experiment number: 4

TITLE: CALIBRATION OF VACUUM GAUGE

WORKING PRINCIPLE:

A bourdon gauge works on the principle of the following

* BERNOULLI’S THEOREM: The theorem states that for an inviscid flow of a non conducting fluid, an increase in the speed of fluid occurs simultaneously with a decrease in the pressure or a decrease in the fluid potential energy.

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* CONTINUITY EQUATION: This equation describes the transport of some quantity. It is particularly simple and powerful when applied to a conserved quantity but it can be generalized to apply to any extensive property.

DESCRIPTION:

As the fluid pressure enters bourdon tube, it tries to be reformed and cause of a free tip available, this action causes the trip to travel in free space and tube unwinds, the simultaneous actions of sending and tension due to internal pressure make a non-linear movement of free tip. This travel is amplified for the measurement of internal pressure.

A lot of compound stresses originate in the tube as soon as the pressure is applied. This makes the travel of tip to be non-linear in nature. If the tip travel is small, the stresses can be considered to produce a linear motion that is parallel to the axis of link. Small linear tip movement is matched with rotational pointer movement. This is multiplication which can be adjusted by adjusting the length of the lever. But the same amount of tip travel a shorter level gives larger rotation.

Like all elastic elements a bourdon tube also has some hysteresis in a given pressure cycle. By proper choice of material and its heat treatment this may be kept within 0.1% and 0.5% of the maximum pressure cycle. Sensitivity of tip movement of a bourdon tube a teammate without restraint can be as high as 0.01% of full range pressure reducing to 0.1% with restraint as central point.

PRECAUTION:

1. Open the nozzle with full safety otherwise there might be a possibility that sudden opening may cause water to mix with mercury.
2. While observing the mercury level in the U-tube manometer, due clear must be taken to reduce any type of error.

CALIBRATION OF VACUUM GAUGE

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| --- | --- | --- | --- |
| MAKE OF GAUGE | BOURDON | DATE OF EXPERIMENT | 30/06/2021 |
| RANGE | 0-76 cm of Hg | PAPER CODE | MES 481 |
| BAROMETER READING | 76 cm of Hg | ROLL NUMBER |  |

OBSERVATION

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| SL NO | MANOMETER | | | | BOURDON GAUGE | | % ERROR |
| LEFT (cm of Hg) | RIGHT (cm of Hg) | DIFFERENCE (cm of Hg) | ABSOLUTE (cm of Hg) | READING (cm of Hg) | ABSOLUTE (cm of Hg) |
| 1 | 72.16 | 81 | 8.4 | 67.6 | 10 | 66 | 2.366 |
| 2 | 71 | 82 | 11 | 65 | 12 | 64 | 1.53 |
| 3 | 70 | 82.6 | 12.6 | 63.4 | 14 | 62 | 2.21 |
| 4 | 69 | 83.8 | 14.8 | 61.2 | 16 | 60 | 1.96 |
| 5 | 68 | 84.4 | 16.4 | 59.6 | 18 | 58 | 2.68 |
| 6 | 66 | 85.3 | 19.3 | 56.7 | 20 | 56 | 1.23 |
| 7 | 65.3 | 86.6 | 21.3 | 54.7 | 22 | 54 | 1.28 |

CALCULATION