Genesis Fluids Case Study

Project 8176

Premium emulsifier application, performance, and product usage evaluation

Summary

Exploration and developmental assets, both conventional and unconventional, continue to pose new and more demanding drilling environments for which Operators must find economical solutions. One such environment is elevated bottom-hole temperature (BHT) in which the temperature exceeds 350°F and approaches 400°F. When using an OBM for drilling, most typical emulsifier packages begin to deteriorate around 350°F requiring increased product usage to maintain a stable emulsion. Even then, overall stability and performance may be affected. Furthermore, recent field trial results indicate the operational, technical, and commercial benefits of a premium high-temperature (HT) emulsifier in a non-HT application may be substantial. This study demonstrates how the implementation of a premium HT emulsifier in a non-HT environment (< 350°F) resulted in lower product usage, stronger emulsion (ES) values, and reduced overall fluid cost.

Scope

This study focuses on gas wells drilled in the Bossier & Haynesville Shale using a diesel-based OBM maintained with commonly used calcium chloride and lime, but with two different emulsifier packages; a conventional and a premium HT emulsifier package. The study evaluates the performance of a premium HT emulsifier in an environment around 350°F or less in comparison to offset or control wells that used a conventional emulsifier package.

Background

The need for a premium HT emulsifier was first identified as downhole temperatures increased in the Haynesville formation over the past several years. This is most likely attributed to longer laterals, and in some areas, deeper TVD targets. Lab testing indicates that as emulsions weaken due to prolonged exposure in the 350°F range and above, product usage increases and the HPHT rheology can increase on a non-linear scale. This can lead to excessive cost, increased ECDs and swab/surge pressures, and other operational setbacks.

Extensive lab testing led to the identification of a suitable emulsifier which was field trialed with excellent results. Key performance indicators monitored during the assessment of the premium HT emulsifier were HPHT rheology from 350°F to 400°F, HPHT fluid loss at 350°F, and overall fluid stability. After successful field trials, it was hypothesized there could also be suitable application in using the premium HT emulsifier in the sub 350°F wells. The expectation was overall product usage and emulsifier cost would decrease and the fluid emulsion strength would increase.

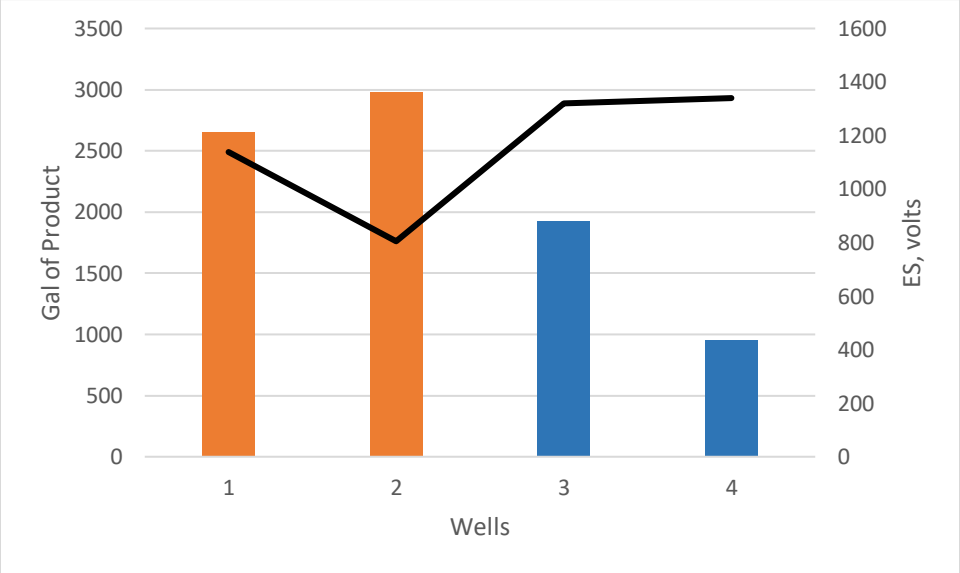
Evaluation

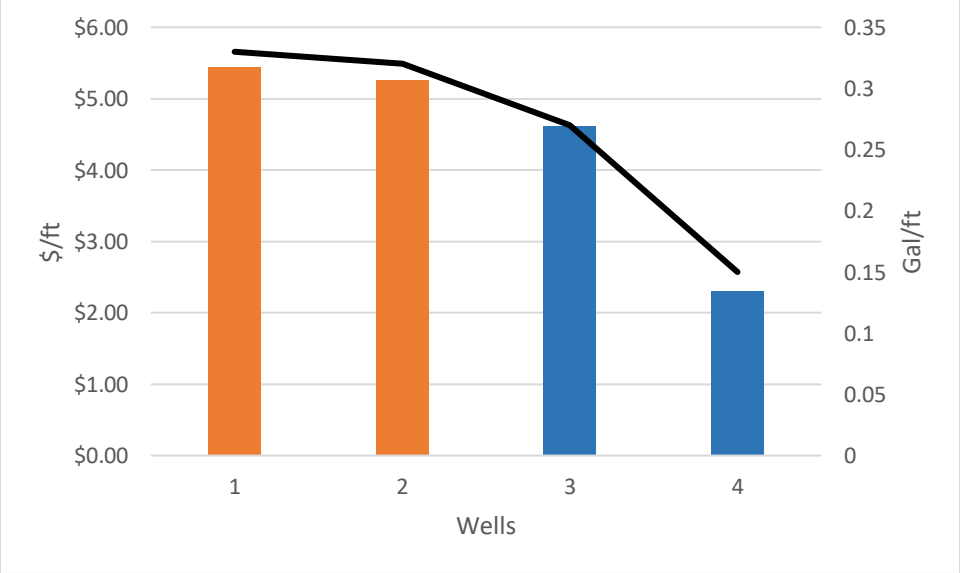
Four wells were assessed; two used a conventional emulsifier package and two used a premium HT emulsifier package. The key performance indicators evaluated were total gallons of emulsifier consumed in the interval, gallons of emulsifier and wetting agent used per foot drilled, electrical stability

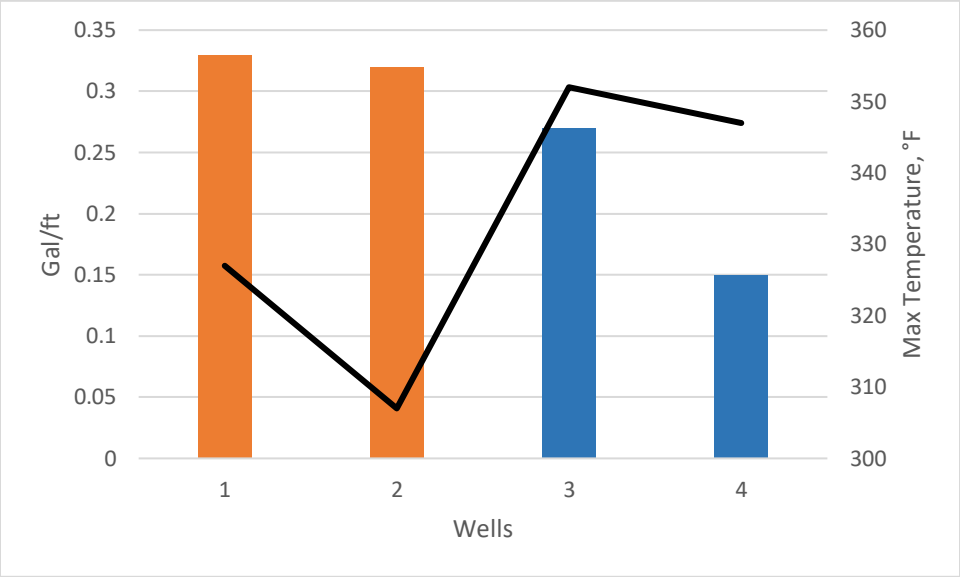
(ES) value, max recorded BHT, and total associated cost of emulsion products. Subject wells had very similar fluid design, density, fluid properties such as OWR, and interval footage. It should be noted the wells using the premium HT emulsifier had on average a BHT 30°F greater than the wells using conventional emulsifier packages.

Results

The following charts illustrate the results. Orange represents the conventional emulsifier package and blue represents the premium HT emulsifier package.







Economics

While the data set is small, the results are very apparent and conclusive. Based upon the first two field trials using a premium HT emulsifier in a non-HT environment, product usage and emulsifier cost decreased while OBM fluid stability and emulsion strength increased. Overall a 16-55% decrease was realized in product consumption complimented by a 12-58% decrease in emulsifier package cost.

Additionally, observations indicate once initial product concentrations are introduced and achieved in the fluid system, subsequent wells have a drastically reduced premium HT emulsifier product usage which relates to drastically reduced usage costs. This is due widely in part to the lack of product degradation in temperatures in the 300°F - 350°F range and less.

While the economic and operational benefits were initially conceptualized for extreme temperatures, the primary benefits of reduced product usage and improved stability and emulsion strength will occur at all temperatures. This is a result of the premium nature of the product utilized at its full undiluted strength.

Conclusions

Based on empirical basin data, using a premium HT emulsifier in drilling environments that range from 300°F - 350°F and less will provide the following benefits:

- Reduced total product usage
- Reduced emulsifier and total fluid cost
- Increased strength and stability of an OBM
- Reduced HSE exposure and risk with a smaller location footprint
- Superior performance in comparison to wells with considerably less BHT

Please contact the person you are most comfortable speaking with at Genesis Fluids to learn more. If a contact is not readily available, Harry Dearing, VP Engineering & Technology, may be reached at the below.

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