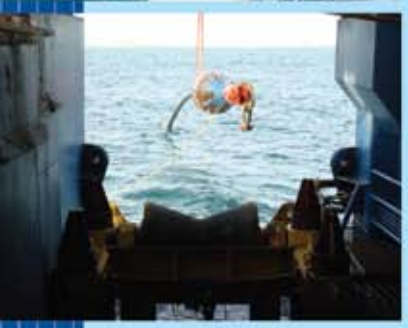
TWO PIPELINE SHORE APPROACHES FOR BERRI AND QATIF OFFSHORE PIPELINES

ABU ALI ISLAND AND QATIF
SAUDI ARABIA

Client:
Saudi Aramco

nvscvc
DrillTec
GROSSBOHR- UND UMWELTTECHNIK

MAC Construction
Concrete Repair Division



In 2008/2009 MAC was entrusted by Saudi Aramco and Global Industries with the construction of two pipeline shore approaches as part of the Berri and Qatif Offshore Pipelines Project in cooperation with NSCC-DRILLTEC JV, a specialized drilling contractor from the United Arab Emirates. The shore crossings were realized using the technology of Horizontal Directional Drilling (HDD) being the first application of its kind in the Kingdom and a state-of-the-art challenge for Saudi Aramco's pipeline landfall installation.

Basic Concept

To minimize the volume of preparatory works and marine operations, the product pipe strings were pulled into the HDD boreholes from a HDD rig located onshore.

The process of Horizontal Directional Drilling was executed in 3 main steps to generate a borehole sufficient in size, alignment and stability for installation of the product pipe section in accordance with the available information.

In the case of the Qatif landfall, the product pipe string was manufactured offshore on the Main Contractor's lay barge parallel to the HDD operations. It was then lowered down on the seabed where it remained until commencement of pull-in operations.

After that, the following procedure was implemented:

- **The borehole was created and its suitability for installation of the prepared product pipe section was determined, confirmed and accepted by the Main Contractor and the Client**
- **The product pipe section was pulled into the borehole from offshore towards the onshore entry point by the HDD drilling rig**

The principle of Horizontal Directional Drilling

STEP 1 : Directional drilling of a pilot hole

STEP 2 : Enlargement of the pilot hole to the required final diameter (reaming)

STEP 3 : Cleaning of the borehole prior to pipe installation

- The pull-in process was completed once the HDD pull head reached the rig site and the front end of the product pipe section was clear of the boreholes onshore.

As an alternative to the conventional open trench method, the HDD technology involves the creation of a borehole running from the onshore entry point at a depth of approximately 15-20 meter below the sea bed towards a pre-defined exit point offshore in which the pipeline section is being installed by pulling it into the formation after a borehole of sufficient size and condition has been created. The advantage of this method is not only limited to the improved mechanical protection of the pipeline against exposure/wash-out within the shore zone and shallow water area but it also represents a significant reduction of the environmental impact which nowadays is more and more into focus, especially where sensitive marine life is concerned.

Scope of work

The works contracted by Saudi Aramco/ Global to MAC/NSCC-DRILLTEC included the installation of a 1,500 meter long section of a 30” steel pipe being part of the Berri Flank-1 Water Injection System and a 2,100 meter long section of a 16” crude oil pipeline at Qatif/ Juaymah. In both cases the pipeline sections were installed in one piece using a 4,000 kN capacity drilling rig. Both lines were installed using different methods whereby the 16” line for Qatif was pre-laid on the sea bed simultaneously with the ongoing HDD works and was finally pulled into the borehole off the sea floor, while the 30” line at Berri/Abu Ali Island was pulled into the borehole in single-joint modus being under fabrication onboard a pipe lay barge.

Despite some challenging geological obstructions and severe conditions on the offshore side, the joint effort of MAC’s construction management team with NSCC-DRILLTEC’s team of international drilling experts ensured that all operations could be achieved within the scheduled period and with minimal impact on the marine environment thus making this pilot project an opening for further deployment of this advanced technology in the Kingdom.