# CFD Simulation of Square Threaded & Helical Twisted Pin Fin Arrays In A Rectangular Channel To Enhance Heat Transfer

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***Abstract***- *Heating of an element under various working applications is a major problem for today's engineering devices therefore rapid heat removal from heated surfaces and reducing material weight and cost has become a major task for design of heat exchanger equipment's. Development of super heat exchanger requires fabrication of efficient design techniques to exchange great amount of heat between surfaces such as external surfaces and ambient fluid. Extended surfaces (fins) are widely used in heat exchanging devices for the purpose of increasing the heat transfer between a primary surface and the surrounding fluid.*

***Keywords***- Extended surfaces, heat transfer, primary surface,

## I. INTRODUCTION

Various types of heat exchanger fins, ranging from relatively simple shapes, such as rectangular, square, cylindrical, annular, tapered, dropped shape or pin fins of different geometries have been used. One of the commonly used fins is the pin fin, these fins may protrude from either a rectangular or cylindrical base. A pin fin is a cylinder or other shaped element attached perpendicular to a wall with the transfer fluid passing in cross flow over the element. Pin fins having a height-to-diameter ratio, H/d, between 0.5 and 4 are accepted as short fins, whereas long pin fins have a pin height-to-diameter ratio, H/d, more than 4.

The large height-to-diameter ratio is of particular interest in heat-exchanger applications in which the attainment of a very high heat-transfer coefficient and pressure drop is of major concern. The relative fin height (H/d) affect the heat transfer of pin fins and other affecting factors include the velocity of fluid flow, the thermal properties of fluid, the cross sectional shape of pin fins like square threaded and helical twisted, the relative inter-fin pitch, the arrangement of pin fins like in-line, staggered arrangements.

## II. CASE STUDY

This Study is aimed mainly at examining the CFD simulation for heat transfer enhancement from square threaded and helical twisted pin fins under inline and staggered arrangement which result of introducing body modification to the fin body. The modification in this work is a square threaded and helical twisted geometry made through the fin thickness of cylindrical pin fin. The CFD simulation study investigates the influence of body geometry on heat dissipation rate and pressure drop across the rectangular tunnel of the square threaded and helical twisted pin fins. The modified pin fin geometries are compared to the corresponding solid fins in terms of heat transfer rate and also comparing will be between all different geometries of fins.

## III. CONCLUSIONS

The present work helps to concluded that lot of work has been carried out to investigate the effect of different geometries of pin fin with inline and staggered arrangement and sizes of pin fin on heat transfer and friction factor. Considerable enhancement in the heat transfer can be achieved with little change of its geometry as helical twisted and square thread profiles as it leads to increase in the cross sectional area and turbulence. The effects of the flow and geometrical parameters on the heat transfer and friction characteristics can be determined. Various investigators have developed correlations for heat transfer and friction factor for pin finin a rectangular channel ducts having different geometries. These correlations can be used to predict the thermal performance as well as pressure drops of square threaded and helical twisted pin fins across the rectangular tunnel.

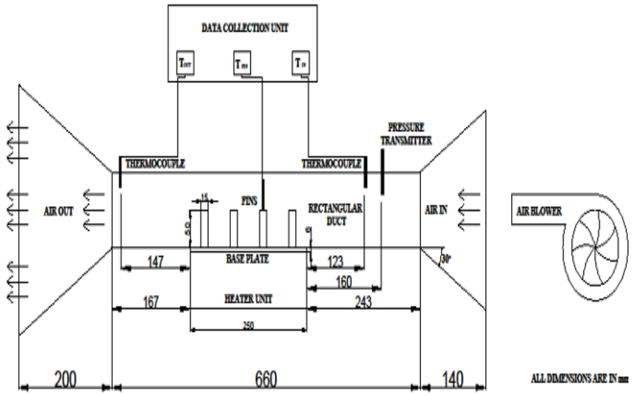


**Fig 1 Experimental Setup for CFD analysis**

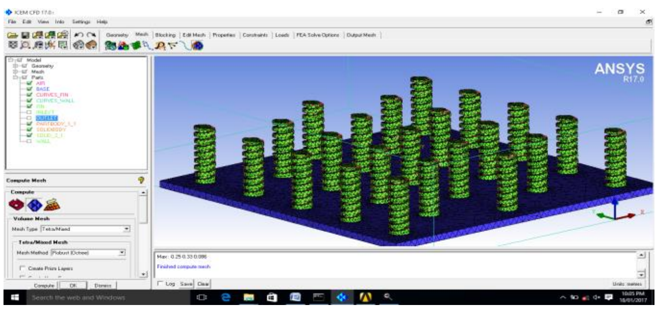


**Fig 2. Meshing of Pin Fin CFD**

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