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HVAC system green retrofit survey and analysis of public institutions building in cold region

Xiaoxu Cai, Huixing Li*, Guohui Feng, Shui Yu and Yibo Zhao

School of Municipal and Environmental Engineering, Shenyang Jianzhu University, Shenyang 110168, China

Abstract

Public institution building energy consumption is an important part of building energy consumption. With the rapid spread of HVAC systems, the status of building energy consumption is increasingly prominent. Taking 16 typical public institution buildings of Shenyang in the cold region for example, this paper presents current problems of Shenyang public institution existing buildings HVAC system green retrofitting. Through the HVAC system green transformation of existing buildings, energy-saving effects demonstrate the effectiveness of the green retrofitting.

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Keywords: Public institutions; HVAC system; Green retrofit; Energy saving rate

1. Introduction

In 2012, total national energy consumption of public institutions 199 million tons of standard coal, accounting for 5.8% of total energy consumption of the whole society. With the rapid spread of HVAC systems, the status of building energy consumption is increasingly prominent. The methods of questionnaire and site visits are adopted to elaborate the development of HVAC system green retrofitting of public institutions in cold region. Data shows that air conditioning and lighting energy consumption of modern office buildings account for 60% to 70% of the total building energy consumption. With the growing demand for energy consumption, the goal of public institutions to achieve energy efficiency is becoming more and more difficult. For this reason, to carry out the research of HVAC system green retrofitting provides strong technical support to public institution in the cold region.

* Corresponding author. Tel.: +86-15040215739.

E-mail address: lihuixing07@163.com

2. Factors affecting energy consumption situation of public institution building HVAC system in cold region

In Shenyang, for example, the area of existing buildings types is about 202 million square meters, including residential building about 112 million square meters, and public institution building about 090 million square meters. 95% of these public institution buildings are not energy saving buildings. The impact of building energy consumption of public institutions are complex, and the main factors are the building envelope and HVAC systems.

2.1. Building envelop

The high energy consumption phenomenon of HVAC systems is exacerbated by the large external structure heat transfer coefficient. In summer, even air conditionings are extensively used, the effect is still poor. In winter, although electric heating is increased indoor, the temperature is still low.

2.2. HVAC system

The survey found that some building air conditioning system is not well quantitatively to be allocated fresh air, resulting in some room air volume, and some room air flow. And because air distribution is unreasonable, some space could not feed fresh air.

The water system is mostly constant flow water volume system, the prevalence problem is large flow of small temperature difference. So to achieve the design load, it will waste a lot of energy by increasing flow method. Therefore, engineering practice will eliminate the phenomenon of "big flow of small temperature difference", and gradually introduce design method of "small flow of large temperature difference". Of course, increasing the cold water supply and return water temperature difference need change equipment operation parameters, so to determine after comparing technical and economic analysis.

The choice of cold and heat source is single, because China's electricity and gas load exists imbalance. In summer, power is short, and gas resources are not fully utilized. In the winter on the contrary, "peak-valley difference" is formed.

Many buildings do not consider heat recovery air conditioning system. In fact, since the introduction of new wind, the air-conditioned environment is bound to drain part of the indoor air. Relative atmospheric temperature of the exhaust gas temperature has a certain temperature, and will bring energy loss. Switching equipment makes use of heat recovery fresh air before being treated first with exhaust heat exchange, new air temperature will be reduced, thus reducing the load of new wind generating units, reducing the energy consumption.

3. Case analysis of public institution building energy consumption in cold region

3.1. Basic building information

For the comprehensive analysis of cold region public institution building green retrofitting in cold region, 16 representative institutions building in Shenyang is selected to be researched and done field testing. Specific information is as follows.

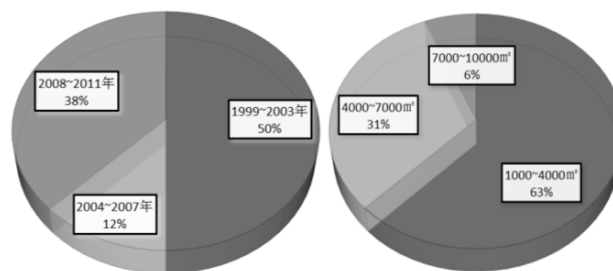


Fig. 1. Cases of public institution building basic information (build time and build area).

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