# Research on the innovation model of the old industrial building renovation under the concept of Ecology

# ——Xi'an -- a case study of 1935 Dahua

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**Abstract.** This article emphasize the ecological planning concept to maintain characteristics of urban old industrial district which will lead to a sustainable development. Including construction request of modern architecture from architecture design, architecture culture, architecture land resource, architecture environment and design idea .Taking Xi'an DaHua 1935 cotton factory for example, we discuss an old industrial buildings transformed into a civil construction modern district. And also containing recover of the existing resources under the current economic status from multiple aspects.

## Introduction

With the restructuring and upgrading of global industry, those former bus station, storage, warehouse, original industrial workshop have been removed from city center to economic development zone. Those cause the degeneration of original distribution such as Public Services Infrastructure and economic facilities. Modern metropolitan is gathered form of human activities, it is a metabolism of living organisms, for this organisms every single part should be connected to each other. Human lifestyle are so much different from pre-20th century which require upgrading system and brand new facilities to adapt urban population surge and economic growth. Under this circumstance, land source has became top one valuable resource in architecture and urban planning design. We aim to maximum utilizing land resource as well as keeping those peculiarities. In meantime to server science technology culture and creating brand new ideas.

# Present situation and problems of domestic old in industrial buildings

With the arrival of the 21st century, China has grate change taken place in the city people's ideology continues to improve, more people has realized that the old city is an basic elements to social development ,and also a sustainable basic link With the increasing urban population ,urban areas expanded, the old industrial plants, warehouses, terminals and other old by new residential quarters of old industrial buildings, and falls far short of production and living environment . But remodeling and renovation of old industrial buildings people lack correct understanding in dealing with many problems about the renovation of old industrial buildings:

(1) Government adopts the way to a fully intactness or a complete demolition method. This method , we all know is very extreme , to preserving old architecture architecture , the building materials of its

life, which does not play role in .This shortage of land resource in modern society does not achieve the objective that can be recycled.

(2)Not coordinated with the surrounding ecological and cultural environment. Now for the reform of old industrial buildings. There are many reconstruction modes such as an art area,

coffee, bar, which these modes have a great commercial atmosphere .But with ecological and cultural environment surrounding ,it is lack of close contact .There is no overall planning and make people messy .And can not contact currently social problems.

(3)Substantial improvements apply to all types of commercials and exhibition space, but this ignores value orientation about factory buildings transformed into civil one.

#### The analysis of the value of old industrial buildings

The value of old industrial buildings as a whole life

The material span of building and functional life are indispensable for building renovation .After lost original function of old industrial buildings, however, keep the surrounding environment and historical culture, transportation .The combination of these factors ,in touch old industrial buildings are given to a new function ,to improve its internal infrastructure ,extend its life-cycle.

The historical and cultural value for existing old industrial buildings

Buildings record history cultures of urban development, regional customs, of econmic and cultural spirit. The demolition will only make the city lost its own unique characteristics, and cut off the historic and cultural context. To reform and reuse, this also the protection of historic and cultural value of the city.

The social and economic value of old industrial buildings

Renovation and reuse existing architectural spaces from the social reality to ease the housing problems of fast growing cities, optimize space resources, to enhance and stimulate the vitality of the city of old industrial buildings to save, or avoid demolition costs .Making use of the old building and its own materials, to save the basic cost of building which depends on the structure of space, building materials. According to different structure space, building material, we need cut down the cost of construction and social investment, as soon as possible to achieve sustainable construction concept, to enhance the ecological and cultural environment of the overall city.

#### The discussion of innovative modes from old industrial reform

Under the ecological concept architecture's development follows the natural ecology, culture, architecture, environment, from an overall perspective, the recycling of resources and energy. Adopting the principles of ecology, building science and technology, the use of modern scientific met hods, to arrange and organize the relationship between architecture and nature, to realize harmonious coexistence among building, people and environment. This is a sustainable development.

Based on the trend of China's rapid urban development, the housing problems of land resources and social and human feelings surrounding the relationship between ecological philosophy are taken into account. Therefore, we put forward some design modes of space innovations.

1) In the space construction , functional integration, enhancing the communication between people. As a whole framework of old industrial buildings is limited ,currently the site of the building renovation of art exhibitions, writing and living space is a separate building, the lack of exchange platform about communication. Therefore, focusing its integration and creating a real space according to the specific function, size.

2) Pursuit of roots and soil characteristics architectural culture

The concept of ecological renovation of old buildings, also contains the architectural culture of the humanities, injection, continuation of local folk customs habits. Therefore, the indoor and outdoor spaces designed into the local culture and way of life, protect the vivid humanistic factors at the same time to create a comfortable living space. Such as: extending of the life of the compound.

3) Adhere to the green, ecological, about environmental design

4) Environmental design should combine the local natural conditions. Should benefit the ecological design of outdoor space in a virtuous circle, will help to improve settlement of micro climate and provides suitable space for outdoor activities, but also for low energy consumption to achieve healthy,

comfortable indoor environment.Combining space, the environment and culture,benefits,strive to achieve harmony and coexistence among people, architecture and the natural environment, social environment.

#### Adhere to green energy and sustainable development.

Making good use of natural resources ,use of old building existing resource the rational using of building construction, space, renewable material, maximizing cost savings, reduction of construction waste generation,

The case study of the innovation reform modes Based on the above study on innovation pattern of renovation of old industrial buildings, government encourage more university graduates to start their own businesses, in most cases, these entrepreneurs are homeless or live in rural-urban fringe in the darkroom, lack of time, energy and even money to communicate with the outside world's current situation. "Xian dahua 1935" factory buildings for creative transformation.

Dahua cotton factory in Xi' an has more than 70years of history,was included in the XI 'an industrial heritage conservation."Dahua • 1935"the palace in the Ming dynasty relics, located in the district in order to perfect the function of Da Ming palace to perfect the function of Da Ming Palace city,enrich connotation, enhance urban quality, create city highlights ,optimize service as the goal ,the entire factory into a modern industrial relics and modern model of urban functions. This, from the creation of architectural space into that cater to the surrounding environment and factory planning ,combine with factors ,such as climate ,geography and resources, the rational use of existing space for young art entrepreneurs to build th e most suitable and economical loft living,DaHua cotton plant compound while saving lives.Under the guidance of the concept of ecological,combined with regional environment ,

the structural characteristics of existing buildings, mainly from the following aspects of the design. Extending the material life of its own, combining indoor and outdoor venues and surrounding environmental site design

Building is a cultural and ecological systems, architecture and the coordinated development of the environment, is an expression of ecological balance. The external areas of the program design, combine with hard paving and planted mostly simple landscapes in the main building entrance, use geometric addition and subtraction, shallow-water landscapes, take advantage of the column, to give the entrance, plant boundaries soften and break the heavy concrete.



Figure one: Green spaces diagram Figure two: The wind and air flow diagram Full use of the existing structures and redistribute the region, the rational use of space, reflecting the pattern of Tiny House +SOHO space

The program will be the entire plant as a small Arts District, Office, live, life, exhibition of micro-office space. The spatial structure of high ,vertically divided .The loft space ,that is "they live on the space ,work under the space" each room is an independent individual living spaces. In the framework of an existing column grid, use the attach method within the plant adding column grid , and

portion of the hollow at the bottom as public exhibitions in public places ,making personal use of space and public space harmony.

Addition to a mezzanine living area. In order to get on well with the humanities, enhance the interaction between people, enhance inspire art entrepreneur inspired by intensive public living space, the whole mezzanine has to do in leisure , catering, communication of the four spaces.

Use existing resources and modern technology to fully embody the energy-saving concept

Green building, low carbon buildings are an expression of ecological concept on sustainable development strategy, is also an important link in ecological architecture. This scenario, emphasizes the application of appropriate technology, namely in architectural of tries not to rely on energy-consuming equipment, architectural layouts, form, externals, building materials and construction on the implementation of measures to make full use of natural resources and natural conditions, passive design methods to improve the built environment, micro-climate to meet the requirements of office, living comfort.

A favorable natural ventilation and day lighting

Interior design, spatial relationship between excess and deficiency of, create the building itself "micro climate in garden" which principal function is natural ventilation and lighting. Using the micro-climate can adjust not only the architectural energy consumption in use, but also the heavy building itself .Atrium with combination of top and side lighting mode. Design of natural ventilation and air conditioning systems for both winter and summer temperature regulation.



Figure three: Sharing, communication spaces and exhibition spaces

## Use of renewable

In this program, energy solar is used in active and effective way in architecture between windows in the South to install solar panels for exterior wall, wall switch connected with the solar wall duct laying in the hallway, and other end of the duct by hot air to the desired heating North room.

The recycling of waste materials

Construction is an important part of energy and material consumption, we keeping sustainable development of building materials, improve the rate of comprehensive utilization of energy and resources which has become a topic of concern in today's society. In this scenario, referring to experience of the old steel mills, using epidermal stitching, integrated approach, existing waste concrete remnants of walls and the mechanized plant material, by plane composition techniques to decorated the facade of the building, reducing the output of building materials costs. In part on of building materials costs. In part on the exterior envelope, we use brick and recycle ability, more new wall material using 240 thick hollow brick built transparent wall material using 240 thick hollow а brick built a transparent wall can also enrich the architectural style.

Save water – water retention technology

In arid or semi-arid areas, rain water retention and reuse is an important water resources technology for rainwater retention and we reuse the rainwater utilization in natural terrain or artificial methods stored, treated simply as a chore after use. The program adapt the retention of the underground cistern. By simple sedimentation, we can be used as water for flushing, watering the flowers, etc.



Figure four: Water retention diagram

#### Summary

Under the influence of ecological sustainable development the concept of ecological in China, the transformation of the old industrial buildings was an irresistible trends, in an important part of building energy-saving design and approach. Based on the research and discussion on a variety of integrated wide range of design methods, to adapt to the rapid development of modern social and economic situation. This paper adapt to the shortage of land resources, especially the scarcity of urban land resource sand innovative design patterns, that is, dominated by modern young art entrepreneurs, designs-miniature houses office space, for their economic capacity. In the limited resources available, multiplexing space applied is provided. Exploring the use of more and more new green technology of architecture energy-saving design, the old industrial buildings in full life cycle reached a new peak. Although in China there are old industrial buildings transformation of success case. we should created adapted modern city development of building space mode from more of social phenomenon, and problem consider, reduce building garbage, we explore old industrial building resources and city new looks can mutual promote, and mutual inclusive of variety development mode in city development, then from all aspects upgrade old industrial buildings of using value and humanities value, rich spiritual life, while also can reduce ecological system of damage, reach harmonious coexistence among building, people, environment.

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