Seam welded super duplex tubes for Glenlivet umbilical

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EDRADOUR GLENLIVET PROJECT

- Edradour and Glenlivet are gas condensate fields located approximately 100km North West of the Shetland Islands, in water depths ranging from 300m to 430m
- Subsea development, tied back to existing Laggan-Tormore system and installation of a Condensate Mercury Removal Unit at Shetland Gas Plant
- Two 12" production flowlines of 17km and 35km, with design capacity up to 200MMscfd with associated condensate
- Edradour and Glenlivet are planned to come on-stream in 2017 and 2018 respectively







EDRADOUR GLENLIVET PROJECT OVERVIEW



- Edradour umbilical: 38km long umbilical with seamless tubes
- <u>Glenlivet umbilical</u>: 19km long umbilical with seam welded tubes

EDRADOUR GLENLIVET UMBILICALS OVERVIEW





Components

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- 2 x ³/₄" HP super duplex tubes 10,000 PSI
- 2 x ¾" LP super duplex tubes 10,000 PSI
- 2 x ³/₄" chemical super duplex tube 10,000 PSI
- 1 x ¾" spare super duplex tube 10,000 PSI
- 3 x 16 mm² power quad electrical cable
- 3 x single mode fibre optical cable

Edradour umbilical Seamless super duplex tubes

Glenlivet umbilical **Seam welded** super duplex tubes

BACKGROUND FOR USE OF SEAMWELDED TUBES ON GLENLIVET UMBILICAL

- Process developed by Vallourec Umbilicals with laser welding technology for longitudinal welding
 - Enhance increased competition on umbilical tubes market
 - Higher mechanical properties than seamless tubes
 - Tight tube dimension tolerances (ID and WT)
- Extensive qualification program carried out since 2012 with active participation on development and qualification from Total E&P Technology Dpt
 - Qualification of raw material
 - Qualification of manufacturing process
 - Homologation by Bureau Veritas
- Technology deemed mature enough for application on project, starting with a static umbilical application



VALLOUREC UMBILICALS PROCESS DESCRIPTION





(1) Only for segments with defect indications



MANUFACTURING IN VALLOUREC UMBILICALS FOR GLENLIVET UMBILICAL



Forming



Laser welding



Laser welding



Sizing



Orbital welding



MANUFACTURING IN VALLOUREC UMBILICALS FOR GLENLIVET UMBILICAL



Glenlivet seam welded tubes delivery

- Contract awarded by umbilical manufacturer to Vallourec Umbilicals in August 2014
- Glenlivet tube details: 19.05mm nominal diameter, 1.82mm nominal WT
- Approx. 140km of tubes manufactured
- Manufacturing from December 2014 to June 2015 at Venarey Les Laumes plant



MANUFACTURING IN VALLOUREC UMBILICALS – LESSONS LEARNT

- As expected, technical difficulties faced during start-up of the manufacturing of the seam welded tubes
- Technical challenges
 - Ferrite content in weld metal
 - Precise forming required on plate for acceptable welding
 - Sensitivity of AUT system
 - Failure of one strip-to-strip splice process weld
 - Internal surface imperfections due to bead rolling
- Great support from Vallourec group to overcome challenges and ensure delivery of Glenlivet tubes within required schedule



MANUFACTURING OF GLENLIVET UMBILICAL AT UMBILICAL MANUFACTURER



Pictures from Glenlivet umbilical manufacturing using seam welded tubes



UMBILICAL SEAM WELDED TUBE IN THE FUTURE

- Take advantage of lessons learnt from Glenlivet umbilical manufacturing
- Technology well suited for coming ultra deep water challenges and for increased subsea tie-back length
 - Increased mechanical properties
 - Reduced tube wall thickness ⇒ reduced weight of umbilical
- Extension of the qualification domain to dynamic applications (dynamic umbilicals) with focus on fatigue performance of seam welded tubes
- Extension of the qualification domain to larger tube diameters



SUMMARY AND CONCLUSIONS

- Innovative technology proposing a new seam welded umbilical tubes product that offers :
 - a significant reduction of weight
 - combined with an increased strength
- Successful application on Glenlivet project, confirming great ability from Oil & Gas Industry to turn R&D concepts into reality
- Glenlivet umbilical manufacturing still ongoing at umbilical manufacturer
- Good example of achievement possible thanks to collaboration between all players of supply chain (suppliers, umbilical manufacturer, SURF contractors, Company)
- Technology well suited to coming challenges in offshore industry
- Special thanks to Technip Norway, Technip Umbilicals , Vallourec Umbilicals and to our partners DONG Energy and SSE for all their contribution on this success story

