DESIGN AND FABRICATION OF HEAT PIPE

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ABSTRACT

The main objective of this is to study the heat transfer characteristics of micro heat pipe of circular geometry by design, fabrication and theory of analysis on the same. The experimental investigation is also done on micro heat pipe by using difference parameter. Different working fluids are used to examine the performance of the micro heat pipe. Design has been created of micro heat pipe by the research of different literature and to study different parameters of micro heat pipe. We use three type's working fluid in future; acetone and water. To study the heat flow rate and analysis different parameters of micro heat pipe.

Keyword: - *Micro heat pipe, acetone.*

1. INTRODUCTION

A heat pipe is a device which can transfer the heat from one porsion to another porsion,so it is called as the "superconductors" of heat. The potential threat heated the electic elements like IC circuit.so this heat absorb by micro heat pipe. Integrated circuit lifetime depends on optimum cooling of electronic components in a smaller electronic device When increasing market demand of electic componets in the smaller and smaller electic device creates a trade off situation: either to modify the package to accept additional cooling or to sacrifice IC lifetime.
The Computers and telecommunication devices are compact in size, so we required a carefull attention for the size of heat pipes. This application of micro heat pipe (MHP) has reduce heat transfer rate .

1.1 Material/Tool Required

The micro heat pipe having light weight.
It has no any moving parts.
It is silent in operation and having several time the heat heat transport capacity as compared to the best metallic heat conductor like silver and copper.

1.2 Typical Materials

Aluminum,
Stainless steel,
Copper,
Composite materials,
High temperature heat pipes may use refractory materials or linings to prevent corrosion.

1.3 Problem Specifications

Overheating using long time
Time consuming.
Less efficient in working.

2. LITERATURE REVIEW

In order to study the heat transfer characteristics, a micro heat pipe (MHP) of circular geometry having inner diameter 1.8 mm and length 150 mm is designed and fabricated. An experimental investigation is carried out also to investigate the performance of the MHP with different experimental parameters. These experimental parameters include inclination angle, coolant flow rate, working fluid and heat input. Inclination angle are varied from 300 to 900, whereas coolant flow rate and heat input are varied from 0.3 lit/min to 1.0 lit/min and 0.612 W to 8.71W respectively. Three different types of working fluids are used; acetone, ethanol and methanol. For each working fluid, heat transfer characteristics are determined experimentally for different inclination angle and different coolant flow rate at different heat input. Acetone is proved to be better as working fluid. A correlation is also made for acetone to relate other experimental parameters for determination of heat transfer coefficient.

3. DESIGN METHODOLOGY

The heat pipe consists of three sections; evaporator section, adiabatic section and condenser section. The total length of MHP is arbitrarily selected as 151 mm. This dimension is convenient to handle and can easily be used in practical applications. Evaporator section is located at the bottom of the heat pipe. Heat is added to the heat pipe through evaporator section. Adiabatic section is located in between the evaporator and condenser section. This section is actually kept with heat pipe to distinguish evaporator section and condenser section. Condenser section is the uppermost part of the heat pipe. There is a water jacket around this section which is concentric with the container section. Water flowing through the jacket cools the condenser section of the pipe and thus takes away the latent heat of condenser of vapor.

Fig. 1 Micro heat pipe.

- This design is about micro heat pipe. The description of dimension is given below.
- Length : 300mm
- Diameter : 8mm

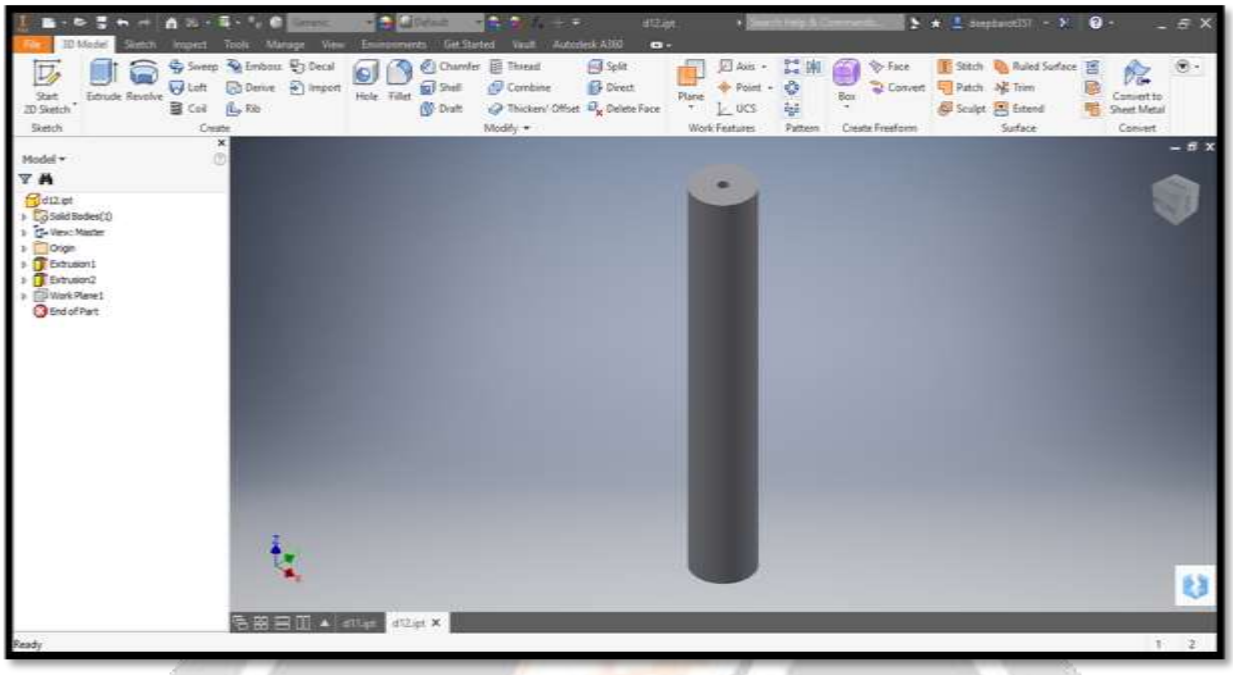

Fig. 2 Condenser section.

- This figure is show about condenser section. The description is given below.
- Outer Diameter : 18 mm
- Inner Diameter : 9 mm
- Length : 100 mm

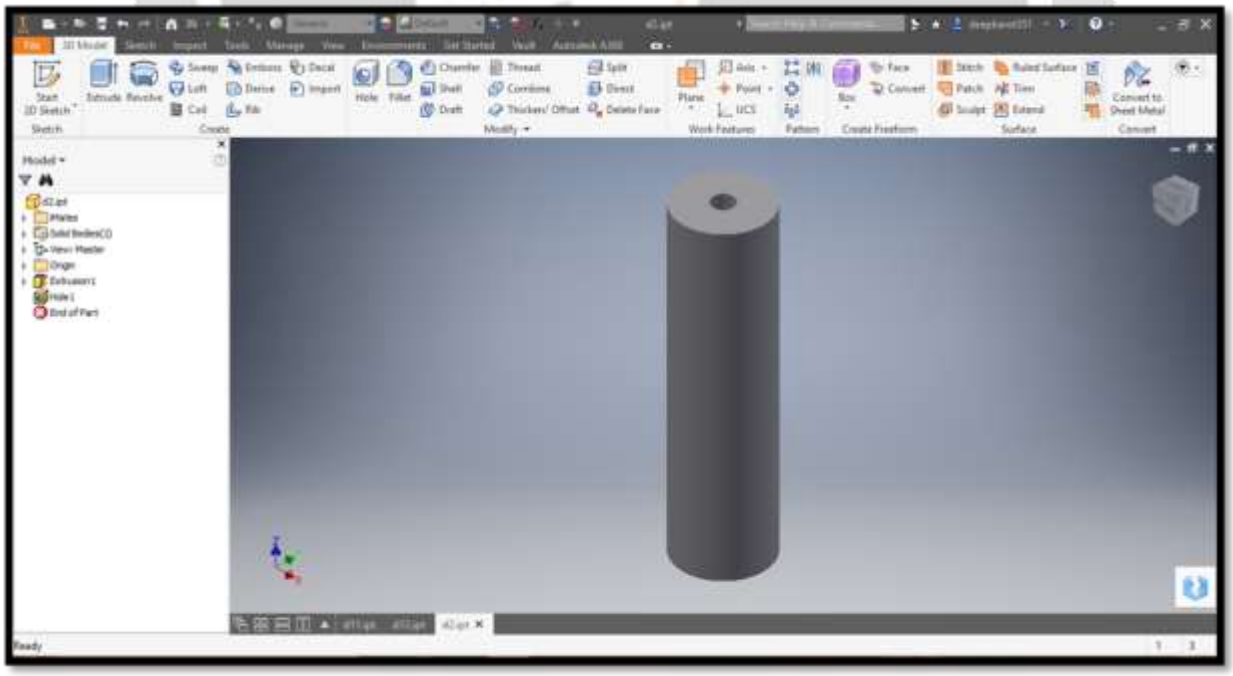

Fig. 3 Coolant inlet port.

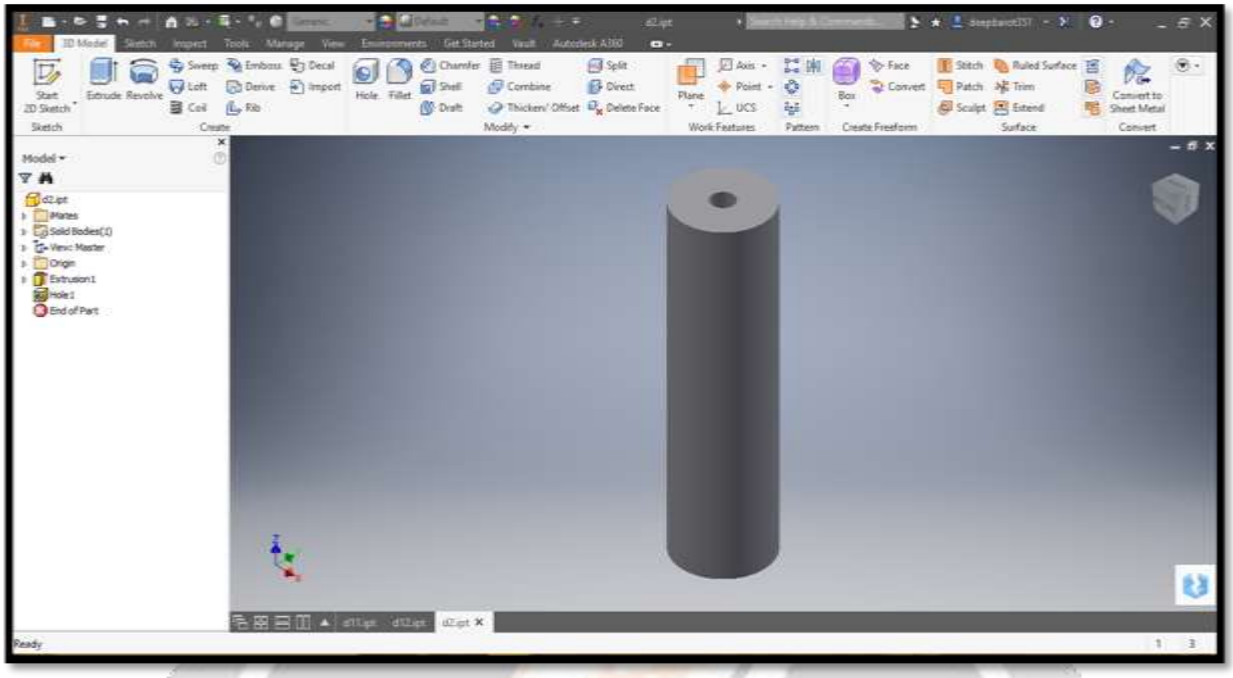

Fig. 4 Coolant outlet port.

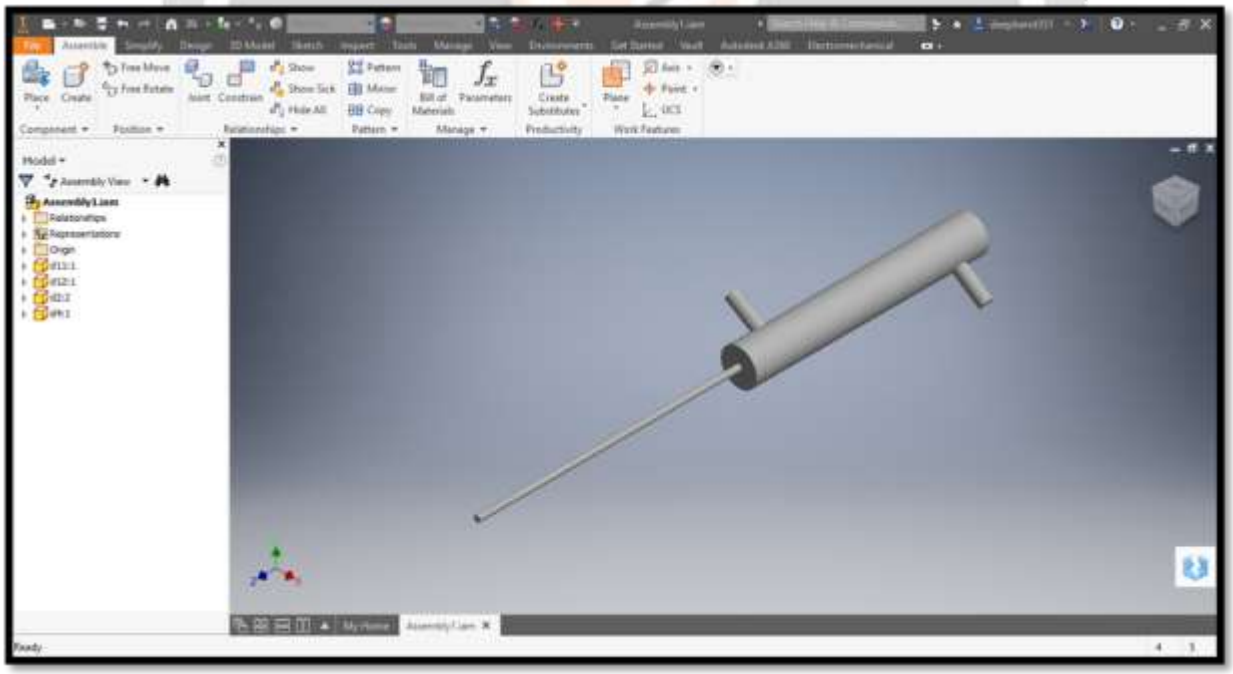

Fig. 5 design of micro heat pipe

It is final design of micro heat pipe. It consists of micro heat pipe, condenser section, and evaporator section and coolant inlet and outlet port.

4. IMPLEMENTATION

A heat pipe is a device that can transfer large quantities of heat with a very small difference in temperature between the hot and cold interfaces.

It is pencil-sized metal tubes that moves heat from one end of the tube to the other end of the tube without the aid of a pump. Within the heat pipe, heat vaporizes a small amount of fluid at the pipe's hot end, the fluid travels to the other, slightly cooler end and condenses before returning to the hot end through a capillary wick, where it repeats the process.

The minimum feature size in microprocessors has reduced from 1990 to 1997 and which will go down further reduce by the year 2012. This has increased the heat dissipation density for desktop microprocessors. Now we have again increased the size of the heat pipe.

The reduction in size also brings severe limitations to the conventional cooling techniques. So we have increased the size of the heat pipe.

It is essential to develop the efficient thermal management scheme dissipate for high heat fluxes and maintain suitable operating temperature of the device. Micro heat pipes are increasingly filling this role.

To keep up with today's thermal solution challenges, micro heat pipes must improve efficiency and integrate remote heat transfer into thermal management solutions. Thus application of MHP has been extended gradually.

5. FREEDOM OF DESIGN

Since the basic mechanisms of a heat pipe are the capillary pumping of a wick and the evaporation and condensation of a working fluid, heat pipe design is only restricted by the need to provide for these mechanisms. With this in mind, heat pipes can be designed so that they fit various shapes and configurations. These geometries range from simple cylindrical or flat heat pipes, to curved plate heat pipes for solar collectors and leading edge heat pipes.

8. CONCLUSION

The experiment of investigating thermal performance of MHP is done by varying the coolant flow rates, working fluids and heat inputs. From the results the following conclusion can be made. Coolant flow rate has a significant effect on the performance of MHP. Heat input has significant effect on the performance of MHP. It is found that overall heat transfer coefficient is higher for higher heat input. In spite of reducing the size of the micro heat pipe, here the size of the micro heat pipe is increased.

9. REFERENCES

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