# Performance of Low Cost Alternative Radiant Cooling Panel in Malaysia

Muhammad Syukri Imran[1], Azhaili Baharun[1], Siti Halipah Ibrahim[1], and Wan Azlan Wan Zainal Abidin [1]

[1] Engineering Faculty, University Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia.

*Corresponding E-mail : 14010080@siswa.unimas.my

## Abstract

Radiant panel cooling is still considered uncommon in Malaysia due to unavailability of local manufacturers with limited architects or engineers who are familiar in the system. The initial construction cost for radiant cooling system may be higher than air system and not forgetting the need for a smaller supplementary air system to dehumidify the air to avoid condensation which is an inherited problem of the system in hot and humid region. Promotion and public awareness is lacking in the country and very much dependable on government demonstration program of green technology application where only a few governments owned building having such system. With the aim of long term energy and cost saving this study looks into the development of custom design and locally assembled low cost radiant cooling panel and how its performance in comparison to its overseas and more expensive counterpart could help in provide alternative cheaper building cooling system. Custom build cooling panels with selected materials were constructed and tested to find out its cooling capacity. Finite Element Method (FEM) software was used to establish a design chart to assist in the design and sizing of the alternative radiant panel for Malaysian residential house. The experiment shows that cooling performance in term of mean surface temperature and its cooling capacity is almost identical to its overseas counterpart. Use of cooling radiant panel with free night cooling of water as its chill water supply shows a significant energy saving potential while at the same time provide an acceptable room thermal comfort. Given the local made product having similar performance and suits local condition the technology could grow and be applied with confidence.

*Keywords*: *Radiant cooling panel, energy savings, thermal comfort, cooling capacity, night cooling*

## 1.0    Introduction

Radiant system is used to condition space to produce a selected air temperature much like a traditional convection system or air system does. The objective is to save energy or to overcome adverse local comfort condition  [1].   In this system, building surface is converted to radiant heat transfer panel that can be used for heating or cooling application. The radiant heat transfer does not directly affect the room air temperature. The long wave radiation heats or cools the surrounding surfaces, which then indirectly heats or cools the room air. The radiant cooling system basically consists of heat absorbing surface, chill water supply as the cooling medium, distribution pipe and control system. Some are integrated with building structure or embedded surface system and some are in the form of panel system with open air gap. Radiant panel cooling system is still considered uncommon in Malaysia due to lack of local manufacturer, suppliers and the high risk of surface condensation of cooling panel in this tropical hot and humid climate which makes its unpopular and prevent its growth. No doubt radiant cooling technology is not new especially in the western with its temperate climate, its application in this part of the world is still rare due to various factors that hinders the development of radiant cooling system [2]. Even in the latest Malaysian green building products and services directory publish by Malaysian Green Building Confederation [3] there is no radiant based cooling product or service provider was listed. Such product will have to be imported should the system were to be applied locally thus cost of acquiring such product is a something to be considered beforehand. It is likely that product availability and competition from various readily available suppliers prompts building designer to