



## APPLICATION NOTE Oil & Gas

### Advanced flow measurement on mobile test separators

- Increased well testing performance using ultrasonic and Coriolis flowmeters
- Accurate and reliable data on gas, oil and water flow rates
- Enhanced diagnostics for information on liquid carry-over and gas carry-under
- Replacement of orifice meters: maintenance-free flow measurement over a wide dynamic range

#### 1. Background

A global leader in energy services provides well testing and intervention services to enhance oil production sites. The company has an operation in Argentina, where it acquires reliable well test data for clients to evaluate current well conditions and identify underperforming wells by using field-proven mobile test separators.

#### 2. Measurement requirements

Test separators are applied to separate oil, water and gas in order to obtain accurate measurements of the individual produced phases. Flowmeters provide the well data for evaluating production performance which is essential for making decisions about required workovers. The customer previously used orifice plates to monitor the gas flow rate. However, with limited turn down, as process conditions change when swapping wells, the customer was required to replace orifice plates with a different beta ratio every time. For this reason, the company always stocked a large number of orifice plates to adapt its mobile well testers to changing flow conditions. This resulted in regular maintenance work with associated costs and safety risks. It also raised doubts about the long-term accuracy and stability of the orifice flow measurement.

The service company wanted to improve their well tester performance by replacing the orifice meter with an ultrasonic gas flowmeter that features a much wider dynamic range in order to measure the varying process conditions with one single instrument. This would reduce maintenance costs, downtime and safety risks but it demanded that the flowmeter also feature enhanced process diagnostics to detect anomalies in the separator at an early stage, such as liquid carry-over to the gas leg.

#### 3. KROHNE solution

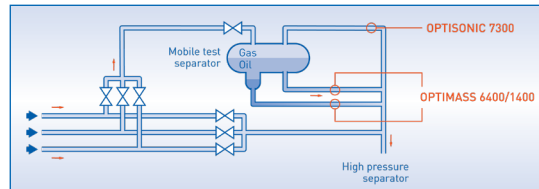
The operator replaced the orifice meters in the gas leg of the separator with the OPTISONIC 7300 ultrasonic gas flowmeter. For oil and water flow measurement,

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## APPLICATION NOTE

they opted for the OPTIMASS 6400 or the OPTIMASS 1400 Coriolis mass flowmeters as required by the application. The 4" version of the OPTISONIC 7300 flowmeter with two independent ultrasonic paths proved to be particularly stable and reliable for gas flow measurement even under wet gas conditions. The service company connected external temperature and pressure sensors to the signal converter to permit the integrated volume correction in the ultrasonic flowmeter to directly output the standard volume flow. The gas flow-meter's wide dynamic range allows it to start measuring from zero flow while also providing status information about the process and the meter health. The diagnostic data can also be applied to quickly identify liquid carry-over and its built-in velocity of sound monitoring can detect changes in the gas composition.

The selection of the Coriolis mass flowmeters for oil and water measurement depends on the required design pressure. If the pressure range exceeds 100 bar / 1450 psi, the customer would use the OPTIMASS 6400 twin bent tube flowmeter made from alloy 22 with ASME Class 900# flanges. At lower pressure conditions a more cost-effective OPTIMASS 1400 with ASME Class 600# flanges and duplex stainless-steel twin straight tube can be used. Both Coriolis flowmeters feature Entrained Gas Management (EGM™), which allows them to operate even in the event of gas carry-under.



Process scheme of three-phase separator



Gas flow measurement on a mobile test separator with OPTISONIC 7300

## 4. Customer benefits

Use of the KROHNE flowmeters has increased the reliability, accuracy, and validity of the allocation data. This has benefited the service company's end-customers, who now have much more accurate data at hand to manage their reserves and well decline curves appropriately and with a positive impact on well revenue and OPEX. The ultrasonic gas flowmeters have several advantages over the previous orifice meters: They feature a full-bore design with little or no pressure drop, reducing pump energy consumption and costs. There is no need for frequent calibration and the customer benefits from a large dynamic measuring range. A single OPTISONIC 7300 covers a wider dynamic flow range than the combined range of the six previously used orifice meters. This leads to massive savings in terms of maintenance costs and reduces safety risks as there is no longer any need for swapping orifice plates.

The flowmeters also provide enhanced diagnostics. The OPTISONIC 7300 gas flowmeter can provide process-related information to detect liquid carry-over to the gas leg of the separator. With their EGM™ functionality, the OPTIMASS Coriolis meters can be used to not only output the mass flow of the separated oil and water streams, but also a 2-phase flow signal in the event of gas carry-under. Since Coriolis meters also feature integrated density measurement, this information can be used to monitor the separator performance by detecting presence of oil in the water leg or the other way around. All this increases the service company's potential to optimize the performance of the test separators and improve the data quality for its customers.

## 5. Products used

### OPTISONIC 7300

- Ultrasonic flowmeter for natural gas, process gases and utility gas applications

### OPTIMASS 6400

- Twin bent tube design Coriolis mass flowmeter for advanced process applications

### OPTIMASS 1400

- Twin straight tube Coriolis mass flowmeter for universal applications and process control



## Contact

Would you like further information about these or other applications?  
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