SELECTION AND EXECUTION OF A SERIES MEASUREMENTS TO INVESTIGATE THERMAL CONDUCTIVE MATERIALS USE FOR COOLING ELECTRONIC COMPONENTS IN IP65/67 POWER SUPPLY UNIT CONSIDERING THE ASSEMBLY AND COSTS

By

Mikola Francesco
11901038

BACHELOR'S DEGREE
in

MECHANICAL ENGINEERING – MECHATRONICS CONCENTRATION
FACULTY OF ENGINEERING AND INFORMATION TECHNOLOGY

SWISS GERMAN UNIVERSITY
The Prominence Tower
Jalan Jalur Sutera Barat No. 15, Alam Sutera
Tangerang, Banten 15143 - Indonesia

Revision after the Thesis Defense on 10th July 2023

STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.

Mikola Francesco
Student

18.07.2023
Date

Approved by:

Dr. Yunita Umniyati, S.Si., M.Sc.
Thesis Advisor

18.07.2023
Date

Christian Wolfförster, B.Eng.
Thesis Co-Advisor

18.07.2023
Date

Dr. Maulahikmah Galinium, S.Kom., M.S
Dean

24.07.2023
Date

ABSTRACT

Investigating Thermal Conductive Materials for Cooling Electronic Components in IP65/67 Power Supply Unit

By

Mikola Francesco
Dr. Yunita Umniyati, S.Si., M.Sc., Advisor
Mr. Chrisian Wolfförster, B. Eng., Co-Advisor

SWISS GERMAN UNIVERSITY

Cooling components inside Power Supply Unit (PSU) is vital to prevent the device from overheating. In the IP65/67 Power Supply Unit, there is another important problem to be solved as the power supply is working underwater and isolated from outer environment. This means there will be no air circulation and the heat are accumulated inside the power supply.

The purpose of this thesis work is to design and assemble the cooling system that suits the IP65/67 Power Supply Unit (PSU). The PSU currently experiencing over temperature in a several components inside. By applying heat transfer theory and method, conductive heat transfer method must be applied. The cooling components must be designed to reduce the heat and temperature inside the power supply. The components and materials can be defined through calculation and research. Several materials can be used as thermal conductive materials to help absorb heat and reduce temperature inside the power supply while the device is running. After the calculation and design has finished, the cooling system must be assembled and tested inside the PSU. After obtaining the result, the final components and material must be assembled so the IP65/67 Power Supply Unit (PSU) can run smoothly and will not experience any overheating issues. It is recommended to use the material with a high thermal conductivity and high dielectric strength for safety reasons and better heat conduction.

Keywords: IP65/67 PSU, Thermal Conductive Materials, Heat transfer, Overheating, Phase change Materials

DEDICATION

I dedicate this Thesis work to my parents, lecturer, and last but not least

AEConversion GmbH & Co.KG

ACKNOWLEDGEMENTS

I am very thankful for the people that has support me in the making of this thesis work. The right guidance and gentle direction have been most appreciated. Dr. Yunita Umniyati, S.Si., M.Sc. was tremendously helpful in teaching me about the thermodynamics and guiding me toward the calculation in heat transfer method. Mr. Christian Wolfförster, B.Eng.'s intelligence and practical experience has taught me more about the IP65/67 Power Supply Unit and how it works. Finally, I would like to give my deepest gratitude to Dr. Theodor Schulte and Dr. Stefan Grösbrink. They gave me the chance to do the thesis work in AEConversion GmbH & Co.KG in Germany. From the beginning, they believed in my ability to complete this IP65/67 Power Supply Unit flawlessly.

Throughout the semester in Swiss German University. I found that all the subject and coursework has been very useful especially thermodynamics subject. The subjects have taught me a lot about what to do and choosing the right method and that helped me in finishing the thesis work.

TABLE OF CONTENTS

Page

LIST OF FIGURES

Figures Page

Chapter 1

Chapter 2

Chapter 3

Chapter 4

Appendix

LIST OF TABLES

Table Page

Chapter 3

Chapter 4