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Remediation of Hydrate Plugs in Offshore Wells via Capillary Tubing— A Cost Effective Alternative

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Abstract

Description: A new, cost-effective, time-saving alternative for removing hydrate plugs offshore has been successfully applied three times in the Gulf of Mexico. By using 3/8” tubing and a capillary tubing unit, chemicals can be delivered directly to the top of the hydrate plug, allowing the plug to be dissolved.

Application: Gas hydrates have long been a concern for operators in offshore gas wells. In the Deepwater Gulf of Mexico, the water temperature at the mud line can be as low as 34 F. This presents a potential problematic area for hydrate plugs to form as a result of the extreme temperature changes experienced in the well. Many remedial actions have been used to remove hydrate plugs in the past. These former methods are very expensive due to high operational costs and many days of non-productive time (NPT). A new option provides operators with a high chance of success while saving a considerable amount of money and greatly reducing NPT.

Results, Observations, Conclusions: A capillary tubing unit was used to snub 3/8” OD stainless steel tubing into the well. Once the tubing reached the plug, methanol was pumped at a rate of 1-2 gallons per minute until the plug was completely dissolved over a distance of 160 ft. So far, this technology has been 100% successful. By delivering the chemical directly to the plug, the chance for success is greatly increased. Depending on the size of the production tubing, penetration rates into the hydrate plug average 20 ft/hr, which is much faster than the traditional method of bull-heading. Chemical costs can be reduced considerably because the method uses only 1 bbl of methanol per 10 feet of hydrate plug in 3-1/2” tubing. Rigging up can be accomplished in hours instead of days, reducing operational costs and NPT substantially.

Significance of Subject Matter: Many wells are being left off production for long periods of time due to the high costs and operational issues involved with bringing in large coiled tubing units or workover rigs to remove a single hydrate plug. This new method allows operators to safely and effectively remediate the obstruction with minimal lost production time.

Introduction:

Hydrates have long been a problem for operators around the world, especially in the deep waters of the Gulf of Mexico where the water temperatures at the mud line are as low as 34 F. Hydrates have the potential of forming any time natural gas and water are present at the right temperature and pressure. Of course the best method for combating hydrate plugs is prevention. Unfortunately conditions such as plugged down-hole chemical injection lines, insufficient amounts of chemical, long shut-in periods, and human error can make full-time prevention a difficult task.

Past Methods:

Many methods have been used in the past to remove hydrate plugs. Bull-heading methanol or glycol into the well is usually the first method attempted. It is usually relatively cheap and can be done with the methanol and fluid pump on the rig. This method can be effective if there is still communication with the well. If the well is completely plugged off, it is very difficult to apply the chemical to the top of the plug, and the dissolving process is usually extremely slow. Therefore, although this may be the simplest method, it is not always effective.