



APPLICATION NOTE Oil & Gas

Flow measurement of produced water from a low-pressure separator

- Accurate water measurement for determining water cut at a 3-phase separator
- Reliable monitoring of produced water flow with a high-accuracy electromagnetic flowmeter
- Increased plant uptime due to a maintenance-free meter design and wide dynamic measuring range
- Lower operational costs (OPEX) with no frequent recalibration or servicing required

1. Background

An oil and gas producer has multiple onshore oil fields in Central America. The company operates various types of separators for well-testing and production including 3-phase low pressure (LP) ones. These separators are used after the primary segregation of oil, gas and water and enhance the recovery of lighter hydrocarbons, while effectively separating the reservoir water from the oil stream to maximize oil quality.

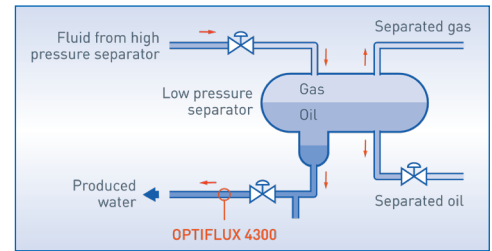
2. Measurement requirements

The efficiency of the separation process is highly dependent on effective process control and the use of reliable instrumentation. A critical measurement in this context is monitoring the produced water flow at the separator outlet. At one site, measurement had always been challenging since the fluid contains high concentrations of salt, oil residues and other components. Electromagnetic flowmeters faced the challenges of high pressures, electrode coating, corrosion and liner diffusion, so operators turned to other flow technologies. However, these other devices have required frequent calibration and are susceptible to wear from suspended solids, resulting in process interruptions from regular maintenance. Similarly, orifice plate flowmeters require constant adjustments to maintain some degree of accuracy and long-term stability in varying flowing conditions. Both approaches result in time-consuming manual interventions and lost productivity.

With these challenges in mind, the oil and gas producer was searching for a robust alternative for flow measurement on the water leg of one of its 3-phase LP separators. The optimal solution needed to reliably measure produced water without relying on intrusive or rotating parts, while also providing a wide dynamic range with a high turndown ratio. In addition, the instrument had to demonstrate proven performance in the harsh oil and gas industry production environments while also offering advanced diagnostic capabilities to improve the separator control efficiency.

3. KROHNE solution

The oil and gas company selected the OPTIFLUX 4300 electromagnetic flowmeter (EMF) for the measurement of produced water flow. Designed for advanced process applications, this flowmeter delivers accurate and reliable measurements on water legs, even under high pressures, with high salt concentrations and with the presence of oil residues and solids content. The OPTIFLUX 4300 has a proven track record for produced water measurement in oil separator applications.



Simplified process scheme of 3-phase separator with the OPTIFLUX 4300

This meter was preferred by the customer due to its reliable operation and long service life under these conditions. With an adapted design for electrodes and liner, it reliably handles fluctuating produced water flow rates, making it ideal for all phases of production. The rugged construction, combined with a variety of available wetted materials for the liner and electrodes, ensures durability and reliability under harsh process conditions. In addition to its robust design, the OPTIFLUX 4300 offers advanced diagnostic capabilities that provide valuable insights into both the meter's integrity and the process conditions.

4. Customer benefits

By supporting real-time monitoring of the separation process, the OPTIFLUX 4300 helps the customer optimize operations and reduce maintenance efforts. It allows the oil and gas producer to determine the water cut and assess the performance of the separation process. The installation of the EMF eliminated the need for mechanical meters, avoiding the challenges associated with rotating components or intrusive sensor parts for the customer. Maintenance efforts and faulty measurements caused by high salt concentrations and oil components have become a thing of the past, significantly increasing plant uptime while reducing process interruption and OPEX associated with it. The OPTIFLUX 4300 also offers far greater flexibility in terms of measurement span compared to specialized orifice plate meters. Its higher turndown ratio enables the EMF to handle all phases of water production without any manual intervention to adapt the meter to process conditions.



OPTIFLUX 4300 produced water flowmeter installed in water leg

The integrated diagnostics of the OPTIFLUX 4300 further enhance operational efficiency by continuously monitoring the health of the meter and the process conditions. For example, the flowmeter can detect and report substantial oil carryover via its diagnostic features, providing valuable process information to the operator for quicker decision-making.

Electromagnetic flowmeters, along with ultrasonic and Coriolis meters, have proven their efficiency and versatility in separator applications, where mechanical meters once dominated. Their ability to function without moving parts makes them particularly well-suited for demanding environments, offering operators a durable, low-maintenance, and reliable solution. KROHNE is able to supply all of these advanced flow measurement technologies from a single source, tailored to the needs of separator operators and manufacturers, which can include custody transfer applications for produced water, crude or gas.

5. Product used

OPTIFLUX 4300

- Electromagnetic flowmeter for produced water, advanced process and custody transfer (CT) applications
- For low conductivity media ($>1 \mu\text{S}/\text{cm}$) and high solid contents ($\leq 70\%$)
- Flange: DN2.5...3000 / $\frac{1}{4}$ "...120"; up to ANSI 2500 lbs.



Contact

Would you like further information about these or other applications?
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