

Exploration of Architectural Design for the Renovation and Reuse of Old Industrial Plants under the Concept of Urban Renewal

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Abstract: In the process of urban renewal, the transformation and reuse of old industrial plants is an important way to revitalize urban stock space and promote industrial upgrading. This article takes the renovation project of a general factory building in Shanghai Free Trade Zone as an example to explore how to achieve functional transformation and spatial regeneration of old industrial factories through architectural design under the guidance of urban renewal concepts. The project successfully transformed the old factory building into a modern biopharmaceutical innovation center through design methods such as optimizing the layout and reshaping the facade, providing reference for the renovation of similar old industrial buildings.

Keywords: urban renewal; Old industrial buildings; Renovation and reuse; Architectural design; Spatial Regeneration

1. Introduction

With the acceleration of urbanization in China, urban development has shifted from incremental expansion to stock optimization, and urban renewal has become an important strategy to improve urban quality and promote sustainable development. Old industrial buildings, as witnesses of urban industrial civilization, carry unique historical memories and spatial resources. However, many old industrial factories face the fate of being idle or demolished due to their rigid architectural form, single function, and outdated appearance, which are disconnected from the needs of modern urban development[1-2]. How to transform and reuse old industrial plants under the guidance of urban renewal concepts, so as to give them new vitality, has become an important issue in the field of architectural design.

2. Project Overview

The general factory building, completed in 1998, has a total land area of 1.57 hectares, a construction area of 22525 square meters, a plot ratio of 1.43, and 3-5 floors on the north and south sides of the building. Due to its rigid architectural form, single function, and outdated appearance, which does not match the positioning of Shanghai Free Trade Zone, it urgently needs to be updated (Figure 1). The project is facing difficulties such as poor foundation and high positioning. After demonstration, the design team reinforced and expanded the building, reshaped the space, and adjusted the functions. After the renovation and expansion, the building area is 31508 square meters with a plot ratio of 2.0, and the factory is revitalized (Figure 2).



Figure 1. Realistic view of the factory building before renovation



Figure 2. Realistic view of the renovated factory building

3. Renovation Design Proposal

3.1 Regeneration of Plane Layout

3.1.1 Spatial Structure Optimization

The original layout of the general factory building was north-south. From south to north, there are a total of 12 column spans from axis A to axis P, consisting of 3 floors from axis A to axis C, 4 floors from axis C to axis H, and 5 floors from axis J to axis P. Among them, only 2 floors are partially excavated from axis C to axis F, and a fully elevated outdoor landscape courtyard is set up from axis J to axis M. The vertical floor height of the entire factory building is 5.4 meters for the first floor, 4.5 meters for the second floor and above, and 24.85 meters for the highest point of the building[3].

3.1.2 Landscape and Spatial Environment Creation

The renovated factory will maintain a north-south layout, with the original structural column grid unchanged. The A-axis to C-axis and C-axis to H-axis will be added to 6 floors, while the J-axis to P-axis will remain at 5 floors. The building will reach a maximum height of 29.25 meters. The original C-axis to F-axis partially excavated areas have been transformed into a high outdoor landscape courtyard, and a new area has been added through “copy” and “paste” techniques to improve the indoor environment. Add supporting service rooms on the east side of the first floor, using a “twist” technique to connect the two landscape courtyards, forming a “day” shaped layout, which not only ensures the usable area but also creates an experiential research and office space with green windows (see Figure 3).

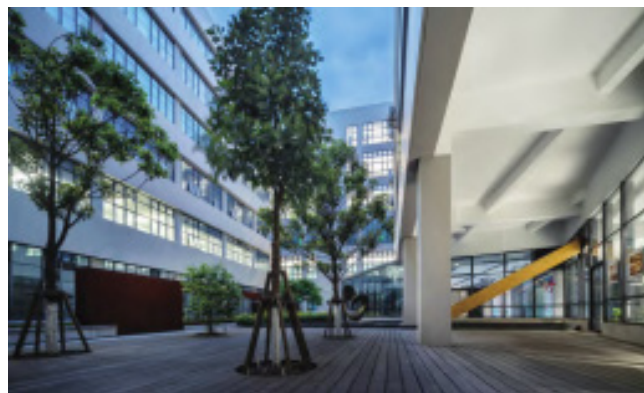


Figure 3. Landscape courtyard

3.1.3 Traffic and Entrance Space Design

The original building did not have a typical entrance space. The design team upgraded four vertical traffic cores to shared spaces, expanded the west entrance, and strengthened the main entrance glass box. Glass blocks were interspersed with traffic cores to create a contrast between reality and virtuality, connecting the entrance, traffic, and communication spaces. Through the glass curtain wall, pedestrian flow was transformed to create a dynamic facade, integrating social activities into the indoor environment (see Figure 4).



Figure 4. Main entrance glass box

3.2 Reconstruction of Building Facade

3.2.1 Material and Shape Design

The paint on the facade of the original factory building is outdated and does not meet the environmental requirements of the free trade zone. The renovation adopts modern techniques, combining clay panels and glass curtain walls, and adding horizontal sunshade metal louvers to create a sense of innovation. Through the application of materials, the contrast between reality and virtuality is highlighted, making the building form dynamic and active, and enhancing the urban spatial experience.

3.2.2 Color Design

For the overall color of the facade, the design scheme has been carefully considered and compared multiple times, and finally selected the “technology blue” that represents rationality and trust in psychology as the main color tone of the facade, accompanied by varying shades of gray. The term ‘technology blue’ easily evokes images of calmness, vastness, and wisdom, which is exactly what scientific research needs. The renovated facade showcases the simple and smooth image characteristics of modern industrial architecture. Whether it is materials, colors, or detailed design, the renovated building presents a different visual impact.

4. Conclusion

This project aims to renovate and reuse an old general factory building in the Shanghai Free Trade Zone under the concept of urban renewal. Retain the original main structure and reinforce and add layers, increase the plot ratio from 1.43 to 2.0, and increase the building area by nearly 9000 square meters. By regenerating the plan layout and reshaping the facade, optimizing the spatial structure, improving the environment, shaping a modern scientific and technological innovation image, coordinating with the positioning of the free trade zone, providing reference for similar projects, and proving that reasonable design can promote the transformation of old factory functions and urban upgrading.

References

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