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Installation Challenges / SCR / In-line Tees

Frank Kluwen, Allseas USA Inc., and Patrick Rijnveld, Allseas Engineering bv.

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Abstract

As the advance of oil and gas production into deeper water continues, S-Lay has repeatedly proven to be suitable as installation method for pipeline installation in ultra-deep water.

In 2006 Solitaire has set another milestone in deep water S-Lay, installing the deepest export pipeline to date: the 24" Independence Trail gas export pipeline for Enterprise Field Services in a water depth of 2420 m (7940 ft) in the Gulf of Mexico.

Particular challenges encountered during project preparation and execution were: installation in water depths ranging from 35 m to 2420 m with lay tensions up to 600 mT, in-line double Tee installation in 1987 m water depth, and flex joint installation in 2420 m water depth.

Introduction

Success of deep water S-lay in the Gulf of Mexico was established approximately 10 years ago with the dynamic positioned pipelay vessel Lorelay, successfully installing the 12-inch and 6-inch Mensa flowline and infield lines in water depths ranging from 112 meters to 1653 meters.

Since then, subsequent water depth milestones were achieved on the Horn Mountain, King and Nakika field developments in water depths of 1663, 1676, 1920 meters respectively, challenging the envelope of the technical and operational limits of the existing equipment.

Never before, however, had an offshore field been developed in a water depth exceeding the capabilities of the available equipment. That is, until Enterprise Field Services in a partnership with Anadarko, KerrMcGee, Dominion, Devon and Norsk Hydro decided to develop the Mississippi Canyon area. The conceptual development comprised a central hub, a complex infrastructure of infield flowlines and umbilicals, and one 217 km (135 miles) long 24-inch gas export pipeline, the "Independence Trail".

The now called Independence Hub is a deep-draught semi-submersible platform located in Mississippi Canyon block 920 in 2410 m of water depth, Gulf of Mexico. Several gas resources in the vicinity of the hub are being developed, and will tie back to the Independence Hub. Hence, the Independence Hub is host to the Merganser, Vortex, Jubilee, Atlas, Spiderman, San Jacinto and Q flow lines. On Independence Hub, the gas is processed and compressed for export through the 24" Independence Trail export pipeline. Starting with a 20" steel catenary riser (SCR) from the Independence Hub in 2420 m water depth, the Independence Trail export pipeline transports the gas to the West Delta 68 Platform in 35 m water depth, over a distance of 217 km. At KP 40, in 1987 m water depth and KP 85 in 1372 m water depth, in-line double Tees are installed.

Table 1 shows the main important pipe properties of the Independence Trail gas Export pipeline.

Table 1 Pipe Properties of the Independence Trail Gas Export Pipeline

		Export Line	SCR
Outer Diameter	[mm] (Inch)	610 (24)	508 (20)
Wall Thickness	[mm]	34.29 (1.35)	30.73 (1.21)
	(Inch)	30.99 (1.22)	
		27.18 (1.07) 24.13 (0.95)	
Steel Grade	[-]	API-5L-X65	API-5L-X65

Allseas was contracted to install the Independence Trail export pipeline with the dynamically positioned S-Lay pipelay vessel Solitaire. The very deep water in which a large part of the pipeline is installed, created some specific challenges during project preparation and execution.