Tunu9, located in the swamps and shallow waters of the outer margin of the Mahakam Delta, is a gas and condensate field located east of Kalimantan in Indonesia. The purpose of the Tunu Field Development - Phase 9 is to enable TOTAL E&P Indonesia to meet its production requirement with the construction of trunklines connecting new Gathering Testing Satellite Stations (GTS) to the existing pipeline network. The gas is further exported to one of the largest LNG terminals of the world in Bontang.
TOTAL E&P Indonesia and PT Punj Lloyd Indonesia have worked together extensively over 8 years for the development of Tunu and Peciko oil fields. TOTAL E&P Indonesia awarded the EPC contract for Tunu Field Development – Phase 9 to PT Punj Lloyd Indonesia based on past performance, availability of marine equipment and an enviable safety record.

To execute this project successfully, Punj Lloyd deployed its entire fleet of marine equipment comprising 'purpose built' barges, amphibian equipment, shallow dredgers and tugs with a draft as low as 1 m.

At each stage emphasis was laid on QHSE and at an audit conducted by TOTAL E&P Indonesia for the high risk category, PT Punj Lloyd Indonesia achieved 85.7 per cent, the highest score of any contractor in Indonesia.

Challenges

Pipe Pull Operations from GTS 'Y' to Shore Line

2,000 m (20" dia) pipeline had to be laid from the shoreline (KP 2000) to offshore GTS platform (KP 0). The pipe string was fabricated in the inshore trench in two sections of 1,300 m and 900 m each. Two sections were required due to insufficient length inshore.

The offshore sea has rough weather with currents exceeding 8.5 knots and 16" dia lateral guide piles were driven at a distance of 50 m along the entire length in two rows separated by 3 m. This was to arrest the excessive movement of the pipe string during high tides and against heavy currents. Custom built poly buoys were attached to the pipe string to make the
string buoyant during the pulling operation.

A barge ‘Jovial Mariner’ 120 ft in length with a four point mooring system was positioned to pull the string. The barge is equipped by dual RTK, GPS and barge management systems for accurate positioning. Mounted with a 7 T winch having a 22 mm wire rope of 1,500 m length, it is also equipped with a 75 T crane.

The entire area is in shallow waters with clusters of sand dunes, which were visible during spring tide. The Mahakam Delta is infamous for excessive surface currents in shallow seas. Salt-water crocodiles, snakes and other reptiles inhabit the inner delta. The extremely shallow pockets are mainly sand dunes, with unstable elevation, which get displaced over time making our job tougher. The presence of sand dunes necessitated pre-trenching prior to any pulling operations. A cutter suction dredger was deployed to carry out the pre-trenching operations.

The Q&HSE team conducted a detailed hazard identification and risk assessment before commencing the work. Brainstorming sessions were conducted to mitigate the residual risk.

Laying of wire rope

The wire rope was laid with a special push-boat of less than 3 m width, which enabled its movement between the two lateral guide piles.

Pulling Operation

Pipe Pull Operations from GTS ‘Y’ To Shore Line

The pulling operation commenced and the first string of 900 m length was successfully pulled offshore. The tie-in of the two strings was carried out in the inshore swamp trench. The pipe pull head was at KP 1350, which means 750 m of pipe section was pulled offshore. Four flexi-yoke barges 32 T SWL were deployed along with two swamp excavators to carry out this specialised tie-in inshore.

This inshore activity is also tide dependent and the movement of flexi-yoke barges is possible only during the high-tide. Tie-in and other associated activities i.e. radiography and field joint coating are performed during suitable tides.

The pulling operation resumed after the successful completion of the tie-in and acceptance of radiography of the joint. The barge was re-positioned meanwhile near GTS ‘Y’ (KP 0) platform and the wire rope was laid again to reach KP 1350. The string was regularly monitored for buoyancy so that the load on the winch did not increase its SWL. Expertise of underwater divers was used to check the position of the pull head with regard to the desired pipe centerline.

Riser and Dog-Leg Installation

PT Punj Lloyd Indonesia had acquired a new work barge for the installation of ‘Riser and Dog-leg’ in-house. Five platforms of Riser and Dog-leg were to be installed with pipes of 8” and 2” piggy back line and 20”. The 230 ft barge with a deck loading capacity of 10 T/m² was fitted with four davits each for SWL of 35 T and is supported on a four point mooring system. The winches have a 35 T with a drum capacity of 900 m. Two cranes of 150 T and 50 T were mounted on
this barge in order to carry out the installation of riser and dog-leg assemblies.

The installation involved hook-up to previously laid trunk lines on the platform and are held in position vertically by special riser clamps. The offshore pipelines are laid with an accuracy of ± 5 m while the platform position is fixed. A comprehensive metrology is performed by divers to finalise the length of the dog-leg based on the actual position of the laid pipeline. On completion of metrology the dog-leg spool is fabricated on the barge itself. The final tie-in is done in 2 G position at the location above the riser clamp. Pipe laying on an existing pipe rack is a critical activity as it is parallel to the pipeline and is within a congested area.

Offshore Shallow Water Push Pull Operations

For shallow water pipe laying, PT Punj Lloyd Indonesia developed a technique to be used at points where the seabed is shallow and conventional pipe laying is not possible, with minimum levels of + 1.5 CD. Lateral guide piles of 16” dia were driven at 30 m intervals spaced at 5 m to arrest the excessive movement of the buoyant pipe string. The pipe string was laid from a specially built shallow water pipelay barge, named ‘Yuheti 180’.

After the successful push-pull operation, the pipe string is lowered and the section jetted down to achieve the required cover.

Horizontal Directional Drilling

Another milestone successfully met was the laying of a 2,000 m stretch of pipeline by Horizontal Directional Drilling method. The pipe string has to be prepared and wet stored in the open sea with currents of 3 knots.

Quality, Health, Safety and Environment

PT Punj Lloyd Indonesia has been accredited ISO 14001:1996 and OHSAS 18001:1999. The safety record of 2.35 million safe man-hours achieved on this project in 2004, is the highest among the contractors working for TOTAL in Indonesia.

With the successful completion of Tunu Phase 9 PT Punj Lloyd Indonesia has demonstrated the synergy between man and machine and their vision of a safe working environment.