

**THE FEATURES OF ARCHITECTURAL RENOVATION OF INDUSTRIAL HERITAGE FOR NEW FUNCTIONS**<sup>1</sup>**V.P. Urenev,**

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**Abstract:** The article deals with some issues related to the renovation of industrial facilities. The authors under the concept of «renovation» mean a set of measures aimed at the socialization of the stopped industrial facilities by introducing public, residential, recreational or mixed functions into them. This process is considered as a complex event, which is determined not only by architectural and urban planning solutions, but also with the complicity of the municipality, business and citizens. Domestic and foreign examples of renovation at different levels of the urban hierarchy are considered, ranging from small objects to the largest industrial zones: a separate object, a complex of buildings and structures, an industrial hub (zone). The authors have found that in Ukraine at the present stage, renovation is dictated more by economic considerations than by the desire to preserve the industrial heritage, in contrast to existing trends abroad. Foreign experience shows that not only buildings with an architectural and planning solution corresponding to the new function are adapted for new functions, but also special-purpose buildings (for example, silos) for manipulations that require large capital investments and design changes. In Ukraine, only the first method is used so far. It has been established that there is a tendency to introduce several functions to create multifunctional facilities both in Ukraine and abroad. A modern city with an industrial past requires an increase in building density and a comprehensive reconstruction of the urban fabric for successful life. The formation of multifunctional complexes based on stopped industrial facilities will help the urban structure in the process of restoration and regeneration in the context of sustainable development.

**Keywords:** renovation of industrial facilities, multifunctional architecture, industrial heritage.

**Statement of the problem.** Consideration of the processes of modern urban transformation of cities, trends and prospects for the new use of territories of stopped industrial enterprises.

**Analysis of the latest researches and publications.** The theoretical basis for this study is fundamental works, articles, essays in the field of industrial architecture development by Ukrainian and foreign experts. Scientific and methodological researches in the field of architectural and planning development of urban planning systems of different hierarchical levels at the present stage are set out in the work of V.A. Glazychev [1].

The formation of industrial architecture is reflected in the works of N.N. Kim [2], V.I. Vershinin [3].

The issues of organizing the architectural and spatial environment, taking into account the reconstruction of industrial areas, are disclosed in the works of I.M. Lobov [4].

Renovation of stopped objects of industrial architecture for public and residential functions is considered in the works of Yu.A. Suprunovich [5], O.A. Popova [6].

The problems of preserving the industrial heritage are disclosed in the works of Alex Fel [7], M.S. Stieglitz [8].

The development of industry in Odesa and its current state are disclosed by such authors as K.U. Rashkovsky [9], G.I. Goncharuk [10], V.V. Sherstobitov [11], V.I. Timofeenko [12].

**Formulation of the article goals:** analysis of world experience in the renovation of industrial objects for new functions and identification of the main directions of reconstruction and functional-spatial transformation of these objects and territories.

**Main part.** The first examples of the renovation of industrial facilities were heard back in the 70s. last century in Western countries. The crisis of 1973, which engulfed the countries of the Western world, led to the fact that the main industries began to be transferred to such countries of East Asia as China, India, etc. As a result, in the countries of Western Europe, the USA, England, huge territories, buildings and objects that began to adapt to new functions. Already at the turn of the 70s of the last century, a galaxy of industrial facilities appeared that underwent renovation.

For example, the Coleport Porcelain Factory was converted into the Ironbridge Gorge Museum in Britain (1968), and the cement factory in Barcelona in the early 70s was converted into architectural workshops and apartments; a historic warehouse in Toronto on the waterfront was converted into office space and a restaurant, another — the so-called blue warehouse — into apartments; the building of a trading pier in Boston for commercial and residential premises [13].

However, many objects were abandoned for a long time, forming depressed areas, there was a whole series of destruction of valuable historical buildings of the Industrial Revolution era. This resulted in a broad social movement and systematic research activities. The concept of «industrial archeology» arises, in 1990 an international committee for the preservation of industrial heritage (The International Committee for the conversation of the industrial heritage (TICCIH)), many other documents are created [14,15]. And in 2011, the recommendations of the "Dublin Charter" were developed — Principles for the conservation of industrial heritage sites: structures, territories and landscapes. These recommendations were developed in collaboration with the International Committee for the Preservation of Cultural Heritage (ICOMOS) [16,17].

Thanks to similar changes in the scientific and public spheres of the Western world, such famous objects of renovation appeared as a multifunctional residential complex based on Gasholders in Vienna (2003), the Tate Modern Gallery based on a power plant in London (2003), the Elbphilharmonic based on warehouses in Hamburg (2005) and many others.

Ukraine's path to the process of renovation of industrial facilities was different. The change in the socio-economic and political foundations of society in the post-Soviet space has led to mass deindustrialization since 1991.

One of the first examples of the renovation of an industrial facility in Ukraine is the «Na Srednefontanskoi» trade and exhibition center in Odesa, which is located on the territory of the former Workshops of railway lines and production workshops of the Agregatmash enterprise (Fig. 1).



Fig. 1. The Srednefontansky shopping and entertainment center based on the production workshops of the Agregatmash enterprise, Odesa, Ukraine [18]

The first city exhibition-fair was opened on December 22, 1998 in a pavilion with an area of 2.5 thousand m<sup>2</sup>. Today, the Srednefontansky shopping and entertainment center operates in the mall format and fully justifies its importance; anchor tenants: Furshet, Comfy, Antoshka; entertainment zone: «Cinema City», «Igroland»; parking: 500 cars [18].

The initial steps towards renovation in Ukraine were dictated more by economic considerations than by the desire to preserve the industrial heritage. It should be noted that the first wave of renovation of industrial facilities was most often associated with the introduction of trade, exhibition and business functions, since these areas became profitable, and the stopped spacious workshops, the so-called «long-term construction» and administrative buildings of industrial facilities showed a good degree of adaptation to these features.

In the early 2000s in Kyiv, Odesa, Chernivtsi, Poltava and other cities, a number of similar objects arose: the gallery «Stilhaus» on the basis of the building of the production association «Koltso» (Odesa, 2001); supermarket «Fozy» and business center «Prestige» based on the buildings of the former plant «SOM»; Shopping center «Gorodok» on the basis of the shops of the plant «Svarka» (Kyiv, 2004); SEC «Boyanivka» on the basis of the technological equipment plant, (Chernivtsi, 2009) and many others.

Along with the trade-exhibition and business function, creative spaces arise: the Most Art Center based on a garment factory in Odesa, (2007); Art Center Mlyn; based on the Niebuhr mill in Zaporozhye, (2017); creative co-working «Blue Crab» based on a warehouse in Odesa (2019) and others.

There are also examples of the renovation of industrial buildings into museums, for example, the Arsenal of Arts based on the Military Arsenal (2006) and the Museum of Water based on a water tower from the late 19th century in Kyiv (2005).

There are a number of examples of renovation for other functions: for example, for a hotel (Tokyo Hotel based on the Tram Depot of the Odesa City Electric Transport Repair Plant, 2013), for management institutions (Department of Odesa City for the sake of the administrative building of the Krayan plant, 2015), for medical institutions (private clinic «Odreks» based on the clothing factory «Acacia»), for theaters (theater on Chaynaya based on tea-packing factory № 2 in Odesa, 2010), for IT parks (IT park «Manufactura» based on Kharkov plant of bakery products № 1, 2018).

From the point of view of the renovation process, the entire industry can be conditionally divided into three groups - steps in the hierarchy of urban relations: a separate object, a complex of buildings and structures, and an industrial area [19].

The renovation of individual industrial facilities is aimed at solving local urban planning issues to adapt a stopped industrial facility to the new conditions of the urban environment. Changes are made at the level of function, landscaping, if necessary, the architectural and artistic appearance of the building.

An example is the elevator granary, built in 1924 with 42 heavy reinforced concrete silos, which is located on the V&A waterfront in Cape Town (Fig. 2). The building for a long time remained the tallest building in all of southern Africa. Up until its closure in 2001, it played a significant role in international trade and the economy. In March 2017, The Silo Hotel, the most unusual and spectacular in all of Cape Town, was opened in the elevator building on the 6 upper floors, and in September, in the lower part of the elevator, and in the building where the silo towers were, the Museum of Contemporary African Art (Museum of Contemporary Art Africa MOCAA). Also, the complex includes such functions as trade, restaurants, faculty of fine arts, library, co-working. [20]

Built in the 1920s for Fiat, Lingotto was one of the largest and most technologically advanced car assembly plants in Europe. Five-story, 500 m long, contained one million cubic meters of volume and was equipped with a rooftop auto track. In 1982 the plant was closed, and

in 1984 Fiat S.p.A. announced a competition in 1985 by Renzo Piano set about transforming the building. The project provided for the conversion of the building into a multifunctional center, while maintaining its architectural identity. [21]



Fig. 2. Multifunctional complex based on a granary, Cape Town [20]

An example of the conversion of industrial buildings to new functions in Ukraine is the former Epsilon plant of the military-industrial complex and conversions. Previously, capacitors for the aviation, defense and space industries were produced here. Soviet consumer electronics also ran on these capacitors: for example, Elektron and Horizon TVs.

Today, one of its buildings, built in 1970, houses the Morskoy Class A business center. The building is a ten-story, frame system, made of precast concrete and has a total area of 8,300 m<sup>2</sup>, including an office area of 4,300 m<sup>2</sup>. There is also a conference center, a restaurant and the Virtus plastic surgery clinic. The renovation works included internal redevelopment, dismantling of hinged facades and installation of new facade systems, arrangement of a two-level parking lot, a hinged structure at the entrance and the addition of a new 4-storey building.

The art center «Most» in Odesa was created on the basis of the stopped sewing association named after. «Rosy Luxembourg», the factory was founded in 1934 in the building of the former Lombard, built by the architect V. Prohaska in 1904-1905. The building is an architectural monument. Today it is a multifunctional organism, which includes many small objects, such as a modeling agency, a sports club, a cafe, table tennis, a quest room, a hairdresser, a dance studio, retail outlets, optics, etc. Outwardly, the massive architectural and artistic appearance of the building does not change, and the internal filling is presented, in general, interesting and attractive to visitors using modern techniques in solving the internal space in the conditions of reconstruction [22].

Another interesting object is the former flour mill, built around 1886, in Kharkov. In 1968, this facility received a different name - Kharkiv Bakery Plant No. 1, which operated until the early 2000s.

The building is a unique structure and is an architectural monument of regional significance.

By decision of the city administration, the factory will be redesigned as an IT park «Manufactura» – a complex for technology companies with a total area of 40,000 m<sup>2</sup>. The renovation involves the construction of three new buildings on the territory, the rehabilitation of the existing one and improvement. The complex will consist of several functional zones: a networking zone (Space), a complex of blocks consisting of coworking centers, shopping and commercial zones, office space (Place) and an apartment zone, each with an area of 23-46 m<sup>2</sup> (Home). Today, work is underway in the building of the flour mill to restore the emergency roof,

as well as the second building, where the campus will be located on the lower floors, and offices on the upper floors. Another building will house a shopping area and co-working space, as well as a conference room and a rooftop restaurant [23].

*Renovation of the complex of buildings and structures* involves a radical urban reconstruction of the industrial quarter, aimed at its integration into the urban structure at all urban planning levels.

The Krasnaya Roza business center is a modern business quarter, a pioneer of the comprehensive renovation of Moscow's industrial areas. The project was started in 2003 and completed in 2012. On an area of 6 hectares there are 10 unique buildings, different in age, concept, category. Initially, these were buildings of industrial manufactories. Ancient objects have retained their individuality, acquiring a new function: conference rooms, comfortable offices, exhibition halls, restaurants, universal spaces. The business function is not the primary use of the former factory. From 2004 to 2009 in the shed, dyeing workshops, the Artplay design studio was located. It accommodated more than 300 design studios offering their clients a range of goods and services in the field of construction and architecture, as well as galleries, artists' studios, cafes, bars, bookstores, a music club, a design school, a cinema and a children's art studio [21].

The Gas Tank Complex (Austria) consists of four buildings-reservoirs for gas storage, protected as architectural monuments (62 m – internal diameter and 72 meters high, 90,000 m<sup>3</sup> of internal space). Due to the current unprofitability of industrial areas and inconsistency with the needs of the city, a project was created to transform gas tanks into a residential multifunctional complex. The internal filling was dismantled, the towers were covered with new domes, repeating the ancient outlines. The gas tanks were connected by a shopping arcade, parking lots were located on the lower floors, and residential and public premises became the new «stuffing» of the towers. A concert hall for 2000 people, a cinema, a municipal archive, a student hostel, etc. have been designed. The housing stock is about 800 apartments [21].

Not far from the Protasov Yar railway platform in Kyiv, the Protasov business center is located, which arose on the basis of former clothing and knitting factories.

The renovation of the complex of industrial buildings was successfully completed in 2008, at the moment the Protasov business park contains several catering outlets, a swimming pool, several banks, offices, a shop, conference rooms, a green area and an open area on the roof. During the renovation, several workshops were reconstructed. The negative components of this project include cardinal changes in the architectural styles of some buildings. Thus, the production hall, previously made in a constructive style, acquired neoclassical decorative elements, which undoubtedly led to the loss of the historical appearance of the building.

An example of the renovation of a complex of industrial buildings is the Kharkov Plant of Transport Engineering named after V. A. Malyshev. The plant was founded in 1895 on the eastern outskirts of Kharkov. On the territory of the plant there were machine-building, copper foundry, model, boiler, painting shops. The buildings of the workshops were built according to the main trends in the industrial architecture of that time: one-story industrial facilities as volumes for mechanisms with the use of brick style in the main artistic solutions.

After the reduction in production, the sale of the premises and property of the plant took place: the workshop No. 175, bought out the plant named after Frunze; the former club "Yunost" was sold and turned into the Chamber of Commerce and Industry, the main store of the plant was turned into supermarket warehouses, the central dining room was turned into a bank branch.

In 2016, the mechanical workshop №170 (formerly steam locomotive and diesel locomotive production), on the street. Plekhanovskaya 126, is being rebuilt into the art factory «Mechanics», a new creative space in the loft style.

The territory was divided into 6 zones. These include a venue for a concert hall for 10 thousand people, an exhibition hall, a hostel, conference rooms, coworking, a park, sports, and

extreme venues. During the construction process, measures were taken to strengthen the old structures, install new ceilings and partitions. The main idea of the organizers was to create a working and creative space for entertainment and study [24].

*The renovation of the industrial area (zone)* and its interaction with the city is a synthesis of phenomena occurring at the first two levels of the urban hierarchy. Solving these problems enriches the urban environment, opening up new horizons for it. Examples are the Docklands area in London and Confluence in Lyon, the Cape Verde area in the Netherlands and Hafencity in Hamburg, the Zollverein mine in Essen, the Kopwan south area in Rotterdam, etc. [21].

Perhaps the best-known example of the complete and successful transformation of a manufacturing district overseas is the story of the London Docks. The docks appeared at the end of the 17th century as a guarded parking lot for ships and for a long time were one of the most dynamic areas of the city, the focus of commercial activity. However, in the 20th century, with the growth of container traffic and the construction of new deep-water container ports in East Anglia, Port of London cargo turnover has fallen sharply. In 1972, he lost the status of the largest port in the country.

In 1981, a special Docklands Development Corporation was organized, whose responsibilities included the redevelopment and renovation of the area. On that moment the area was a collection of unsightly high-rise buildings and terraced houses. The redevelopment created an embankment with numerous walking and cycling paths providing access to the river. Pedestrian bridges, parks and the UK's first bird sanctuary have been erected. The revitalized Docklands has received numerous architecture and urban design awards. In 1987 the Docklands Light Railway and London City Airport were opened. The largest companies were involved in the construction of skyscrapers, for example, the 244-meter One Canada Square tower, which was until 2010 tallest building in the UK [21].

In the center of the French city of Lyon, on the Presqu'île peninsula, a grandiose project called Lyon Confluence, translated from French, is being implemented. – Merging. Here, at the confluence of the rivers Rhone and Saone, from the beginning of the 19th century Rambou cargo port and related industrial facilities and facilities. By the end of the 20th century, the importance of the port rapidly fell. In the 1990s, the authorities of Lyon decided to convert 150 hectares of port and industrial areas stretching from the Perrache railway station to the confluence of the rivers. The ideology of the transformation was as follows: de-enclave the area through the construction of four bridges (one across the Saone and three across the Rhone) to provide communication with the rest of the city, fragmentation of the territory into relatively small blocks, multifunctionality, mid-rise buildings and active, incl. dispersed landscaping.

Jean-Paul Viguier designed the commercial and leisure center Confluence. MVRDV, Massimiliano and Doriana Fuksas, Clement Vergely Architectes and others designed residential complexes. Jakob and Macfarlane Architects are the creators of the office centers the Orange Cube and the Green Cube, where Euronews is headquartered. According to the project of Jean-Michel Wilmotte, the old warehouse was rebuilt into a multifunctional Communiqué center, where there are galleries, a restaurant and offices. The customs warehouse was built in the 1930s and served the needs of river navigation. In its new form, it has become an accent of the Sona embankment. The former chamber of commerce of the port of Rambou has been converted into an art space, on the roof of which is the Le Sucre nightclub. On the other side of the building, original staircases and colorful pipes – former sugar storages – have been preserved.

In total, it is planned to create housing for 16000 people, 25000 jobs, build full-fledged public transport here, lay out parks, open shopping centers and museums [21].

The multifunctional district of Hafen City was formed on the territory of the former port with an area of 157 hectares. On the one hand, the district borders on the central part of Hamburg and expands it, and on the other hand, it is limited by the river and canals, through which moving sea transport. In the 50s of the XX century. maritime trade switched to container ships that could

not moor in this area of the Elbe. The part of the Hamburg port is obsolete. For large ships, it was decided to build a new terminal.

In 1999, the Hamburg Senate announced a competition for compact development projects for the former port. The territory of the abandoned harbor was sold for the construction of a new urban complex. The zone for the new district occupied an advantageous position in the historical center and was an island surrounded by water. The joint design of the architectural firms Hamburgplan and Kees Christiaanse/ASTOC won the building project competition. The construction work began on April 9, 2001. According to the project, the district was supposed to include office buildings, residential apartment buildings, shops, entertainment venues, and a promenade for walking. All houses were designed in a futuristic style. Hafen City was planned to be made not just an elite area, but a cultural center with an organized infrastructure. Under public facilities (parks, squares, squares, churches), as well as buildings of cultural, a fifth of the territory was allocated for scientific and educational purposes. The total investment in construction amounted to more than a billion euros. The development of the port made it possible to expand the city center by 40%.

Today, Hafen City is considered the elite district of Hamburg. The project is completed by 40%. Full implementation is scheduled for 2025. A subway line has been laid in Hafen City; HafenCity Universität, an architectural university, was opened here to train urban planners [21].

The development of the territory of the Leninskaya Kuznya plant on the Rybalsky Island in Kyiv was planned in 2005. It was planned to build the Kyiv City office and residential complex here, and in 2011 to build the 40-story Golden Gate skyscrapers. However, in 2016, the development of the former industrial area began under a new project – the Rybalsky residential quarter. The area of the developed site is more than 45 hectares. It is expected that after the full implementation of the project, more than 20 thousand people will live here. The concept involves quarterly development, as is typical for the development of Podil. Each quarter-cluster of the new district is supposed to be closed and self-sufficient - it will be a closed square in terms of which a recreational space will be organized for residents to relax. Each block will have its own underground parking, which will be located under the courtyard.

The architects are proposing a canal system that will permeate almost the entire Rybalsky Island. Embankments along the canals are planned to be pedestrianized. The social and commercial infrastructure of the future district will be 4 kindergartens, 2 schools, clinics, cinemas, fitness clubs, trade, public catering, while most of the facilities will be located on the first floors of buildings. Height - 10 floors. The demolition of old buildings is mainly planned. Objects whose designs still meet the standards and do not interfere with the new urban planning concept will be left for the introduction of sports grounds and for use as public pavilions.

In 1945 the Kyiv Motorcycle Plant was created on the basis of armored workshops. Over the entire period of operation, KMP has produced about 3 million motorcycles. After Ukraine gained independence, the plant continued to function, but not at full capacity. The last batch of motorcycles was made in the early 2000s. In 2012, more than 90% of the company's shares were bought out by a private person. In 2015, the owner decided to create an innovative UNIT.CITY park on the territory of the plant. In the spring of 2017, one of its first facilities, the UNIT Factory IT school, was opened on the territory of the plant. The project is implemented by the UFuture group. According to the project, the park should include not only a school, business campuses and co-working, but also open public spaces, creative sites, and a residential complex (Fig. 3).

At the beginning of 2019, more than \$50 million was invested in the renovation of the plant and the creation of Unit City, by the end of the year the amount of investment should double. UNIT.City residents already have a number of Ukrainian technology start-ups and innovative companies. In January of this year, the sixth UNIT.City facility was opened, a new business campus for 1,000 people. According to the founder, in 2020 the project should become one of the largest innovation parks in Europe. UNIT.City is located on 25 hectares of land just 6 km from

the center of Kyiv. The innovation park forms a whole block of real estate for various purposes: offices, residential premises, innovative educational institutions, R & D-centers, VR and AR labs, 3D printing and additive manufacturing facilities. The total area of UNIT.City at the final stage will be about 860,000 m<sup>2</sup>, which will create space for the interaction of 30,000 tenants, students and residents. [25]



Fig. 3. UNIT.CITY innovation park based on a motorcycle factory, Kyiv [25]

Summing up, it is worth noting that the above objects, in addition to the main functions, such as a museum, hotel, shopping center, etc., have two or more related functions, which makes these objects multifunctional. These complexes make it possible to effectively solve the problems of a modern city at all levels of the urban hierarchy, positively influencing the quality of functional migrations in the body of the city and stabilizing it.

**Conclusions.** The analysis of the experience of renovation of industrial facilities showed that abroad there is a practice of placing new functions in industrial facilities with an appropriate space-planning system, and in facilities that do not have the appropriate indicators, but are unique or of historical significance. In domestic practice, the first option is used due to economic considerations. At the same time, the creation of multifunctional facilities is a priority for renovation, both in Ukraine and abroad. Multifunctional complexes based on the renovation of industrial facilities are an important link in the process of preserving the historical fabric of the city, and also allow solving aesthetic, environmental and ethical problems of the existence of industrial buildings and their territories in a new quality. Based on the identified data, further research is needed with the participation of various experts to find the most optimal solutions for the renovation of industrial heritage.

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## ОСОБЛИВОСТІ АРХІТЕКТУРНОЇ РЕНОВАЦІЇ ІНДУСТРІАЛЬНОЇ СПАДЩИНИ ПІД НОВІ ФУНКЦІЇ

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**Анотація:** У статті розглянуто деякі питання, пов'язані з реновацією промислових об'єктів. Авторами під поняттям «реновація» мається на увазі комплекс заходів, спрямованих на соціалізацію зупинених промислових об'єктів методом впровадження в них суспільної, житлової, рекреаційної або змішаних функцій. Цей процес розглядається як захід комплексний, який визначається не тільки архітектурно-містобудівними рішеннями, але і при співучасті муніципалітету, бізнесу та городян. Розглянуто вітчизняні і зарубіжні приклади реновації на різних рівнях містобудівної ієрархії, починаючи від невеликих об'єктів і до найбільших промислових зон: окремих об'єктів, комплексів будівель і споруд, промисловий вузол (зона). Авторами виявлено, що в Україні на сучасному етапі реновація продиктована швидше економічними міркуваннями, ніж прагненням зберегти індустриальну спадщину на відміну від існуючих тенденцій за кордоном. Зарубіжний досвід показує, що під нові функції пристосовують не тільки будівлі з відповідною новою функцією архітектурно-планувальним рішенням, але і будівлі спеціального призначення (наприклад, силосні вежі) для маніпуляції з якими необхідні великі капітальні вкладення та конструктивні зміни. В Україні використовується поки тільки перший метод. Встановлено, що існує тенденція впровадження кількох функцій для створення багатофункціональних об'єктів як в Україні, так і за кордоном. Сучасне місто з індустриальним минулим вимагає збільшення щільності забудови та комплексної реконструкції міської тканини для успішної життєдіяльності. Формування багатофункціональних комплексів на основі зупинених індустриальних об'єктів допоможе міській структурі в процесі відновлення і регенерації в контексті сталого розвитку.

**Ключові слова:** реновація промислових об'єктів, багатофункціональна архітектура, індустриальна спадщина.