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STUDY OF SHELL AND TUBE HEAT EXCHANGER AND THE VARIATION IN HEAT AND OTHER FACTORS USING CUSTOM BAFFLES

Guide- Prof. Kore Sir

AGENDA

Introduction

Primary goals

Areas of growth

Timeline

Summary

INTRODUCTION

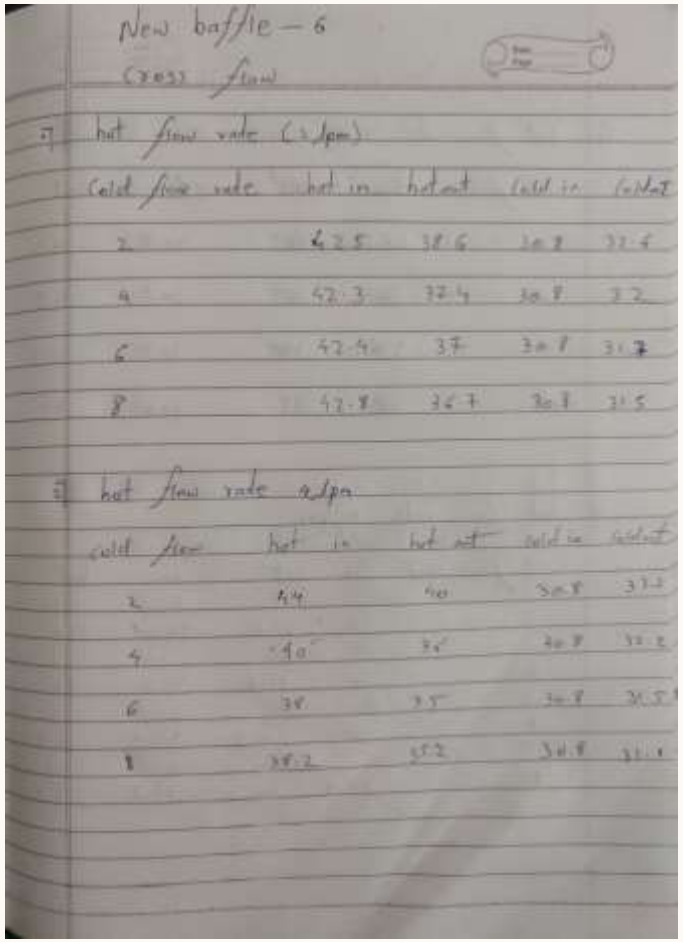
In the field of industries heat exchangers are used on large basis and there are certain types of advanced heat exchangers used for enhanced thermal performances and pressure drop. There are many attempts in this field to increase the performance of heat exchangers and the industry leading shell and tube heat exchanger. Shell and tube heat exchanger is used in almost all the largescale industries. This heat exchanger has several components which includes baffles, tubes, shells, measuring instruments and combining which we make the best suitable combination with given terms and conditions. We are focusing on shell and tube heat exchanger and the complex design of the baffles which is to be inserted in the shell at certain mass flow rate of hot and cold water. Our goal is to study and analysis the effects on the heat transfer rate and pressure drop.

PRIMARY GOALS

To increase the efficiency of the shell and tube heat exchanger by custom design of baffles. First we try the experiment on the apparatus constructed in Sinhagad Kondhwa by Prof. Wasekar Sir

CURRENT VARIATIONS-

READINGS-



New baffle – 6

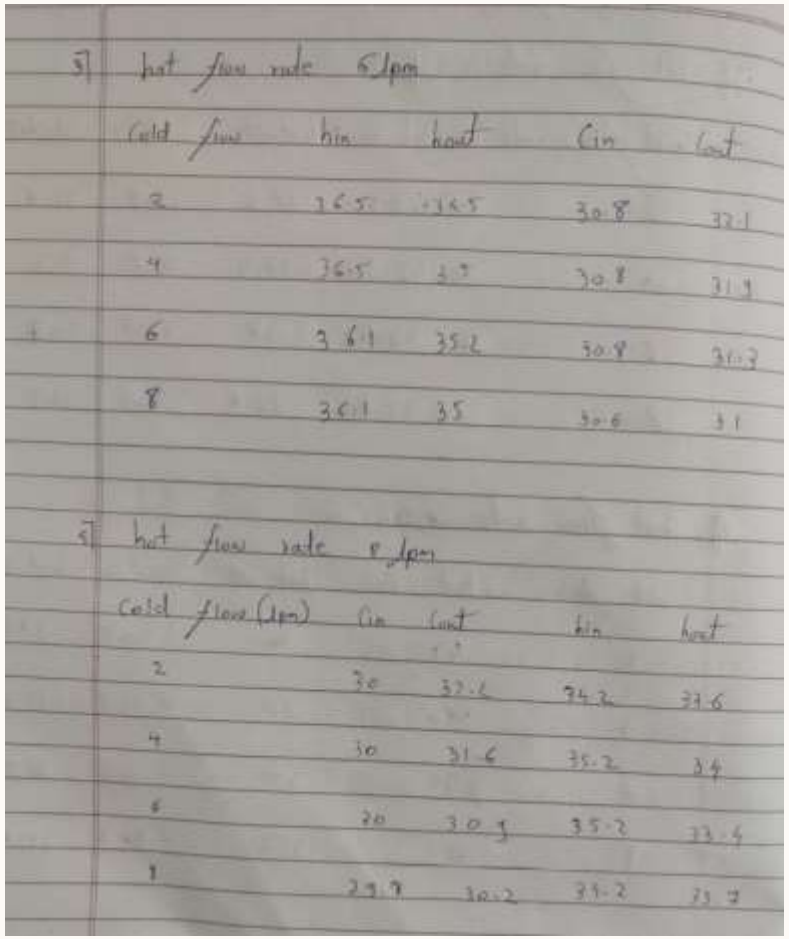
Cross flow

1] hot flow rate (3 lpm)

Cold flow rate	hot in	hot out	cold in	cold out
2	42.5	38.6	30.8	32.4
4	42.3	37.4	30.8	32
6	42.4	37	30.8	31.7
8	42.8	36.7	30.8	31.5

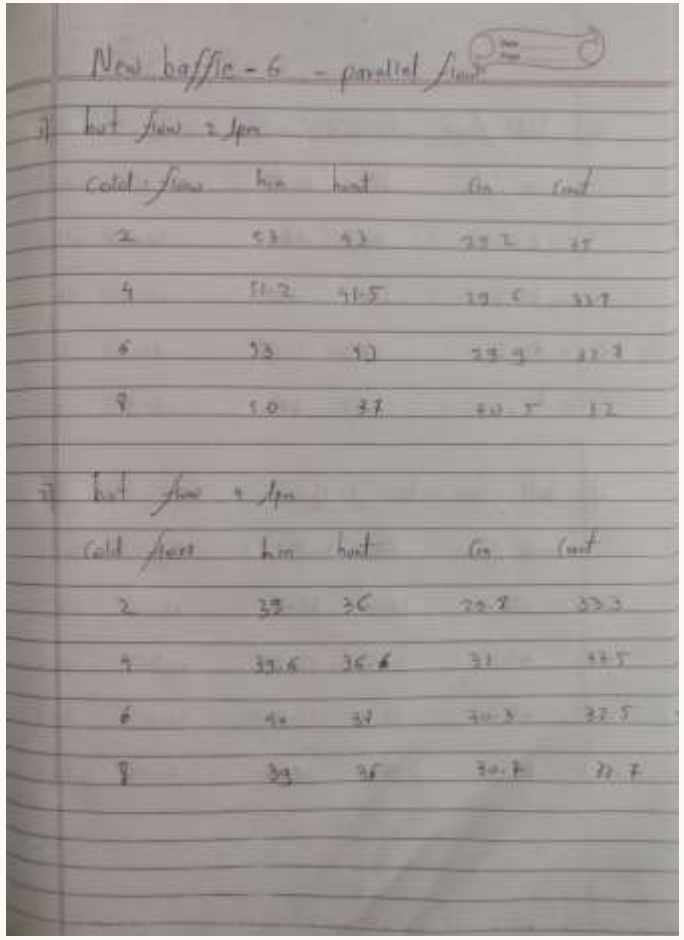
2] hot flow rate 6 lpm

Cold flow	hin	hout	Cin	Cout
2	36.5	36.5	30.8	32.1
4	36.5	[illegible]	30.8	31.9
6	36.1	35.2	30.8	31.7
8	36.1	35	30.6	31



3] hot flow rate 8 lpm

Cold flow (lpm)	Cin	Cout	hin	hout
2	30	32.6	34.2	33.6
4	30	31.6	35.2	34
6	30	30.5	35.2	33.4
8	29.9	30.2	35.2	33.4



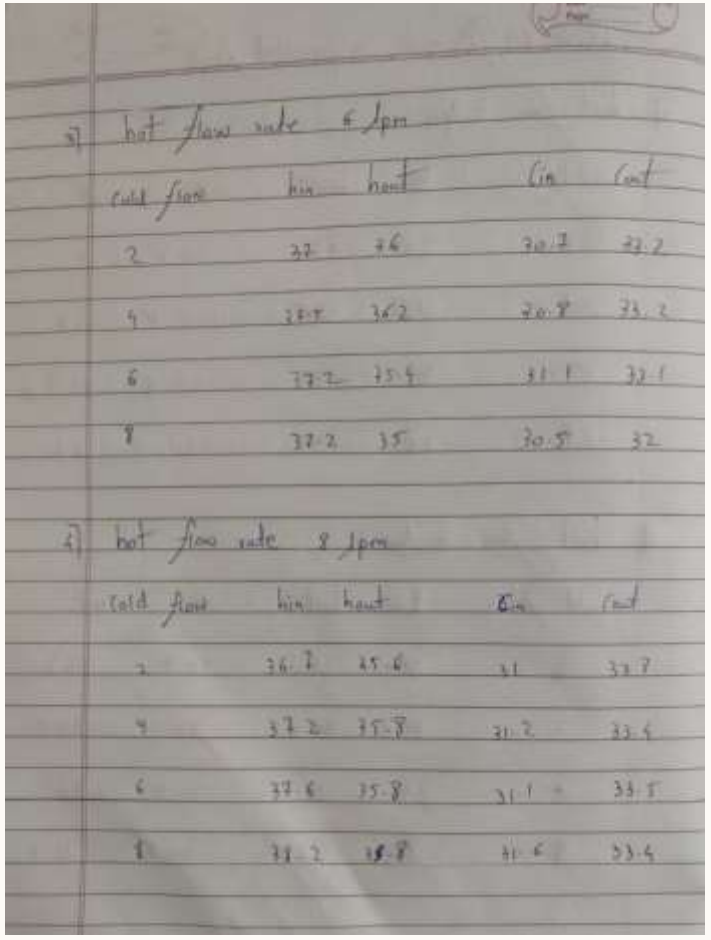
New baffle - 6 - parallel flow

1] hot flow 2 lpm

Cold flow	hin	hout	Cin	Cout
2	43	42	29.2	35
4	41.2	41.5	29.6	33.7
6	33	40	29.9	32.7
8	40	37	30.5	32

2] hot flow 4 lpm

Cold flow	hin	hout	Cin	Cout
2	39	36	29.8	33.3
4	39.6	36.6	31	33.5
6	40	37	30.3	32.5
8	39	36	30.7	32.7



3] hot flow rate 6 lpm

Cold flow	hin	hout	Cin	Cout
2	37	36	30.7	33.2
4	38.7	36.2	30.8	33.2
6	37.2	35.4	31.1	32.1
8	37.2	35	30.5	32

4] hot flow rate 8 lpm

Cold flow	hin	hout	Cin	Cout
2	36.7	35.6	31	33.7
4	37.2	35.8	31.2	33.4
6	37.6	35.8	31.1	33.5
8	37.2	35.8	31.6	33.4

AREAS OF GROWTH-

Inserting 8 Baffles

We need to have more precise and very well dimensioned tools and parts of the shell and tube heat exchanger. Because of the less ordered parts we need to face a lot of problems and hence need to face delay in the project.

TIMELINE

OCT 2022

Finish the design of Baffles

NOV 2022

Manufacture the desired design

DEC 2022

Try all the possible readings

AREAS OF FOCUS

APPROPRIATE EQUIPMENT'S

- In order to get precise readings we need good quality of measuring devices like pressure meter, flow meter.
- The flow should always be constant which is a real life difficulty because of water level in the college water tank.
- The temperature of the inlet cold water also varies day to day and hence results in some error.

TIME CONSUMPTION

- All the iteration performed takes a lot of patience and focus. Per reading we need at least 25-30min of constant observation.
- This is a very time consuming process and to maintain the precision we need to have patience.

HOW WE GET THERE

MINI TARGETS

- Try the practical solution out on available baffles.
- Get enough theoretical knowledge.

MODIFICATIONS

- Try the same practical result using different type of custom baffles.

CHECK THE OUTCOME

- Check if the results we get is more efficient that that of the earlier type of baffle.

Problems faced by the team-

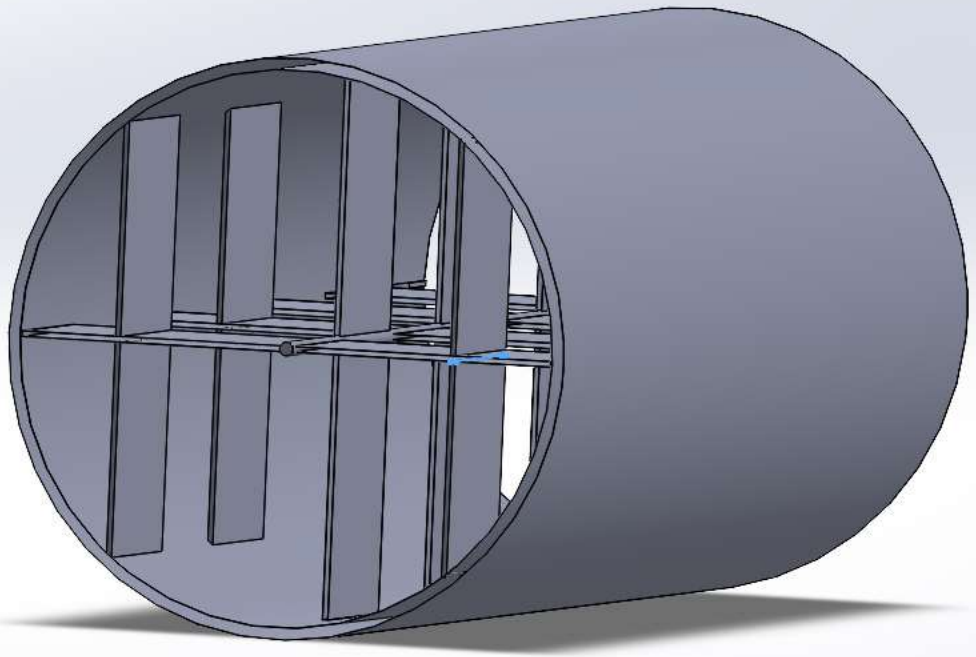
THE FOLLOWING SHOWS HOW WE CARRIED OUT THE DESIGN.

SOLIDWORKS File Edit View Insert Tools Window — Final Project * — Search Commands

Extruded Boss/Base | Revolved Boss/Base | Swept Boss/Base | Lofted Boss/Base | Boundary Boss/Base | Extruded Cut | Hole Wizard | Revolved Cut | Swept Cut | Lofted Cut | Boundary Cut | Fillet | Linear Pattern | Rib | Draft | Shell | Wrap | Intersect | Mirror | Reference Geometry | Curves | Instant3D

Features | Sketch | Surfaces | Sheet Metal | Markup | Evaluate | MBD Dimensions | SOLIDWORKS Add-Ins | MBD | SOLIDWORKS CAM | SOLIDWORKS CAM TBM | SOLIDWORKS Inspection

Final Project (Default<<Default>_Disp
- History
- Sensors
- Annotations
- Solid Bodies(3)
- Material <not specified>
- Front Plane
- Top Plane
- Right Plane
- Origin
- Extrude-Thin3
- Cut-Extrude2
- Cut-Extrude11
- Boss-Extrude3
- Boss-Extrude4
- Boss-Extrude5
- Boss-Extrude6
- Boss-Extrude7
- (-) Sketch17
- Boss-Extrude8
- Boss-Extrude9



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COSTING(8 BAFFLES TYPE)-

Mild steel plates(Thickness 2mm)- 3,499rs.

Rod with threads of length 500mm- 1,000rs.

And cost of labour charge- 500rs.

Total cost approximate= 5,000rs.

This design is to be manufactured soon for the year end project. Sad part is that we could not add this as our copyright work due to some unfortunate circumstances and we wish this too helps to some extent for the betterment.

The main reason we did this was to learn the details about the heat transfer in the shell and tube heat exchanger. And so we did!

SUMMARY

In this project, we believe that under proper guidance this project can make a big impact, and we wish that happen. By using the data, we help industries the best way possible by improving the efficiency.

THANK YOU

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