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# NUTAN MAHARASHTRA INSTITUTE OF ENGINEERING & TECHNOLOGY

## DEPARTMENT OF MECHANICAL ENGINEERING

### “To Study, Design and Fabricate a Double Pipe Heat Exchanger”

Name of the Student's: 1. Aditya J Gangawane 2. Avinash Argade 3. Amar Hinge

Name of the Guide: Prof. Rohit Jadhao

Session: 2020-21



**Abstract:** The project is to design and fabricate a double pipe heat exchange to explain the process of exchange of heat between two fluids in the parallel and counter flow arrangement. The other aim of this project is to find the LMTD, effectiveness, Reynolds number, NTU and friction factor for the flow of fluid in the pipe. Internal copper pipe of 1.5m and 12.7mm diameter is used and annulus pipe of 1.5m and 25.4mm diameter is used.

### Introduction:

As discussed earlier heat exchanger is process equipment designed for efficient heat transfer between two fluids, a hot fluid and a coolant. The purpose may be either remove heat from the fluid or to add heat to fluid. The heat exchanger is used in the heater, coolers, condensers, evaporators, cooling towers.

A pipe is a closed conduit used for carrying of fluids under pressure. The fluid flowing in a pipe is subjected to resistance due to shear forces between the fluids itself. As some energy possessed by the flowing fluid will be consumed in overcoming this frictional resistance, there will be always some loss of energy in direction of flow. So in order to estimate these losses due to friction, the friction factor is to be determined. Here the fabrication of direct transfer heat exchanger. or recuperated type id done, I this type the fluid simultaneously on the other side of the separating walls, the heat transfers between the fluid streams without mixing or physical contact with each other. They are used when two fluids cannot be allowed to mix.

a) Parallel Flow Arrangement: Here the fluid enters the unit from the same side and flows in the same direction and leaves from same side

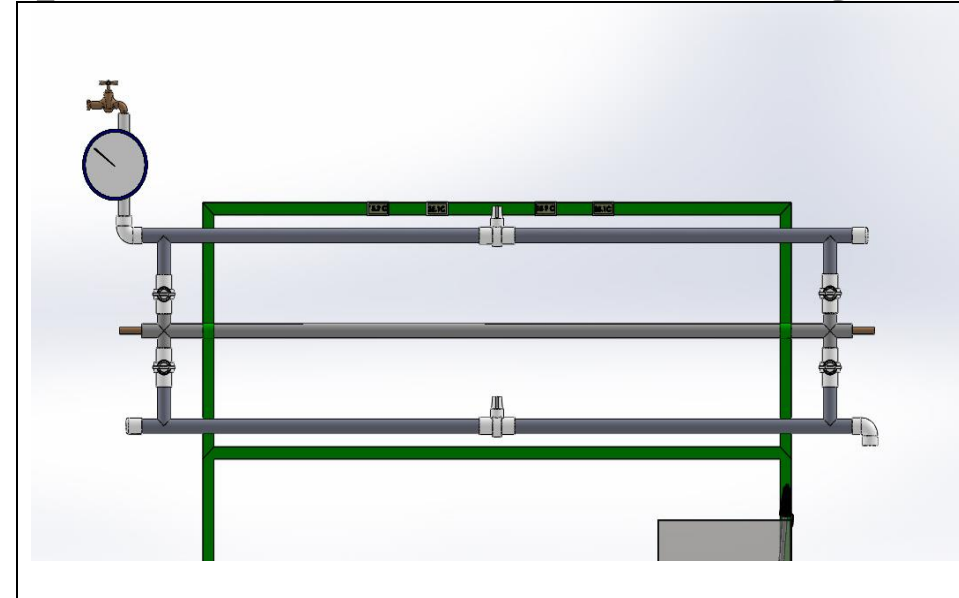
b) Counter Flow Arrangement: Here the two fluids enter from opposite ends, travel in opposite direction and leaves on opposite side.

### Aim & Objective

The aim of the project is to observe and study various flow rates conditions in Heat Exchangers. Also design and fabricate the double pipe heat exchanger to find Log Mean Temperature Difference (LMTD) and the effectiveness for parallel flow and counter flow arrangement and to study the variation of temperature with length.

objective of the project is to study of cording to the various flows with different & also calculate error occurs between experimental final result.

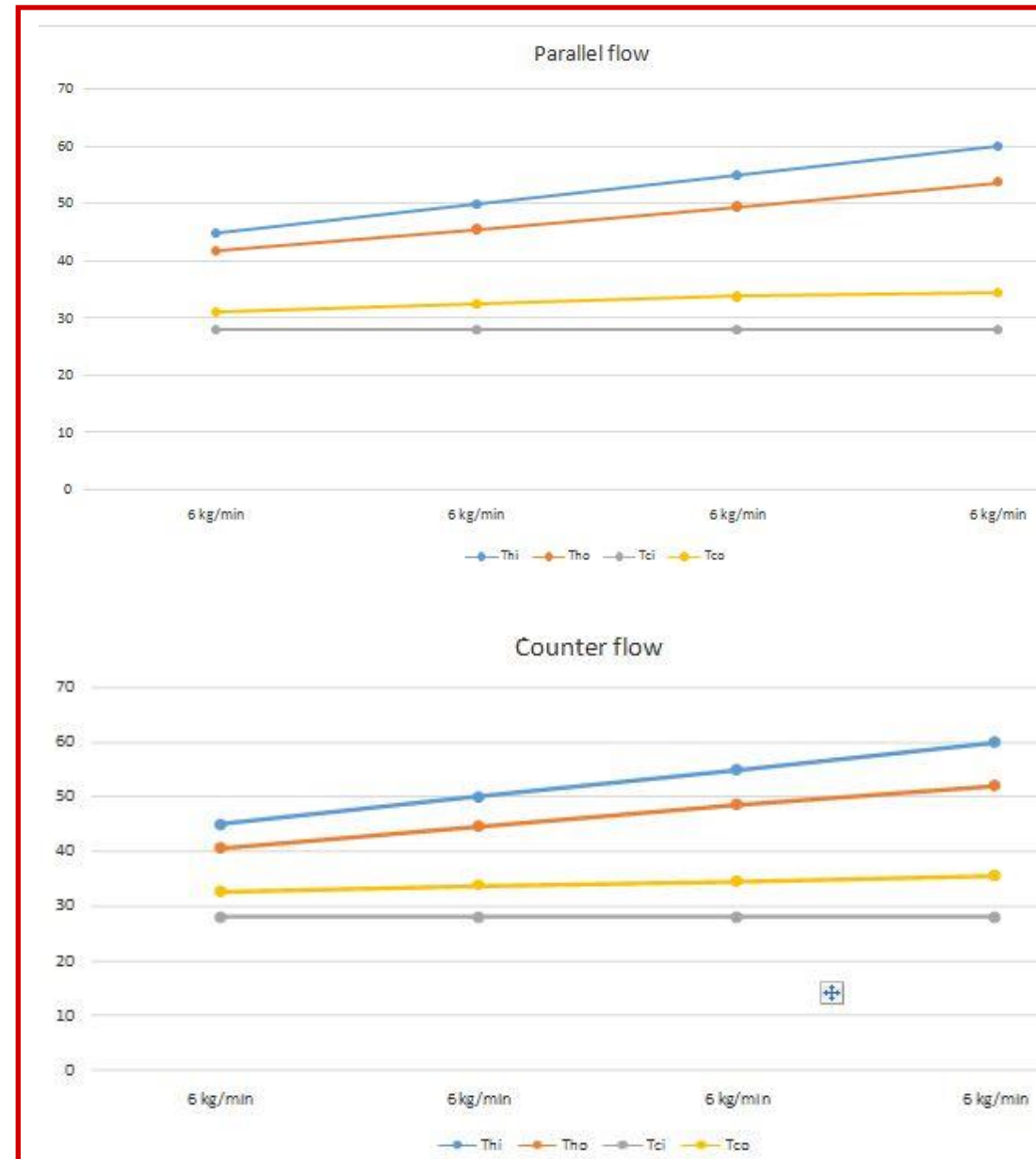
### Implementation/Simulated Designs:



### Implementation Results

HEX Type	FLOW OF HOT WATER		FLOW OF COLD WATER	
	Hot water Temp in °C	Hot water Temp out °C	Cold water Temp in °C	Cold water Temp out °C
Parallel Flow	45	41.9	28	31.2
	50	45.6	28	32.6
	55	49.5	28	33.8
	60	53.7	28	34.4
Counter Flow	45	40.5	28	32.6
	50	44.6	28	33.8
	55	48.5	28	34.5
	60	52	28	35.6

Results shows that efficiency of counter flow is slightly more than parallel flow  
Efficiency of counter flow will increase as much as length of pipe increases



### Conclusion and Future scope:

**Conclusion:** In this project, from the graph, we can clearly see that, in both the flows (i.e. parallel flow as well as in counter flow) the temperature of hot water is progressively decreased. Whereas, the temperature of cold water is progressively increased.

This concludes that, heat is lost by hot water and that heat is gained by cold water. Friction factor in both the pipe is too low. So we can conclude that power loss in the pipes is very much less. From results, we can rightly conclude that the counter flow arrangement is more effective than parallel flow arrangement.

#### Future scope:

1. Analog flow meter can be replaced by digital flow meter for fast readings.
2. If diameter of tube as well as material of tube is changed its effect on heat exchange rate can be studied further.
3. Thickness of internal pipe can be decreased for increasing efficiency.

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### Program Outcome (PO's)

a	b	c	d	e	f	g	h	i	j	k	l
3	2	2	2	2	3	3	2	2	2	2	1
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