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Ecological design and research on energy saving of industrial building

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ABSTRACT

This paper introduces the design of the industrial architecture in the attempt of ecology and energy via three aspects of concise, namely ecological planning considerations, ecological energy-saving strategy according to the local climate and how to improve the efficiency of energy use. This paper expounds the new site building culture, combined with the characteristics of ecological design ideas of modern industrial building. Design in the expression of cultural industrial times building at the same time, is also based on the original environment through the planning and design of optimized design, create an ecological balance of the built environment, form an organic body and the natural environment.

KEYWORDS

Ecological; Design; Energy saving; Industrial building; Culture; Environment.

INTRODUCTION

The energy problem, environmental problems, ecological problems have gradually become the focus of attention. In recent years, the sustainable idea is accepted gradually, more and more people realize the transformation of the old building demolition waste than a more sustainable way of handling[1,2]. However, currently widely adopted for transformation of the old building way while avoiding the large demolition, overturned the resource waste and environmental pollution which caused by it, but in real life there is still high energy consumption, serious environmental pollution and other issues. Therefore, the transformation of old industrial buildings reuse should be based on the leading role of the base of the climate factors through the whole building renovation period each transforming link ecological transformation in many aspects of thinking and design work, the ecology of old industrial buildings and the aims of all aspects of the comprehensive unification[3-5]**.** Tall buildings because of its construction requirements are high, not a single layer and multilayer industrial construction is convenient to use, in the soil area rich in resources have not been widely adopted, ecological aspects is not involved. First, the land and natural resources shortage, industrial building energy consumption occupies a large proportion in the total energy consumption of buildings based on the background of imminent combining ecological design theory and high rise buildings. And put forward a tall industrial building ecology is actually based on the ecological theory and architectural design theory as a guide, the use of ecological technology and related knowledge, tall industrial building a system of ecological construction and balanced, the purpose is to make people, a virtuous circle of ecological system is formed between the production, construction, natural[6]. Secondly, high ecological industrial building design is the external support and promote to develop smoothly, the external factors include: total policy mechanism, national powerful resource constraints, tend to promote open owners decision and urban agglomeration, these external factors into in order to promote the strong foundation of high-rise industrial buildings ecological design. In the external factors, from the ecological level combined with the characteristics of tall buildings and summarizes the theories to tall buildings ecological design.

Ecological concept of industrial building

Due to the deteriorating global environment, the continuous reduction of non renewable resources a word is not only in the construction of ecological design. In the design, has been widely praised in other areas. However, we tire of it and transformation of the environment of people together is because we have no choice. It is undeniable that the building has consumed more than half of the energy, and generates the greenhouse gas, more than half of the. Therefore, the ecological architecture is the inevitable choice for the development of architecture. "Ecological" in Chinese refers to the biological state of survival and development or physiological characteristics, biological habits and so. However, in the "architecture" of the word is preceded by the "ecological": one is ecological construction or building, two refers to the "ecological building", the three refers to "all buildings with ecological of Zong said. Whatever the explanation, the ecological architecture all belong to the category of building, just put the ecological environment into consideration. However, the true meaning of the ecological building, the premise is must depend on the state of the construction of their elements to form a complete, conforms to the ecological circulation system, highlights the benign circulation in the whole system of material etc.. We should not only pay attention to nature, we should also pay attention to the social environment, but also the whole life cycle building including the design process, construction process and construction after the use of all ecological process.

Eco industrial building design refers to the design of industrial buildings in the ecological concept under the guidance of the. On ecological building theory as guidance, building design theory as the foundation, according to the characteristics of the regional natural environment, ecological resources, use of technology, the relationship between rational organizational building internal and external space and people, and the city, and the whole ecosystem, which form a complete, organic whole. Ecological tall industrial building which makes use of natural resources to use artificial means to create a good environment to ensure smooth production, and also control the consumption of building energy use of natural, organic balance between target reach the building system and ecological system,

The formation of a good indoor and outdoor production environment and staff living environment construction system is to form a benign circulation system between people, production, construction and nature.

Definition of old industrial building

Special industrial building called / workshop or factory building, that is used for various houses engaged in industrial production. General industrial buildings include production and processing workshop. Ensure the normal production of the construction of various buildings such as warehouses, power stations and factory management building, plant life and many other buildings. Discussed in this paper is generalized on the basis of the definition of industrial building based on: refers to industrial production, processing, maintenance workshop and warehouse, for the service of the service buildings, structures, industrial facilities and infrastructure.

Combined with the research on the definition of industrial buildings, can put the old industrial buildings are divided into three types: (L) the old industrial buildings to keep production function: because the construction form is obsolete or lost era buildings, including do not comply with industrial production of architectural form and spatial form. (2) the old industrial buildings lost production function: with the industrial decline, the adjustment of city layout, lost production function of the industry building, or the building itself is no longer suitable for old industrial buildings of production activities, the function update. (3) the old industrial buildings of historical value: also known as the historic industrial buildings, with the value and meaning of history, the need for protection through the transformation of old industrial buildings.

Because of the developed countries in Europe and America earlier than developing countries development industry, so also the first face to industry

Adjustment and transformation of the city's many problems to overcome the problems in solving the contradictions in the process of the practice and system need a large number of summaries. Today, in the development of the old industrial architecture transformation, can be combined with the situation of our country, absorb and learn from foreign advanced experience, better processing encountered in the process of old industrial buildings in the reconstruction of the problems and contradictions.

For there were dismantled will inevitably cause a waste of resources, reuse of old industrial buildings of the same value, unreasonable transformation can also cause the waste of social resources. For example, in the transformation process does not consider the energy saving design of structure of the maintenance and construction of natural lighting, natural ventilation design, will be due to the improvement of indoor thermal environment, air environment and cause additional energy consumption. On the contrary, if the renovation design considering ecological reconstruction measures, it will reduce or avoid the waste of energy transformation of the traditional bring appeared environmental pollution problems.

The demolition of the old building process requires considerable human, financial, material resources, but also generated a lot of

Construction waste and dust, caused the pollution of the environment, after the removal of new, also occupy a lot of new resources, and these

New resources of production also need to consume a large amount of energy, the discharge amount of carbon dioxide, causing two times if the traditional transformation in the early planning pollution "of the environment, design to the late construction, operation and reconstruction of timber in the process of building the internal and external environment factors are not considered, will cause the same damage" and ecological transformation of the environment it not only pays attention to the whole, and strive to achieve the construction of internal and external ecological environment sustainable development goal, but also pay more attention to the ecological environment in the process of transforming the whole building life cycle, compared with the traditional transformation only focus on one aspect or a period of time, more systematic, comprehensive.

Because of these old buildings have existed for a long time in the area, formed a relatively mature social resources, should avoid large demolition Dajian and loss of large-scale environmental change of social resources, to maintain its integrity of the surrounding environment, the use of ecological idea after the transformation, will pay more attention to historical heritage context, the into an organic, continuous process.

The old industrial architecture invigorated and update has been widely concerned about a social issue, it relates to the agency of use of resources. The natural and social environment of the harmonious development and historical continuity and other aspects, has certain social influence. Hope this issue from a new angle, combining the old industrial architecture transformation and ecological transformation theory, and obtains a set of system, suitable for ecological reconstruction strategy of old industrial buildings in our country, to guide the current of old industrial building renewal, sustainable life continuation of old buildings.

The basic principle and target of ecological architecture design

According to the local natural environment and climate conditions, the use of ecology, the basic principle of building science and technology, the use of appropriate means of science and technology, the relationship between rational arrangement and organization building and other fields related factors, which with the local natural ecological environment become an organic whole to biological health, and reduce the energy and resources consumption in the whole life cycle, reduce environmental pollution and actively protect the ecological environment, the core is not only in the life cycle and the building is abandoned after can reduce energy and resource consumption and protect the ecological environment, and is characterized in the material, energy and information orderly cycling and transformations in the internal ecological architecture system, resulting in the whole life cycle was a highly efficient, low consumption, no waste, no pollution, ecological balance, comfortable building environment. Ecological architecture is the ecological civilization reached in traditional architecture and modern architecture, the basis of material civilization and spiritual civilization, make it become more close to nature, more humane, more comfortable, and the ecological philosophy and the pursuit of the sustained attention and continuous technical improvements have gradually realized in the process.

The overall comprehensive study design lots of internal and external interdependent environment relationship reduce artificial level, the reasonable protection of land! Vegetation and natural environment; wastes and emissions to make the building produced the least, and reasonable into raw materials for other production departments; the use of non polluting, low energy consumption, easy degradation, and easy regeneration of local materials, the use of local non polluting materials technology conditions; avoid social behaviors in human activities damage the environment.

Minimal resource consumption, as far as possible the use of renewable resources to achieve the purpose of saving resources, not is the future continuous access to resources to provide protection.

The continuation of local history, culture and human context; adjust measures to local conditions, reasonable location in planning, architecture design, the layout, orientation, the adverse impact on the environment is reduced to the minimum; the use of local climate conditions, the use of appropriate technical means, and strive to achieve the best human creature comfort and comfortable artificial environment with minimal resources.

The requirements of artificial architecture and its environment not only to meet the use function as the ultimate goal, should also meet the person's basic physiology, psychology, health, behavior and culture requirements, provide material and spiritual guarantee for human life and production.

The ecological construction goal is as far as possible to reduce energy and resource consumption; the construction of pollution on the environment directly and indirectly to a minimum, protect the natural ecological environment; create a healthy and comfortable indoor and outdoor space environment; the architectural function, and uniform quality goals largest environment, economic and social benefits.

Ecological architectural technology

Ecological architecture is a collection of modern ecological technology. At present the international definition of ecological technology is still not unified a view, relatively broad to save resources, Protect environment construction techniques, is considered to be of ecological building technology. The formation of ecological building technology, includes two kinds of situations, one kind of situation is based on the traditional construction techniques on the resources and the environment, according to the two requirements, the new technology of forming a common reorganization. Second is a new technology in other areas in accordance with the requirements of eco transplantation onto the construction technology, and the integrated use of "the ecological building techniques are classified as simple technology, conventional technology, high and new technology. Generally speaking, simple technique and the conventional technology belongs to the popularization of technology, research technique is a kind of high technology, the use of different hierarchical ecological construction techniques can produce different types of ecological architecture and its products to adapt to different conditions, but is conducive to the protection of the natural ecological environment, is conducive to saving resources and energy, is conducive to human and other organisms health. From our point of view of practice, should be based on convention.

Ecological considerations on the planning

1. optimization design, economical use of land: at the stage of general layout, we decided to build in the west side of the base in the first phase, including the single building, roads, forestation, parking, sports venues and other staff, covers an area of approximately half of the total use area, east to set aside as development land. In the overall layout, the different functions of the production, living area separated treatment; living area is arranged in the base of the end, greening and sports venues will it separated from the surrounding area, thus reducing the external disturbance. Service area as the link of the production area and living area in between, with linked by corridor, compact layout, traffic flow is short and convenient, not only saving land, and material saving, energy saving, saving investment. 2. to improve the adaptability, flexibility of Architecture: the overall planning is introduced into the design techniques of dynamic, each building has the growth space fully, makes it "growth" with the development of production of different requirements, can be divided into many phases of construction. For example, an integrated plant production workshop can be added to the two layer, and re - adjust according to the actual needs of the workshop layout. Grinding workshop, equipment rooms, restaurant workers can be extended to the east of the north, reserved for the development of land as a further development of the first phase of construction and use, can be the same size of the production and living area, plant and staff quarters as extensions to the east. The whole plant is available together as one. 3. Landscaping: planning design emphasizes "low density, high rate of greening" garden plant characteristics, create a beautiful living environment for workers, production.

Ecological energy saving strategy based on local climate

Make full use of natural ventilation and lighting, the creation of the humanization of the indoor environment: in the first phase of construction, in addition to integrated plant cleanliness requirements due to central air conditioning, the production workshop need artificial lighting, the remaining four buildings full use of natural ventilation and lighting. Integrated plant production workshop in other regions except the as far as possible the use of natural lighting. In the comprehensive workshop staff locker between maintenance and production areas of the traffic space, we will expand its width, and processed into sharing atrium form, using the roof will introduce indoor light.

Staff quarters in order to guarantee every room to get adequate natural lighting and good ventilation, using the first layer of local overhead, each layer of both ends and the middle open layout mode corridor combined with inner courtyard, each dormitory is equipped with separate bathroom and balcony. Green and the outdoor environment in chambers of mutual penetration, created a kind of not only energy-saving and clean and comfortable living atmosphere.

Improve the efficiency of energy use

In view of the special requirements of the production workshop, we minimize the external doors and windows of the area, the use of small high window, and use of plastic steel windows and doors good heat resistance performance and the double-layer hollow glass, can save 35 to 45% energy compared with ordinary glass doors and windows.

Staff quarter's hot water supply has been a urgent problem to be solved, solar energy is the first of our plans. We use the "heat recovery" plan: the overall plant production workshop all-weather running clean air conditioning unit refrigeration byproducts -- heat this part of heat is usually through the cooling tower is emitted into the outdoor,

The principle of heat recovery is the heat fully utilized). Cold water refrigeration host we use three two level capacity in the design of one increases the heat recovery condenser, and through the heat pump to enhance the thermal energy, become the heat pump type air conditioner condensate recovery system, directly to the hostel provides hot water. The

design of the hot water temperature can reach 55 DEG C. Heat recovery compared with solar energy, not only saves the initial investment of more than 60%, more energy saving.

In the design of artificial lighting system integrated plant production workshop, we have to measure and control the energy consumption of the whole system, the final choice of a particular brand of high efficiency and energy saving light pipe, and to meet the same luminance, from double reduced to single tube, so that the annual lighting electricity greatly reduced, reducing the power consumption by 50%.

Practice has proved, we design to create a beautiful production, living environment, effective in saving resources and energy consumption, has obtained the very good economic benefits, social benefits and environmental benefits.

Architectural design in ecology is mainly from the planning to consider, first of all is to optimize the design, saving land. In the stage of the general layout, we decided to the north to the office and workshop construction land is arranged in the base, including office buildings, industrial factory buildings, roads, landscaping, parking spaces, etc.. Workshop two periods as reserved for the development of land, in the overall layout of the different functions of the production, general living area as separation processing. The base of the south is to set up a staff canteen, staff quarters, and sports venues greening and separate it with the surrounding area, thus reducing the external disturbance. Planning layout is compact, short and convenient traffic flow, not only saving land, and material saving, energy saving, saving investment. The second is to improve the architecture adaptability, flexibility. The overall planning of the introduction of design methods of dynamic, office building and production plant are organically combined together, according to the nature of production, in the design, to reach a consensus with the construction of consultation, office, management, integration of production, from the office can directly into a production workshop. Office management functions of office buildings, and product exhibition, production management function. Production workshop to finished products have partially into the office building of the exhibition hall, the flow of a product the production workshop and office building into an organic whole. The last is to respect the original environment and landscaping, and improve its ecological condition through the planning and design, highlight the people-oriented thought, create a pleasant living environment of the industry, in planning the design try to respect the original topography, near the production workshop, machining workshop, the original part of the big stone site, combined retaining the original site in China the big stone and the planning and design of the production workshop organic ecology, the original no break on this site, but according to its characteristics, design a workshop in the park is located in the surrounding. Workers psychological status determines the efficiency of a part, environmental layout relaxing in the tedious work, park to create a new space, workers in the production of respiratory directly with nature, ease the work pressure and fatigue, to give a raw machine enterprise image. This is a view of the rarely in the industrial building, and in order not to destroy the original stone, the stone park extends to the "internal machining workshop", truly planning design and natural ecological environment combined, and stressed that "low density in the planning design, high rate of greening, landscape plant characteristics, create beautiful production and the living environment for staff and workers.

CONCLUSIONS

Building a record of the evolution of culture in different times, each time all has the classic contemporary building which contains more political, cultural and spiritual connotations embodies the culture of the time belongs to her. The design of the new factory building of the adopted simple modern style combining with the colonnade, chamfer, architecture and building materials, color embodies the modern high-tech building spiritual; the production characteristics of source image of industrial building design on its own, using very large, long the functional requirements, to create the building blocks of new, production the workshop by the performance of function and architectural art performance culture is complementary; ecological design for the new factory's respect for the original environment, improving the ecological conditions through the planning and design, highlight the people-oriented thought, and create a pleasant living environment for the industry, design placed people at work at the same time to obtain labor pleasure and emotional satisfaction, get rid of slavery labor and thus can really effectively improve labor productivity.

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