MCE Deepwater Development 2016

All Electric Subsea Production System – A World First

Rory MacKenzie Total E&P, Technology Division

Key Contributors:

Cedric Roux – Total E&P Netherlands BV, K5-F3 Project Manager Antonin Baume – Total E&P, Drilling and Wells Division Ewan Allstaff – Total E&P, Drilling and Wells Division Juliano Pimentel – Total E&P, Deep Offshore R&D Division





PAU, FRANCE • 5-7 APRIL 2016

K5-F Development











K5F All Electric Xtree





K5-F Status Overview

- Development launched in 2005
- AET manufacture and test completed 2008
- Phase 1 deployed in May 2008
 - Hydraulic SCSSV
 - Actuator reliability 100% to date
 - Power distribution/Hydraulic system failures experienced
- Phase 2 development launched in Nov. 2013
 - Business driven decision to include electrical SCSSV to address hydraulic leak issues July 2014
 - Qualified improved system design 2015
 - Completed manufacture and test Jan 2016
 - Deployment due May 2016







Electrical failures
Hydraulic failures
Operational Issues
K6 shutdown
K6N shutdown
Unclassified







MCE Deepwater Development 2016

Halliburton electrical SCSSV (eDHSV)



Based on DepthstarTM technology

- Field proven (in operation since 2006) no operational issues
- Magnetically coupled SCSSV tubing integrity maintained
- 100 % MTM no moving seals within the tubing wellbore
- eDHSV Fully Qualified to ISO/API and extended HALT/ALT testing

Features

- Dual electric linear actuators
- Electronics isolated from well fluids and pressure
- Position sensor real time status
- Full redundancy in actuation and controls





Incorporating the eSCSSV into K5F-3

- Hydraulic SCSSV included as backup (project acceptance)
- 2 retrievable A&B channel control units fitted to Xtree
 - Industry standard interface to SCM (low power IWIS)
 - Contains interface cards, PSU and ESD power storage
- 2 additional electrical feedthroughs/cables included
 - Standard downhole gauge components
- Completion design modified to accept electrical SCSSV
- Project specific lock-out tool developed







AE System – Key Benefits

HSE

- Removal of hydraulic fluid
 - Supply, transportation, storage
 - Spillage, contamination
- Removal of high pressure storage

CAPEX

- Removal of topside hydraulic infrastructure
- Removal of hydraulic lines in umbilicals (>> long stepouts)
- Removal of subsea hydraulic distribution system
- Removal of hydraulic tubing on Xtree's and Manifolds (<-20%) (cutting, bending, welding, fitting, flushing, testing etc)

Functionality

- Control, Speed, Feedback, Condition Monitoring, Self Test
- Hybrid options eDHSV and/or eChoke on conventional EH systems
- Ultra deep water, ultra long offset, subsea processing

Reliability

- Technology transfer quantifiable MTBF figures, 15 years subsea
- Built-in redundancy all the way to the valve



Case Study – AE/EH long offset Umbilicals

6 well template, 10 valves/well30 years operation, 3 act/valve/year

Umbilical - 4 x ¾" lines, 2 x FO tubes, 2 x quads/triads

Hydraulic fluid and electrical power consumption (100Mw GTG)



50%-65% cost saving for AE







Conclusion - Long Offset concept (OIL)





Conclusion - Long Offset concept (Gas)



