



APPLICATION NOTE Oil & Gas

High-accuracy crude oil flow measurement in a LACT system

- Integration of Coriolis flowmeters for Lease Automatic Custody Transfer (LACT) units
- Mass flow and density measurement without the need for recalibration or maintenance
- Robust straight-tube design reduces wear and enhances meter durability

1. Background

A South American manufacturer specializes in designing and producing Lease Automatic Custody Transfer (LACT) units for the oil and gas industry, adhering to API standards. These turnkey systems are essential for transferring produced and separated oil from upstream operations to midstream oil companies. LACT units enable fully automated, unattended measurement of oil quantity and quality, ensuring accurate calculation and seamless transactions between companies. A typical LACT system comprises key components, including a pump, a basic sediment and water (BS&W) meter to monitor water cut, an air eliminator, a sampler system, and a diverter valve to redirect low-quality oil to a dedicated tank for further separation or removal of gas and solids. Once the oil meets agreed quality specifications, it flows through a high-accuracy flowmeter for quantity measurement. Additional components, such as valves and connection ports for ball provers, are installed after the flowmeter and at the LACT unit's outlet, where the processed crude is transferred to midstream pipelines for transport. All system data is transmitted to a control system for comprehensive monitoring and operation.

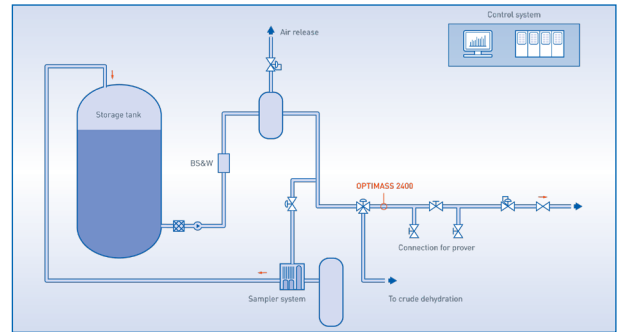
2. Measurement requirements

Historically, flow measurement of crude oil in LACT units relied on specialized orifice plates, turbine meters, or positive displacement flowmeters. While widely used, these technologies require frequent maintenance due to the wear and tear of their moving or intruding components. Additionally, they have a limited measuring span, especially in the low flow range. Turbine and positive displacement meters are particularly sensitive to viscosity changes, which can introduce significant measurement errors when oil quality fluctuates. Regular calibration and optimization with ball provers are necessary to maintain their accuracy. In recent years, Coriolis meters have become an alternative. They measure mass flow directly. However, conventional Coriolis meters often feature a bent-tube design, which is prone to wear over time due to the high solids content typically present in LACT oil streams. For a skid equipped with two LACT systems, the manufacturer was therefore searching for a highly robust Coriolis flowmeter designed to better withstand the mechanical stresses inherent to this application.

3. KROHNE solution

The LACT manufacturer selected the OPTIMASS 2400, a high-accuracy Coriolis mass flowmeter. Featuring a straight-tube design, it is specifically optimized for the custody transfer of crude oil and the mechanical stress involved.

This flowmeter offers custody transfer mass flow measurement in accordance with AGA standards over a wide dynamic range, without requiring any compensation or experiencing drift, regardless of viscosity. Its integrated density measurement enhances crude oil analysis by providing insights into the medium's quality. In addition, the built-in Entrained Gas Management (EGM™) functionality delivers advanced application diagnostics by generating a two-phase signal in the event of entrained gas in the oil stream. The "OPTICHECK technology built-in" diagnostics of the meter also allow for on-site monitoring and verification of the meter health, for example, quickly via Bluetooth®.



Simplified process scheme of LACT system with the OPTIMASS 2400

4. Customer benefits

The OPTIMASS 2400 offers significant advantages for LACT systems, ensuring highly accurate and reliable measurement performance while reducing maintenance demands. Its straight-tube design minimizes mechanical stress and abrasion caused by the composition of crude oil, avoiding the wear and tear commonly associated with bent tube meters. This makes it ideal for long-term, low-maintenance operation. Unlike mechanical flowmeters such as turbine meters, which require frequent recalibration, the OPTIMASS 2400 allows for seamless flow measurement even during changes in medium quality as there is no need to adjust for different viscosities, densities or flow ranges. The absence of rotating or intrusive parts further reduces the risk of wear, making it a more robust and durable solution. Moreover, its wide dynamic range also eliminates the need for frequent adjustment, e.g. by changing of orifice plates under pressure as required by dual-chamber orifice plate flowmeters.



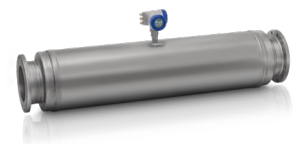
LACT system with KROHNE twin straight tube Coriolis flowmeter

The OPTIMASS 2400 also enhances operational efficiency by providing direct mass measurement, which avoids drift commonly seen with other flowmeter technologies. In many cases, it can eliminate the need for regular calibration with ball provers, simplifying operation while ensuring consistent accuracy. Integrated density measurement delivers continuous quality monitoring, providing real-time data to the control system for enhanced process oversight, e.g. as an additional safety measure in case there is residual water in the process. Additionally, the Entrained Gas Management (EGM™) functionality provides vital diagnostics, such as confirming whether the air eliminator has effectively removed air from the oil stream. By detecting entrained gas, it ensures optimal system performance and maintains the integrity of custody transfer processes.

5. Product used

OPTIMASS 2400

- Coriolis mass flowmeter for custody transfer flow measurement of crude oil on LACT systems
- Only minimum wear due to robust straight tube design
- CT: OIML R117, MI-005, MI-002; API and AGA compliant
- Maintains operation with air/gas entrainments in the medium (EGM™)



Contact

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Do you require technical advice for your application?
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