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ADVANTAGES, DISADVANTAGES AND CHALLENGES OF USING CORIOLIS METERS
Coriolis effect discovered by:

- Gustave-Gaspard Coriolis in 19-century, 1835.

Coriolis effect:

- Apparent deflection of the path of an object that moves within a rotating coordinate system.
Coriolis Flowmeter

CORIOLIS PARTS:
- U-tube
- Drive coil
- Pickoff coils
- Sensors assembly

- Coriolis meter is a device that measures mass flow rate of a fluid traveling through a tube
Theory of operation

Volumetric flow rate is the mass flow rate divided by the fluid density.

\[ \dot{V} = \frac{M}{\rho} \]

\[ \rho \propto \frac{1}{f^2} \]

\[ \dot{M} \propto \Delta T \]

Volumetric flow rate is the mass flow rate divided by the fluid density.
Preferred installation

Downward:
For measuring liquid flow.
➢ So that air can not get trapped

Upward:
For measuring gas flow.
➢ So that liquid can not get trapped

Sideward:
For slurry applications.
➢ To prevent solids from collecting in tubes
Why mass flowmeter?

- Eliminates inaccuracies.
- Mass is not affected by changing temperature and pressure.
Gas and liquid can be measured with the same technology.

Good accuracy up to 0.05% of rate for liquids & +/- 0.25% of rate for gases.

Good repeatability up to 0.025% of rate for liquids +/- 0.20% of rate for gases.

 Doesn’t require inlet and outlet runs.

No routine maintenance required since no moving parts.

Multiple outputs

Can operates in both flow directions (forward and reverse)

Suitable for supercritical fluids, e.g. carbon dioxide (CO₂) or ethylene (C₂H₄)
DISADVANTAGES

- Not available for large pipes.
- Expensive compared to other flowmeters.
Challenges

- Susceptible to errors when bubbles are present in the liquid (flashing)
  - Using a Back Pressure Regulator to Inhibit Bubbles.
- Affected by stress applied from the adjoining pipe work
  - should be clamped securely both upstream and downstream of the flow meter
Case study : Line Fill Meter in Sea Island V-21 (MOC)

- There are 6 streams with 16” turbine meter + prover.
- In north pier pumping station (NPP) there is 12” PD meter in line fill where in sea island there is no line fill.
- The plan to make a line fill out of run 6 in Sea island.
Line fill meter Design

- There is an estimation between 0 to 1000 BBL/hr shrinkage of oil between two vessel loading.
- About 45 minutes to fill the line (based on operation practices)
4” Coriolis Meter

- Small meter calculated with 45 minutes limit.
- Zeroing with 4” double bleed & block valves.
- Manual globe valve for back pressure.
Conclusion

- Why we choose Coriolis flowmeter?
THANK YOU