



APPLICATION NOTE

Oil & Gas

Flow measurement for wellhead oil and water allocation

- Monitoring of reservoir performance at a legacy oil field
- Flow measurement of water and crude oil discharged by three-phase separators
- Detailed results on wellhead allocation for process control

1. Background

Legacy oil fields are ones that have been in operation for decades but whose production has fallen over the years. A petroleum exploration and production company in West Texas (USA) redevelops legacy oil and gas fields using new exploration and development technology to boost production.

2. Measurement requirements

The hydrocarbons are transported from the wellhead to numerous horizontal separators, where the multiphase medium settles. In this way, different gas, crude oil and water fractions split up and can be regained. The different phase fractions must be continuously determined to allocate the yield of a well. Detailed results from allocation to wells help improve reservoir management.

In the past, the operator tried to determine the volume of the different phases by interface measurement using tank gauges. Unsatisfied with the efficiency and accuracy of these devices, the customer started searching for an alternative process instrumentation to make the allocation process more cost-efficient and more practical to operate. Instead of measuring interface within the separators, the oil company decided on monitoring the output flow rate of the water and crude oil fraction (up to 10,000 bbl/d) directly.

3. KROHNE solution

KROHNE supplied the OPTIMASS 1400 C Coriolis mass flowmeter for measurement of the crude oil output from the separator. At first the company opted for the OPTIFLUX 4100 C electromagnetic flowmeter (EMF) for the water measurement. Later on they switched to the OPTIFLUX 4300 C to make use of the enhanced process diagnostics in the IFC 300 converter. So far 60 separators have been equipped with Coriolis flowmeters and EMFs with 2" ASME CL150 flanged connections.

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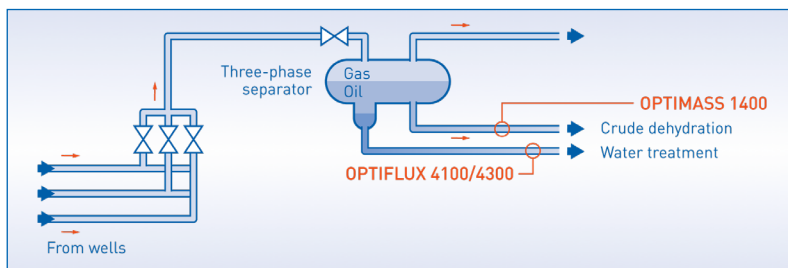
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Both flowmeters are ideally suited to the rough environment of this application. The OPTIMASS 1400 with its twin straight tube design fits perfectly into the confined space of the separator environment. Featuring Entrained Gas Management (EGM™) the flowmeter is able to maintain operation even in the event of gas entrainment that may occur immediately after the dump valves are opened.

Due to their rugged electrodes and PFA liner material, the OPTIFLUX 4100 and 4300 flowmeters allow a long term stable flow measurement of the produced water. It provides resistance against the abrasive particles from drilling mud that may still be present in the discharged water.



Allocation from wellsite through separator



Process scheme of three-phase separator

4. Customer benefits

Using the KROHNE flowmeters rather than tank gauging enables the customer to get precise information on daily production per well. The result is a more accurate allocation of crude oil and produced water of each production well, helping the customer streamline product collection more effectively. If necessary, the more accurate information on flow rates can also be used to adapt reservoir management with the best oil yield in mind.

The EGM™ functionality of the OPTIMASS 1400 provides an additional advantage in controlling the process. Gas entrainment caused by flushing is no longer an issue. Its disturbing effect on flow measurement can be eliminated. Using the density readings and the 2-phase signal of the Coriolis flowmeter, the operator can determine the accurate holding time. If there is too much gas in the line, the customer can close the dump valves and have the tank settled sufficiently.



Crude oil measurement with the OPTIMASS 1400

5. Products used

OPTIMASS 1400 C

- Coriolis mass flowmeter for crude oil measurement in oil/water separator applications
- Twin straight tube design
- With Entrained Gas Management (EGM™): maintains operation even with entrained gas of up to 100%

OPTIFLUX 4300 C

- Electromagnetic flowmeter for advanced applications with produced water
- Extensive flowmeter and process diagnostics (incl. NE 107)
- For hazardous areas: FM, CSA, ATEX, IECEx, NEPSI, INMETRO, etc.

OPTIFLUX 4100 C

- Electromagnetic flowmeter for standard applications with produced water
- For hazardous areas: ATEX, IECEx, FM, CSA

Contact

Do you have questions or are you interested in this or other applications?
Would you like advice or a quotation?
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The current list of all KROHNE contacts and addresses can be found on our website.



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