



10th International Symposium on Heating, Ventilation and Air Conditioning, ISHVAC2017, 19-22 October 2017, Jinan, China

Qualitative analysis of the cooling load in the typical room under continuous and intermittent runnings of air-conditioning

Lili Zhang^a, Yating Wang^a, Xi Meng^{a,*}, Jialun Li^a, Nan Sun^a, Jiawen Hou^a, Enshen Long^a

^a College of Architecture and Urban-Rural Planning, Sichuan Agricultural University, Dujiangyan, China

^b College of Architecture and Environment, Sichuan University, Chengdu, China

Abstract

The air-conditioning continuous running in the whole building is the most fundamental assumption to simplify the energy conservation design in the present research and practice, but the most of air-conditionings run intermittently in the partial space of the whole buildings. According to this contradiction, this study analyzes the cooling load rules of a typical room comparatively under intermittent and continuous running of air-conditioning and deeply explores the features on the composition and formation time of the cooling load under the air-conditioning intermittent running. Results show that for the cooling load composition, three additional parts, including the precooling load of indoor air and furniture, the cooling storage load of non-transparent external envelope and the heat transfer cooling load of internal envelope, must be considered under the air-conditioning intermittent running, compared to under the air-conditioning continuous running, so the transient cooling load under the air-conditioning intermittent running is more than that under the air-conditioning continuous running during the air-conditioning running period. For the cooling load formation time, more complex factors must be considered under air-conditioning intermittent running, compared to under the air-conditioning continuous running.

© 2017 The Authors. Published by Elsevier Ltd.

Peer-review under responsibility of the scientific committee of the 10th International Symposium on Heating, Ventilation and Air Conditioning.

Keywords: Cooling load; Continuous running; Intermittent running;

* Corresponding author.

E-mail address: mengxihvac@163.com

1. Introduction

Energy and environment are two major challenges faced by the mankind. In China, building energy consumption accounts for more than 30% of the social energy consumption [1, 2] and becomes the largest terminal part, so building energy conservation has a great significance on the energy crisis alleviation and the environment protection. However, in the present research and practice on building energy conservation, more attention is focused on the air-conditioning continuous running in the whole building to simplify the energy conservation design [3,4]. However, in fact, air-conditioning intermittent running, which accords with the occupant's daily habits, is widely used in the buildings. So the corresponding norms, standards or regulations on building energy conservation are inconsistent with the actual running situation of air-conditioning, which leads to the large difference between actual value and design value of building energy consumption [5]. In the beginning of air-conditioning intermittent running, indoor air, furniture and medial wall has the higher temperature than the design temperature (usually 25~26°C) of the air-conditioning continuous running, so there must be a large difference of the transient cooling load rules of a typical room between intermittent and continues running of air-conditioning [6]. Therefore, in order to analyze the cooling load transient variation rule of the air-conditioning intermittent running, an comparison is carried on for the composition and formation time of the cooling load under the air-conditioning intermittent and continuous running.

2. Methods

According to the response coefficient method of building thermal process [7], Figs. 1 and 2 shows variation schematic diagram of indoor air temperature and cooling load formed by a room with time under three cases of air-conditioning running. As shown in Figure 1, indoor air temperature presents the sine waveform with outdoor air temperature without air-conditioning in the room, while it is always constant under the air-conditioning continues running in the room. Under the air-conditioning intermittent running in the room, air-conditioning running period can be divided to invariable and variable air temperature period, according to indoor air temperature variation character. Meanwhile, as shown in Figure 2, air-conditioning running period can be divided to the precooling period, the cooling storage period and the normal running period according to air-conditioning running character.

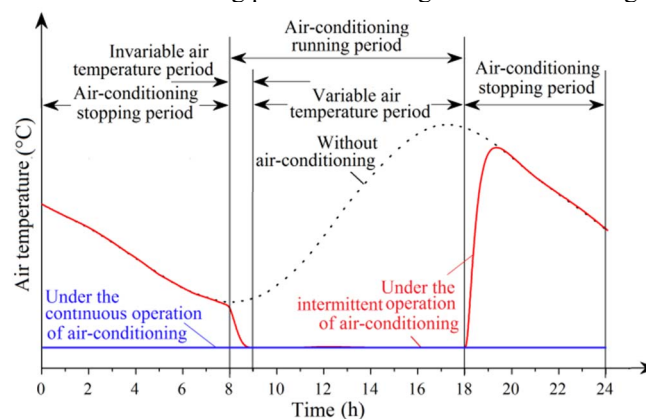


Fig. 1. Indoor air temperature variation under three cases of air-conditioning running

Download English Version:

<https://daneshyari.com/en/article/7227745>

Download Persian Version:

<https://daneshyari.com/article/7227745>

[Daneshyari.com](https://daneshyari.com)