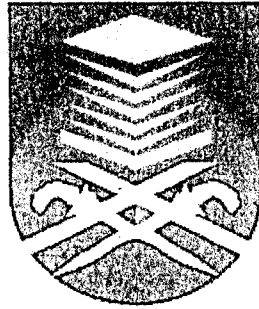


**UNIVERSITI TEKNOLOGI MARA
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**FINAL YEAR PROJECT REPORT
FACULTY OF MECHANICAL ENGINEERING
B. Eng. (Hons.) in Mechanical**

**COMPARATIVE STUDY OF PERFORMANCE OF A PLANE
AND PACKED-BED SOLAR AIR HEATER**

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ABSTRACT

Conventional solar air heaters have been found to have poor thermal performance because of low heat transfer coefficient between absorber plate and air. The usage of packed-beds could enhance heat transfer coefficient in solar air heaters. The blackened absorber matrix in heater channel absorbed solar radiations "in depth" and have high ratio of heat transfer area to volume and hence high heat transfer capability, resulting in the increase in the thermal efficiency of the system.

In this study, thermal performance of solar air heater having their duct packed with blackened iron chips has been experimentally investigated.

The concept for obtaining data was to have airflow through a long rectangular duct packed with absorber matrix. The experimental apparatus was designed and fabricated comprising of a compressor, packed-bed solar collector, airflow straightener and instrumentations capable of experimentation under actual outdoor conditions to evaluate thermal performance. For comparison, the same experiment is repeated, however without absorber matrix.

The experimental investigation is done with different mass flow rates at different days.

Thermal performance of solar air heater has been found to be considerably enhanced by packing its duct with bed of absorber matrix. Thus it is more beneficial to use packed-bed solar air heater for collecting higher-grade energy and for system that are required to operate under lower isolation conditions.

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