhibition spaces, workshops, museums, a sports club, cafes, restaurants, a hotel and housing. In the second project a mono function was used: a sports complex.

Summary
The industrial architecture renovation will give an opportunity to preserve the morphology of the area, as well as to create the new residential, public or recreational functions that improve the social, environmental and aesthetic development environment.

The re-functionalization of industrial areas makes it possible to improve and reorganize the existing environment, as well as increase the number of socio-cultural spaces with an increase in the aesthetic quality of industrial facilities and surrounding territories.

Considering the possibilities of the industrial facilities’ renovation, it is impossible not to note their most important historical and cultural component, and the need to maintain it during these territories’ reconstruction. Historical continuity, preservation of authentic features of a specific urban development, allows to avoid depersonalization of the urban environment objects. First of all, it is possible to avoid similarity by preserving, and not destroying the iconic objects’ development in the territory of architectural and / or historical value, and endow them with new functions. These do not have to be the architectural monuments. Any buildings that characterize the era in which they were built become a landmark of the updated urban situation and serve as an object of the place identification.

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