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Comparative Study of Single Pass Collector and Double Pass Solar Collector Filled with Porous Media

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ABSTRACT

This research reports a comparative study of the conventional single pass flat plate collector and the double pass solar collector filled with porous media such as gravel and metal chips at the lower channel of absorbing unit. The component materials, design, performance efficiencies, capabilities and the application of the solar collectors are presented to show various disparities that exist between the collectors. Emphasis was laid on the multi-pass approach as a gate way to future development on solar collectors.

Key words: Solar energy, collector, single pass collector, double pass collector, porous media

INTRODUCTION

The research on solar collector has gained its popularity over the years due to the increase in demand for the utilization of solar energy. Series of research have been done to improve the means of converting solar energy to other forms of energy that would meet the needs of human being. This as called for a concerted effort of scientists and engineers, who came out with the classification, different approaches of designing and evaluation of the efficiency of solar collector, that would be economically viable and technically effective.

Energy is vital input for economic growth in agriculture and industry. Fossil fuels are depleting at a faster rate due to over exploitation, besides increasing in cost of environmental sustainability. Search for sources of green energy and their technological development is of paramount importance to have a balanced and buoyant environment for better quality of life (Kothari *et al*., 2009).

Amer *et al*. (2012) proposed solar power and wind energy as adjunct renewable energy sources for due to increase in consumption of fossil fuel which poses a threat on environmental sustainability. Joseph *et al*. (2011) emphasized the future of solar energy supplying the whole energy needed in facilities such as building with cheap cost of production and environmental friendly.

The single pass collector is also known as flat plate collector. It was said by Garg and Parkash (2006) that it forms the hearts of any solar collection system designed for operation in the low temperature range, from the ambient to 60°C or the medium temperature range, from ambient to 100°C. A well engineered flat plate collector delivers heat at relatively low cost for a long duration. The most important part of the collector is the absorber plate along with the pipe or duct to pass air in thermal contact with the plate to transfer heat from it.