

# BIODRILL RC100 series

## Environmentally friendly cement retarders for the oil & gas industry

Borregaard's BioDrill RC product family includes a wide range of lignin-based speciality cement retarders and dispersants. Variation in well conditions dictates the need for specialised retarders to fulfil the requirements of proper zonal isolation.

BioDrill RC100 series additives are used in a broad spectrum of cements and drilling temperatures to retard setting, extend pump times and allowing the cement to reach the desired location in the production string. Additionally, several BioDrill RC100 series retarders provide the valuable dual functions of retarder and cement dispersant.

The BioDrill RC100 series of cement retarders are primarily designed for circulating temperatures up to approximately 175°F [80°C] but may be used up to 203°F [95°C]. BioDrill RC102 is the strongest retarder in this group. BioDrill RC103 exhibits the best salt tolerance.

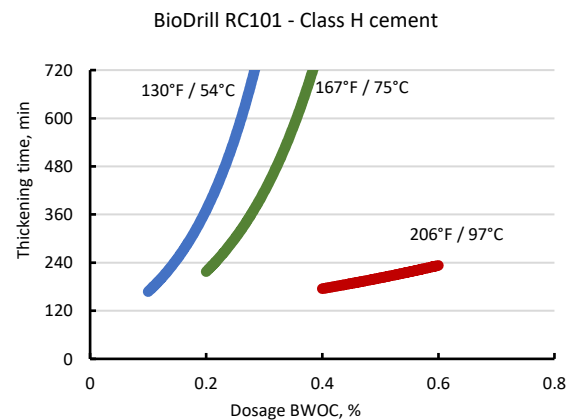
The BioDrill RC products are part of the OSPAR List of Substances Used and Discharged Offshore which are Considered to Pose Little or No Risk to the Environment (PLONOR)

### THICKENING TIME AS A FUNCTION OF RETARDER DOSAGE, TEMPERATURE AND CEMENT DOSAGE

Retarders inhibit hydration and delay setting, thereby enabling adequate time for placement of the slurry in deep and hot wells. Our products are derived from lignosulfonates. They are thought to function by adsorbing onto the initial layer of the calcium-silicate-hydrate gel, thereby delaying further hydration. They are added in concentrations ranging from 0.1% to about 1.5%.

The thickening time response varies depending on the class of cement, the cement's composition, temperature and the particular retarder and its dosage. Therefore, it is necessary to test each cement design due to variability in cement composition and quality from source to source and even from a particular supplier.

For illustration purposes, we present thickening time response as a function of retarder, dosage and bottom hole circulating temperatures (BHCT) in class H and class G cements. The overall trends indicate a region of nearly linear increase in thickening time at low dosages. The trend gradually transitions to a region of practically exponential increases with increase in retarder.



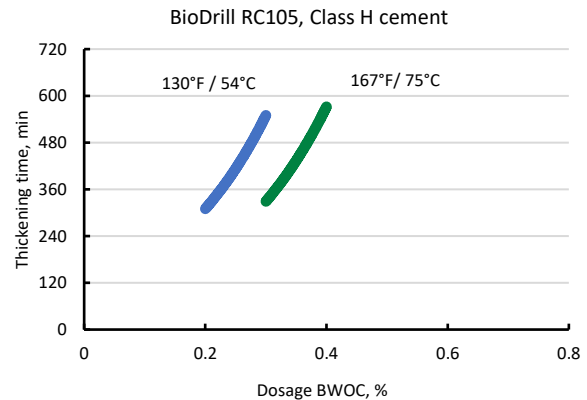
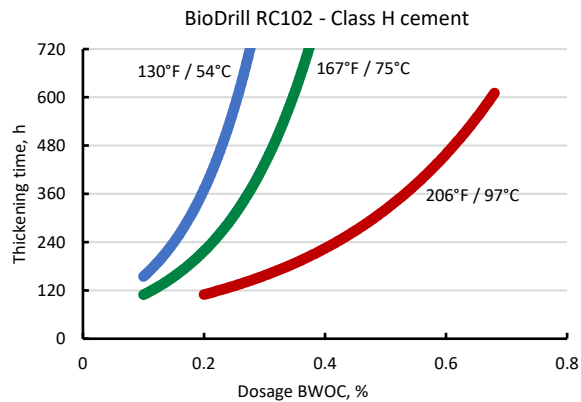


Figure 1. Thickening time at different temperatures in class H cement

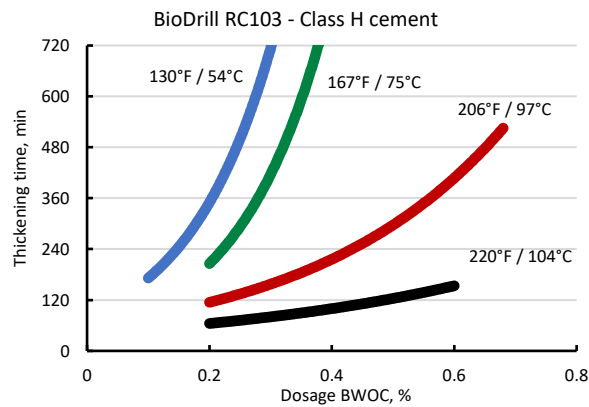


Figure 1. shows tests of the RC100 series products with class H cement having a w/c of 0.38 for temperatures of 220°F [104°C] and below.

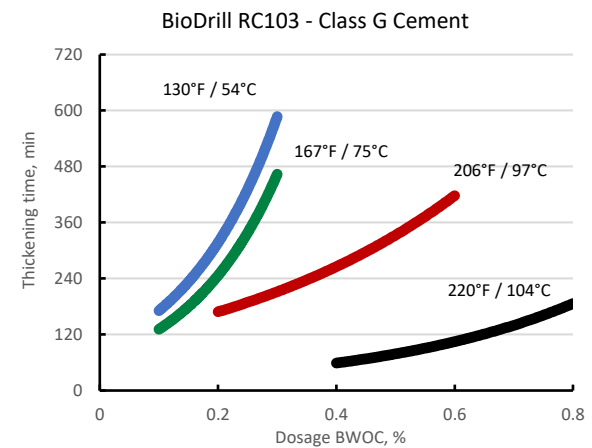
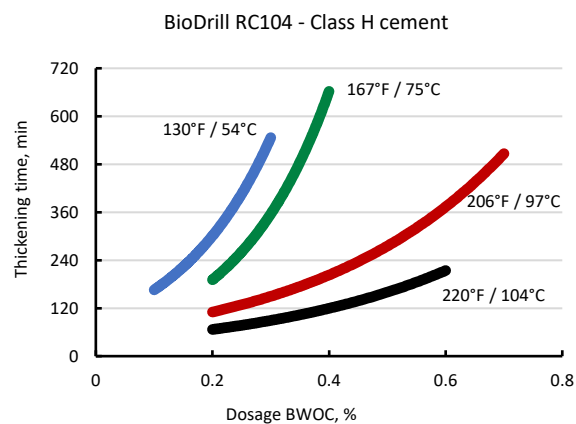


Figure 2. Thickening times of BioDrill RC103 at different temperatures in class G cement

Figure 2. shows tests for RC103 with class G cement having a w/c of 0.44 for temperatures of 220°F [104°C] and below.