Thesis Title. A Study of Electrical Energy Management in Buildings of Rajabhat Institute, Rajamangala Institute of Technology and Technical College of Sakonnakhon Province

Thesis Credits 6

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Abstract

This thesis aims at studying electrical energy consumption and evaluating energy utilization indices of buildings in three academic institutions in Sakonnakhon ; namely Rajabhat Institute Sakhonnakhon, Rajamangala Institute of Technology Sakhonnakhon campus and Sakhonnakhon Technical College, to explore strategies for electrical energy conservation. In Rajabhat Institute Sakhonnakhonn, studies were performed for four buildings consisting of the Library Building, Computer and Language Center Building, Kanjanaphisek Building, the Faculty of Humanities and Societies Building. In Rajamangala Institute of Technology Sakhonnakhon campus studies were performed for four buildings consisting of the Administration Building, the Faculty of Business Administration Building, the Faculty of Electrical Building and the Faculty of Civil Construction Building. In Sakhonnakhon Technical College studies were performed for four buildings consisting of Administration Building, Common Building III, Laboratory Building and the Faculty of Electrical and Electronics Building.

For data collecting from each building, Institute's blue-print, electrical system blue-print, construction blue-print, and electrical energy bills were collected. Surveys were made on installed equipment. Electrical energy audit through the use of measuring devices actually measured the total electrical energy consumption of the building, air conditioning

systems and other electrical appliances. Based on energy audit results, energy utilization indices and energy conservation opportunities were then evaluated.

All the buildings studied have square concrete structures. Most of them consumed a lighting system and an air conditioning system. Library Building, Computer and Language Center Building, Kanjanaphisek Building, the Faculty of Humanities and Societies of Rajabhat Institute Sakhonnakhon consumed the electrical energy about 186,336 kWh/year, 202,428 kWh/year, 69,804 kWh/year and 56,448 kWh/year respectively. The electrical utilization indices were found to be 59.34 kWh/m^2/year, 107.10 kWh/m^2/year, 15.34 kWh/m^2/year and 26.16 kWh/m^2/year respectively. Meanwhile the buildings of RIT Sakhonnakhon campus comprising of the Administration building, the Faculty of Business Administration Building, The Faculty of Electrical Building, and Civil Construction Building consumed electrical energy approximately to 56,880 kWh/year, 194,112 kWh/year, 209,556 kWh/year and 96,552 kWh/year, respectively. The electrical utilization indices were found to be 69.88 kWh/m^2/year, 37.68 kWh/m^2/year, 52.20 kWh/m^2/year and 40.65 kW/m^2/year, respectively. Sakhonnakhon Technical College, which consists of Administration Building, Common Building III, Laboratory Building and the Faculty of Electrical and Electronics Building , consumed electrical energy of 78,912 kWh/year, 14,616 kWh/year, 53,208 kWh/year, and 80,604 kWh/year, respectively. The electrical utilization indices are approximately 40.59 kWh/m^2/year , 13.53 kWh/m^2/year, 33.26 kWh/m^2/year and 40.76 kWh/m^2/year, respectively.

The low efficient energy utilization was found in those buildings. This is mainly due to the lack of maintenance of electrical equipment, too many installed light bulbs, low efficient electrical equipment and wasted energy in unecessarily equipment. As a consequence, energy conservation strategy is proposed through the use of a timer switch for an air-conditioning system of the buildings in Sakhonnakhon Technical College to conserve electric energy approximately to 10,673.38 kWh/year, which converts to 19,745.75 Baht/year, and receive a real economics internal rate of return (EIRR) more than 9 %. The buildings in RIT Sakhonnakhon campus are suggested to reach electric energy conservation by removing some unnecessary bulbs and installing electronics ballast and electronics thermostat devices. It is possible to save 135,440.46 kWh/year or 269,074.76 Baht/year. A timer switch is also suggested to control the operation of light

bulbs and air-conditioning systems that could save electrical energy about 40,920.85 kWh/year or 75,703.58 Baht/year and the EIRR is more than 9 %, whereas the buildings in Rajabhat Institute Sakhonnakhon is expected to save electric energy by using light performance light bulb, efficient type of lighting fixtures, electronics ballast and electronic thermostat. This could save energy about 86,817.34 kWh/year or 15,9622.04 Baht/year. A timer switch is suggested for saving in air-conditioning systems about 21,438.92 kWh/year or 39,662.00 Baht/year. The EIRR were found to be more than 9 %.

Keywords : Electrical energy management / Electrical energy saving in building / Electrical energy conservation in university / Energy audit