INTRODUCTION

The proposed work relates to an improved heat exchanger (Radiator) design for either heating or cooling of a fluid. Also, it deals with the work particularly which relates to an improved fan assisted air-cooled heat exchanger used in Automobiles, Internal Combustion (IC) engines, Refrigeration system, and Power plants. In the race of manufacturers, everybody is working hard not only to enhance quality, efficiency, performance of their equipments but also to improve components including heat exchangers.

Different types of heat exchangers are known where air is used as heat transfer medium since it is freely and abundantly available, and there is no problem of its disposal. In known heat exchangers, flow of air is induced naturally or is aided by the use of one or more fans. The use of fan reduces the size and the cost of the equipment, which makes it more compact. Hence, fan assisted air cooled heat exchangers are more popular than others. In known air-cooled heat exchangers, the fan either forces or draws the air through the heat exchanger, some of which are described herein below by way of examples.

In the known heat exchangers, the fans are placed behind the heat exchangers to force/draw the atmospheric air. These exchangers use a shroud. This directs the air over the entire area of the heat exchanger. A study was undertaken to find out the distribution of airflow and variation of its temperature.

Generally, all conventional heat exchangers are either square or rectangular in shape and the fans with circular blades are used to create the flow of air through such heat exchangers. In all known heat exchangers, there are several drawbacks and or disadvantages which can be classified as follows –

a) Fans with circular blades deliver air in a circular area even when the heat exchangers are square in shape.

b) The velocity of the air flow generated by the fan is not constant or uniform along its entire axial direction. It is to be zero at the centre and gradually increases at the rate of square of the radius.

c) When the thickness of the heat exchanger is constant, there has been no attempt to increase the heat transfer area at the periphery of such heat exchanger. The heat transfer area near the hub of the fan should be zero. Since this is not the case with present heat exchangers, they do not offer optimum utilization of material and air velocity.
d) A square or rectangular shrouds were provided for the fan to convert the circular flow of air into the required shape.

Further the known equipments consume more power, more material and are therefore not cost effective.

Therefore it has been proposed to develop a new heat exchanger, which would avoid all the disadvantages of the known equipments.

![Figure 1.1 Natural Cooled Engine](image1.png)

![Figure 1.2 Forced Cooled Engine](image2.png)

- Small engines
- Light duty
- Large surface area
- Simple engine layout
- Engine component
- Material
- Lubrication
- Large operating temperature range
- Emission
Engine Demand:

- High Power to Weight Ratio,
- High Speed,
- Long Life, Reliable

- High & Uniform Torque,
- Low Emission,
- High Efficiency
Engine jacket heat transfer depends on

- Thermal conductivity of engine components
- Oil film viscosity & service temperature
- Combustion temperature
- Abnormal combustion
- Emissions
- Turbocharger demand.
- Limitations of jacket heat transfer