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PRESS RELEASE

# SUBSEA 7 PRESENTS PAPERS ON PIPE-IN-PIPE AT OTC 2013

Subsea 7, a global leader in seabed-to-surface engineering, construction and services to the offshore energy industry, will deliver two papers on Pipe-in-Pipe (PiP) in the Offshore Pipeline Session at this year's OTC on 8 May, in Houston, USA.

Subsea 7 with Applus RTD will present a paper on the 'Control of the integrity of swaged weld on insulated Pipe-in-Pipe'. This paper presents an Automated Ultrasonic Testing (AUT) system recently developed to inspect swaged weld more efficiently. The authors describe the principle of this system and its DNV qualified performance in term of defect detection capability and sizing accuracy.

In a recent West African SURF deepwater project, this AUT system coupled with fitness-for-purpose acceptance criteria was successfully applied.

The second paper is by Subsea 7 and ITP InTerPip on 'Pipe-in-Pipe swaged field Joint for reel-lay.' The paper describes the development of highly efficient PiP technology to be installed by reel-lay using swaged field joints.

This paper details the test programme which includes test sample fabrication, Non Destructive Examination, pre-test FE based feasibility and post test FE based validation analysis against measured strain gauge results from testing.

ENDS

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PRESS RELEASE

**OTC 23973**
**Control of the Integrity of Swaged Weld on Insulated Pipe-in-Pipe**
Jue WANG, Cesar ATIN, Jean Luc LEGRAS, Subsea 7; Xavier DELEYE, Ajit MALLIK, ApplusRTD

Abstract
In typical insulated Pipe-in-pipe (PIP) systems, both extremities of the outer jacket pipe are swaged down close to the inner pipe and are welded directly to the outer surface of the inner pipe. This full penetration weld (hereafter called swaged weld) works as a structure connection between the inner and outer pipes and seals the annulus between the two pipes. The integrity of this swaged weld ensures the structure integrity of whole PIP as well as its thermal properties.

The non standard geometry of this swaged weld presents a real challenge for its Non Destructive Examination (NDE). Despite of its long existence and its importance, the inspection of this swaged weld has always been performed by Manual Ultrasonic Testing (MUT) or Semi Automated Ultrasonic Testing.

This paper presents an Automated Ultrasonic Testing (AUT) system recently developed to inspect this type of weld more efficiently and more completely. The principle of this system and its Det Norske Veritas (DNV) qualified performance in term of defect detection capability and sizing accuracy will be described.

To enhance the integrity of the inspected welds, fitness-for-purpose acceptance criteria have to be developed for this AUT system. Due to the range in weld geometry, the analytic approach conventionally employed for girth welds is no longer applicable. A Finite Element Analysis (FEA) based on Engineering Critical Assessment (ECA) approach has to be applied and this approach will be presented.

In a recent West African SURF deepwater project, this AUT system coupled with fitness-for-purpose acceptance criteria has been applied with success.

**OTC 24077**
**Pipe-in-Pipe Swaged Field Joint for Reel Lay**
Venu Rao, John Mair, Dr T Sriskandarajah, Richard Jones, Paul Booth, Subsea 7
Christian Geertsen, ITP InTerPipe SA

Abstract
Subsea 7 and ITP InTerPipe (ITP) have developed a highly efficient Pipe in Pipe technology to be installed by the reel-lay method. This solution is based upon the ITP technology where insulation material is assembled within the Pipe in Pipe annulus and the annulus pressure drawn down to create the overall enhanced thermal performance.

To adapt this technology to reel-lay, the solution has adopted Swaged Field Joints, similar to those of ITP used for J-lay and S-lay applications, to provide sealing barriers between each stalk length (typically 1km in length) prior to reeling onto

the vessel, but with flush welded half shells to avoid diameter changes.

The outer pipe is typically swaged down close to the inner pipe and welded directly to outer surface of inner pipe between stalks. This full penetration weld (hereafter called swaged weld) works as a structural connection between the inner and outer pipes and seals the annulus between the two pipes for pressure reduction within the annulus. The integrity of this swaged weld and the half shells ensure the structural integrity during reeling and straightening of PiP system as well as its thermal properties.

In order to take advantage of speed and reliability of reel-lay of pipe-in-pipe, the Swaged Field Joint utilising two half shells flush with the outer pipe was studied for reelability using an FE based approach. A qualification plan for testing the design was developed and qualified in compliance with DNV-RP-A203 [2].

This paper details the test programme which includes test sample fabrication, Non Destructive Examination (NDE), pre-test FE based feasibility and post test FE based validation analysis against measured strain gauge results from testing.

The work was performed in compliance with DNV recommended practice for new technology qualification DNV-RP-A203.

The comprehensive test programme led to the award of DNV “Fit for Service” qualification for a reelable Swaged Field Joint for Pipe-in-Pipe.

The paper also provides a brief discussion on multiple uses of this Swaged connection as a partial pressure seal, water stop, and integral buckle arrestor for deep water applications.

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Notes to editors:

1. Subsea 7 will have a major presence at this year’s event. As well as presenting conference papers, it will be exhibiting at stand 1641. On display will be examples of the Company’s deepwater and ultra-deepwater technical expertise and its investment in its fleet.
2. Subsea 7 is a seabed-to-surface engineering, construction and services contractor to the offshore energy industry worldwide. We provide integrated services, and we plan, design and deliver complex projects in harsh and challenging environments.
3. For further information visit www.subsea7.com