

BYK-GO 8780 – an effective hydrogen sulfide scavenger

The use of a liquid additive to control hydrogen sulfide in oilfield applications

Hydrogen sulfide (H₂S) gas is one of the most dangerous hazards in the oil and gas industry. Formed by the decay of organic matter containing sulfur, H₂S gas is both highly toxic and flammable. H₂S can enter drilling fluids when drilling through subsurface formations or from sulfate-reducing bacteria that produce H₂S.

Not only is H₂S deadly, but it can also cause sulfide stress corrosion cracking in metals, such as casing. Luckily, with proper monitoring and control procedures in place, H₂S can be precipitated from both water-based and oil-based drilling fluids by treatment with an H₂S scavenger.

BYK has developed an H₂S scavenger that is commercially available. BYK-GO 8780 is a 15 % active general-purpose scavenger based on zinc ammonium carbonate, which can quickly and thoroughly eliminate the threat of H₂S through the precipitation of zinc sulfide. The liquid form allows for a more rapid precipitation rate than those exhibited by powdered zinc containing H₂S scavengers.

BYK used a third-party independent lab to conduct a study to determine the effectiveness of BYK-GO 8780 H₂S scavenger in a water-based drilling fluid and a non-aqueous drilling fluid. H₂S detection tests were carried out via a Garrett Gas Train.

For the water-based formulation, a low-solids, non-dispersed drilling fluid was formulated, and the pH was adjusted to 10.5. The base mud was compared against two levels of BYK-GO 8780 H₂S scavenger, pure zinc oxide, and 80 % triazine.

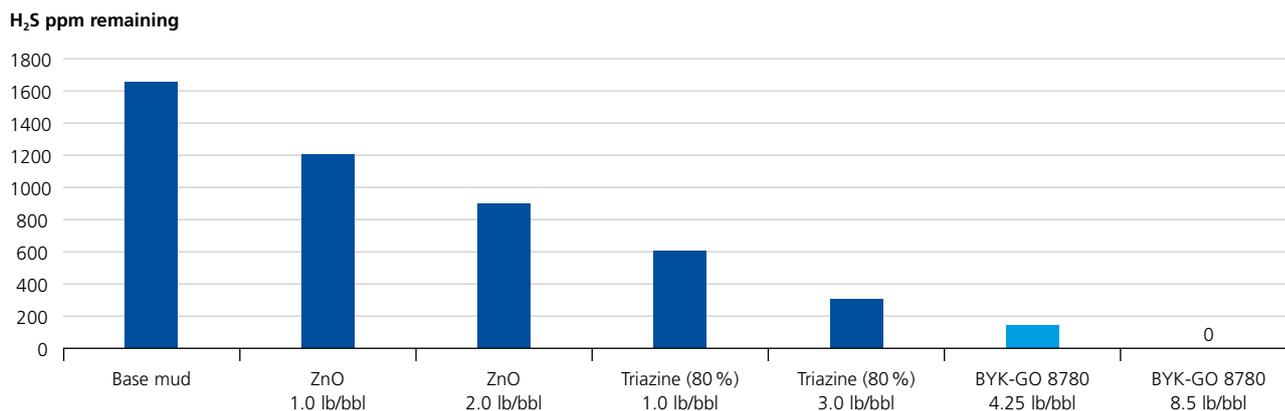
5.75 lb/bbl of a 98 % assay sodium sulfide nonahydrate was added to each sample and hot rolled at 150 °F for five hours. Sodium sulfide is basic, converting to H₂S based on the pH of the drilling fluid. The following procedure was used for the evaluation:

- Mix the water and bentonite for 10 minutes.
- Add the xanthan gum and mix for 10 minutes.
- Add the lignite and mix for 10 minutes.
- Adjust the pH to approximately 10.5 using sodium hydroxide.

- Add the required amount of H₂S scavenger and mix for one hour using a multi-mixer.
- Add sodium sulfide nonahydrate to each sample.
- Immediately close and seal the aging cells and hot roll at 150 °F for five hours.
- Collect filtrate from each sample using API fluid loss.
- Test for H₂S content via Garrett Gas Train.

The graph below demonstrates the efficiency of BYK-GO 8780, triazine, and zinc oxide at different treatment levels in the water-based formulation.

H₂S scavengers evaluation in water-based mud



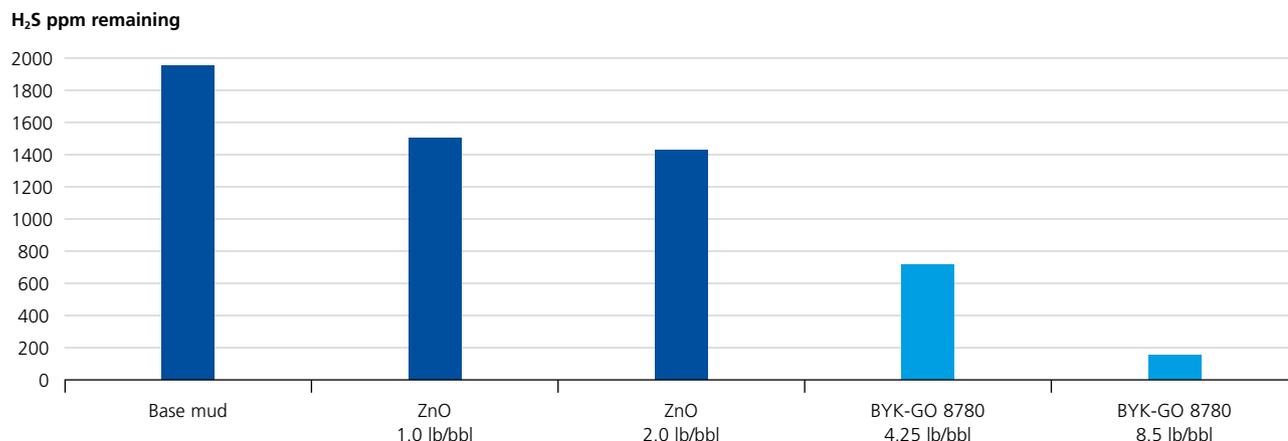
A treatment of 8.5 lb/bbl of BYK-GO 8780 contained 1.3 lb/bbl of zinc. This treatment level effectively removed all the H₂S compared to 2.0 lb/bbl zinc oxide, which left significant levels of H₂S in the system. 3.0 lb/bbl of 80 % triazine contained 2.4 lb/bbl of active triazine. At this treatment level, unsafe levels of H₂S remained in the test system. For the aqueous trial on an active basis, BYK-GO 8780 was the most efficient treatment for removing H₂S.

The versatility of BYK-GO 8780 allows for the same product to be used in non-aqueous drilling fluids. A non-aqueous 10.0 pound per gallon of drilling fluid was formulated in a synthetic base fluid. As with the aqueous formulation above, 5.75 lb/gal of sodium sulfide nonahydrate was added as the source of H₂S generation. The system was hot rolled at 150 °F for 4 hours. For this evaluation, BYK-GO 8780 was evaluated against zinc oxide. The results are summarized in the graph below.

The results were similar in the non-aqueous fluid to those exhibited in the aqueous fluid. 8.5 lb/bbl of BYK-GO 8780 with an active level of 1.3 % active zinc had a 9x efficacy over the 2.0 % zinc oxide, reducing the H₂S by 92 %.

BYK-GO 8780 is an effective sequestrant of H₂S in both aqueous and non-aqueous fluids, and an excellent addition to your safe drilling program.

H₂S scavengers evaluation in synthetic-based mud



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