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CLEANING AND INSPECTION OF A 30-INCH CAVERN WELL IN OIL

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Abstract

This paper will discuss the process used to clean and inspect a 30-inch center well on LOOP LLC's ("LOOP") caverns without emptying the cavern. The ultrasonic tool used for inspection requires that the casing be clean of all paraffin to provide accurate results. The tool checks for internal/external corrosion, pipe deformation and girth weld cracking. The final cleaning process was developed with Halliburton and Bilco Tool Company of Houma, Louisiana, using equipment from both companies to accomplish the required results. This cleaning process minimized the cavern out of service time, reduced the cost of surface pipe removal and avoided the use of a barge mounted work over rig and equipment required to support the rig.

Introduction

In 2002 LOOP began a multi-year program to replace the original 22-inch brine strings with 20-inch buttress thread and coupled casing. LOOP caverns are a five-well design with 26-inch or 30-inch product casing strings. The four corner wells are equipped with hanging brine strings and the center well is a slick hole (Figure 1).

The casing depths range from 1500 to 1900 feet. When the brine strings on LOOP caverns 7, 10, and 11 were replaced in 2002 and 2003, conventional oil field inspection tools that have the capability of casing inspections for 26-inch and 30-inch casing were not available. LOOP relied on pressure testing only to insure the integrity of the casing.

As the work over program continued on the remaining caverns, LOOP worked with inspection companies to develop a tool that could quantitatively evaluate the condition of the final cemented casing strings. After considering and discarding the use of a tethered conventional pipeline smart pig, a modified tethered ultrasonic pipeline riser tool was proposed by Röntgen Technische Dienst (RTD). The RTD tool employs 64 ultrasonic transducers in a circular carriage. The tool has the capability of providing 100% coverage of the casing, providing real time readout at the surface for internal corrosion, external corrosion, pipe deformation, and girth weld cracks. Multiple passes for additional evaluation could be made through any specific points of interest (Figure 2).

Casing Cleaning Requirements

One requirement for the inspection tool to provide accurate data to the surface for evaluation was that the casing had to be clean. To accomplish the cleaning, a standard pipeline brush cleaning pig was adapted to drill pipe and tripped several times to the bottom of the casing using the work over rig after the pulling of the existing brine string (Figure 3). This method provided a good clean environment for the ultrasonic inspection.

After evaluation of the inspection results on the 20 wells that had been inspected, LOOP decided to go back to the 3 caverns that the brine strings had previously been changed on the corner wells and inspect the center wells to establish a baseline inspection on all caverns for future comparison. In an effort to minimize cost and downtime on the caverns, a cleaning process had to be developed to facilitate the inspection without the removal of all the surface piping and emptying of the cavern to allow work over rig access to the center well.