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Innovative Technique for Flowline Plug Remediation

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Abstract

The paper describes conditions involving the plugged flowline of a >20 mile subsea tieback in the Gulf of Mexico and the innovative techniques and procedures that were utilized in the remediation process. The procedures performed also provided information used for locating and identifying the plug composition. Included is a description of the system and a diagram of the well, wellbore and flowline. The paper explains the innovative technique that was utilized for lowering the flowline pressure on the backside of the plug while minimizing the risk in resolving the plugged flowline.

Alternatives to the innovative procedures are extremely costly, ranging in the Millions of dollars, and can be very time consuming in terms of resolving it by means of using an intervention vessel. The application of the procedure involves utilizing the tubing volume between the process choke valve (PCV) and the surface controlled subsurface safety valve (SCSSV) as a means to bleed the pressure off of the flowline. Included in the application is a description of the type of chemicals and produced fluids involved, the valve setup and different arrangements used in the well and at the wellhead. Also included are the diameters, lengths, volumes, pressures and temperatures of the system and the components.

The results from the implementation of the procedure include the calculated location and informed assessment of the composition of the flowline plug based off the information gathered from the application. The procedure was performed multiple times with similar results, indicating its repeatability. Results are included from multiple applications of the procedure. The results and observations from the implemented procedure provided the producers with the appropriate information to make an informed decision on a path forward that improved the efficiency of the subsequent remediation procedures. A conclusion of the paper is that the new technique and/or operating procedures for flowline bleed down operations are successful and repeatable for this system and those similar in design.

The implementation of the new innovative procedures can provide a significant cost savings and eliminate the risk to the environment and personnel from interventions.

Introduction

Conditions can occur in flowlines, jumpers, wellheads and even wellbore tubing such that they become plugged. In this instance, the flowline of a >20 mile subsea tieback became plugged after producing for many years without any flowline blockages. The type of plug that can form in a system depends on the composition of the fluids being produced. Typically plugs that form can be composed of either paraffin, hydrates or in some cases a combination of both. Scale and other solids deposition such as sand/sediment and asphaltenes can also cause plugs. The produced fluids in the >20 mile subsea flowline were from a predominately gas producing well that also produced water and some condensate, which required continuous treatment for both wax deposition and hydrate formation. The >20 mile subsea flowline is un-insulated and the conditions were such that the system operated inside the hydrate formation region even during steady state production and thus required treatment for hydrate formation on a continuous basis.

Sometimes plugging can occur rapidly, as in a matter of hours, or can happen gradually over time and take weeks or even months to form. Hydrate plug formation is considered to be extremely risky due to the fact that hydrates can form rapidly and can be very costly and time consuming to remediate. Hydrate plug remediation can also be dangerous to personnel and increase the risk of a release to the environment. The differential pressure across the flowline is continuously monitored and an increase in the differential pressure can indicate that the flowline is becoming plugged. In a system that is continuously