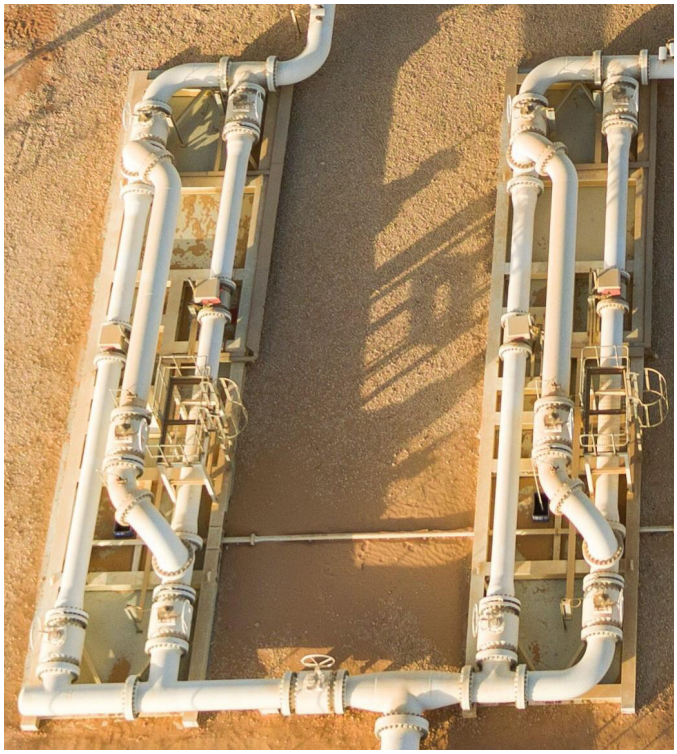


Photos: © BAUER Resources

APPLICATION REPORT

Water & Wastewater

Flow metering system for the inlet of a reed bed water treatment plant

- Tailored metering skid for measuring contaminated water from oil wells
- Pre-assembled metering solution with flowmeters and valves
- Calibrated to meet OIML R49 custody transfer regulations

BAUER RESOURCES

1. Background

BAUER Nimr LLC, Oman, a subsidiary of BAUER Resources GmbH, Germany, is a full-service provider within the sectors water, environment and natural resources. Among others, the company is specialised in the development, construction and operation of water treatment facilities.

Under a DBOOT (Design-Build-Own-Operate-Transfer) contract, BAUER Nimr has been taking responsibility for the whole wastewater management at a water treatment facility in the Arabian sultanate of Oman. This wastewater treatment plant is basically used to treat contaminated water from an adjacent oil field.

2. Measurement requirements

The produced water from the oil field is brackish, containing total dissolved solids (TDS) between 7,000 and 8,000 mg/l. The average amount of oil in the water is higher than 400 mg/l. Oil makes up 10 percent of the medium, the rest is contaminated water. Initially, the water had once only been disposed of in deep wells after separation.

For more sustainable and efficient water treatment BAUER Nimr fully transformed the wastewater treatment plant, reaching a capacity of 175,000 m³/d of water. In implementing a unique model, BAUER Nimr built a wetland of reed. The species absorb the residual hydrocarbons that are not removed by oil/water separation. The wetland facilities are supplied by gravity lines. In this way, the sophisticated system does not only provide a highly effective and environmentally friendly way to regain clean water. As energy-intense pump capacities are no longer required, it also reduces energy consumption by up to 98%, reducing the carbon footprint of the plant significantly.

Photos: © BAUER Resources

Wastewater treatment plant with reed bed wetlands

KROHNE

The operator is paid by the authorities based on the amount of water received. To enable highly precise billing procedures, the customer required a complete flow metering system at the plant's inlet. The system was to comply with OIML R49 custody transfer requirements as well as meet the demanding requirements in terms of process conditions.

3. KROHNE solution

KROHNE designed, engineered and manufactured a metering system tailored to the needs of the wastewater treatment plant. It consists of a water skid with two OPTIFLUX 2300 electromagnetic flowmeters (24", Cl 300#), inlet and outlet runs (10D/5D), ball valves and pre-installed gaskets.

The metering skid had been calibrated as per OIML R49 standards for custody transfer measurement prior to delivery. The Z-type of the water skid enables dual channel measurement as well as single channel measurement, where the non-active channel is ready for service activities while in full operation.

Given the challenging environment with high ambient temperatures, the flowmeters were specially coated. Additionally, the difficult process conditions demanded the complete piping of the skid to be equipped with a phenolic lining to avoid corrosion. All the valves were made from Inconel to handle the high saline content of the medium.

KROHNE has also provided a modular metering control solution for each measuring system. The metering control cabinets for the control room have been supplied fully wired, preconfigured and tested. These are equipped with the SUMMIT 8800 flow computer designed for custody transfer measurements and have as a central component SynEnergy, a process monitoring and visualisation software, including appropriate hardware.

As a solution for continuous process monitoring and reporting, SynEnergy collects data from field devices and offers a full control over the entire metering system. Being a web-based software solution, it enables secure access to all measuring data from any geographical location. This allows KROHNE to provide fast and direct support as well as to carry out software upgrades without a visit being necessary at the customer's site.

Photo: by courtesy of BAUER Resources

OPTIFLUX 2300 installed on water skid

Photo: by courtesy of BAUER Resources

Manufacturing of water skid at KROHNE factory in Breda, the Netherlands

Photo: by courtesy of BAUER Resources

Supervisory control cabinets equipped with SUMMIT 8800 flow computers and SynEnergy software

4. Customer benefits

With the help of the tailored skid, the operator can precisely determine all the wastewater loads received and processed. The contaminated water with a small amount of oil is reliably measured by the flowmeters. In this way, clear and consistent data are provided for billing purposes.

Photo: © BAUER Resources

Treatment plant with water skids

The WTP operator is now also able to reveal the loss of revenue from oil left in produced water. The wastewater treatment project recovers around 750 bbl of crude oil from the wastewater per day. The recovered oil is fed back to the exploration company.

Today, the KROHNE metering system has become an essential part of the world's largest, innovative and sustainable wastewater treatment facility of its kind. KROHNE has provided this turnkey solution from a single source. This indeed turned out to be one of the main benefits for the customer. KROHNE differentiated itself from competitors by delivering the complete scope of work including the whole project management – ranging from consultation, planning, engineering and documentation to the supply and integration of the metering solution to after-sales services while meeting the required quality norms and complying with the relevant OIML regulations at all times.

Photo: © BAUER Resources

Metering system at the inlet of the water treatment plant

Photo: © BAUER Resources

Photo: © BAUER Resources

Both water skids installed side by side

Photo: © BAUER Resources

Water skids with the OPTIFLUX 2300

5. Solutions and products used

Custody transfer metering systems for produced water

- Metering solution for contaminated and treated water from oil wells
- Pre-installed measurement skid with flowmeters and valves
- Pre-calibrated to meet custody transfer regulations (e.g. OIML R49, MID MI-001)
- Completely designed, engineered and manufactured according to customer specifications

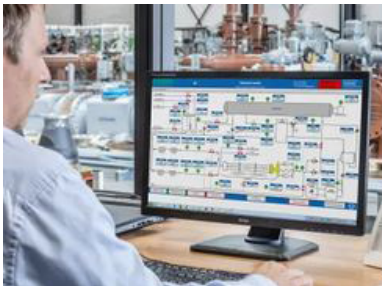
Photo: © BAUER Resources

OPTIFLUX 2300

- Electromagnetic flowmeter for advanced water and wastewater applications
- High accuracy (±0.2%), with CT approvals (OIML R49, MI-001)
- Flange: DN25...3000 / 1...120", max. PN40 / ASME Cl 300

SynEnergy Supervisory and visualisation software

- Solution for continuous process monitoring and reporting
- HMI/SCADA software for measurement solutions
- State of the art HTML5 secure web technology
- Optimisation of operation results due to predictive maintenance
- Easy integration into existing DCS and ERP networks



Modular flow control and data transfer cabinets

- Cost-effective, modular metering control solution
- Based on the SUMMIT 8800 flow computer
- In-house KROHNE design, manufacturing and testing
- Supplied in combination with new metering systems, or for an upgrade to existing systems
- Supplied fully wired, preconfigured and tested

SUMMIT 8800

- Flow computer for custody transfer (CT) measurement
- Cost-effective solution due to modular hard- and software design
- Full colour graphical touch screen for maximum process transparency
- Easy operator access enabling time efficient maintenance
- Automatic Performance Monitoring extends recalibration interval

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.

www.krohne.com