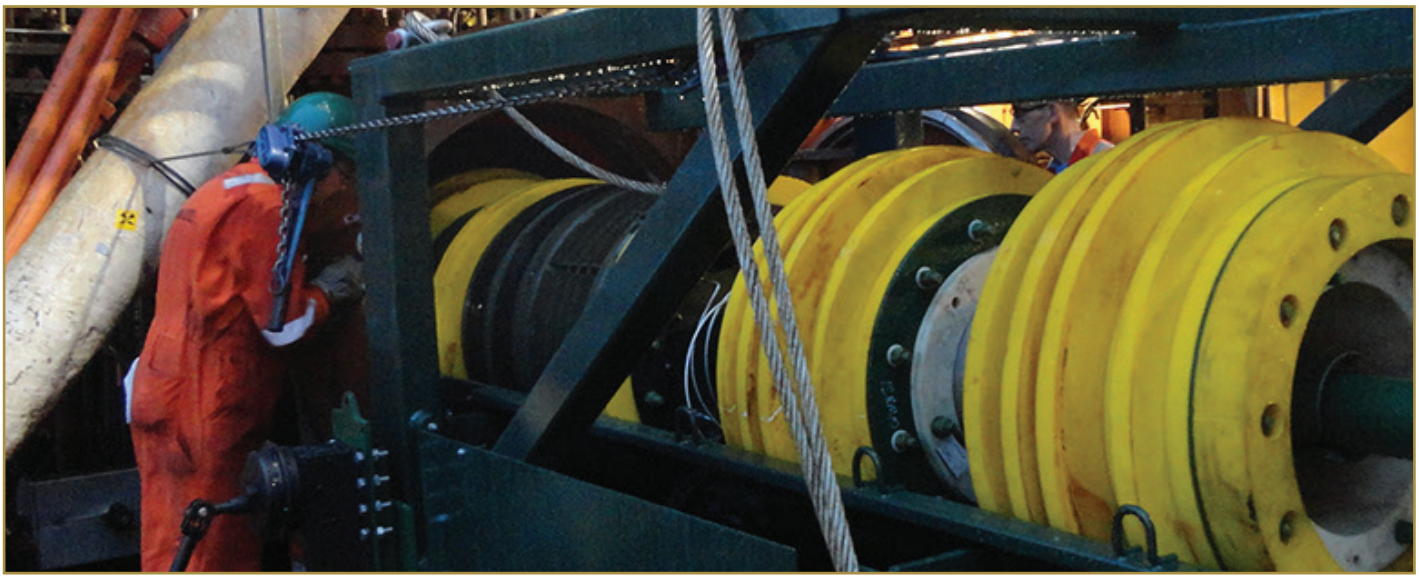
STATS GROUP
Managing Pressure, Minimising Risk

36” Remote Tecno Plug™ | Forties Pipeline System, North Sea, UK

STATS Group were contracted by Apache North Sea Ltd to safely isolate the Forties Pipeline System (FPS) so that subsea isolation valves (SSIV) and piping spools could be safely installed and leak tested, avoiding the need to depressurise the entire pipeline system. The 36” main crude oil line is a pre-eminent pipeline network in the North Sea carrying 40% of the UK’s oil, with over 50 offshore assets flowing into the Forties Pipeline System. The pipeline runs 169 km from the Forties Charlie platform to the terminal at Cruden Bay, transporting approximately 700,000 barrels of oil per day.

To facilitate the double block isolation and enable a reinstatement leak test in accordance with PD8010 pipeline design code, STATS provided two remotely controlled Tecno Plugs™. The first Tecno Plug™ provided proven double block isolation from pipeline pressure. The second Tecno Plug™ provided a local leak test boundary. Using two plugs in this manner maintains a safe isolation and provides a leak test boundary which prevents pressurising the entire pipeline up to leak test pressure.



36” Remote Tecno Plug™ being deployed into pipeline launcher

STATS Tecno Plugs™ provide a fail-safe and fully tested double block isolation against pipeline pressure and contents, ensuring a safe and reliable barrier prior to breaking containment and the subsequent installation of the SSIV’s and pipe spools.

STATS began the project by conducting a detailed engineering and piggability assessment to confirm the fitness for purpose of the Tecno Plug™ and identify a suitable set location for the isolation plugs. An expert isolation committee from a subsea engineering and construction company assessed the suitability of the high pressure remote isolation plug as a double block barrier for diver breaking containment activities. The critical operational areas of concern were analysed and the Tecno Plug™ was deemed to provide an acceptable, proven isolation barrier for the required work scope.

In order to verify functionality for the offshore operations, all equipment was subject to a client witnessed Factory Acceptance Testing programme in a purpose-built test fixture with client supplied pipework at STATS Group headquarters in Kintore. This was then followed by a Site Integration Test and pigging trials conducted at Invergordon, utilising the SSIV and subsea spool before they were shipped offshore.

Once all equipment and personnel were located on-board the Forties Charlie platform and diver support vessels, the remotely operated Tecno Plugs™ were deployed and pigged in a train with two bi-directional batching pigs positioned ahead of the plugs. The complete plug train was pigged to the set location using inhibited seawater to ensure the section of pipeline being removed was fully de-oiled, prior to breaking of containment preventing any oil release into the environment.

The Tecno Plugs™ were supplied complete with monitoring equipment for precise positioning and accurate tracking by means of an assured subsea extremely low frequency (ELF) control system. The remotely operated control system sets the locks and seals on the plugs and provides continuous monitoring throughout the isolation. Additionally the bi-directional pigs were fitted with magnets to enable detection by Magsig detectors and an EM transmitter to aid detection during pigging operations.

Due to the criticality of the work scope and substantial consequences of any delay, two contingency methods of communicating with the Tecno Plugs™ were also available. Communication with the Tecno Plugs was achieved via the SSIV control system umbilical, however additional methods included a through water acoustic link and a direct hard wire link from the DSV, however these were not required. All the communication systems were commissioned and proven to be fully functional before the Tecno Plugs™ were launched.

Once the isolation Tecno Plug™ was accurately positioned at the designated location, the Tecno Plug™ was hydraulically set to activate the locks and dual seals. At this point, the second Tecno Plug™ was at location but was not be hydraulically set until the construction scope was completed.

The dual seals of the Tecno Plug™ were then independently tested with full pipeline pressure to confirm leak-tight isolation and allow the pipeline to be bled down to subsea ambient from the platform launcher to the rear of the Tecno Plug™. The annulus between the Tecno Plug™ seals is then vented to ambient to create a zero-energy zone. This was then subject to an eight hour isolation stability hold period before an 'Isolation Certificate' signed by the STATS Isolation Supervisor, client representative, Cruden Bay, and DSV could be issued. The Tecno Plug™ was then confirmed as providing double block isolation of the Forties Pipeline and allowed the subsea construction phase to commence. Two pipeline spool pieces were safely removed to allow the installation of the two metrology spools required to tie-in the pre-installed SSIV arrangement to the pipeline and the Forties Charlie platform.

Subsea isolation valve (SSIV) prior to offshore deployment


36" metrology spools used to tie-in SSIV

With subsea construction completed, the newly made-up flange joints were locally leak-tested at each gasket to provide initial confirmation of the joint integrity. This then allowed the pipeline pressure to be equalised behind the isolating Tecno Plug and the seals and locks were actively unset.

The rear Tecno Plug™ was then remotely operated to hydraulically set the seals and locks; once the barrier was proven, a successful re-instatement leak test of the newly installed SSIV was then conducted by raising the pipeline pressure from the platform launcher to 158 bar against the leak test Tecno Plug™.

Upon completion of the leak testing scope, the leak test Tecno Plug™ was unset and the pipeline pressure equalised. This allowed the plug train to be pigged through the newly installed SSIV back to the launcher on the Forties Charlie platform for recovery.

Pete Duguid, Chief Executive Officer of STATS Group, said: "We were proud to have been selected to undertake this highly critical and high consequence project by Apache. The key to the success of this project was the team effort across all parties involved, which delivered a well-engineered solution which was completed incident-free and three days ahead of schedule."

Mark Richardson Apache North Sea Limited Projects Group Manager, said "STATS Group provided a safe and expedient execution of the pipeline isolation, which formed a major part of the SSIV Project. The isolation of the FPS Pipeline was a complex project, but the hard work and great team effort by all parties involved resulted in a successful outcome. The enthusiastic and dedicated attitude of STATS developed a great working relationship, resulting in a safe and successful outcome."