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Deepwater Subsea Tie-In Between Chevron Blind Faith and Williams Devils Tower Export Pipelines

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Abstract

This presentation will concentrate on the design challenges, experience and learning from the SIT and offshore installation of two deepwater pipeline tie-ins using first-of-its-kind subsea technology and installation methodologies on the "Blind Faith" project. The Blind Faith Subsea Tie-Ins join the Blind Faith oil and gas pipelines with the Canyon Chief gas pipeline and the Mountaineer oil pipeline in 5100 feet of water. Both of the Blind Faith oil and gas pipelines are terminated with conventional PLEMs providing a horizontal connector for the tie-in and a vertical connector for a future tie-in connection point. The connectors are ROV operable / installable clamp style connectors.

The method of joining to the DT oil and gas export pipelines and the type of jumper employed are unique to the tie-in. An ROV operable / installable mechanical pipe end connector connects the bare ends of the Canyon Chief and Mountaineer pipelines. The mechanical pipe end connector is fitted with an integral clamp connector hub and rests on an ROV installed mud mat. After installation of the mechanical connector, metrology was performed to create a neutral state horizontal jumper for joining the mechanical connector hub and the Blind Faith PLEM.

The neutral state horizontal jumper is a compliant "Z-Bend" design. During installation the jumper was elastically pre-deformed using a bowstring system. Pre-deformation of the jumper provided installation clearances and facilitated the neutral stress state after installation. Once landed the jumper bowstring was relaxed, allowing the jumper to expand to fit between the hubs. After expansion and make-up, the clamp connectors were tightened via an ROV operated hydraulic torque wrench. A seal test verified the integrity of the connections. After installation the jumper remains in a minimal residual stress state atypical of most horizontal jumpers.

The horizontal jumper was chosen over the vertical jumper because it provides a more compact and lighter weight connection system. This also allows a wider choice of installation vessels. In addition the horizontal "Z–Bend" provides the greatest amount of compliancy for the neutral state jumper. Lastly, the successful installation (and deployment) of the jumpers (and tooling packages) proved out the desired goals of installation by any medium size MSV vessel retrofitted with any work class ROV system.

Nomenclature

API – American Petroleum Institute
A&R – Abandonment and Recovery Head
BF – Blind Faith Semi-Submersible Floater
DSAW – Double Submerged Arc Welding
DP – Dynamic Positioning
DT – Devils Tower Spar
FAT – Factory Acceptance Test
FBE – Fusion Bonded Epoxy
FSW – Feet of Sea Level
GoM – Gulf of Mexico
GRC – Oceaneering's Grayloc Remote Connector
HCB – Heave Compensated Buoy
HSF – Oceaneering's Hydraulic Smart Flange
MAB – Misalignment Ball Joint
MC – Mississippi Canyon Block
OD – Outside Diameter, inches
OSV – Offshore Service Vessel
PLEM – Pipeline End Manifold
PLET – Pipeline End Termination
PLES – Pipeline End Sled
PLF – Pipe Lift Frame
ROV – Remotely Operated Vehicle
SCR – Steel Catenary Riser
SIT – System Integration Testing
WT – Wall Thickness, inches