ศักยภาพในการติดตั้งเครื่องควบคุมกำลังไฟฟ้าสูงสุด

Potential of Peak Demand Controller Installation

สมาน งามเลิศนภาภรณ์ อภิชิต เทอดโยธิน และ จันทนา กุญชรรัตน์
สายวิชา เทคโนโลยีการจัดการพลังงาน คณะพลังงานและวัสดุ มหาวิทยาลัยเทคโนโลยีพระจอมเกล้าธนบุรี
91 ถนนประชาอุทิศ แขวงบางมด เขตทุ่งครุ กรุงเทพมหานคร 10140
โทร. (02) 872-5491-4 , โทรสาร (02) 872-5495 , E-Mail : isamporn@kmutt.ac.th , saman@acbangmod.com

Saman Ngamlertnapaporn Apichit Therdyothin and Jonathan Kunchornrat
Department of Energy Management Technology, School of Energy and Materials,
King Mongkut's University of Technology Thonburi
91 Phacha-utis road Bangmod Thungkung Bangkok 10140
Tel. (02) 872-5491-4, Fax. (02) 872-5495 , E-Mail : isamporn@kmutt.ac.th , saman@acbangmod.com

Abstract :

At present, the electricity demand of the country is constantly increase and the unit cost of the produced *electrical* will be very high due to distribution system, sub-station and environmental protection system. Thus, the demand side management is considered to be suitable measure . The objective of this research is to evaluate the suitability of using maximum demand controller and build automation system in office building . The Head office of Siam City Bank was used as a study site. This building consume approximately 485,000 kWh per month with maximum peak demand of 1,437 kW. The result of installation of Peak demand controller show 37 kW and 135 kW of load can be controlled during partial and peak period respectively. The investment of the system is 203,621 Baht while 392,544 Baht per year can be saved with pay back period 0.52 years .

Keyword : peak demand controller / building automation system / *energy* management in building

1.Introduction

At present, Electrical energy consumption that increase and expect this energy will be not enough in future when consideration with the unit cost of the produced electrical will be very high due to distribution system, sub-station and environmental protection system.

So, Electricity Generator have used electrical charge by time of day rate (TOD rate) with electrical customers which electrical power consumption average in 15 minute more than 2000 kilo-Watt (kW) or electrical energy consumption average in 3 month more than 355,000 kilo-Watt hour (kWh). Then the electrical customers would like to change profile with using electrical energy for more efficiency and decrease their electrical charge. Electricity Generator split the electrical customer using time to 3 periods, the first period is called peak period (18:30-21:30), the electrical power charge in this period is 285.05 Bath/kW then the second period, partial peak (8:00-18:30), the electrical power charge is 58.88 Bath/kW and the last one, off-peak (21:30-8:00) that no the electrical power charge.

For, Decreasing the electrical power charge of the electrical customers, they should control electrical power demand each month fitting valuation. The Demand controller Installation is one method that controls the electrical using to fitting valuation. Demand controller is a computer system, which monitor, record and control electrical power demand consumption. The controller will check peak electrical power demand consumption and transfer data to compiler to compile electrical power demand consumption rate if electrical power consumption value less than electrical consumption set point that no command anything but electrical demand *consumption* value more than consumption set point, system will control to switch electrical loads off and switch on again when electrical demand consumption value less than set point in order follow to priority.

2. Research of Methodology.

2.1 measurement and record electrical power demand consumption value building from electrical meter recorder average 15 minutes is show in figure 1.

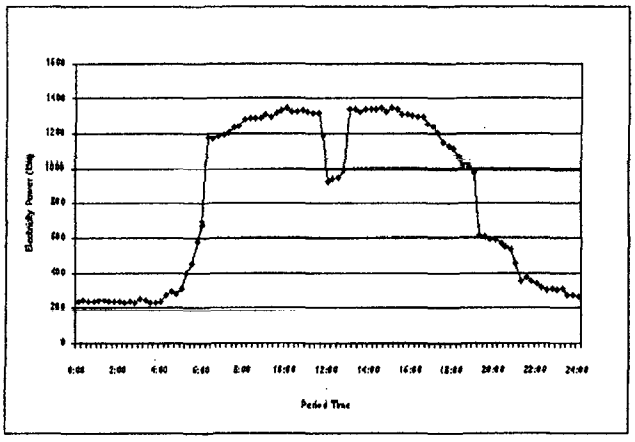

Figure1. Profile electrical power demand consumption in building

2.2 measurement and record electrical power demand consumption value with electrical main loads.

2.3 Order to priority of electrical load set the controller point switches off on the electrical loads.

Data from recorder will can set electrical loads in partial peak follow to priority are

1.	Pump No.1	12.5	kW
2.	Pump No.2	12.5	kW
3.	Motor AHU No.1	11.34	kW
4.	Motor AHU No.2	11.34	kW

And on peak period follow to priority are

1.	Pump No.1	12.5	kW
2.	Pump No.2	12.5	kW
3.	Chiller system	75.0	kW
4.	Cooling system	110.0	kW

2.4 Analysis with demand controller installation.

Data from electrical bill history 1 year found the electrical power demand consumption in partial peak period is 1,437 kW and on peak period is 1,025 kW. Consider electrical loads and electrical energy profile to set demand consumption point in partial peak period at 1,400 kW and 980 kW in peak period show in figure 2. So, when install demand controller could decrease the electrical power demand consumption in partial peak period 37 kW and 135 kW in peak period.

Investment analysis

The electrical power charge in this period is 285.05 Bath/kW.

Electrical power charge saving = 285.05 X 135

= 38,842 Bath / Month

The electrical power charge in this period is 58.88 Bath/kW.

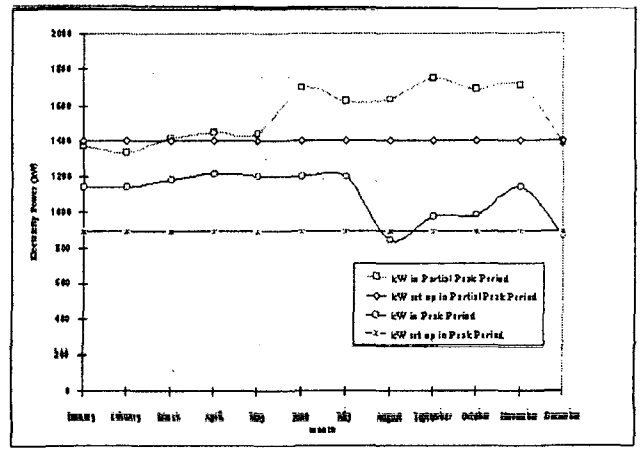

Figure2. Electrical power demand consumption from electrical bill history 1 year and set point demand consumption

Electrical power charge saving

= [(1,437 – 1,025) - (1,400 – 890)] X 58.88

= - 5,770 Bath / Month

Total saving = 38,842 – 5,770

= 32,712 Bath / Month

= 32,712 X 12 Bath / Year

= 392,544 Bath / Year

Pay back period

Investment demand controller installation cost = 203,555 Bath

Pay back period = 203,555 / 392,544

= 0.52 Year

3. Summary and Suggestion

The result of installation in the example building of Peak demand controller show 37 kW and 135 kW of load can be controlled during partial and peak period respectively. The investment of the system is 203,621 Baht while 392,544 Baht per year can be saved with pay back period 0.52 years.

The electrical power demand consumption each month to appear in 15 minutes average effect to electrical charge, so controlling electrical power demand each month fitting valuation could decrease the electrical charge that using computer control more efficiency.

References

[1] Sudsakorn Nuydee, 1995, "Energy conservation and Reduction of Peak Electrical Demand in Tuna Canning Factory",thesis of Master of Engineering, Department of Energy Management Technology King Mongkut's Institute of Technology Thonburi, p.80

[2] Limaye, D.R., " Demand-Side-Management: Developing least-cost strategies to reduce electricity costs and protect the global environment ", International Conference on Energy and Environment, 27-30 November 1990,pp.1-5.5.