

Study On Energy Saving Power Consumption Characteristics Of Idle Time In The University

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Abstract: The idle time power consumption of universities has a significant impact on the total power consumption of universities. In the paper the power consumption problem is analyzed from the definition of the power consumption of idle time, idle time monitoring of power consumption and idle time factors influencing the composition of consumption, reducing the idle time consuming electricity and other aspects of the method of idle time for universities [1]. The power-saving measures are proposed to reduce idle time power consumption.

Introduction

Power consumption characteristics of colleges and universities have a strong representation in large-public buildings. The idle time is the 8 hours outside of day time (including lunch time). Energy waste situation can easily occur in idle time [2]. Therefore, How to manage and monitor campus energy consumption scientifically has become one of the hotspot regarding building in economical campus. Referring to the practical energy consumption of the construction of a university in North China, this article hereby studies and solves related problems to reduce the idle time power consumption of universities [3].

Project Design

This article, with the campus energy consumption of a university in North China as its study object and 23 individual buildings installed with 650 monitory points as its monitoring object, monitors the idle power consumption of campus. These specific values are obtained by monitoring idle time power consumption of campus. Combine with the practical situation of university idle time power consumption to analysis the reasons, the final analysis conclusion. Through this research, ultimately put forward solutions to lower the idle time power consumption of universities, and then, in the hope to achieve energy efficiency goals. The analysis schematic of the idle time power consumption is shown in Fig.1.

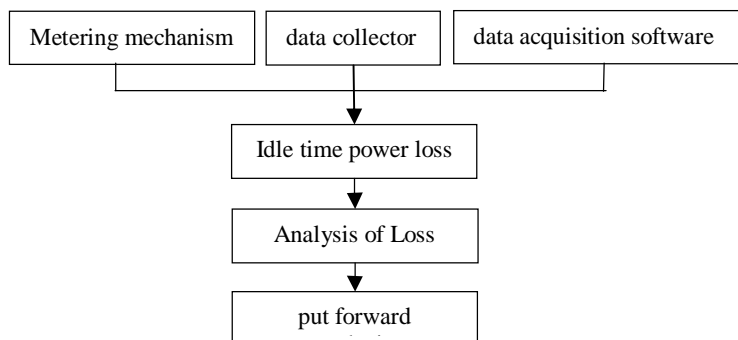


Fig.1 The analysis schematic of the idle time power consumption

Real-time Metering of Idle Time Power Consumption

The variety of their electrical loads is such as: 1) The load of air conditioner is a general term of its load for ventilation and heating in buildings. 2) The load of general power equipment: the load of power equipment refers to the load generated by a range of power and energy for the access of building, including elevator, heat transfer station, fire water pressurization system and smoke extraction system utilized in canteen. 3) The electrical load of general lighting socket device: this type of load is the important regional lighting that including indoor lighting and outdoor lighting, load in the unit projects as well as the load of indoor equipment such as socket. By proceeding real-time measurement to the construction area of 31649m² teaching building-public teaching museum, data is updated once every hour, recording the power loss situation from 0:00 to 24:00. The curves of real-time are monitored, they are observed that the idle time power consumption from 12:00 to 13:00 and from 17:00 to 8:00. actively counts up peaks load of energy consumption and then uploads them to server so as to allow the logistics department in colleges and universities to monitor the operating data of live energy-consuming equipment at any time. In this way, data can be effectively and timely collected and the technology's rapidness is well proved. The real-time measurement schematics of power consumption are shown in Fig.2 and Fig.3.

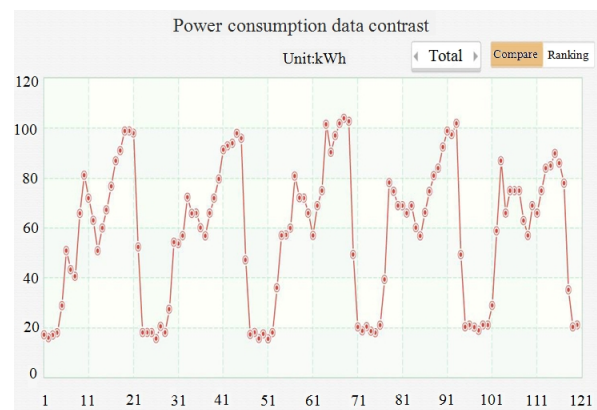
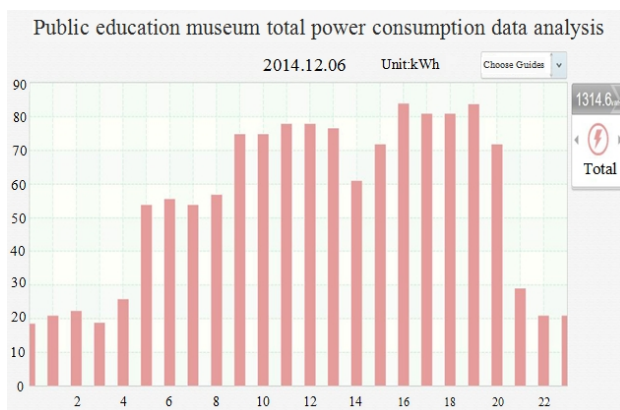


Fig.2 Day Power consumption measurement diagram Fig.3 Weeks of electric power metering figure

Data analysis

It is observed in table1, the power consumption of idle time from 12:00 to 13:00 and from 17:00 to 8:00. Through the dosing of daily power consumption calculation shows that the average daily consumption is 1314.57kwh and idle time power consumption is 813.31kwh in the public teaching museum. The idle time power consumption accounted for 61.87% of the average daily consumption is shown in Fig.4. The proportion of the university's electricity consumption in idle time is the higher. This rule is one of the common characteristics of energy consumption of buildings in colleges. And according to the statistics on China International Lighting Network, electricity consumption of lighting is increasing at the rate of 23% per year on average in China; electricity consumption of lighting in 2014 is up to 1.7478 trillion KW·h that is over 19.6% of national electricity consumption. Thus, we should start study on energy-saving in universities with the decrease of their electricity consumption of lighting in the idle time.

Table 1. Idle time power consumption statistics (kWh)

Time(24-hour system)	12:00	13:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Power consumption(kWh)	77.87	76.70	80.89	80.87	83.85	71.89	29.12	20.92	20.96
Time(24-hour system)	24:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	
Power consumption(kWh)	18.55	20.96	22.46	19.00	25.83	53.91	55.67	53.86	

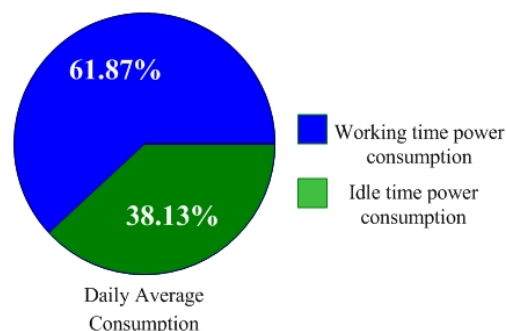


Fig.4 Daily Average Consumption

Cause and Specific Measures for Energy-saving

Cause of energy-saving. By analyzed on power consumption, it can be seen that one of the significant cause of building energy loss is idle time power consumption [4]. The main following reasons of the idle time consumption of campus building as follows: 1) Some members of the staff and students do not turn off the light when leaving and have less conscious of saving energy in building[5]. 2) Multimedia and computer are in standby mode, running host is waste of energy. 3) The school buildings are used as study lounge, which can not be fully utilized and cause waste to the energy. 4) When classrooms used can not take advantage of natural light. In addition, the classrooms can not be used and managed power in different regions of the classroom.

Calculations of Energy saving. This use energy calculation software MatIP5 on the standard layer of public teaching classroom for illumination calculation are shown in the Fig.5 and Fig.6. By calculation knows, an area of 128.64m² classroom, which reaches the national illumination standard 300lx, and need 12 double tube fluorescent of 80w. According to 15 hours a day idle time to calculate, the daily power consumption $Z = 0.08 \text{ KW} * 12 * 15 * 0.619 = 8.91 \text{ kWh}$, while under 12 pairs of fluorescent lamps using a factor of 0.443 in the case, calculating about 0.54 RMB per kilowatt hour, and an ordinary classroom idle time every day power consumption is 4.81 RMB. As we all know, because of the electricity consumption by idle time is huge at school every day.

Specific Measurements for Energy waste. 1) Based on the analysis above-mentioned, we can save more energy for our school if one third of lighting in a university are replaced by LED lighting that will saving 60% and 70% energy. 2) Human infrared sensor switches are installed on the basis of the original lighting system[6,7], people should turn off the lights when they leaving. 3) Strengthening management measures. Then, asking the teacher to turn off the multimedia host power after class to save energy. 4) Massed learning in the library study room, while concentrated open classroom of teaching building for student study, if the library learning space are not insufficient. 5) Taking full advantage of natural light during the day time instead of use curtains. Rational utilization of the switch control lighting area [8].

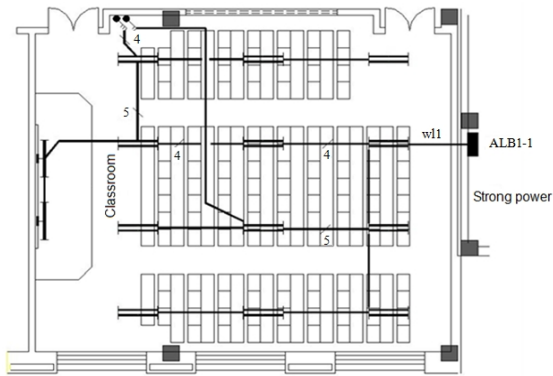


Fig.5 Standard floor classroom electrical construction drawings

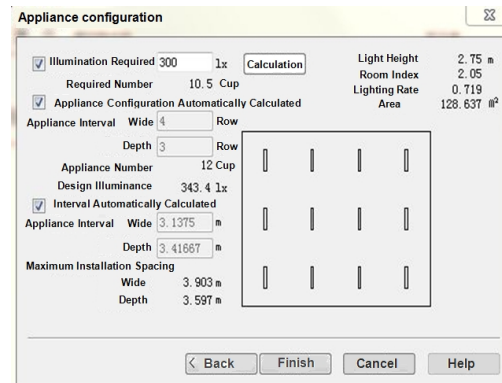


Fig.6 Using Matlp5 illumination calculation results

Conclusions

This article gives an instance of a university in north of China, introducing a definition of idle time power consumption, collecting and monitoring of the idle time power consumption, the calculation of idle time power consumption, causes and specific measures for energy-saving. In this paper, 1) the proposed scheme and measures to provide reference for the implementation of a conservation-minded campus effectively reduce the operating costs, 2) response to the national call to build a conservation-minded campus and it makes an important promoting.

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