

# **ENHANCEMENT OF HEAT TRANSFER IN A COILED HEAT EXCHANGER**

**A Project report submitted  
in partial fulfillment of the requirements for award of  
degree of  
BACHELOR OF TECHNOLOGY  
IN  
MECHANICAL ENGINEERING**

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**CERTIFICATE**

This is to certify that the thesis entitled "ENHANCEMENT OF HEAT TRANSFER IN A COILED HEAT EXCHANGER" being submitted by V S V VAMSI SHARMA (14811A03D0), S LIKHIL RAMA SWAMY (14811A03B3), T S R SANTOSH (14811A03C0), S HARI CHANDU (14811A03B9) in partial fulfillment of the requirement for the award of the degree of BACHELOR OF TECHNOLOGY in MECHANICAL ENGINEERING is a record of bonafide work done by them under my supervision during the academic year 2017-18.

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## ABSTRACT

Heat transfer enhancement due to helically coiled heat exchanger is a burning topic in the field of research. But so far, there is no experimental or theoretical analysis of a helically coiled heat exchanger considering fluid to fluid heat transfer published, hence intending our work on this subject by using Methanol in water solution as a cold fluid.

Methanol (also known as methyl alcohol, carbinol, wood alcohol, wood naphtha or wood spirits) is a chemical compound with chemical formula  $CH_3OH$ . It is the simplest alcohol, and is a light, volatile, colourless, flammable, poisonous liquid with a distinctive odour that is somewhat milder and sweeter than ethanol (ethyl alcohol). At room temperature, it is a polar solvent and is used as an antifreeze, solvent, and as a denaturant for ethyl alcohol. The Methanol when prepared a solution with water can be used as a coolant in Heat Exchanger ( Helically Coiled Heat Exchanger in our case) to take advantage of their improved heat transfer properties which would result in enhanced heat transfer in helical coil heat exchanger.

For this purpose, a solution was prepared with varying proportion of Methanol in water. We used four concentrations of 5%, 10%, 15% and 20% of methanol by volume in 5 litres of water. As Water is Polar and Methanol as well. So, when we put methanol in water it gets dissolved and producing intermolecular forces i.e. hydrogen bonding. Various properties such as pH, Electrical Conductivity, Thermal Conductivity, boiling point etc. were tested.

An experimental setup of helically coiled heat exchanger was fabricated to test the performance of this solution as a coolant in heat exchange phenomena. The effect of considering the actual fluid properties instead of a constant value is established. Heat transfer characteristics inside a helical coil for various concentrations and initial temperature are compared. The experimental results are compared with the water- water combination. The effectiveness was calculated and hence the results are used as a benchmark to evaluate and analyse the performance of the solution as a coolant in heat exchanger.