



## Completion Solutions

### Intelligent Completion in System Provides Operator Solutions in the Remote Niger Delta

Location: Niger Delta, Nigeria

#### Overview

The Nigerian subsidiary of an international oil company wanted to pilot test intelligent completion technology in one of the largest fields in the western swamp area. However, the remoteness and the peculiar operating environment in the Niger Delta made installation of surface equipment required to operate/communicate with the downhole intelligent completion equipment a challenge.

Country regulations did not allow for commingled production due to concerns of accurate production allocation to individual reservoirs and proper reservoir management. The operator wanted to prove to the regulatory body that the technology being deployed would not only improve well deliverability through controlled commingling, but also provided potential cost savings in the swamp terrain.

#### Solution

A three-zone intelligent completion was installed in the pilot well. The intelligent completion consisted of a discrete choke position HS interval control valve (HS-ICV) to regulate flow from the three zones and a dual sensor ROC™ reservoir monitoring system installed in each zone. HF1 production packers were installed and MC isolation packers were deployed for zonal isolation of the lower two zones. A customized surface system was also installed to allow for data transmission and control of the intelligent completion to and from the field logistics base, which was a few 100 miles away. In addition, a two-way transmission V-monitor was installed at the wellhead to transmit wellhead and downhole information to the flow station.

Due to the remoteness of the location, a thermoelectric generator (TEG) power unit was chosen to power the surface hydraulic system (SHS) and the XPIO 2000™ data acquisition system. The TEG operates with natural gas provided by the well itself and has a rugged design to prevent vandalism. Back-up batteries capable of powering the system for 21 days were installed, should the TEG unit fail.

MINIMISING TRIPS  
TO THE WELLBORE

EVEN IN THE MOST  
**REMOTE  
LOCATIONS**

## Results

The benchmark for installing the completion in place was 24 days. However, the actual operations took a total of 13.5 days, thus reducing the rig time by 10 days. The Asset Financial Expenditure (AFE) for the well was reduced 20% by optimizing the completion design and astute planning. Moreover, the success of the pilot project gave the operator confidence to implement the technology on other wells in the field regardless of the remote location. The data derived from subsequent well testing and analysis satisfied the Nigerian regulators with regard to the correct allocation of production in a commingled scenario.

Halliburton was able to provide the operator with an economically viable solution for this challenging environment.

Ref. SPE/IADC 166800

CHALLENGES	SOLUTIONS	RESULTS
Remote pilot well	Three-zone intelligent completion and thermoelectric power generator	Minimized trips to the wellbore and successful execution of the pilot well
Regulator concerns pertaining to commingling	HS-ICVs for zonal control	Data/analysis from subsequent well testing satisfied regulatory requirements
Remoteness monitoring	Dual sensor ROC™ system for reservoir surveillance	Customized solution to address remoteness
Vandalism	Utilize gas from the wellbore	Tamper-proof solution
Economical	Back-up battery and two-way cellular transmission	Able to communicate with the intelligent completion remotely