Experiment- 4

ARKA PRAMANICK, AE21B007
Department of Aerospace Engineering
IIT Madras
Basic Aerospace Engineering lab
Bourdon Gauge Caliberation

Instructor:
Professor Dr. Manikandan Mathur

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1. Aim:

To verify how accurate is the pressure shown by the Bourdan's gauge.

2. Apparatus:

- Bourdon Pressure gauge:-This measures the apparent gauge pressure according to the deflection in the Bourdon's pressure tube.
- Weights:- Weights can be added in top of each other to increase the pressure in the Bourdon's gauge.
- Water:-Water is needed to carry the pressure across the plastic tube to the buordon pressure gauge.
- Holder of 0.5kg.

3. Theory:

Bourdon tube pressure gauges are used for the measurement of gauge pressures from 0.6...7,000 bar.They are classified as mechanical pressure instruments,and thus operate without any supply voltage.

Figure 1: Bourdon pressure gauge

Figure 2: Bourdon tube pressure gauge

4. Procedure:

- Read the pressure reading on the gauge before loading.This is the pressure due to the water column.
- Load the weights one by one.Take readings with 5 weights.
- We can obtain the pressure applied by each weight using the formula $P_w = \frac{weight*g}{\frac{\pi D^2}{4}}$
- Now unload the weights one by one and take pressure readings at unloading.
- Perform this experiment 5 times.

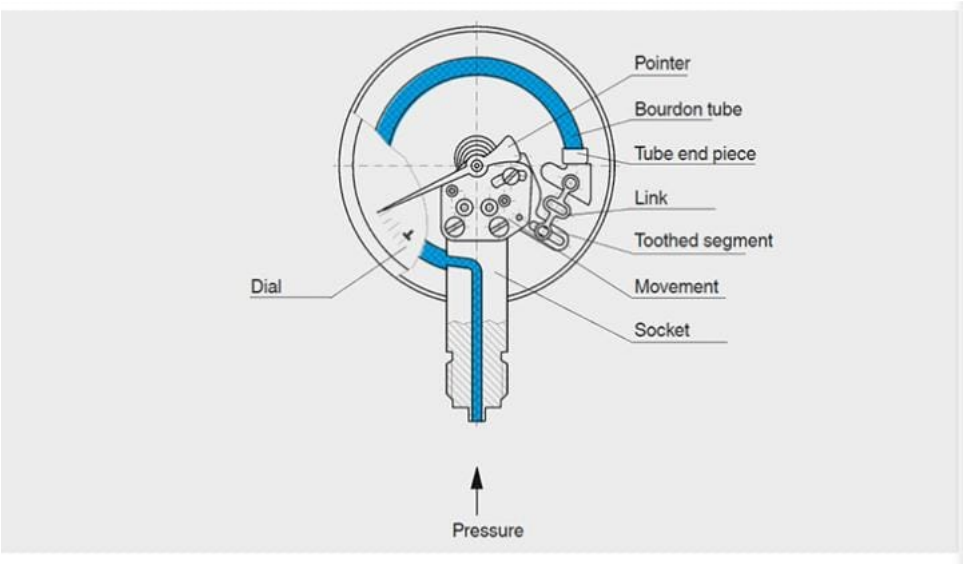

Figure 3: Bourdon pressure gauge

5. Result:

5.1 Theoretical value of pressure

$$P = \frac{mg}{\frac{\pi D^2}{4}}$$

D=17.67mm

S.No.	mass (in kg)	Pressure,p(in kPa)
1	0.5	20
2	1.0	40
3	1.5	60
4	2.0	80
5	2.5	100

Table 1: Theoretical data for corresponding mass and pressure

5.2 Experimental value of pressure

Mass(in kg)	P(in kPa)(loading)	P(in kPa)(unloading)	Average P(loading)	Average P(unloading)	Average P
0.5	20,25,25,25,25	25,25,25,25,25	24	25	24.5
1.0	40,45,40,40,45	40,40,40,40,40	42	40	41
1.5	60,60,60,60,60	60,60,60,60,65	60	61	60.5
2.0	80,85,85,85,85	85,85,85,85,85	84	85	84.5
2.5	100,100,100,100,100	100,100,100,100,100	100	100	100

Table 2: Experimental data for corresponding mass and pressure

6. Graph:

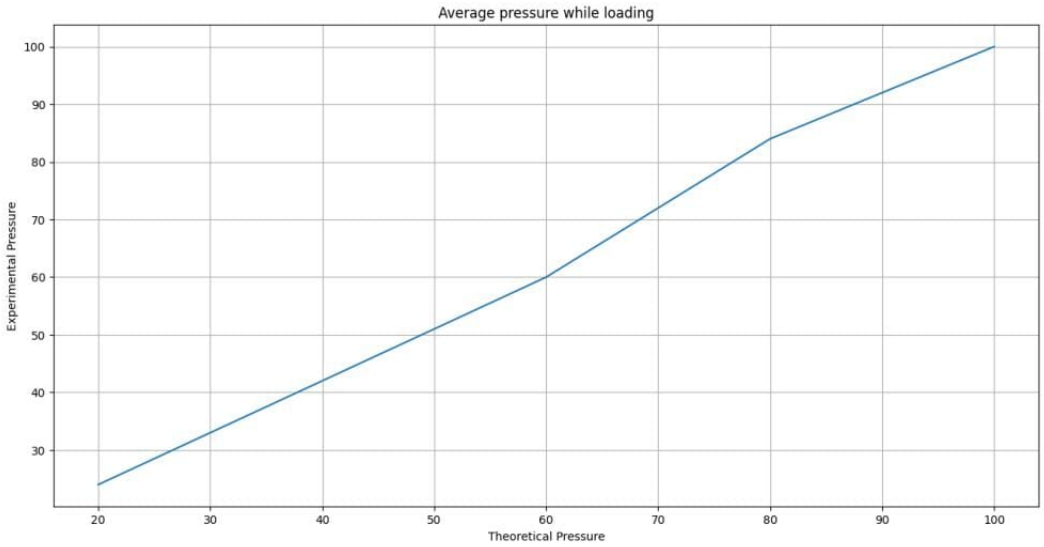

Figure 4: Experimental pressure vs theoretical pressure while loading

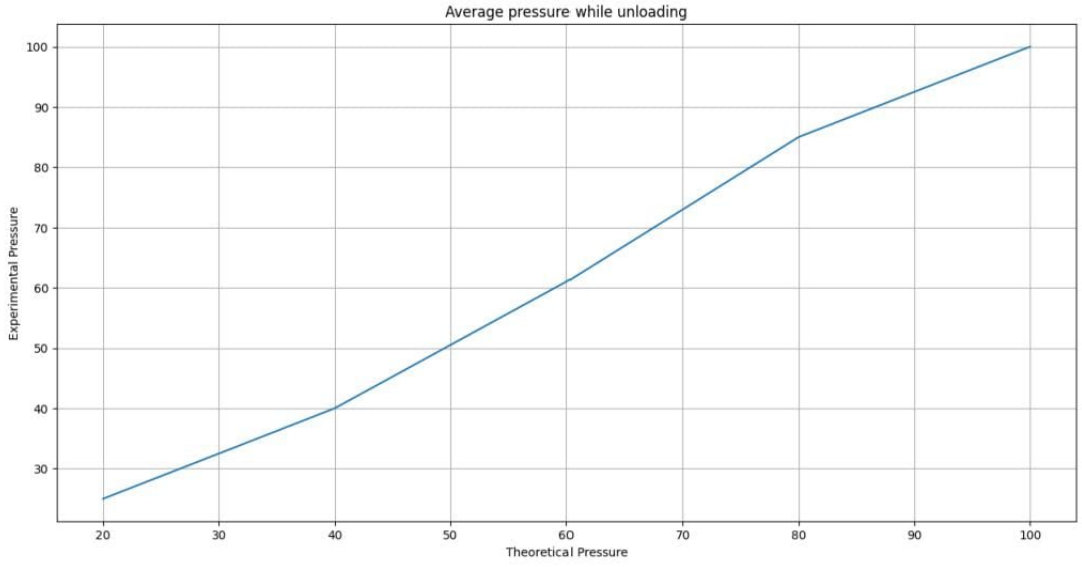

Figure 5: Experimental pressure vs theoretical pressure while unloading

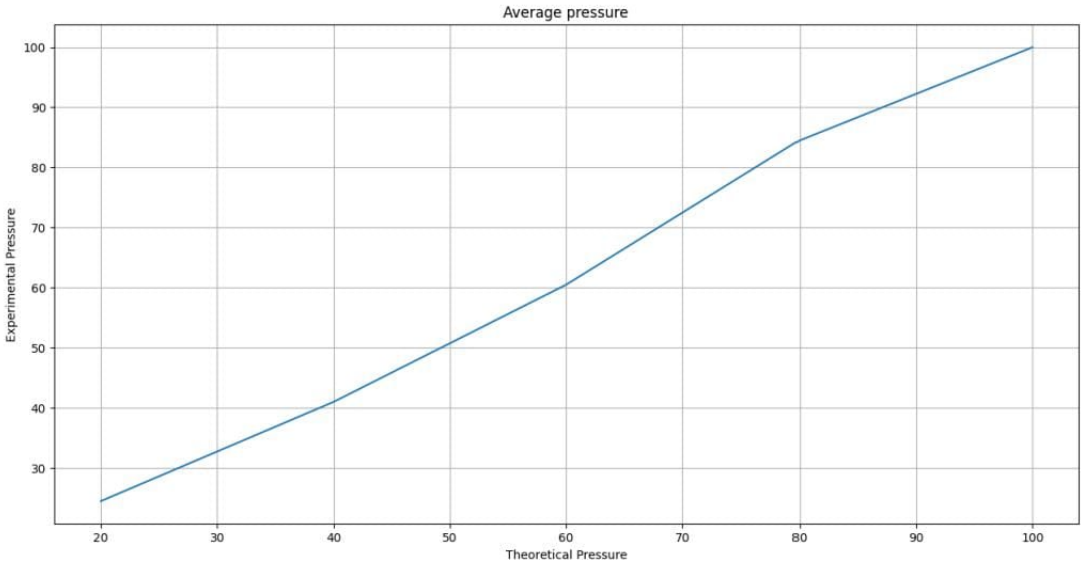

Figure 6: Average experimental pressure vs theoretical

7. Sources of error:

- Inaccurate reading due to parallax error
- Due to friction between piston and walls of tube
- Varriations in experimental conditions.
- Vibrations and overpressure.

8. Conclusion:

From experimental result I can conclude that the pressure measurement using a Bourdon Gauge is fairly accurate and advantageous for applications that allows an error of 10 percentage.
The instrument is also accurate since there is a very little variation between theoretical and experimental value.