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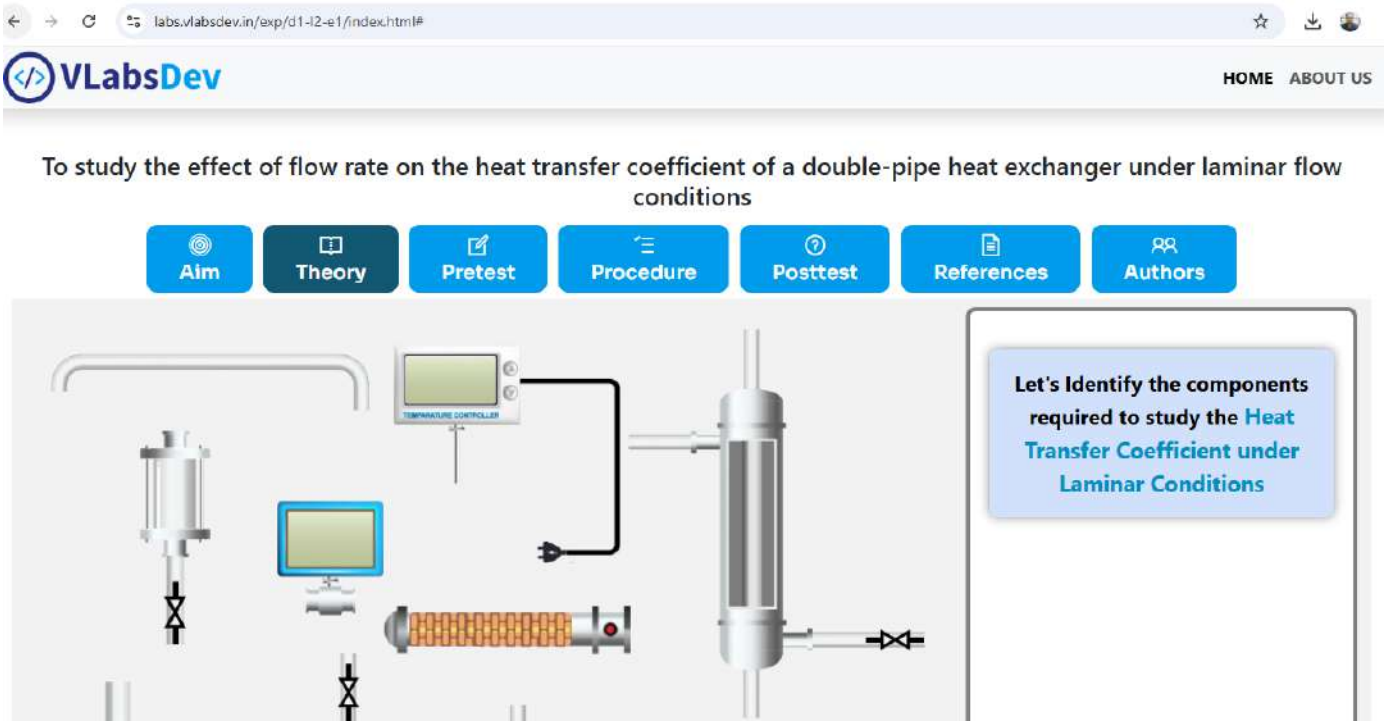
One Page Report for Virtual Lab

Aim: To study the effect of flow rate on the heat transfer coefficient of a double-pipe heat exchanger under laminar flow conditions.



Pre Test

Question 1: Which of these terms is associated with laminar flow?

A Eddies

B Stream lines

C Streak lines

D Contours

Question 2: Which of the following is more correct for turbulent flow?

A Efflux time

B Reynolds number

C Entry effect

D Eddies

Question 3: Which of the following is more correct for Laminar flow?

A Parabolic profile

B Stokes law

C Boundary layer

D Efflux time

Question 4: Which of the following is more appropriate for Reynolds experiment?

A Radial dispersion

B Dye

C Axial dispersion

D Diffusion

Question 5: Which of the following is more appropriate for Turbulent flow?

A Hagen-Poiseuille

B Fanning

C Darcy

D Both b & c

Procedure

1. The components of the experimental set-up will be displayed on the screen. Based on the item displayed as 'text' click on the correct component. Hints will be provided for wrong selection. Points will be deducted for the hints provided.
2. The components of the experimental set-up will be displayed on the screen. They have to be dragged and dropped at the requisite locations to assemble the experimental set-up. Hints will be provided for wrong selection. Points will be deducted for the hints provided.
3. A new screen with the dimensions of the heat exchanger will appear. Based on these, the user should calculate the inside heat transfer area, equivalent diameter of annulus, cross-sectional area of inner tube and annulus respectively. Points will be deducted for the hints provided.
4. Click on the C.W. valve to open it fully.
5. Click on the glass section valve to open it.
6. Move the slider to the first division.
7. Click on the Power Button 'P' to switch on the pump.
8. Click on Power Button 'H' to switch on the heater.
9. Click on Set Temperature to select the temperature.
10. Click on the GREEN Button of the Timer to start and wait for 15 min (900 s) to attain steady state.
11. Click on the RED Button to stop the timer when the Timer shows 900 s.
12. Click on the Glass Section valve to close it and immediately click on the GREEN Button of the timer to start it.

13. Click on the RED Button to stop the timer when the fluid in the glass section reaches the arrow level.
14. Click on the Glass Section valve to open it.
15. Click on the RESET Button of the Timer.
16. Enter the Hot and Cold fluid inlet and outlet temperatures along with the time in the Table displayed on the screen.
17. Repeat the steps from 6 to 16 for 2nd to 8th slider positions.
18. The table with the fluid properties will be displayed on the screen along with the areas and equivalent diameter calculated earlier. Also, a table with the temperatures and time along with the various entities to be calculated will be displayed.
19. The various entities namely, v, u, m, Q, LMTD and U have to be calculated. The formulae for the same shall be visible by moving the cursor on the headings of the respective columns.
20. After entering the calculated value, click on the CAL Tab. If the value is correct, proceed for the next calculation, else a message RECALCULATE will appear.
21. Click on NEXT for the next screen to appear.
22. Additional quantities need to be calculated and entered in the table displayed. The formulae for the same shall be visible by moving the cursor on the headings of the respective rows. After each calculation click on the CAL Tab. If the value is correct, proceed for the next calculation, else a message RECALCULATE will appear.
23. Click on NEXT for the next screen to appear.
24. Two additional tables for calculating Prandtl number, Reynold's number along with heat transfer coefficients will be displayed. The formulae for the same will be visible by moving the cursor on the respective headings. After each calculation click on the CAL Tab. If the value is correct, proceed for the next calculation, else a message RECALCULATE will appear.
25. A CAUTION or ERROR message may be displayed if the value of Reynold's number exceeds the laminar flow range.
26. Click on NEXT for the next screen to appear.
27. Based on the table showing m, hi_exp and hi_theo, plot a graph by clicking on PLOT GRAPH tab.
28. Select the data for x and y axis respectively for experimental and theoretical data points.
29. Based on the plot displayed, the tabs Is Deviation Observed? YES/NO will appear. Click on the appropriate tab.