

The progress and development of environment control techniques in the building

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Abstract: This paper reveals the unity and opposite relations between human and the environment control in the building, expounds the basic principle, the roles and techniques of environment control in the building, looks back the gestated, formed and the development courses of the science and technology of HVAC in the environment control, emphasizes the backgrounds and trends of the progress and development of the science and technology of modern HVAC, forecasts that they have a good development foreground in the new century.

Keywords: Building; thermal environment; indoor air quality; HVAC; green building

Mankind is a member of natural. We have undergone our working hard since the beginning of our history. The initial problem that ancient mankind faced is how to protect them and survive in the bad nature environment. From living in nest to building the house, all of these show the human to adapt the nature, to make use of the nature, to rebuild the nature.

Up to the present the environment that mankind rely on existence already have changed, and have had depth and wide of connotation. It includes the nature environment, the artificial environment, the nature attribute and the society attribute. But the human and environment always is a pair of opposition and unity thing, their relation is mutually opposite and interdependent. It is the mission of the environment science to research the relation of opposition and unity of contradiction.

Once the building is appeared, the special function of building is foredoomed to become the most close and direct place of human activity. These concepts about the building environment and its control have come into being. Broadly, the building environment includes the hot and wet environment, the air environment, the acoustic environment, the light environment etc., it also can be sort live, work and study environment, the produce environment, leisure, entertainment, shopping environment and social intercourse environment, human relations environment etc., it can be a material environment and it also can be a society and psychology environment. In fact the building environment bases on the nature background, it has been reformed and processed. It is a exist environment which includes the interaction of the nature factor and

the social factor. It shows one side of the human history. Such as adapting the nature, making use of the nature, reforming the nature, it affects the living quality of human and relates to the advance and development of society.

This paper emphasizes the relation of the comfortable and health of the human with the thermal environment and the indoor air quality. The building is surrounding by the nature environment and the thermal environment and the indoor air quality are always interfered by 2 kinds of things---the inconstancy nature environment and indoor personnel, illuminate, equipments and craft process etc. The basic building environment control is according to the different quality request of indoor environment, and use difference applications such as heating, ventilation and air-conditioning etc. We can use the system and equipments to remove all kinds of interferences affected by the indoors and outside, so we can establish and maintain a special function that called "artificial environment" in the building.

Mankind has undergone a long-term exploring, practice and experience to improve the building environment. For example, people usually use doors and windows to make the pass through wind, use the fan and the natural ice to cool in summer. People also use the stove, the firewall, and the fire ground and so on to keep warm in winter. In china, up to the Ming dynasty the heating system has already found in the basilica, this type of smoke heating is applied by a kind of the fire ground. Up to now, All the systems have been completed conservancy in the Imperial Palace and Summer Palace in Peking. All of these are a few simple

and efficiency ways to improve the building environment. That is to say the building environment control technique have already gradually come into being.

As the social progressing, the development of social production capacity and science technique, on one hand, the ability of mankind to control the environment has already consumedly strengthened, on the other hand, the living of mankind become more and more rich and colorful, all of these will need the building environment control to be higher level and satisfy the new need of the indoor environment to the living and work of the people, the production and the experiment of science. On this background, HVAC must gradually come into being and develop to deal with the changing interference of the indoor and outdoor environment, It also attention to improve the thermal environment and the indoor air quality of the building environment control and the guaranty technique.

Far to the end of 15th century, the European revival of Learning, an Italian who was called Leonardo da Vinci designed and made out the first ventilator. Afterward, the invention of the steam engine promoted the development in the Occident region boiler, heat exchanger and refrigerator. At the early of 19th century, the first central heating system was heated by steam and hot water in Europe. In 1877 New York set up the 1st district boiler, and concentrated provided the heat to nearby 14 household users. In 1834 an American who named Jacob Perkins designed and made the earliest refrigerator which used the aether as work medium. In 1844, John Gorier, an American doctor used a circulating closely of refrigerator which used air as work medium and established the first "air conditioning station" used for the medical treatment. Clearly, the ventilator, the boiler and the refrigerator promoted the building environment control very fast. It also provided important guarantee for the application and development of HVAC.

At the end of 19th century, in these developed countries, the quick development of the textile industry needs strictly the thermal environment and the indoor air quality. So the HVAC first been used in this industry. After that to the early 20th century, The HVAC came into being an opposite independence branch of the engineering technique sciences, based on the large quality practice, summarizer and the theories research. Stuart .W. Cramer and Willis. H. Carrier as the

exploiter and founder made the outstanding contribution.

In 1920s, Accompanied with the development of the compressor, the HVAC began substantive application in the environment control to guarantee the comfort of public and commercial buildings. But, after the World War II, along with economy recovering, the HVAC gradually walked to ascend the road of the booming development in the world.

In the recent half century, the HVAC entered into a continuance-developing period, its course can be sum up to 3 important stages. The main characteristics of these development stage are: accompany with the booming development of the post-war building industry, especially in the high building, the air conditioning method had been changed very magnitude; regarding the "energy crisis" of 1970s as the chance, it completely push forward the technique which was the aim to save energy; guide with spanning century of "Standing development concept", people strived for saving energy, protecting environment, health and harmonic development of society and economy.

Especially after 1980s, new technique revolution runs high, computer and other high technique applied quickly, the third industries and information industries grow up quickly, the problem of earth's resource and environment protecting stand out increasingly, intelligent building and green building merge as the times require with environment control's aims of comfort, health, saving energy and high efficiency and HVAC comes into the phase of modern development all over the world. In this development period, the Occident, Japan, the former Soviet Union and China gave important contribution to promoted the technological advance and development of modern HVAC.

Above all, HVAC was an important environment guarantee technique coming from the self-contradict, opposite and unify relation of the person and the environment. It was the core of technique of the building environment control, also was one important part of the newly arisen edge science of environment science. It was a very important thing to improve the level of the people's material and culture live, also to promote the development of the national economy modernization. Today, As an application technique science, it has already carried up this mission which follows the aim of "basing on people" and adopts the

science environment control technique to create a health and comfortable building environment for human, As a result it can satisfy the increasingly indoor environment needs for the people's life, work and other activity of the modern society.

The time past very fast, we have already gone into 21st century. The new century must follow the development of society and economic and the progress of the technology, the people will put forward more and more needs to the building environment quality. As a important application branch of environment science, the building environment control and HVAC will have a good development opportunity, also will have a rigorous challenge in the new century; the science and technology of the modern HVAC will promote the person reside environment comfort, health, protect the Earth environment and validity make use of the energy etc. All of these also can accelerate progresses and development of the HVAC. Certainly, we also can see, indoor environment quality needs some society, physiologies and mental factors to guarantee; all of these depended on many subjects and the whole society. As the profession technology worker of the building environment and equipment subjects, we should carry the glorious mission to protect the Earth and green environment; we should create a high quality living space through our hard work.

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