



# APPLICATION NOTE Oil & Gas

## Custody transfer metering system for crude oil

- API Compliant metering solution for billing purposes
- Full-scope delivery of flow metering skid with ultrasonic and Coriolis flowmeters, flow computers, mobile prover, sampling and analyser system, control cabinets and supervisory software
- All from one source: from design and construction to calibration, commissioning and testing

### 1. Background

An oil and gas company specialised in the exploration, development and production of hydrocarbons operates various assets in the Middle East. The quantities of crude oil from the oil fields are delivered to oil processing businesses.

### 2. Measurement requirements

The settlement of crude oil deliveries is subject to custody transfer. A custody transfer metering system (CTMS) is therefore one of the key components of the entire oil field as it is mandatory for crude oil export and billing procedures.

The oil company invited tenders for the supply of a full scale CTMS including all measurement instrumentation and peripheral equipment such as flowmeters, control cabinets and flow computing, an automatic sampling system as well as supervisory and validation software systems. The CT measuring system was to meet the strict requirements of API.

Measurement specifications	
Measured medium	Crude oil
Volume flow rate	280...850 m <sup>3</sup> /h
Density	830...850 kg/m <sup>3</sup>
Pressure	35...77 bar / 507.6...1116.8 psi
Temperature	+50...+70°C / +122...+158°F
Viscosity	3.1 cSt (at +80°C /+176°F) 7.63 cSt (at +20°C /+68°F)

Given that even relatively small errors can have large financial implications, only CT certified flowmeters with a track record in high accuracy oil and gas transfer operations were considered by the operator. To enable on-site verification of the inline duty meters, the oil producer also asked for a mobile prover to be part of the CTMS package.

## 3. KROHNE solution

As a renowned and long-standing supplier of measurement solutions and CT metering systems to the oil and gas industry in the Middle East and beyond, KROHNE prevailed and was trusted with this project. A complete solution for custody transfer operation was engineered, manufactured and supplied by KROHNE in accordance with customer specifications.



Custody transfer metering system for crude oil with mobile prover and automatic sampling system

The metering solution included:

- 1 Custody transfer flow metering system for crude oil with the ALTOSONIC 5 as its core element. This ultrasonic inline flowmeter is designed for CT measurement of hydrocarbons and has proven itself in a wide range of upstream and midstream applications. Given its sophisticated multipath configuration, it can handle all flow regimes without Reynolds number limitations. It provides a vast number of diagnostics, enabling recognition and visualisation of the complete flow profile. The API 5.8 compliant and OIML R117 certified flowmeter is used on the skid in duty and master meter configuration.
- 1 Flow control skid featuring butterfly type valves with electrical actuator and check valves at the outlet.
- 1 Automatic liquid sampling system with fast loop pumps, density meters, viscosity meters, electrical grab samplers, a static mixer as well as the OPTIMASS 6400 Coriolis mass flowmeter. The KROHNE flowmeter is one of the most accurate instruments in its class, providing reliable readings for the quality analysis of crude oil. It was mounted into the small DN15 sample line of the cabinet.



ALTOSONIC 5 flowmeter installed on custody transfer metering system for crude oil



OPTIMASS 6400 Coriolis mass flowmeter mounted on the sampling system

## APPLICATION NOTE

- 1 Small volume prover mounted on a mobile prover for on-site verification of the CT flowmeters.
- 1 Water draw system for the verification of the small volume prover.
- 1 Metering control panel including SUMMIT 8800, SynEnergy and a PLC. SUMMIT 8800 is a digital high-performance flow computer for CT measurement. SynEnergy is KROHNE's web-based HMI/SCADA solution offering continuous process monitoring and visualisation of the complete CTMS.



Mobile prover (right) and water draw system (left)



SynEnergy HMI: Complete overview of all CTMS components

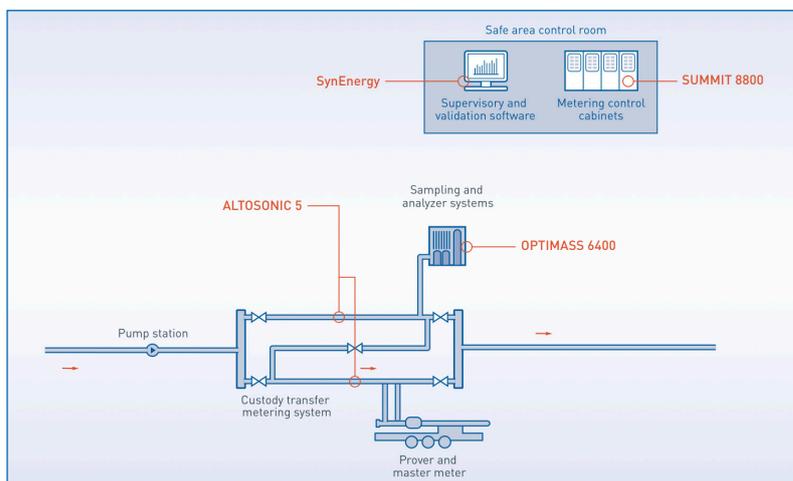
### 4. Customer benefits

The engineered turn-key solution enables reliable and long-term stable CT flow metering in accordance with API requirements. Only with the fully functional, accurate and certified CTMS can the oil company monetize their crude oil and comply with legal billing procedures. In addition, the solution provides maximum transparency needed to prove the oil field's productivity.

The complete solution was supplied from one source, meeting the customer's specifications. KROHNE has taken responsibility for the whole project-lifecycle – ranging from first consultancy and engineering to calibration, delivery and commissioning ending up with factory acceptance test procedures (FAT) and after-sales services such as maintenance and support based on service level agreements. In this way, the customer benefits from KROHNE as a globally active full-scope supplier with a dedicated and experienced regional sales and service team located in Dubai, UAE, serving customers in the Middle East.



Connecting the remote converter of the ALTOSONIC 5 with a pressure transmitter



Simplified scheme of custody transfer metering system (CTMS) for crude oil



KROHNE service engineer inspecting the status of the CTMS via SynEnergy HMI

## 5. Solutions and products used

### Custody transfer metering systems for crude oil and refined products

- Metering solution for liquid hydrocarbons, e.g. crude oil
- Comprising flow metering skid, flow balancing, metering control cabinets, sampling and analyser systems, including all supervisory and validation software
- Systems with mobile or integrated master meters, uni- & bi-directional ball provers or small volume provers



### Supervisory control cabinets

- Complete solution for process control
- Provides control of the metering system, including validation of field instrumentation
- Installed in a safe area (e.g. in a control room)



### Flow computing

- Solution for the visualisation of measurements based on the SUMMIT 8800 flow computer
- Graphical representation of all measurements
- Fully pre-configured and tested according to customer requirements



### Sampling systems

- Automatic sampling solution for liquid hydrocarbons
- Sampling systems for stand-alone use, or integrated into the flow metering systems



### Mobile provers

- On-site master metering solution
- Lowest measurement uncertainty by periodic verification of prover against national and international standards



### SynEnergy supervisory and visualisation software

- Solution for continuous process monitoring and reporting
- HMI/SCADA software for measurement solutions
- Easy integration into existing DCS and ERP networks



### ALTOSONIC 5

- Ultrasonic flowmeter for custody transfer (CT) measurement in upstream and midstream applications
- Multipath inline meter for crudes, refined products, cryogenic media and chemicals
- CT: OIML R117, API compliant
- Flange: 4...24"; max. ASME Cl 600



### OPTIMASS 6400

- Coriolis mass flowmeter for advanced process applications
- Maintains operation over a wide range of gas fractions and complex flow conditions (EGM™)
- SIL 2/3; OIML R117, R137, MI-005, MI-002; API, AGA



### SUMMIT 8800

- Flow computer for custody transfer (CT) measurement
- Cost effective solution due to modular hard- and software design



### Contact

Would you like further information about these or other applications?  
Do you require technical advice for your application?  
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Please visit our website for a current list of all KROHNE contacts and addresses.

