GNPC gears up for Ghana O&G sector

Determining the maritime boundaries

Angola’s clean alternative to flaring

Technology driving Africa’s LNG

Changing the face of real-time remote pressure management

Africa’s subsea market hots up

Meeting the deepwater challenge

Vsats - how much should one pay?

Joe Udofia, MD-CEO of Vandrezzer Energy Services Limited, Nigeria
See page 6.
Driven by the need to develop fields in deeper waters, more challenging locations and in reservoirs of increasing geological complexity, the subsea installation market is expected to grow at a significant pace over the next few years, with deepwater developments likely to be a major element of many of the world’s IOC and NOC portfolios.*

The African subsea market continues to hot up

The last few years have seen a raft of new subsea challenges

Concession offshore Egypt, where 49 Roxar Wetgas meters have been installed to help the operator Burullus monitor water production profiles in real-time; the deepwater Akpo field, offshore Nigeria where Roxar subsea Multiphase meters have been deployed; and the Kizomba B development, offshore Angola, where Roxar subsea Multiphase meters and subsea sensors have been installed for the operator, Exxon. Through the continuous measurement of the amount of oil, condensate, gas and water at the wellheads on the sea bed, Exxon will be able to determine the optimal production capacity of each well (thereby avoiding the risk of overproducing the well), increase flow assurance from the fields and optimise the production process.

In the WDDM example in Egypt, over just a four month period, the Wetgas meters were utilised to avoid several water breakthroughs, identify zones for water production, and optimise gas production within acceptable and controlled water rates. By providing early warnings of the water produced, the meters have helped Burullus and its partners save several wells from water breakthrough leading to a sustainable production strategy moving forward.

For all the benefits of multiphase meters, however, the last few years have seen a raft of new subsea challenges that they have to face. This includes a wider range of process conditions with more liquid and water present in the flow as well as deeper wells with higher process pressures and temperatures; and the growing remoteness of many subsea fields where costs for subsea interventions and periodic fluid sampling (PVT) are high.

In addition, there has also been an increase in the number of subsea tie-backs with EICDataStream, the global projects database of the UK trade association, the Energy Industries Council noting that there are 27 current and future subsea tie-back projects in Africa. Examples of fields where subsea tie-backs are in place include the Diega & Carmen oil fields in Equatorial Guinea; the Foxtrot, Mahi & Manta gas fields off the Côte D’Ivoire; the Erha North and Erha South fields, offshore Nigeria; and the Kizomba development offshore Angola where Emerson’s Roxar meters are in place.

The risks of longer horizontal production pipelines and tie-backs is that it takes more time to detect a water breakthrough in the well, increasing the need for real-time monitoring to prevent obstacles to flow assurance, such as hydrates and water encroachment.

It is therefore vital that today’s subsea multiphase and wet gas meters come with an extended operating range, added resilience, and generate ever more accurate and sensitive measurements of flow rates and water production profiles.

Emerson’s latest subsea wet gas meter, for example, is being designed to include new microwave electronics to provide even more stable and accurate measurements. The meter will be...
Hydrate build-up, where crystals formed in high pressure and low temperature gas flows can block pipelines and interfere with production, are also a particular risk in deepwater fields today. The situation can be made even worse, however, if the wrong amount of hydrate inhibitors, such as MEG (Monoethylene Glycol), is injected. We have seen cases, for example, where up to 20 per cent of the pipeline capacity is occupied with MEG, due to overdosing.

In response to this need to establish greater control over the measuring and injection of hydrate inhibitors, Emerson has developed a compact and robust subsea retrievable injection valve solution, which provides operators with precise control over chemical dosage rates.

The injection valve can also be integrated with other measurement solutions, such as the subsea wet gas meter, to increase subsea production performance. In this case, the wet gas meter measures the early onset of formation-water production and then the subsea chemical injection valve ensures that the necessary preventative is action.

**Downhole reservoir monitoring and hydrate management are also crucial to African subsea operations today.**

particularly applicable for new gas finds, such as off the East African coast where Anadarko and ENI, for example, are engaging in significant exploration activities offshore Mozambique.

With the new meter, transmission and resonance measurement significantly extend the operating range. The meter also includes a salinity measurement system which can inform the reservoir engineer where formation water is entering the flow as well as also helping the process engineer when adjusting injection rates of scale and corrosion inhibitors.

Other developments in Emerson’s multiphase metering capabilities include a new downhole flow sensor system which will, for the first time, generate multiphase flow measurements from downhole in the well and deep in the reservoir, leading to increased operator understanding of reservoir flow and zonal contributions from wells; and to be launched in early 2013, a subsea version of Emerson’s third generation multiphase meter.

The new meter version will be two thirds of the size and half the weight of the current subsea version without any technology compromises. Such compactness is crucial, with many subsea manifolds offshore Africa already crowded with instrumentation.

**Downhole reservoir monitoring & hydrate management**

Downhole reservoir monitoring and hydrate management are also crucial to African subsea operations today.

To this end, Emerson’s Roxar intelligent measurement devices and sensors are highly robust and are utilised not only to monitor temperature, pressure and water cut, but also gas fraction, sand rate and flow velocity.

Deployed in production, injection, or observation wells, the Roxar Permanent Downhole Monitoring System (PDMS), for example, continuously transmits accurate pressure, temperature and flow rate data from the reservoir in real time to local or remote well control facilities. Some of its gauges have been in operation for decades, requiring minimal maintenance.

In addition, Emerson has recently launched a new solution that can generate information from the B annulus within the casing of an oil well — previously a ‘no go’ area. The new tool is expected to have a significant impact on both production and offshore safety, provide early warnings of high pressures, protecting casing integrity, and preventing pressure build-up and, in the worst case scenarios, shallow gas blow outs.

**Transparency & integration**

It is this integration of instrumentation which is central to the increased need for transparency and better handling of information in Africa’s subsea field operations.

This is being enhanced through a specialised Windows-based field monitoring system which enables E&P operators to observe their fields from remote facilities.

Known as Roxar Fieldwatch, the system incorporates a wide range of Emerson’s reservoir monitoring instrumentation within one single control system framework, covering everything from sand monitors and erosion probes through to downhole pressure and temperature gauges; and the tracking of well test jobs.

The latest version also comes with new erosion-combating capabilities which enable operators to install virtual erosion sensors within their production system — particularly to monitor bends, T-bends and reducers in areas where it’s difficult to deploy physical sensors. While not as accurate as real sensors, the virtual erosion models can calculate important production information by inputting flow information, pressure and temperature data.

**Maximising asset returns**

Success in maximising asset returns in subsea operations today depends largely on operators’ ability to characterise and understand reservoirs and generate accurate production information to guide decision-making.

How are my wells performing? Are there any conditions that affect my assets and the production flow? How do I keep my assets working for the full life of the field with the same efficiency? Many of these questions are now being answered.

*By Steve Jennings & Ingar Tyssen, Emerson Process Management.*