



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**INVESTIGATION OF WATER FLOW TEMPERATURE
ON SOLAR PANEL**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering Technology (Industrial Power) with Honours.

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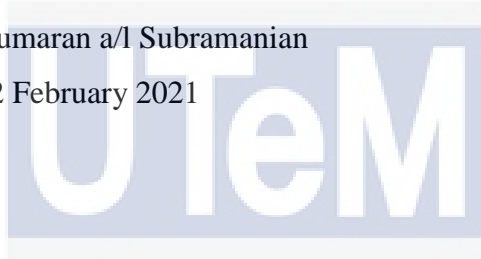
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APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Industrial Power) with Honours. The member of the supervisory is as follow:



ABSTRAK

Solar panels are important to focus solar energy from sunlight for the sake of generating electricity. Renewable energy power plants have an advantage over high efficiency solar panels as less number of solar panels are required for the same power output. Along with duration and temperature, temperature has a great effect on the performance of a solar panel as high temperature significantly reduces output power. So, we require more efficiency while high temperature we require a cooling system such as water. This research paper explains a practical approach to investigation of water flow temperature on the solar panel. The water cooling system is free of maintenance, easy to handle and simple in operation. But without the cooling system solar panels operate efficiently in generating electricity as long as the solar panels are kept cool by some heat sinks. Experimental results indicate appreciable enhancement in the overall output of the solar panel. Experimental readings obtained from results. Corresponding results obtained from different conditions showing improvement in efficiency are tabled and plotted.

ABSTRACT

Panel suria penting untuk memfokuskan tenaga suria dari cahaya matahari demi menjana elektrik. Loji tenaga boleh diperbaharui mempunyai kelebihan daripada panel suria kecekapan tinggi kerana bilangan panel solar yang lebih sedikit diperlukan untuk output kuasa yang sama. Seiring dengan tempoh dan suhu, suhu mempunyai pengaruh yang besar terhadap prestasi panel suria kerana suhu tinggi dapat mengurangkan daya output dengan ketara. Jadi, kita memerlukan lebih banyak kecekapan sementara suhu tinggi kita memerlukan sistem penyejukan seperti air. Makalah penyelidikan ini menjelaskan pendekatan praktikal untuk penyiasatan suhu aliran air pada panel suria. Sistem penyejukan air bebas dari penyelenggaraan, mudah dikendalikan dan mudah dikendalikan. Tetapi tanpa sistem penyejukan panel suria beroperasi dengan cekap dalam menjana elektrik selagi panel suria tetap sejuk oleh beberapa pendingin. Hasil eksperimen menunjukkan peningkatan yang ketara dalam output keseluruhan panel suria. Bacaan eksperimental yang diperoleh daripada hasil. Hasil yang sesuai yang diperoleh dari keadaan yang berbeza menunjukkan peningkatan dalam kecekapan dibentangkan dan diplot.

DEDICATION

To my beloved parents



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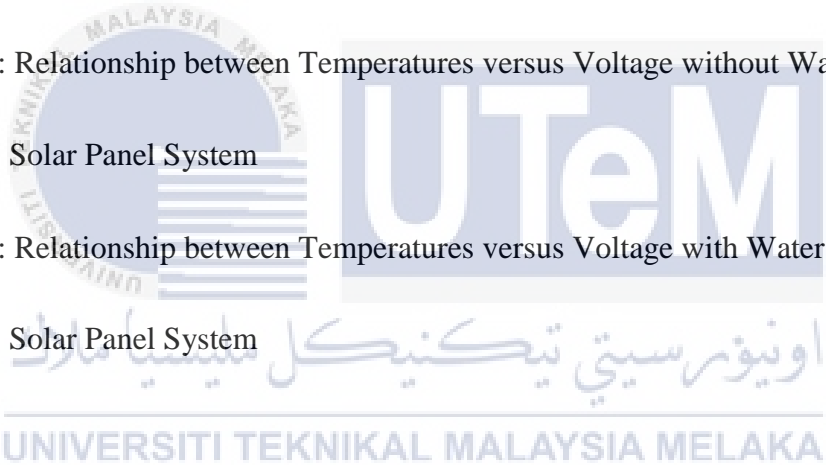
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LIST OF SYMBOLS

D, d	-	Diameter
W	-	Power
A	-	Ampere
V	-	Voltage
L	-	Length
m	-	Mass
°C	-	Degree Celsius
PSI	-	Pressure
M	-	Metre
mm	-	Millimetre
W/mK	-	Thermal Conductive
rpm	-	Rotational Speed
%	-	Percentage

LIST OF ABBREVIATIONS

PV Photovoltaic



CHAPTER 1

INTRODUCTION

1.1 Background

In the new era of Industrial Revolution 4.0, the organization in developing countries had faced the most challenging issue in renewable energy power plant. The solar energy is also most developing source in power plant because it is a clean and renewable energy source. The solar panel consists of photovoltaic (PV) cells are attained to convert solar energy from the sunlight directly to electrical energy. Sunlight is the main power of photovoltaic cells to perform its progress, therefore sunlight produce so much of heat together with sun light at daytime. Heat is one of biggest problems among solar powered plant which will decreases the efficiency, while sun light and heat cannot be separated. Many experimentation have been done to boost the efficiency of the solar cell.

In this project, the objective was to increases efficiency of the solar panel. The purpose behind this project is to investigating of water flow temperature on the solar panel. In other word, control the temperature of the solar panel using water flow. The nowadays solar panel cooling system play a big role in maintaining the lifespan and the efficiency of the solar panel. Presently the researchers develop the solar panel which can withstand high temperature under hot sun using water cooling system which more effective. By using the water flow system in the solar panel, it can help to maintain the temperature and increases the lifetime of the solar panel.

Furthermore, the water flow cooling system is much more effective to decrease high temperature to lower. The water flow cooling system is much more thermally conductive than an air cooling system. The automotive industry also still uses a water flow system to cool down the hot engines. As well-known, the solar panel consists of photovoltaic cells that are connected by bus wires which will break when the temperature is too hot. Progressively, a water flow system on a solar panel is a process of maintaining the panel and increasing the efficiency of power production under hot sun.

1.2 Problem Statement

Solar-powered plants face issues with increasing temperature. According to this case, the problem occurs in how the performance of the solar panel under a hot sun in daytime. It has been realized that the sunlight brings a high temperature effect on the efficiency of the solar panel. The heat from sunlight cannot be avoided as it is known that solar panels work only under sunlight. In this case, some power plants keep producing power under high temperature with low efficiency. Other than that, an increase in temperatures from certain causes can reduce the lifespan of the solar panel due to damage to PV cells. Many cases are concerned about reducing costs and increasing the performance of the transformer to produce power.

Table 1.1: Comparison of Solar Panel With and Without Water Cooling System

Results

Output power	Without Water Cooling System	With Cooling System

Power Generated (W)	66.96	78.5
Power Consumption (W)	0.0	2.16
Net Output Power (W)	66.96	76.34
Net Output Power Saving (W)	0.0	9.38
Percentage of Net Output Power Saving (%)	0.0	14.00

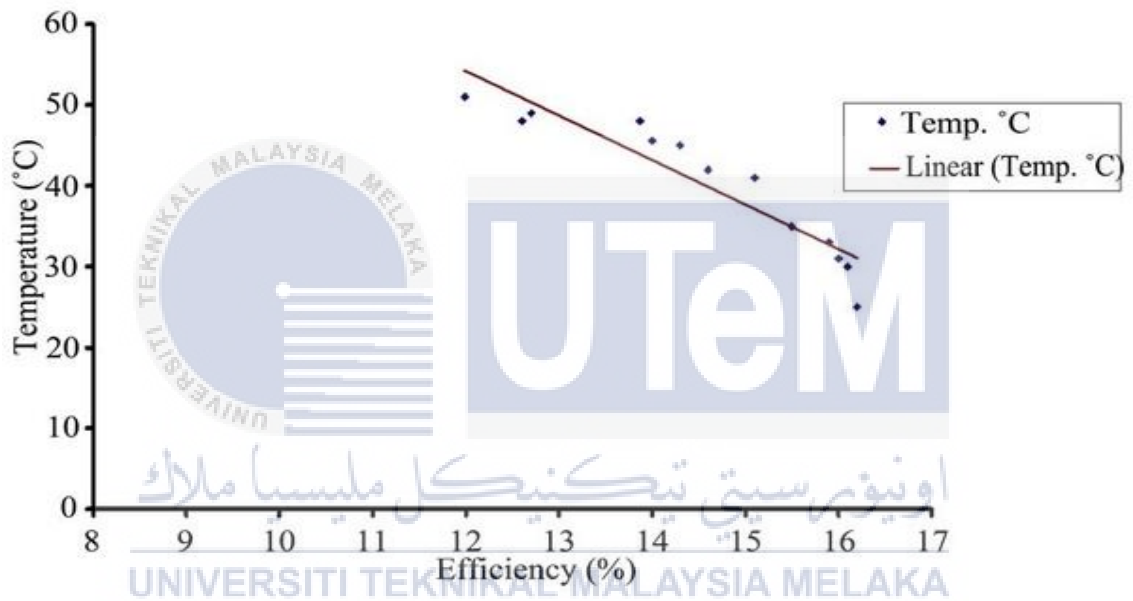


Figure 1.1: The Efficiency of Solar Panel According To Data Collection

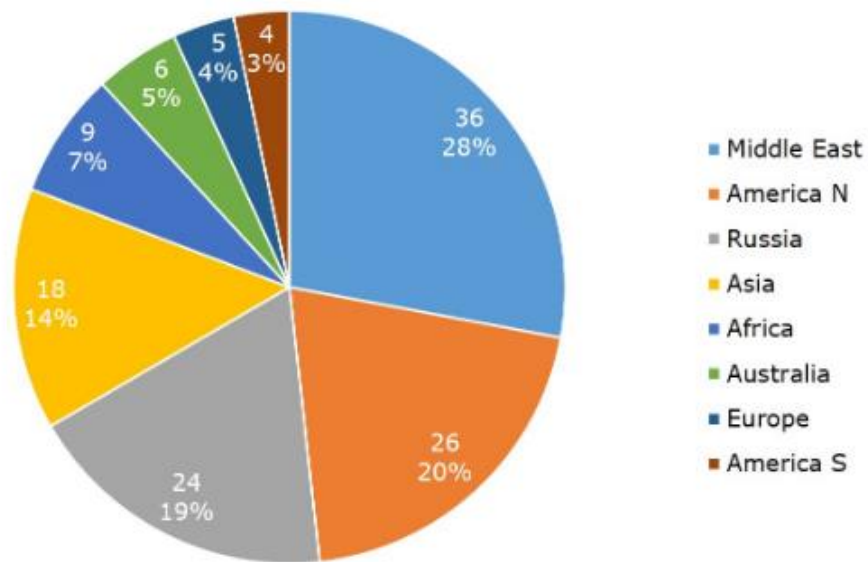


Figure 1.2: Number of Country Using Solar Energy

This project is important these days because as we know power plant need to operate continuously and using solar panel is a good option. A part of cooling system for the solar panel based on water flow system that had been to a great extent unexplored ability to decrease the temperature.

1.3 Objective

The overall purpose of this project is to investigate the effect of water flow on the solar panel temperature in order to increase its efficiency. Although, there are a few objectives as shown:

1. To increase the efficiency of solar panel.
2. To reduce the temperature of the solar panel.