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الراعـي الرسمـي

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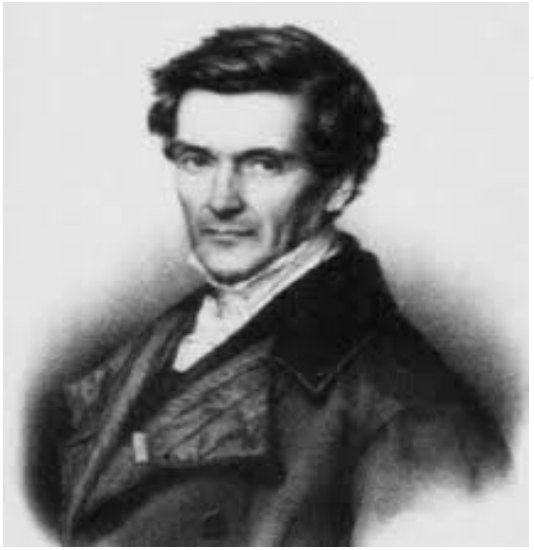
ADVANTAGES, DISADVANTAGES AND CHALLENGES OF USING CORIOLIS METERS

Coriolis Principle and History.

Coriolis effect discovered by :

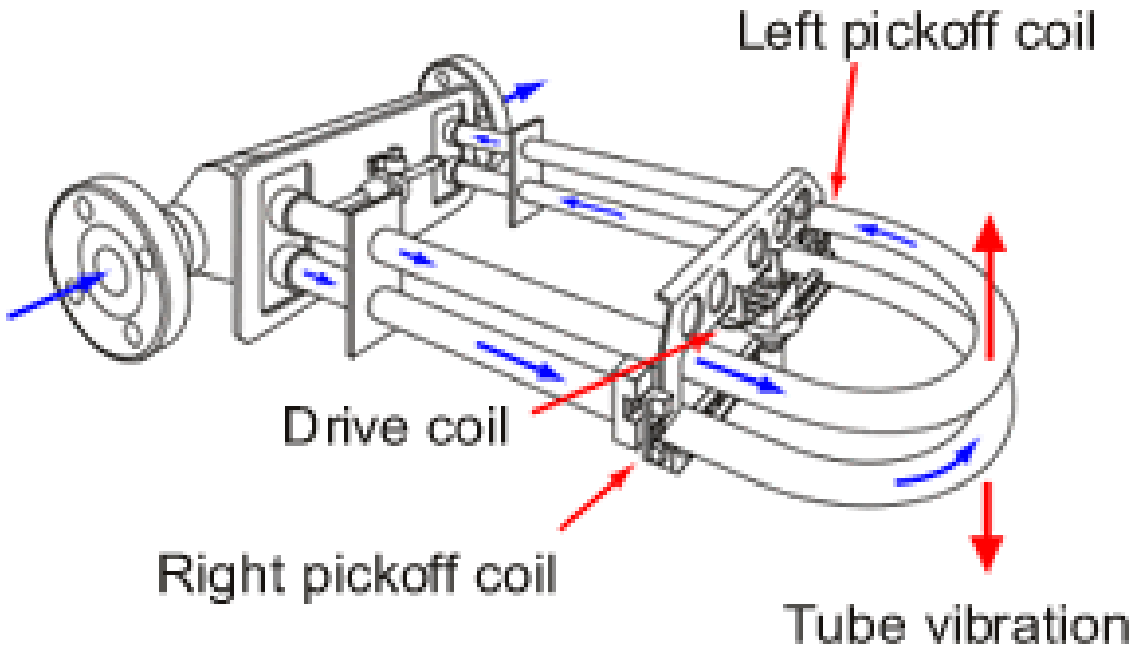
- ✓ Gustave-Gaspard Coriolis In 19-century , 1835.



Coriolis effect:

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

Coriolis Flowmeter

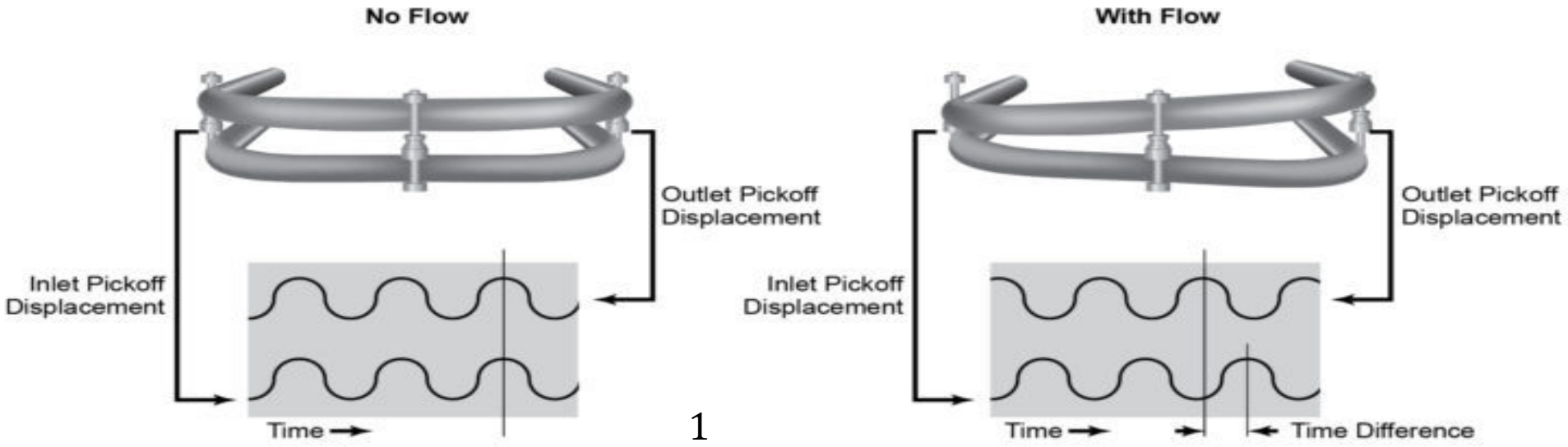


CORIOLIS PARTS:

- 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

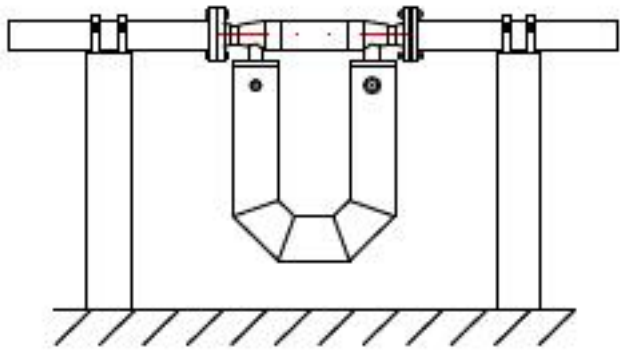


$$\rho \propto \frac{1}{f^2} \qquad \dot{M} \propto \Delta T$$

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

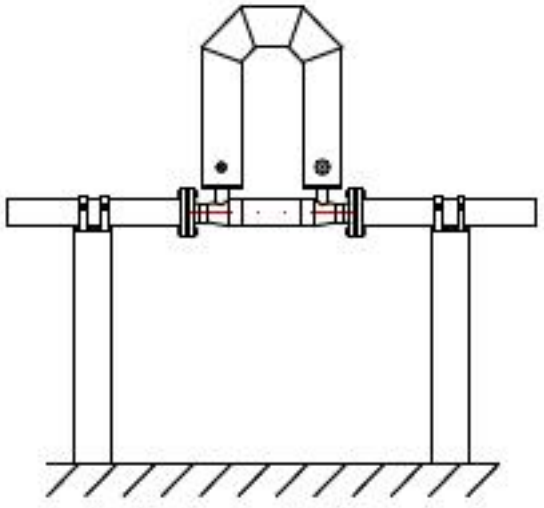
$$\dot{V} = \frac{\dot{M}}{\rho}$$

Preferred installation



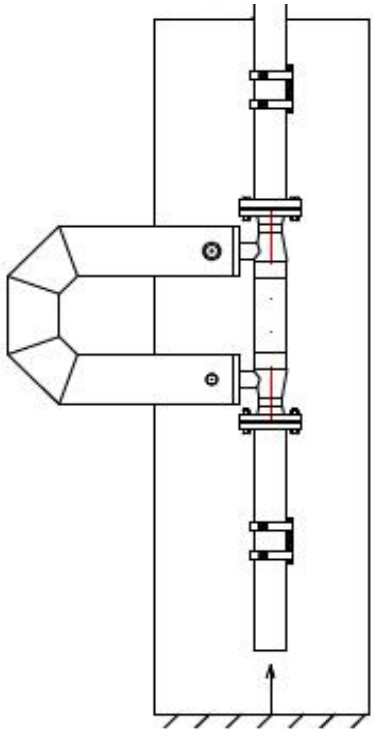
Downward :
For measuring liquid flow.

- 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.

ADVANTAGES

- 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 (CO_2) or ethylene (C_2H_4)

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