World First Pressurised Subsea Pipeline Repair
Facilitated By A Combination Of
Non-Piggable And Piggable Isolation Tools
Yacheng Pipeline Repair Case Study

In October 2013 an anchor strike damaged a 780km 28” gas pipeline from Yacheng Platform to Hong Kong. Damage occurred in a water depth of 90m at the future midline gas compression PLEMS.

This year (2016) COOEC Subsea, on behalf of CNOOC, performed a subsea repair on the Yacheng pipeline, located in the South China Sea.

Damage and Initial Temporary Repair Actions

- North PLEM overturned and offset by 3m.
- 28” Pipeline tie-in section at North PLEM severely buckled ~ secured and supported the damaged pipe section.
- 14” bypass (400m) installed between South PLEM and North PLEM ~ 28” valves closed.
- Two leaks from valves in the North PLEM sealed.
Permanent Repair

- Removal of existing PLEMs, the 400m pipeline section between them and the severely buckled pipeline section.
- Recovery of both pipeline ends onto a pipe-lay vessel.
- Installation of new pipeline sections and tie-in flanges onto existing pipeline and re-laid onto seabed.
- Installation of two new PLEMs, 25m apart as opposed to original 400m.
- Tie-in of both ends of the pipeline to the new PLEMs.
- Tie-in spool connected between the PLEMs.

During permanent repair;
- 28” Pipeline remained pressurised (780km at 50bar / 725psi).
- No residual seawater was allowed to remain in the system.
MSV HYSY 286

HYSY 286 MSV (DP3)

- Overall length: 140.75m
- Breadth molded: 22m
- Draft (max): 6.6m
- Deck: 1900m², 10T/m²
Hot Tap Fitting Deployed and Fitted to Pipeline

Handling frame with hot tap fitting and hot tap machine being deployed

North PLEM showing damaged pipe section preventing deployment of piggable isolation tool

Hot tap fitting and hot tap machine installed
Intervention and Isolation

- **Hot Tap Intervention**
- **BISEP Isolation**
- **BISEP Deployment**

The Coupon

Hot Tap Intervention
Subsea Launcher Installed - Once Safe Access Provided by BISEP

- BISEP provides safe DBB access into pressurised pipeline
- ROV handling launcher subsea

Subsea launcher over boarding

Temporary subsea launcher connected to pipe end (c/w two Tecno Plugs)
Pigging the Tecno Plugs into the Pipeline with Nitrogen

Pigging bar insertion plug installed into hot tap penetration

1st Tecno Plug pigged 700m with Nitrogen against pipeline pressure 50bar
2nd Tecno Plug pigged 10m passed hot tap fitting to lock in 30bar Nitrogen
Tecno Plugs Pigged, Set and Proved

Flangeless Subsea Launcher recovery

Hot tap fitting removed
Pipeline Isolated with Tecno Plugs – 4 Plugs Simultaneously

- 1st Plugs isolating 50bar pipeline gas (700m from pipeline ends)
- 2nd Plugs locking in 30 bar nitrogen to aid pipeline recovery to surface

Both sides of the pressurised pipeline isolated – 4 Tecno Plugs simultaneously
Pressurised Pipeline Recovery: PRT Recovering Pipeline Ends onto Pipelay Vessel
Pipeline Lay Down & Plug Repositioning

Pipeline with 400m new section laid back onto seabed with new tie-in connection.

To prevent flooding new section during pipeline tie-in 2nd Plug was unset and repositioned, using locked in 30bar Nitrogen.
New PLEMs Installed

Tecno Plugs unset and recovered into temporary subsea receiver
New PLEMs (25m apart) Connected Together with Closure Spool
Schedule

Receive Tender (End of July) → Contract Award (End of August) → FAT (Late Dec / Early Jan 2016) → Freight, Mobilisation (Mid January 2016) → In Country SIT (early Feb 2016) → Offshore Workscope (mid March / mid May 2016)

LOI for Long Leads

2 weeks for Customs (Client Responsibility)

COOEC & CNOOC witnessed

22 – 24 weeks (to Mobilise)

Non negotiable, 8 week execution schedule
View the Animation

Subsea Pipeline Isolation & Repair

Click here to view on YouTube
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