Case History

Real-time on-site assessment of over 1,600 tests for a Canadian Operator results in reduction in disposal of fluids

In a display of service excellence, an applied scientific approach was employed to illustrate the finer details of flocculation, resulting in the Operator changing their standard operating procedures and resolving flocculation problems when encountering in-situ hydrocarbons.

CHALLENGE	SOLUTION	RESULT
• Maintain clear fluid when encountering in-situ hydrocarbons • Understand the parameters affecting the flocculation process • Minimize or reduce the disposal of fluids	• Establish quantitative testing method to determine efficacy of flocculating polymers • Determine optimal flocculating polymer selection and fluid parameters	• Calcium targets were altered to aid in coagulation of solids, especially when encountering hydrocarbons • 10 different floc polymers were evaluated and 3 were determined to be suitable candidates for future use • Reduction in disposal of fluids

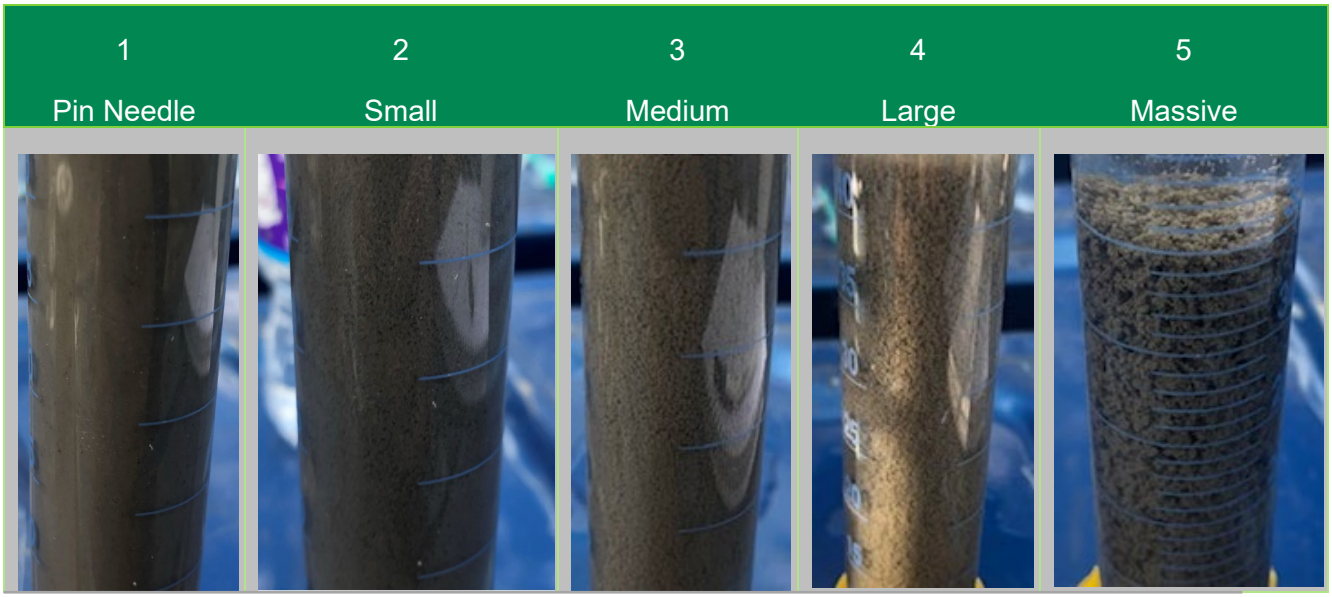

Figure 1: *The above photos help give relevance when describing the size of the flocs observed. The larger the floc, the more likely the solids are to fall faster and the potential for a larger volume of clean fluid exists.*

NEWPARK FLUIDS SYSTEMS

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OVERVIEW

Flocculated Water is basically fresh water that uses both chemical and mechanical processes to aid in the removing all drill solids.

Polyacrylamide flocculating polymers are used in conjunction with calcium as a coagulant in order to achieve coagulated solids which can then be stripped out or settled out through equipment.

The operator had concerns around losing flocculation and had questioned about whether the right flocculating polymers were being used in the field.

Newpark conducted a field study to evaluate the effectiveness of various floc polymers for this Canadian operator. A wide variety of floc polymers were chosen and tested varying in charge type, charge density and molecular weight.

In addition, Newpark presented the results to the operator on the subject and the presentation was subsequently used to educate the rest of the drilling team.

CHALLENGE

The primary challenge was that the operator had issues with flocculation and maintaining clear fluid especially when encountering in-situ hydrocarbons. As a result, the operator was forced to dump and dilute more volume than was necessary. This led to increased disposal of fluids systems and operational slowdowns.

No centrifuge was being run and therefore settling time is also highly important and correlated to keeping the active system clean.

SOLUTION

Newpark proposed an engineered solution to determine the optimal flocculating polymer and calcium range for their specific application when encountering hydrocarbons.

Floc polymers were individually added to 50ml samples collected from the active mud system on site in real time. The samples were then evaluated based on the following parameters: floc time, height of clean fluid column and size of the flocs. The sample grabbed to conduct each round of testing was also evaluated for calcium content in mg/l as well as for pH. These properties are often correlated to floc quality.

Based on the results obtained from the field, Newpark recommended that a High Molecular weight Anionic polymer continued to be used. The decision was based on the polymer's ability to handle variance in calcium levels, pH and oil contamination.

Anionic #4 was also determined to be a viable alternative even though it was noted to be slightly less tolerant to the swings in calcium. This could be a suitable alternative in the future if the current existing polymer has supply constraints or price increases.

Throughout the testing, it was demonstrated that calcium levels have a large impact on the effectiveness of all floc polymers. Newpark recommended that calcium levels be monitored and maintained within target parameters, so that faster settling times can be attained. Standard operating procedures were altered to emphasize calcium levels.

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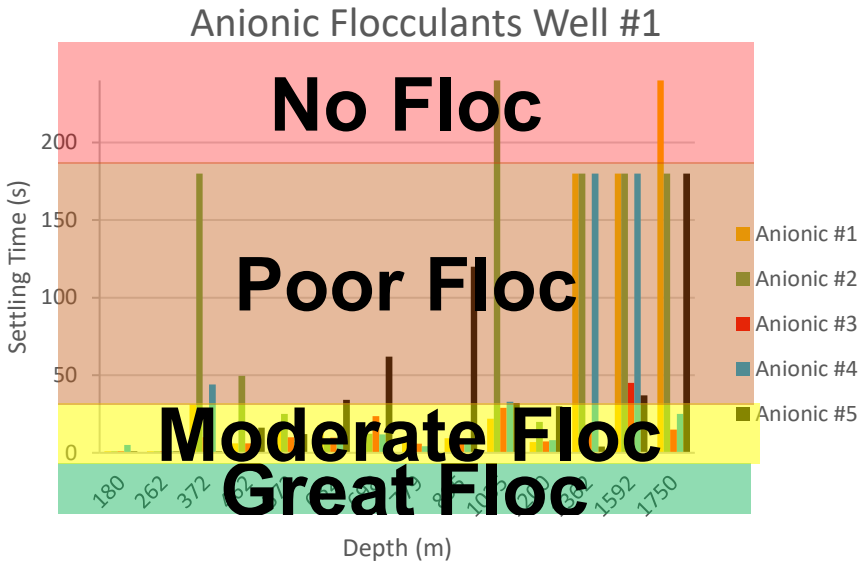
RESULTS

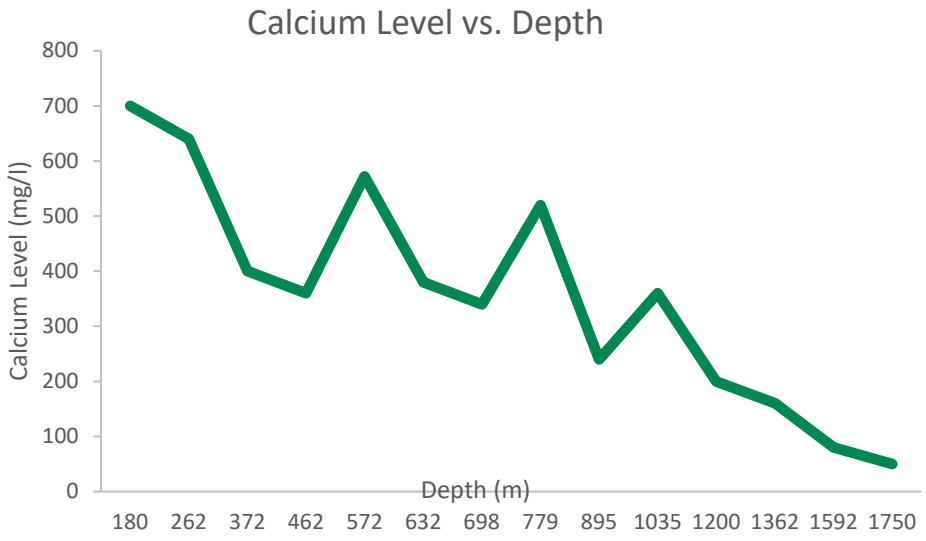
The data collected onsite was broken down into two different charts shown below.

The first chart depicts the results from the anionic flocculants. The second chart encompasses the cationic and non-ionic flocculants.

The testing was conducted over the course of two wells and upon evaluation of the data collected, Newpark determined that settling time, floc size and clean fluid head space were all important in determining the quality of floc formed.

The first chart below shows anionic floc polymers and their respective floc times. It can be noticed that when the calcium level drops below a critical level the average effectiveness of each polymer is greatly impacted.





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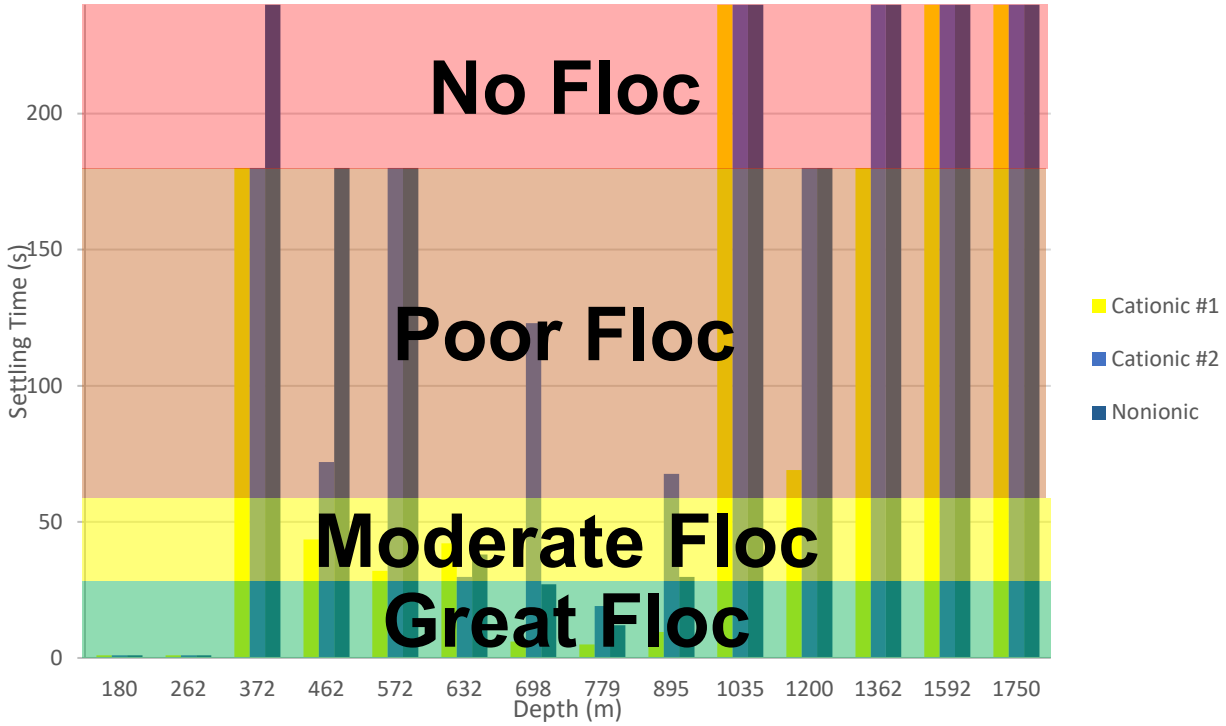
Cationic/Non-ionic Flocculants Well #1



The above chart shows cationic and nonionic floc polymers and their effectiveness throughout the course of a well. Initial observations of the data captured from the cationic flocculants are that they are less effective than the anionic chemistries in this particular application. They were observed to perform poorly off the start and then once oil was observed at 1035m they appear to stop working again.

Collecting all these data points in real time allowed for an inexpensive and easily implementable plan to help improve the drilling fluid maintenance onsite. The operator was able to change the standard operating procedure when encountering flocculation issues or hydrocarbons going forward, resulting in 15-20% less dilution and less operational slowdowns.