CASE STUDY

North Sea

HALLIBURTON

CHALLENGE

- Provide an accurate well integrity model to extend the life of wells in a mature field, which had experienced a decline in production due to reduced reservoir pressure
- Determine both the maximum load for each casing string and the amount of wellhead movement that would occur during production
- Enable the installation of the velocity strings and the commencement of production

SOLUTION

Perform well integrity analysis, using Halliburton WELLCAT™ software to:

- Determine the maximum load that each well could withstand
- Validate the structural integrity required to install velocity strings and extend production
- Calculate loading on tubing during production and injection to verify well integrity

RESULT

- Conducted crucial analysis to extend the production life of these wells, while also complying with well integrity and safety regulations
- Enabled the operator to determine the appropriate number of shims needed between the wellhead and the casing top to redistribute loads
- Provided a clear understanding of project economics, production, and safety risks

Well integrity analysis extends field life in North Sea

Expertise in evaluating well integrity proves critical for managing mature field production

Overview

An operator in the North Sea had experienced a decline in production because of reduced reservoir pressure. To maintain gas production and extend the life of several platforms, the operator decided to install velocity string hangers in the production tubing of over 50 wells. However, due to well structural issues, the operator asked Halliburton to complete an analysis to determine the integrity of the well casing and tubing. The Halliburton team was also asked to confirm if the operator's plans met strict regulatory and corporate requirements for well integrity and safety, and if they were appropriate for extending gas production in the field.

Challenge

External corrosion had been found near the wellhead in the conductor, surface casing, and tubing string. Further inspection indicated a typical reduction of 20% or more of the effective wall thickness in the surface casing because of this corrosion, thus causing uncertainty about whether the wells could bear the added loads generated during the installation of the velocity string hangers and the commencement of subsequent production. Consequently, a well integrity analysis was necessary to identify the project's economic, production, and safety risks. Additionally, the operator needed to establish whether its plans to extend the production life of these wells would comply with strict regulatory and corporate requirements for well integrity and safety.

Solution

Halliburton consultants performed a well integrity analysis to determine the expected distribution of the surface loads and to assess the structural feasibility of installing the velocity strings. To understand how the loads would be distributed from the surface casing to the conductor, the Halliburton team analyzed the amount of wellhead movement that would occur during production.

Through analysis and modeling, using WELLCAT™ software, Halliburton determined the maximum load that each casing string would be subjected to during the installation of the velocity strings and during subsequent production.

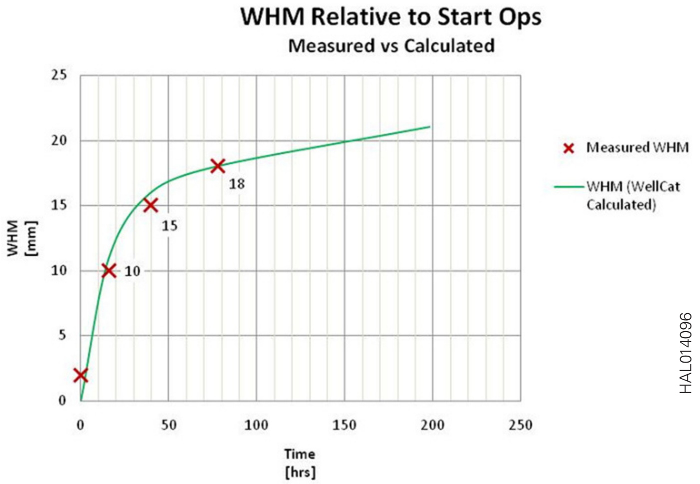

Figure 1: Measurements of actual wellhead movement correlate favorably to the calculated values.

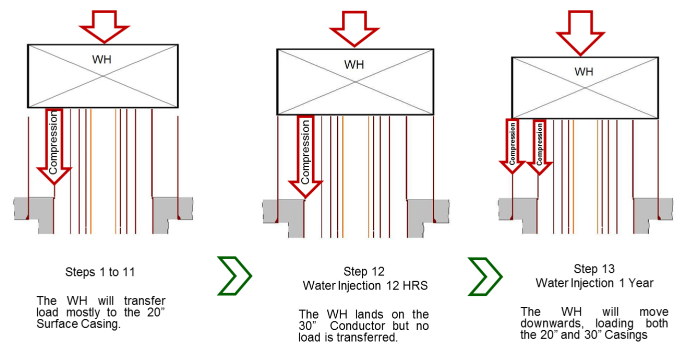

Figure 2: This illustration shows how loads would be transferred from the surface casing to the conductor.

Result

The Halliburton team identified all significant operations related to the installation of the velocity strings and then modeled the resulting complex load conditions. This enabled Halliburton to determine both the maximum load for each casing string and the amount of wellhead movement that would occur during production. Although accurately calculating wellhead movement is a complex task, a comparison with the operator's previously performed measurements validated the accuracy of the Halliburton model's results. This crucial analysis also enabled the operator to confirm its plans to extend the production life of these wells would comply with all well integrity and safety requirements.

Utilizing these analysis results, the operator was able to determine the number of shims needed between the wellhead and the top of the casing to close the gap and redistribute the loads across the surface casing and the conductor. The Halliburton model also established the maximum load that the casing strings could take, thus allowing for the successful installation of the velocity strings and for the extension of production.

> Through the Halliburton Consulting team's well integrity modeling, an operator in the North Sea was able to extend the life of its field, while also complying with strict regulatory and corporate requirements for well integrity and safety.

For more information, contact your local Halliburton representative or visit us on the web at www.halliburton.com