



9th International Symposium on Heating, Ventilation and Air Conditioning (ISHVAC) and the 3rd International Conference on Building Energy and Environment (COBEE)

Simulation and Comparison of Heating and Cooling Load between a Zero-Energy Building and a Common Building in Severe Cold Region

Huixing Li, Ran Zhang, Guohui Feng*, Kailiang Huang, and Chihong Cao

Shenyang Jianzhu University, Shenyang, 110168, China

Abstract

In order to grasp the energy-saving potential of air conditioning system in severe cold region, choosing a nearly zero energy consumption building in Shenyang of China as research object. The concepts of green building and passive building, and many building energy efficiency technology such as phase change energy storage, exhaust air heat recovery, tunnel wind, low-e glass, outside wall insulation, are used in the process. Using the DeST software to establish a physical model and though simulating the heating and cooling load of building air conditioning system to research the Air conditioning system load variation and influencing factors and compare with the same type of conventional building energy consumption. Nearly zero energy consumption building's winter heating load has reduced 73.72% compared with the common building, and the comprehensive energy saving rate is up to 55.22%. The air conditioning system has great energy saving potential.

© 2015 Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Peer-review under responsibility of the organizing committee of ISHVAC-COBEE 2015

Keywords: Zero energy building; DeST; Energy saving;

1. INTRODUCTION:

Currently, with the rapid development of China's economy and the architecture, building energy consumption is inevitable to increase significantly. The energy consumption of HVAC system is the key to building's energy saving. The results of the survey of building energy conservation research centre of Tsinghua University show that the

* Corresponding author. Tel.: +86-024-24690715; .
E-mail address: gengguohui888@163.com

energy consumption of building accounts for 19.74% of total energy consumption, that as more than 56% population in China will live in cities until the year of 2020 [1], the construction and municipal facilities will have a sharp increase. To ease the energy crisis, the development of efficient insulation enclosure of building play an important role in the energy-saving work today.

2. METHODS

This paper uses a zero-energy build in north-east severe cold region as the energy saving analysis target. It has two floors on the ground, one layers of basement, 1537.3 m² and 10.3m high. The architectural plan design and construction process are strictly according with “GB50738-2014 Assessment standard for green building” and hold the rule of green design and green construction. The simple square shape with a small shape coefficient can reduce the heat conduction through building envelope. Many Advanced energy saving technology is used in this net zero energy building such as solar photovoltaic /thermal (PVT), air through tunnel, heat recovery ventilation and so on. The application of renewable source like solar energy and geothermal let the no-coal heating more easily and the local carbon emission reduced. The walls of the building is covered by EPS as 280 mm thick and the heat transfer coefficient of it reached 0.1w/(m² · °C).



Fig. 1. the appearance of the building.

To get the energy saving ability, we build a common building model as same as zero energy building but the envelope. The envelope of common building is based on GB 50189-2005 Design standard for energy efficiency of public building. The envelope heat transfer coefficients of two building are shown on the table next.

Table 1. An example of a table.

envelope	heat transfer coefficient	
	Zero energy building	Common building
Photovoltaic Curtain	0.12w/ m ² K	0.42w/m ² K
Exterior wall	0.10 w/ m ² K	0.42w/m ² K
Basement exterior wall	0.16 w/ m ² K	3.27 w/ m ² K
Femerell	0.8 w/ m ² K	2.5w/ m ² K
Window	0.8 w/ m ² K	2.5w/ m ² K
Door	1.2 w/ m ² K	2.5w/ m ² K

There are a lot of function rooms in this building such business room, meeting room, guest room and so on. Different function has different daily schedule as guests will stay in room at night and business room has more person during day time. The schedule of different room are booked based on their function and characteristic.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات