Improving Fluid Loss Control During Well Intervention: A Case Study on the Use of an Innovative Salt System

Author Block: M. Hussein, Kuwait Oil Company

Abstract

The Kuwait heavy oil development target, the Lower Fars Reservoir in the South Ratqa and Umm Niqa Fields, is a shallow, sub-hydrostatic, and unconsolidated sandstone with relatively high porosity and permeability. Due to nature of this reservoir, well intervention operations in the North Kuwait Heavy Oil Asset exhibit a higher risk of significant fluid loss that causes wellbore impairment, incremental operational costs, excess brine volume usage, and more importantly a significant impact on production deferment. The latter problem is due to excess fluid loss causing formation damage and requiring time to produce the completion fluid that was lost to the reservoir during well interventions.

Systematic research was conducted to find a suitable product/system that could be used in sub-hydrostatic conditions to effectively control fluid loss while retaining as near as possible the original permeability. A novel, flexible salt system was identified, evaluated, and field trialed in these fields. This system allowed operations to workover the Lower Fars Reservoir and achieve objectives in a cost-effective manner.

This flexible salt system was formulated to achieve the following criteria as set by the asset team:

- Acceptable fluid loss control
- Readily available
- Cost effective
- Easy to mix and pump
- Easy to circulate out
- No long-term formation damage thus retains as near original formation permeability

The salt system was field tested whereby results achieved the aforementioned criteria. During well intervention operations, the system effectively arrested fluid loss as confirmed by the fluid level observed at surface. Post operation, the well was brought on nearly immediately to its original production rate thereby confirming little to no permanent reduction of the reservoir permeability.

Historically, during well interventions in these Heavy Oil fields, dynamic loss rates have been measured in the 100 to 120 bbl per hour range. Post application of this salt system realized fluid loss rates ranging from 3 to 4 bbl per hour – a dramatic reduction. To date, no post acid stimulations have been required to restore well production to original levels.
This system can be readily adapted for higher temperature applications, is compatible with existing fluids, deposits filtercakes rapidly whereby bridging of the target matrix and even relatively small fractures are evident due to reduction of the fluid loss rate, as well as enhancing flowback. In summary, this approach eliminated additional AFE costs by minimizing dynamic loss rates and eliminating production deferment.