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Replacing Intermediate Casings with Large Diameter Liners to Cost Effectively Reduce Downhole Risk

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Abstract

In well design, intermediate casings are used to isolate sections of the wellbore that are unstable or abnormally pressured and may compromise the well's integrity while drilling further down. Intermediate casings in cavern well design is traditionally run from the setting depth to the surface and cemented to surface. Liners perform the same function as intermediate casings, can be run faster, require less casing and cement.

In this case study two Gulf Coast cavern wells located in the Atchafalaya basin of Louisiana were designed. The intermediate casing section below the surface casing in both wells was long, consisting of unconsolidated sediments and a strong risk of lost circulation in the caprock. Initially, two options were considered for the intermediate section, a single, long intermediate casing to cover the section, or two intermediate casings to divide the long section into two smaller open-hole sections. The single intermediate casing option carried more risk, and the two intermediate casings option was more costly.

A third option was chosen which was composed of a series of large diameter nested liners. The casing design utilizes offshore casing technology and consists of a landing ring welded into the previous cemented casing, a liner hanger with seals and specialized inner string running tools. The inner string running tools provided the ability to pressure test the casing, run the casing to setting depth, cement the casing and wash out any contaminated mud and cement on the way out of the hole.

In total four liners were set in the two wells, with two in each well, leading to the successful completion of the wells. Several issues were encountered during liner setting operations which led to changes in the drilling procedure, running procedure and inner string configuration. Each liner run iteration created a more robust and efficient operation.

Large diameter intermediate liners have shown to be an effective and efficient method to reduce risk associated with wellbore integrity and stability. The success of the large diameter liners has led to the development of the next generation of liner inner strings and running tools. Plans are in place to drill three additional wells in the same field, each incorporating one or more intermediate liners.

Key Words: anhydrite, casing design, domal salt, drilling, drilling and completion, inner string cementing, intermediate casing, large OD casing, liner, lost circulation, Louisiana, mud, regulations, surface casing, underground source of drinking water (USDW), well casing, well cementing, well design