

DEVELOPMENT OF ENERGY BENCHMARKING OF MALAYSIAN GOVERNMENT HOSPITALS AND ANALYSIS OF ENERGY SAVINGS OPPORTUNITIES

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Abstract

There has been a growing interest in the Malaysian government on the issue of energy efficiency and the environment. This study presents the investigation and analysis of electrical energy performance characteristics of government hospital buildings in Malaysia. A generic questionnaire was developed to collect energy data of all government hospital buildings and a regression analysis was performed based on the feedback to predict the annual energy consumption of a Malaysian hospital building. Using the available surveyed data a generic hospital energy benchmark in Malaysia was developed and the surveyed data was also used to construct a typical base-case hospital building model using Energy Plus software. Using building simulation method with local weather data, areas of energy savings opportunities and its cost effectiveness are investigated. Simulation using selected cost effective energy savings measures suggests that the Annual Electrical Energy Use Index (EUI) of the base-case hospital building model can be significantly reduced to as much as 28.85% with a simple payback of 3.7 years by applying energy saving measures such as improved glazing, lighting as well as optimization of ventilation and cooling system.

Key words: Hospital building; annual energy consumption; regression analysis; energy saving measures; Energy Plus modeling.

INTRODUCTION

The rapid economic growth in the past has resulted in the planning and construction of many new hospitals in Malaysia. Apart from this, many existing large referral hospitals have been or in the process of major physical upgrading and refurbishment to meet the current and stringent medical standards, and to provide new facilities and services for new and expanding medical services. With a hot and humid climatic condition, plus the high expectation and requirement of medical and clinical standards, most hospitals have become very energy intensive. The Malaysian Code of Practice on Energy Efficiency and Use of Renewable Energy For Non Residential Building (MS 1525:2007) aimed at promoting energy efficiency of buildings has been trying to encourage a general awareness in energy conscious design and operational practice (Standard Malaysia, 2007). Lately, there has been a growing interest in the Malaysian government on the issue of energy efficiency and the environment. Malaysia National Green Technology Policy was launched in 2009 under KeTTHA which promotes efficient use of energy that covers major area such as energy, building, transportation and water sector.

It is without question that a very significant increase in hospital operational costs is the result of the increase in energy usage. In the current healthcare environment, with hospitals as the main energy users, challengers in trying to reduce operating costs and improve patient care are becoming more important than ever. Investigation and analysis of energy performance characteristics of hospital buildings in Malaysia using appropriate assessment methodology and analytical tools is therefore important for the purpose of establishing areas of energy wastage and developing strategies in efficient energy usage. This is crucial in order to extract the maximum benefits out of a more efficient building system. While much information is already available insofar as technology and building engineering systems are concerned, there is lacking in the local performance information and benchmarking, and information on breakdown of energy consumption of hospital buildings. This information is critical for the understanding of Malaysian hospital's energy profile.

Energy usage in buildings has long become one of the priority areas in research in many countries. Many developing countries, in particular during the past years, have made various efforts in encouraging efficient use of energy in buildings, with attempts to regulate energy conservation program and energy efficient design in buildings. Studies are carried out with the aim of understanding local and global energy issues for the improvement of energy usage. Janda & Busch (1994) in their report indicated