

Single Well Acid Stimulation

GOM - Mississippi Canyon Block 899

Project Overview

Stimulate an oil and gas production well with sand control and formation face impairment, in order to enhance production with limited capital investment. The formation consisted of sand with a bullhead pressure at the tree of 11,000 psi absolute.

Issue

Production from the client's well had significantly decreased due to a sand control or formation face impairment. This led to a significant loss in productivity, prompting an acid stimulation solution.

The Oceaneering Plan

Oceaneering proposed a rigless stimulation, using a well stimulation tool to bullhead the planned chemical matrix down the well bore and into the formation. The full acid well stimulation equipment spread was mobilized on the Oceaneering Olympic Intervention IV (OI4) multi-purpose service vessel.

Required equipment included 700 barrels of NH_4Cl and 400 barrels of CaCl_2 , which were stored aboard the OI4 in below-deck tanks.

Above-deck the following tanks were also required in order to store and transport chemicals to the site:

- » Six 5,400 gal acid tanks
- » Three 50 barrel nitrogen tanks
- » Ten 25 barrel solvent/acid tanks
- » One 75 barrel open top tank with gas buster

Oceaneering contracted and managed sub-vendors for all topside and subsea equipment. Acid tanks, solvent tanks, and pumps were free-issued by the customer.



Well Stimulation Layout on the Olympic Intervention IV with dual Millennium® ROVs

Equipment Highlights

- » Bullhead Acid Stimulation Tool
- » Two reelers with one each string of 2 inch Open Water Coiled Tubing Risers
- » Nitrogen pumps and tanks
- » High pressure piping
- » 10K Tree Running Tool w/adapter
- » Solvent and acid tanks
- » Skid based stimulation pumps
- » Neutralization tank with gas buster

DNV Class Approval

A necessary component to start the project included ensuring class requirements were met for the OI4, a DNV (Det Norske Veritas) vessel. Working closely with DNV U.S.A., the project was granted class approval for the fire and safety plan, piping and instrumentation, and chemical carrying / handling. A marine warranty survey was carried out by a DNV GL surveyor post-mobilization.

Result

The well stimulation job was successfully completed in 18 days (mobilization through demobilization), in spite of significant weather issues. The 18 day completion time included two days of on-site prep work and three days of pumping. The full matrix of chemicals was delivered to the well, yielding a 75-90% production rate increase compared to pre-treatment. This single vessel rigless well stimulation solution delivered a ~\$15 million savings compared to a MODU operation.

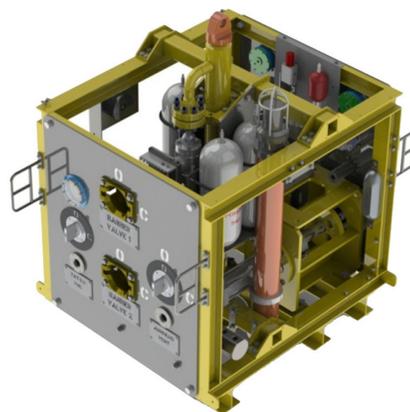
Chemical Volume (Gal)	
N-Ver-Sperse O	2,750
Clayfix	15,250
Diverter	3,300
10% HCl	19,250
9%/1% HCl/HF	11,000
Total Volume	51,550

HSE

The large volume of different acids and solvents posed health and fire hazards to the crew and the vessel. To ensure the health and safety of the offshore workers and the environment, Oceaneering managed a fire, safety, and chemical response plan specific to the hazards on board. This plan included a dedicated fire and spill response crew, along with a range of fire and chemical suppression and monitoring equipment.



Olympic Intervention IV



Bullhead Acid Stimulation System Unit

Job Statistics	
Tree	18 ¾ in FMC Vertical 10K Tree
Tree Interface	FMC 10K Tree Running Tool (TRT)
Water Depth	4,390 FSW
Avg. Pump Rate	~3 bbl/min
Reservoir Depth	18,700' TVD