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## The issues of conservation and revitalization of the monuments of industrial architecture

### Zagadnienia konserwacji, restauracji i rewitalizacji zabytków architektury przemysłowej

**Key words:** industrial architectural monuments, restoration, issues, new adaptation, revitalization

**Słowa kluczowe:** zabytki architektury przemysłowej, renowacja, adaptacja, rewitalizacja

#### INTRODUCTION

Historical objects – monuments of architecture for various purposes, dating from the second half of the nineteenth and early twentieth centuries, that is, the period of the “construction boom”, when the new types of materials and structures were actively used, and fundamentally new function types of buildings appeared, constitute the majority of the architectural heritage of many historical industrial cities such as Kyiv, Kharkiv, Lodz, etc. (fig. 1). This period was called the historicism-eclecticism and Secession. It was during this period that the whole ensembles of development of streets and squares were formed by tenement buildings and industrial buildings, which often stood in the same row with residential buildings, clearly seen in the examples of industrial objects in Kyiv and Kharkiv. If we talk about the stylistic features of the buildings of this period, it can be noted that the features of historicism, “brick style” and Secession were actively introduced not only in residential and public, but also in industrial architecture, that was emphasized in the research of Professor Yu. Ivashko [2]. So, a significant part of the inheritance, that subjects to protection, are the objects of industrial architecture, that provides for a sequential list of restoration measures with changes in functions. As noted by Professor M. Orlenko, “the main problems that need to be solved to preserve the architectural

heritage in Ukraine, including its restoration, are: the insufficient level of legislative and legal regulations for the preservation and restoration of architectural monuments; the consequences of their uncontrolled operation (damage rate, violation of the static nature of buildings, changes in hydrogeological conditions under foundations, loss of parts of foundations, etc.), the lack of methodological and organizational foundations, an information monitoring system and expert assessment of the condition of monuments” [5, p. 2]. Many of these problems are relevant for monuments and restoration activities in Poland. The systematic approach proposed by Professor M. Dyomin helps to solve the problems of systematization of the restoration issues and restoration methods in accordance with the specific tasks.

#### MAIN PART

##### THE STATE OF ISSUE RESEARCH AND THE RELEVANCE OF THE SUBJECT

The topic of revitalization of industrial enterprises was raised by many scientists. A separate group consists of publications dedicated to the objects, in which the artistic function and business function were combined. In particular, within this context, the following names of the researchers should be mentioned: Antonova A.A. [1], Glazycheva V., Makarova K. [3], Martyno-

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**Cytowanie / Citation:** Ivashko O. The issues of conservation and revitalization of the monuments of industrial architecture. *Wiadomości Konserwatorskie – Journal of Heritage Conservation* 2019;58:113-117

**Otrzymano / Received:** 15.01.2019 • **Zaakceptowano / Accepted:** 27.02.2019

**doi:**10.17425/WK58CONSERVATION

*Praca dopuszczona do druku po recenzjach*

*Article accepted for publishing after reviews*

## Methods of revitalization of historical industrial objects (Polish experience)





Photo	Functions
	<p>"Manufaktura", Łódź, Poland shopping and entertainment, catering and recreation</p>
	<p>Dołne Młyny, Kraków, Poland shopping and entertainment, catering and recreation</p>
	<p>hotel "Andel", Łódź, Poland residential</p>
	<p>EC-1, Łódź, Poland scientific and creative</p>

Fig. 1. Revitalization of the historical factories into different functions

va M. [4], Tykulov D. [6], Fedotova N. [7, 8], as well as materials of electronic resources.

Today, in many countries around the world, the practice of revitalization of industrial enterprises for a new function is spreading, since often a non-operating industrial building is an architectural monument and it should be preserved as a whole or in part (the monument protective register clearly states what is being protected — the entire industrial complex, a particular building with interiors or its facade). The issue of the adaptation of an industrial building becomes especially relevant if this is the only possibility of its restoration and preservation while preserving its functioning and profitability. It is possible to convert such industrial facilities into a shopping (shopping and entertainment) centre, a hotel, an art object, but it

should be borne in mind that not all enterprises of different industries may be revitalized in this way, but food and light industry enterprises are most closely subject to revitalization.

As the powerful experience of European countries shows, lots of modern hotels, shopping centres, the most famous creative objects are located precisely in the old industrial enterprises.

Considering the experience of the city of Lodz in Poland, which is considered to be the largest centre of accumulation of industrial facilities (more than 150) – architectural monuments to be protected, and transforming this experience, we note that the situation with non-operating industrial enterprises in Ukrainian cities is more complex, since in Lodz they are multi-storey complexes of the nineteenth century, built of baked brick, expressive architecture, suitable for the placement of elite shops (“Manufactory”) or hotels (hotel “Andel”), while a large number of non-working industrial objects in other cities, are buildings of the Soviet era of typical

architecture, and even the pre-revolutionary industrial buildings, because of their smaller scale compared with the objects of Lodz, cannot be transformed in an elite hotel or a shopping and entertainment centre (fig. 1).

## THE WORLD EXPERIENCE OF REVITALIZATION WITH RESTORATION

There are many examples of the transformation of former industrial facilities into various public buildings and residential spaces. So, in Denmark in the city of Viborg the former steel mill with an area of 2,000 square meters built of reinforced concrete panels and corrugated steel, was transformed into a centre for street sports and youth culture, freeing up additional space,

improving lighting and turning some elements of equipment and structures into small architectural forms on the territory of the complex [9].

In Milan, an abandoned aircraft factory of 1915, which stood empty from the middle of the twentieth century, recently was converted into the headquarters of Gucci with a powerful complex of numerous functional spaces, while partially using primitive dismantled structures for the modernization of old buildings and adding a new part and the dominant of the entire aircraft factory territory – a modern tower.

As an example of the revitalization of industrial facilities in Poland, the EC1 Łódź project (project: Home of Houses) should be mentioned. The thermal power station which provided the city with electricity requirements since 1907, was reconstructed in 1908, 1912–13, its operation was stopped during the First and Second World War, but later resumed, modernization measures were repeatedly carried out, and eventually the thermal power operated until 2005 (fig. 1).

After its closure, there was a difficult question of reprofiling the closed object-monument of industrial architecture of the early twentieth century in the heart of the city, near the central railway station. In May 2008, the Municipal Council of Lodz proposed a program on turning the city into a city of culture, creating a special project “ESI Lodz – the City of Culture”. The project was supported by the Investment Bureau of the Property Management Department of the city of Lodz. The renovation and modernization of the complex provided for the maximum preservation of the authentic appearance of the thermal power plant and at the same time modernizing it with its adaptation to new functions with the siting of a 3D cinema, a science centre, a planetarium, some studios, workshops and laboratories, galleries, the Theatre of Sound and conference halls.

The complex of the thermal power plant was divided into two parts. In the western part there was “Coperni-

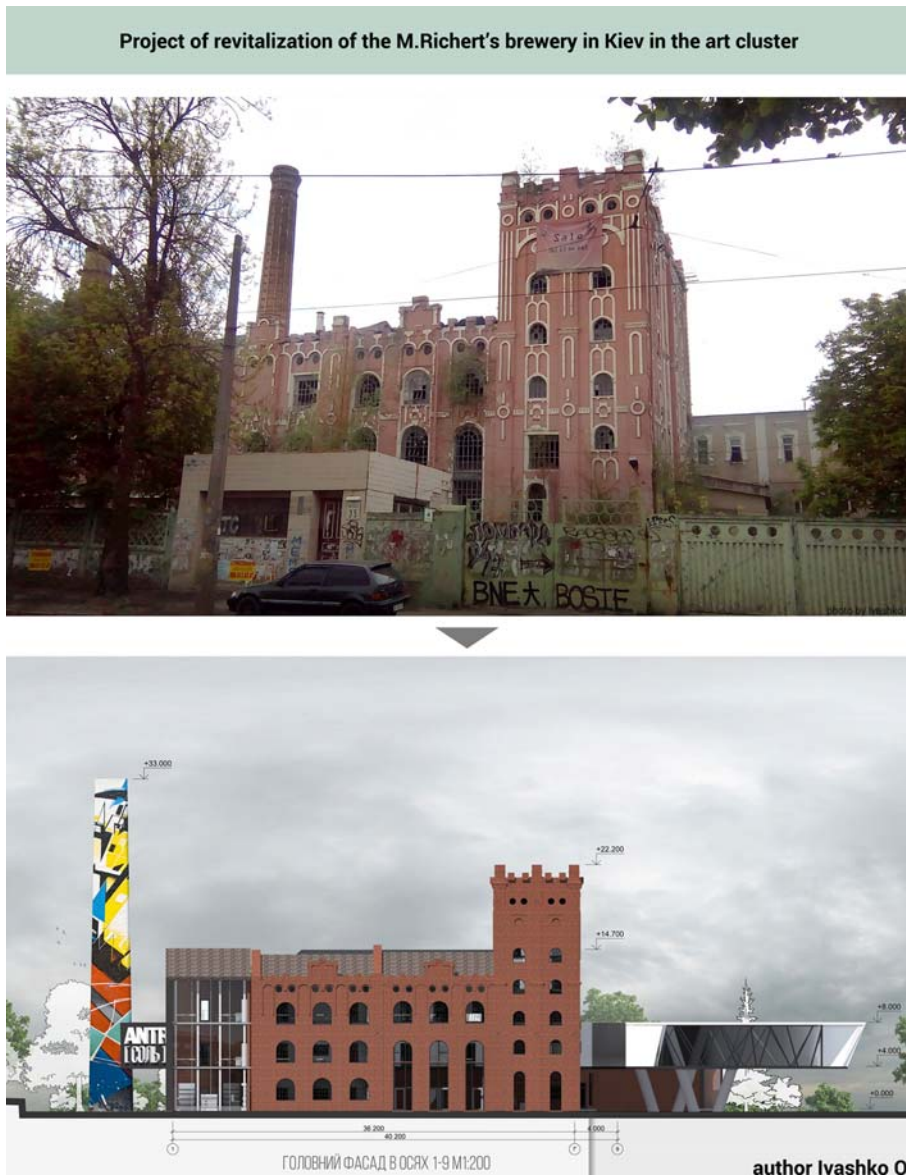


Fig. 2. Project of revitalization into Art-functions

cus”, the centre of Science and Technology – a symbolic institution of perpetuation of technical and architectural inventions related to the old power station, and three educational areas: energy, history of civilization and science, and the “Microworld-Macroworld”. The cultural and artistic functions were concentrated in the old eastern part (modern library, halls for seminars and conferences, bureau of institutes of culture, a gallery, a jazz club, a dance hall, some workshops, the “Theatre of Sound” with professional recording studios, planetarium with 3D cinema, and the so called “Lake of Memory” (tzw. Jezioro Pamięci) – a multimedia project on digital media about preserving in time the facts of the daily life of the people of Lodz”.

## METHODS OF RESTORATION

Taking into account the fact that the main part of the revitalized industrial enterprises is dated to the period of historicism-eclecticism and Secession, those

restoration technologies were selected that are relevant for the buildings of this period making provision for the type of materials and structures (fig. 2). At the same time, irrespective of the building, the main problem of imbalance is uneven subsidence of foundations, weak base soils, wetting of the base soils due to a violation or lack of waterproofing, as it was indicated by M. Orlenko in his works [5].

Some types of damage are recorded visually (fig. 2). The emergency condition of brick walls is most often caused by the changes in hydrogeological conditions, subsidence of footings and foundations (which leads to deformation of walls, their moistening, destruction of masonry, the occurrence of cracks), violation of drainage from the basement and roof, lack of waterproofing of foundations and basement parts, lack of paving, damage to drainpipes and gutters, aging of masonry mortars, a decrease in strength and bearing properties of stone, brick, plinthiform bricks, an increase in the load on the wall as a result of the restructuring and adding storeys, changing the functional purpose of the building and as a result of this placement in the building of equipment that creates vibration [5, p. 5]. As a result of subsidence of the foundation, cracks or a visual disturbance of the straight line of the brickwork appear in the walls, cases of brick chipping may be observed [5, p. 180].

Since the damage rate of old ceilings is most often due to the violation of the static nature of the “footing-foundation-building” system, and wetting of footings, foundations and structures, before carrying out restoration work on the walls, take measures to eliminate the emergency condition of footings and foundations, which are reduced to the expansion of the footing, laying the foundations with pillars in wells, replacing foundations or their transfer, cementation, silicization and electro silicization, fixing of sandy and loess soils with carbamide resins, which together with soil create watertight arrays; thermal strengthening of loess soils, pile strengthening of the foundations.

Before the final choice of the restoration technologies, the composition of the initial materials and solutions is carefully studied, since they can be of several types in one object [5, p. 173].

Some technologies have been developed for the restoration of brick masonry, since aggressive external influences cause peeling and loss of bricks, the appearance of cracks and efflorescence on the outer surface of the brick.

As M. Orlenko studied, one of the reasons for wetting brick walls can be the lack of waterproofing, rising of groundwater levels, freezing and thawing cycles, roof leaks [5, p. 180]. The emergency state of the brickwork is caused by damage of drainpipes and gutters.

One of the methods of strengthening of the dangerous brick walls with numerous cracks is the use of corsets made of metal bracings with additional reinforcement with a metal grid, on top of which

a concrete “shirt” is arranged. [5, p.184]. In addition, the method of remaking of masonry of the walls, the method of replacing the bearing elements – changing of the brick walls and partitions to concrete or frame metal ones, the method of injecting brick or rubble masonry with mortar, the method of reinforcing of brick masonry with cementation (Italian method “cemented mesh”, “Reticolo cementato”) by introducing of the steel reinforcing bars inside walls through the holes, which are filled with mortar; the method of replacing of destructive and significantly saline bricks; the method of strengthening fragile bricks with a putting of external surface of the cavity and filling of the joints, providing that the size of cavities is less than 5 cm [5, pp. 185–187].

## CONCLUSION

As foreign and national experience shows, approaches in reprofiling of the unprofitable industrial facilities differ in accordance with the objectives. Options for solving facades are reduced to three main ones:

- the full preservation of historical facades of monuments of architecture;
- the partial preservation of historical facades and the building on of new volumes;
- the complete modernization of facades in accordance with new needs.

The solutions variants for interior spaces are as follows:

- the maximum preservation of the original interiors and tactful inclusion of new furniture and equipment;
- the fragmentary preservation of the accent fragments of the primeval interiors and industrial equipment, incorporating them into a new solution concept in the interior;
- complete modernization of internal spaces without reference to the original interiors.

Creating a fundamentally new space on the site of the former industrial zone, according to businesspeople, has many positive aspects. This is the possibility of preserving the historical buildings in parallel with modernizing the look of the city, and the significant aesthetic value of old buildings, and the unusual concept and encouragement of new tenants through an interesting functional feature.

Revitalization measures must be preceded by the comprehensive restoration work. General strengthening of walls and strengthening of brickwork in many cases allows eliminating the emergency condition of buildings, however, these works should, as a rule, be carried out together with measures to strengthen the footings and foundations, which are in many cases the root cause of the deformation of walls. In some cases, you should first strengthen and stabilize the walls (above-ground part of the building), and then move on to strengthening of the footings and foundations (underground part of the building) [5, p. 184].

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## Abstract

The issue of restoration with the new adaptation of industrial architectural monuments is one of the most difficult tasks of the restoration industry, taking into consideration the specific character of these objects, the list of materials and structures used, the layout. In most cases, objects of restoration with a change in function are those industrial facilities which are located in the central regions of large cities made of brick and are architectural monuments of the second half of the nineteenth and early twentieth centuries, that is, during the “construction boom” period. As a consequence, the restoration measures are aimed at such activities as strengthening and eliminating the emergency condition of footings, foundations and roofs; replacement and restoration of ceilings, brick masonry, restoration of the decor.

## Streszczenie

Problematyka restauracji oraz adaptacji zabytków architektury przemysłowej jest jednym z najtrudniejszych zadań, biorąc pod uwagę szeroko pojętą konserwację zabytków. Na proces ten wpływa bowiem specyfika obiektów poprzemysłowych, technologia ich wykonania, a także konstrukcja oraz układ funkcjonalno-przestrzenny. Warto także zwrócić uwagę, że w większości to właśnie obiekty postindustrialne, położone w centrach miast zabytkowych, są przedmiotem restauracji oraz adaptacji do nowych funkcji. Obiekty te, wzniesione z cegły, pochodzą w większości z okresu drugiej połowy XIX i początku XX wieku, tj. okresu tzw. „boomu budowlanego”. Proces ich restauracji oraz adaptacji opiera się m.in. na takich działaniach jak wzmocnienie i naprawa fundamentów i dachów; wymiana i renowacja sufitów, wzmocnienie murowanych ceglanych fasad oraz renowacja wystroju.