



OTC 20045

Optical Permanent Monitoring System Meets the Subsea Challenge

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This paper was prepared for presentation at the 2009 Offshore Technology Conference held in Houston, Texas, USA, 4–7 May 2009.

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Abstract

In-well monitoring systems have now been developed which utilise permanent optical fibre sensing and can be deployed in the subsea environment. These optical monitoring systems are well suited for subsea deployment in terms of extended temperature and pressure regimes, along with reliability and advanced optical multiplexing technology.

Hundreds of optical sensors and millions of feet of optical cable have been successfully deployed in land and dry tree platform oil and gas wells since the early 1990's. In the last 1990's, a few prototype optical sensing systems were deployed subsea for single point pressure and temperature monitoring with partial success. However, over the last 10 years, optical sensing technology has progressed significantly, yet no subsea installations have been performed. This was not due to lack of interest but to significant challenges related to subsea deployment, and also in part due to projects cancelled for such reasons as perceived lack of data delivery infrastructure.

This paper describes how the significant challenges of subsea optical sensing were overcome through close cooperation between the operator and other 3rd party companies, along with extensive project organisation, custom engineering, and qualification testing and system verification. Deployment of the system took place offshore Angola in Q1 2008.

The major areas which we addressed in order to assure success were:

- Establishing standards to which the subsea instruments and components should comply with in order to build a robust test regime for qualifying the new optical sensing technology.
- Developing, qualifying and interfacing a subsea connector system for wellhead and tubing hanger penetration.
- Developing, qualifying and interfacing a new generation subsea optical instrument which would be deployed subsea in an atmospheric housing.
- Designing an in-well monitoring system which can deliver accurate reservoir pressure and temperature data from the sand-face to surface.