



FLOW MEASUREMENT OF PRODUCED WATER, OIL AND GAS MIXTURE



Oil & Gas / Upstream



Measuring Task

Field to plant volume flow monitoring of a water, oil and gas mixture from matured remote wells using NoiseTrek parallel beam mode

Esso Exploration and Production Chad Inc. (EEPCI) operates several conventional mature fields in Africa. Crude oil production from wells located in the southern region of Chad is transported via a pipeline system to the Cameroon marine terminal for exportation.

In the field, hundreds of oil wells produce over 120,000 barrels of oil per day by using secondary enhanced oil recovery techniques such as Electrical Submersible Pumps (ESP) and Progressive Cavity Pumps (PCP). Since field production began back in the 1970s, water production associated with the oil production is high. Separation takes place at ExxonMobil's Komé plant.

In remote locations, individual well allocation and production separation is not always viable or cost-effective. Instead, commingled production from well clusters is tied to a manifold or gathering line that transports raw production to adjacent processing plants where individual components can be stored and treated as needed. ExxonMobil's Komé plant in Chad is equipped to receive large amounts of production from the field. However, balancing volumes and optimizing plant performance had become a

challenge due to the lack of existing metering between gathering lines in the field and the inlet holding tanks at the plant.

In an effort to increase field production allocation and improve plant intake, ExxonMobil was interested in retrofitting flow measurement instrumentation to four commingled (water, oil and gas mixture) gathering lines in the fields Moundouli, Maikeri, Nya and KP2, as well as two inlet flow lines at the Komé plant.



Solution

Flexim's non-intrusive measurement technology has proven to be the ideal solution for this measurement task. One of the characteristic advantages of clamp-on ultrasonic measurement technology is that it can be thoroughly tested for its suitability on-site without any disruption to system operation.

In a preliminary on-site test, the Flexim France service team was able to show that the non-intrusive gas flow measurement with FLUXUS® G works extremely well. At the same time, they were able to determine the ideal installation locations that best take the disturbed flow conditions into account.

Due to the convincing test measurements, ENGIE decided to replace the turbine meters with two stationary FLUXUS® G721 ultrasonic measuring systems from Flexim. For the transducers, the GRK1S52 type was chosen. These transducers work with Lamb waves and thus ensure a strong measurement signal over the entire temperature range and overall operating states, including shutdowns and restart processes.

The transmitters have inputs for pressure and temperature. By calculating the measured values for pressure and temperature, the transmitter can output the standard volume or mass flow of the gas. For this purpose, Flexim has created an individual data set for the gas composition used at ENGIE Combigoilfe.

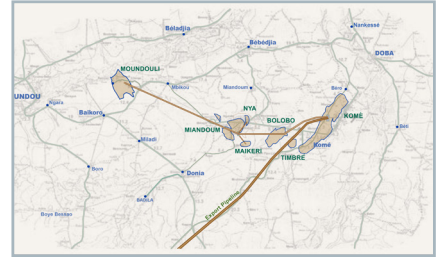
The turbine can now be optimally controlled using the data for the natural gas mass flow transmitted by the FLUXUS® G721 ultrasonic systems to the process control system. Thierry Fougedoire from the ENGIE Combigoilfe maintenance team sums up the positive experience with Flexim as follows:

"Our main concern was to achieve a reliable measurement of the natural gas flow that feeds the turbine of the Combigoilfe power plant. Maintenance of the wetted flowmeters required a production stop every time, incurring costs and delays. Despite a regular maintenance plan, there were frequent failures in the measurements.

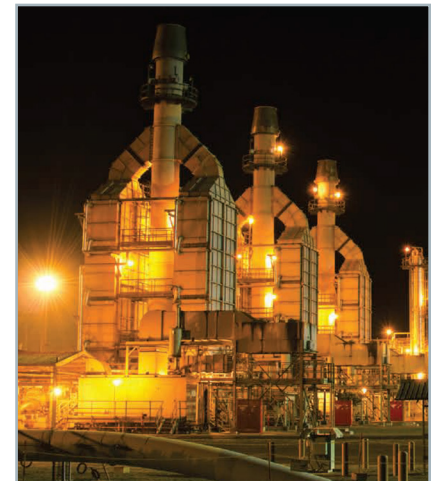
The technical solution offered by Flexim with the FLUXUS® G721 enabled us to install a reliably working flow measurement without having to interrupt production. The Flexim team was available to us at all times and supported us in every way, from selecting the product to commissioning and checking the measurement. The installation in record time and the accuracy of the measurement will allow us to carry out the performance test in our power plant in optimal conditions."



Chad/Cameroon Development Project, Project Overview Map
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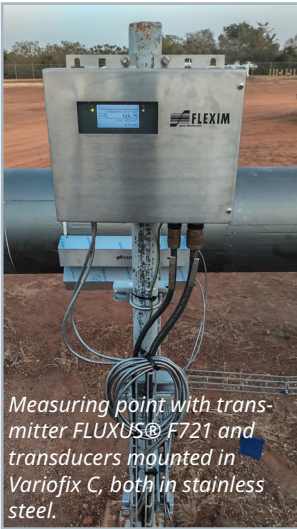
Chad/Cameroon Development Project, Overview of the Oilfield Area
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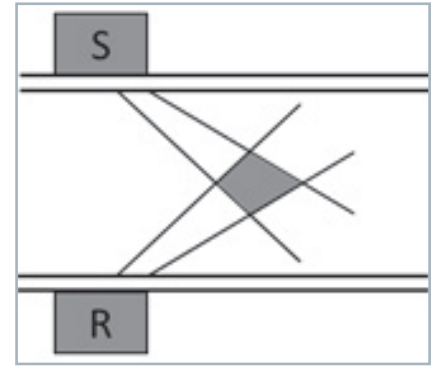
ExxonMobil's Komé plant
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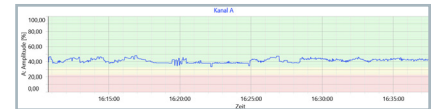
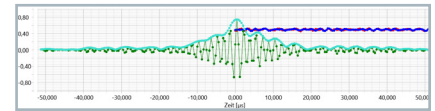
Powerful 0.5 MHz type K transducers are mounted parallel to each other on the pipe for NoiseTrek parallel beam (NTPB) measurement..



Measuring point with transmitter FLUXUS® F721 and transducers mounted in Variofix C, both in stainless steel.



NoiseTrek parallel beam mounting angles



The built-in diagnostics of FLUXUS® show a good signal quality and therefore a good measurement.

Measuring Points and Instrumentation

| | |
|--------------------------|--|
| Pipelines | 20" and 24", steel |
| Medium | Mixture of produced water, crude oil and gas |
| Flow rates | 15,000 ft ³ /h to 15,000 ft ³ /h |
| Measuring Devices | 2 stationary FLUXUS® G721 ultrasonic measuring systems for gases |
| | 4 stationary FLUXUS® F721 clamp-on ultrasonic flowmeters, 4 pairs of clamp-on ultrasonic transducers type CDK1N52 (shear wave, 0.5 MHz), mounted in Variofix C SS316 in NTPB configuration |

Advantages

- Practical demonstration of meter performance in non-standard application on site with portable flowmeter by Flexim's technical support team.
- Clamp-on non-intrusive metering implementation improves field production balance and plant intake visibility.
- Noise Trek parallel beam (NTPB) mode enabled to mitigate signal attenuation caused by entrained gas.
- Cost-effective, retrofittable solution without any impairment of operation.

Customer



Esso Exploration and Production Chad Inc. (EEPCI)

ExxonMobil, one of the world's largest publicly traded energy providers and chemical manufacturers, develops and applies next-generation technologies to help safely and responsibly meet the world's growing needs for energy and high-quality chemical products.

As operator, Esso Exploration and Production Chad Inc. (EEPCI) conducts oilfield development and production on behalf of a project consortium that includes Esso (40 percent), Petronas (35 percent) and Chevron (25 percent).

The Chad/Cameroon development project includes oilfields in southern Chad and a pipeline system to transport crude oil to a marine terminal in Cameroon for exportation.

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