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Heat Augmentation Methods Using Different Types Of Extended Surface –A Review

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Abstract- Heat enhancement technique are used to increase heat transfer rate in various industries such as Aerospace, process, chemical, air conditioning etc. which help in increase the performance of the system.

Index Terms- Augmentation, Extended surface, inserts

1. INTRODUCTION

The methods are used for improving the working performance of heat transfer system by increasing the rate of heat transfer. This method uses the different shapes of extended surface, inserts etc.This method are generally classified as active passive and compound methods.

1.1 Passive method:-Heat transfer augmentation methods used to increase the performance of system by increasing the rate of heat transfer. This methods uses the different shapes of extended surface ,inserts etc.

- Rough surface
- Extended surface

1.2 Active Method:-This method need some external power to enhance the heat transfer rate. Following methods are generally used.

- Surface vibration
- Using mechanical aid

1.3 Compound Method:-This technique is the combination of active and passive technique.The present paper contains the review of heat augmentation with different inserts, extended surface.

2. REVIEW WORK CARRIED OUT

Smith Eiamsa-ard , et.al [1] Investigated the friction loss and enhancement in heat exchanger tube with propeller type swirl generator at several pitch ratio for investigation purpose Reynolds number used in the range 4000-21000 under the uniform heat flux condition. The experiment is also undertaken for different blade number i.e 4, 6, 8 and different blade angle 30°,45°,60° and for pitch ratio 5, 7and 10 and effect of this parameter on heat transfer studied. They found heat transfer in test tube enhanced by insertion of propeller type swirl generator.

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S.k.Saha A.Datta , et.al [2] Experimental study carried out with circular tube fitted with stainless steel twisted tape insert.Under this experimentation study is carried out with varing length varying pitch twisted tape with different twist ratio on heat augmentation rate and friction factor.

Watcharin Noothong, et.al [3] In this paper experimental investigation was carried out for the measurement of tube side heat transfer coefficient ,friction factor, heat transfer enhancement efficiency of water for the tube fitted with rectangular cut twisted tape inserts. The Reynolds number varied in the range of 10000-19000 with heat flux variation 14-22kw/m^2 for the smooth tube and 23-40kw/m^2 for the tube with inserts. At a comparable Reynolds number Nusselt number in tube with rectangular cut twisted tape inserts were enhanced by 2.3 to 2.9 times compared to those smooth tube with 2.6 times average enhancement. Heat transfer enhancement effectiveness were found to be in the range 1.9 to 2.3 and found to be increased with Reynolds number.

Smith Eiamsa-ard, et.al [4] In this paper experimental investigation have been conducted to study the heat transfer in a circular tube equipped with regularly spaced helical tape swirl generators. The flow rate of in the tube is considered in the range of Reynolds number between 2300 and 8800.The swirling flow devices consist of
1.Full length helical tape with and without centre rod.
2.Regularly spaced helical tube are insert in the inner tube of concentric tube heat exchanger

Naga S. Sarda , et.al [5] Studied the heat enhancement in horizontal tube with the help of mesh inserts with air as working fluid. Different types of mesh inserts with screen diameter of 22mm,18mm,14mm and10mm for varying distance between the screens of 50mm,100mm,200mm in porosity range of 99.73 to 99.98 considered for

experimentation..They found that for a constant diameter, further enhancement in heat transfer can be achieved by using porous insert with smaller porosity.
Webb , et.al [6] Investigated heat transfer enhacement with internally helical ribbed tubes. For experimental purpose uses the liquid water as test fluid experiment were carried out in double pipe heat exchanger. Experiment were carried out in range of 20000 to 80000 Reynolds number and 5.08 to 6.29 Prantle number. Total eight tubes with wide range of variation in geometry were used.

Smith Eiamsa-ard , et.al [7] Studied the heat transfer through tube fitted with diamond shaped turbulators in tendam arrangements. It inclined cone angle 15°,30°,45°.The variation of Nusselt number and friction factor with Reynolds number under the effect these parameters are studied and found that both heat transfer rate and friction factor increases with cone angle 45°.The increase in heat transfer rate with increasing the cone angle and decreasing with tail length ratio

Fig.1 Insert with twisted tape

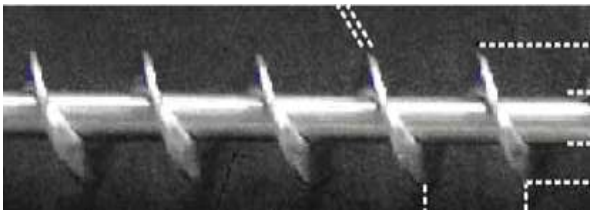

Fig.2 Screw inserts

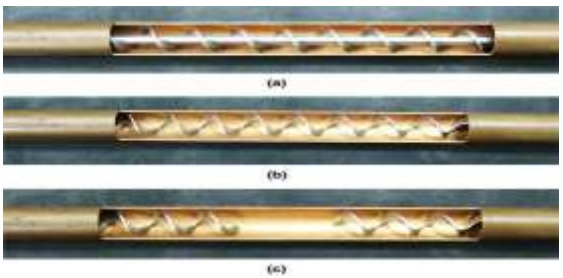

Fig3 Helical inserts

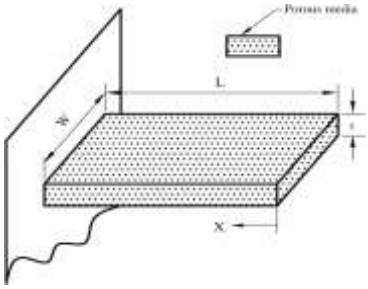

Fig.4 Rectangular porous rib

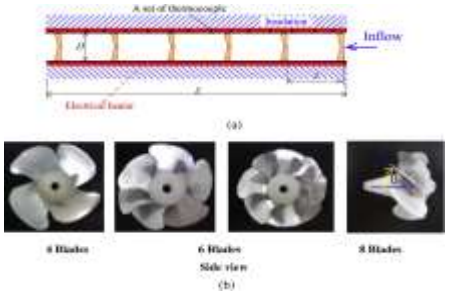

Fig. Tube equipped with propeller inserts

3. CONCLUSION

Heat augmentation is increased with the help of inserts as compare to without inserts. Due to inserts turbulent is created in the passage. This review paper highlights the experimental work done on heat transfer augmentation with the help of different inserts .

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