

Pressure Drop Laboratory
FABE 481 – Dr. Gönül Kaletunç
TAs –Alex King
Spring 2005

Objectives:

1. To study the effect of pipe diameter, pipe length, fittings, and elevation change on pressure drop in a pipe system.
2. To determine the power requirement of a pump.

Procedure:

- Set the pump speed
- After the steady state flow is achieved, measure pressure differential and pressure at various points in the pipe system.
- Read frequency value using oscilloscope
- Repeat this procedure for three different pump speed settings.
- Determine the density of the CMC solution

Calculations:

- 1) Prepare a diagram of the set-up by clearly marking all of the elements in the set up
- 2) Calculate the Reynolds number in 1 and 1.5 inch diameter pipes
- 3) Calculate the pressure drop in 1 and 1.5 inch diameter pipes. Compare the calculated pressure drop with the measured values.
- 4) Calculate the pressure drop due to elbows in the set up. Compare the calculated pressure drop with the measured values.
- 5) Calculate the total pressure drop in the system
- 6) Calculate the power of the pump necessary for pumping the fluid in the system.

Flow rate calibration data

Frequency	Flowrate (kg/s)
3.1	0.04419
5.3	0.04014
7.7	0.09992
13.25	0.15175
15.36	0.2089
25.88	0.3238
27	0.30611

Manometer reading

ΔP 1.5" Pipe	
Frequency	Monometer Diff. (in)
6.135	13.5
13.75	15.5
22.2	17.25

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1% CMC data

shear stress	shear rate	viscosity	temperature
Pa	1/s	Pa.s	°C
0.5968	0.04551	13.11	21
0.7514	0.05981	12.56	21
0.9459	0.076	12.45	21
1.191	0.09769	12.19	21
1.499	0.1268	11.82	21
1.887	0.1653	11.42	21
2.376	0.2172	10.94	21
2.991	0.2855	10.48	21
3.766	0.3939	9.56	21
4.741	0.5873	8.072	21
5.968	0.9642	6.19	21
7.514	1.569	4.79	21
9.459	2.386	3.964	21
11.91	3.562	3.343	21
14.99	5.363	2.795	21
18.87	8.466	2.229	21
23.76	14.12	1.682	21
29.91	24.24	1.234	21
37.66	41.55	0.9064	21
47.41	72.1	0.6575	21
59.68	128.8	0.4634	21

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Lab:3:30pm-5:15pm	<u>Group 1</u>	CHARBEL, CHRIS LUCIUS, RUTH WISMAN, MAGGIE
	<u>Group 2</u>	CROPPER, SHERRILL HALL, LEAH
	<u>Group 3</u>	PRAJITNA, SELY SUTTON, TIFFANI