Coriolis Mass Flowmeter

10 common interview questions and answers

1. What is the most common cause of drift in meters with moving parts?

Mechanical wear is the most common cause of drift in meters like **turbine** and **positive displacement (PD)** meters.

- **How it happens:** Over time, the continuous rotation and friction cause wear on the meter's bearings, gears, or rotor blades.
- **Effect:** This wear increases friction, which causes the rotor or gears to move more slowly for the same amount of flow. This results in the meter's output gradually **drifting lower** than the actual flow rate.
- **Resolution:** The worn components must be replaced, and the meter needs to be recalibrated.

2. How does buildup or coating cause a meter to drift?

Coating on the internal sensing elements is a major cause of drift, particularly for **magnetic** and **thermal mass** flow meters.

- **How it happens:** The process fluid leaves a layer of material (e.g., grease, scale, or sludge) on the sensor.
- **Effect:**
    - On a **magnetic meter**, a non-conductive coating insulates the electrodes, preventing them from detecting the full voltage signal, causing the reading to **drift low**.
    - On a **thermal mass meter**, the coating acts as an insulator, slowing heat transfer and causing the meter to read **low**.

- **Resolution:** The meter must be removed from the line and the sensing elements cleaned.

3. Can the electronics of a transmitter cause drift?

Yes, **electronic component aging** can cause drift in any type of flow transmitter.

- **How it happens:** Over years of operation and exposure to temperature cycles, the values of electronic components like resistors, capacitors, and amplifiers can change slightly.
- **Effect:** This causes a slow, consistent shift in the conversion of the sensor's raw signal to the 4-20mA or digital output. The drift can be either **positive or negative**.
- **Resolution:** The transmitter needs to be recalibrated. A periodic "loop check" can help detect this type of drift.

4. How can changes in fluid properties lead to apparent drift?

This is a common issue for technologies that are dependent on fluid properties, especially **differential pressure (DP)** and **turbine** meters.

- **How it happens:** The meter was calibrated for a fluid with a specific density or viscosity. Over time, the process conditions change, altering these properties.
- **Effect:**

  - For a **DP meter**, a decrease in fluid density will cause the meter to read **low**.
  - For a **turbine meter**, an increase in viscosity will cause it to read **low**. The meter itself hasn't failed, but its reading has drifted from the true flow because its calibration is no longer valid for the new conditions.
- **Resolution:** The calibration factors in the flow computer must be updated to match the new fluid properties.

5. What is "zero drift" and which meters are most affected?

Zero drift is when a meter's output is not zero under a true no-flow condition. It primarily affects **differential pressure (DP)** and **Coriolis** meters.

- **How it happens:** This can be caused by installation stresses, temperature changes affecting the sensor, or unequal liquid levels (head pressure) in the impulse lines of a DP transmitter.
- **Effect:** A zero drift creates a consistent offset in the reading. A positive zero error will cause the meter to read **high**, especially at low flow rates.
- **Resolution:** The meter must be "re-zeroed" under a confirmed no-flow condition while the pipe is full.

6. How does erosion or corrosion cause drift?

Physical damage to the primary element will cause a permanent change in calibration. This is a risk for **orifice plates**, **vortex meters**, and **turbine meters**.

- **How it happens:** Abrasive or corrosive fluids physically wear away or alter the shape of the critical sensing surfaces.
- **Effect:**
  - Erosion of the sharp edge of an **orifice plate** will cause it to read **low**.
  - Erosion of a **vortex meter's** shedder bar will change its vortex shedding frequency, causing an unpredictable drift.
  - Corrosion on a **turbine rotor** can change its balance and efficiency, causing it to read **low**.
- **Resolution:** The damaged primary element must be replaced.

7. Can installation effects lead to drift over time?

Yes, this is often seen in **clamp-on ultrasonic** flow meters.

- **How it happens:** The initial installation is perfect, but over time, vibration can cause the transducers to shift slightly. More commonly, the **coupling grease** used between the transducers and the pipe wall can dry out or get washed away.
- **Effect:** A degrading acoustic coupling weakens the signal, which can cause the reading to become erratic or **drift low** before failing completely.
- **Resolution:** The transducers must be repositioned and the coupling grease re-applied.

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8. How can temperature and pressure changes cause drift?

Changes in operating temperature and pressure can cause drift, particularly in **differential pressure** and **gas flow** applications.

- **How it happens:** The physical dimensions of the primary element (like an orifice plate) or the meter body can change slightly due to thermal expansion or pressure-induced stress.
- **Effect:** This change in the meter's geometry alters its calibration factor, leading to a small but measurable drift, often seen as a seasonal variation.
- **Resolution:** Using multivariable transmitters that dynamically compensate for pressure and temperature is the best solution.

9. What is a common cause of drift in older magnetic flow meters?

In older magmeters, **degradation of the liner** can cause drift.

- **How it happens:** Over many years, a liner material (like rubber) can absorb some of the process fluid, causing it to swell.
- **Effect:** This swelling slightly reduces the inner diameter of the flow tube. Since the meter calculates flow based on the original diameter, but the fluid is now flowing slightly faster through a smaller area, this will cause the meter to read **high**.
- **Resolution:** The flow meter needs to be replaced. Modern liners are much less susceptible to this problem.

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10. Can a faulty power supply cause drift?

Yes, an unstable or incorrect power supply can cause the output of any flow **transmitter** to drift.

- **How it happens:** If the voltage supplied to a 4-20mA loop-powered transmitter is too low (due to a failing supply or long wire runs), it may not have enough power to drive the full 20mA signal.
- **Effect:** As the flow increases, the transmitter's output may "top out" at a value less than 20mA, causing the reading to be accurate at low flows but to **drift progressively lower** as the flow approaches its maximum.
- **Resolution:** The power supply voltage must be checked and corrected. 🔧