wel-lok™ STC

Successful Shut Off of Multi-Annuli Gas Migration for Permanent Abandonment in Offshore California

MAJOR OPERATOR | SEPT 2021 | OFFSHORE CALIFORNIA

CHALLENGE

Design a tool that can be deployed through the 9-5/8" casing on drill pipe and set a plug that can successfully shut off gas migration in both C and D annuli for a permanent abandonment out to the 18-5/8".

SOLUTION

Redesign the alloy deployment mechanism. Deploy alloy in from of small beads instead of casting it onto the heater itself where there were diameter restrictions

RESULT

Successfully shut off gas migration in C and D annuli and reduced rig time with millions of dollars saved for the operator.

INTRODUCTION

Our Wel-Lok STC (Seal Through Casing) has been specifically developed to create a permanent barrier for abandonment through multiple casing and in multiple annuli either through perforations or section milled window. The tool offers the flexibility to be deployed both on wireline (rig less) or on drill pipe without the need of any kind of surface pumping equipment. Unlike cement, which requires hundreds of feet, our innovative tool creates a gas-tight seal in just a few feet reducing the need for a long section milled window thereby reducing overall rig time.

ABOUT US

BiSN's Wel-lok technology is a downhole sealing solution that's been carefully developed to provide a faster permanent seal through a thermite-powered heat ignition and the rapid solidification process of eutectic bismuth alloy. Once heated, our alloy liquifies and has a viscosity similar to water. The liquid alloy then filters through porous locations before solidifying to create a gas-tight seal.

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CHALLENGE

The challenge in these wells were that the tools needed to be deployed through the 9-5/8" casing on drill pipe. To make a 5 ft plug in the 18-5/8" annulus a certain volume of BiSN alloy needs to be deployed which traditionally would be deployed by casting it directly on to the outside of the heater itself. The design of the tool is limited by two major factors. Firstly, the restriction in the well (9-5/8" casing) meant the overall diameter of the tool could not be bigger than 8.00" to successfully drift and make it down to setting depth. Secondly, to make a plug that can seal all the way out to the 18-5/8" casing the alloy needs a certain amount of energy to melt it. Which meant the diameter of the heater could also not be made significantly smaller to accommodate the volume of alloy by casting it on the outside. These meant that the traditional approach of a cast tool was not possible without making the tool extremely long. The project was made even more critical for its high environmental impact due to its location off the coast of California.

SOLUTION

To address these challenges BiSN redesigned the alloy deployment mechanism. Instead of casting the alloy on to the heater itself where the volume was restricted by the diameter of the tool, the alloy was deployed in the form of small beads. The BiSN Bottom Hole Assembly (BHA) which included the bare heater, and the running tool was designed to be deployed on drill pipe with a specially designed ported sub on top. Once the tool was at setting depth, BiSN alloy beads were then introduced into the drill pipe from the surface and exited from the ported sub to settle around the heater inside the section milled 18-5/8" casing. Once all alloy was deployed the heater was then ignited melting all the alloy to make the plug. The heater was then retrieved creating a full cross section gas tight alloy seal for permanent abandonment.

RESULTS

- Successfully shut off gas migration in C and D annuli
- Reduced environmental impact and carbon footprint
- Saved rig time by reducing section mill window length from 120 ft to 20 ft with millions of dollars saved.
- Replaced a 100 ft cement plug with a sustainable 5 ft BiSN plug
- Implemented a sustainable seal not affected by H2S or CO2
- Eliminated surface pumping equipment

BUSINESS VALUE

This successful project gave the customer a more dependable seal while eliminating the need for surface pumping equipment. Permanent abandonment was achieved in minimum time, saving millions of dollars.