



Drilling Fluids

Tips and Tricks for Summertime Tremie Grouting

Whether you're grouting water, geothermal or geotechnical wells, here are some easy tricks and tips to make your summertime project successful.

There are many types of bentonite grouts available, and each is specifically designed for different applications and soil conditions. There are three basic grout categories by process – chips/tablets, two-step grouts and one-step grouts.

Let's start by taking a look at one of the most basic categories – bentonite chips/tablets. Chips and tablets are a great way to create a low-permeability seal for water wells, geothermal and geotechnical applications. Both products come in a variety of sizes to fit each individual application. These can be placed very easily, and don't require any specialized mixing or pumping equipment. However, they do have limitations based on the application and local governance. If you have questions about your local regulations or codes, please contact your bentonite supplier or local authorities.

Although not as popular today as one-step grouts, two-step grouts have been around for years, and provide the applicator the ability to customize the grout to fit the soil conditions. Unlike chips and tablets, two-step grouts require specialized mixing and pumping equipment. A standard grout mixer equipped with a double-acting piston pump and a low-shear paddle mixer are essential for maintaining a good mix. Two-step grouts also must be tremie-placed to ensure the best possible results. In order for a two-step grout to work correctly, the bentonite must be combined with a synthetic polymer to delay hydration time. If done correctly, this will create a 20-percent-solids grout that can be used in water well, geotechnical and geothermal applications (TC of 0.40 Btu/hr/ft/F). By combining synthetic polymers and different bentonite products, we can produce a low permeability seal with minimal grout loss, in even the worst soil conditions.

One-step grouts are, by far, the most popular tremie-placed grouts on the market today. Most major bentonite manufacturers offer both a 20-percent and 30-percent-solids grout that can easily be tremie-placed.

Geothermal one-step grouts are specially manufactured to suspend high quantities of silica sand in order to boost thermo-conductivity values. Sand-enhanced grouts are, by far, the most difficult grouts to pump, due to the high-solids content. These tips and tricks are designed to ensure project success in even the hottest conditions.

Water Temperature

After you have selected which type of grout is best for your application, the second thing to consider in any warm weather drilling environment is your



Grouting a vertical well. Photo courtesy of GeoSource Solutions, Plano, Texas.



Using a tremie pipe to place bentonite grout into an annular space. Photo courtesy of the Pennsylvania Ground Water Association.

mix-water temperature. Many drillers often haul water to the job site for use in the grouting process. Before leaving the shop for the day, the water tank typically is filled and transported with the rest of the equipment to the site. It often takes several hours before the hole is complete and the grouting process begins. During that time, the once-cool water continues to rise in temperature. Before long, you can end up with water hot enough to brew tea. Because bentonite grout is temperature-sensitive, this often can create an unforeseen problem. The warmer your mix water, the faster your bentonite grout will set. If it sets too quickly, it could possibly clog your grouter, pumps or tremie line. In addition to clogs, drillers can experience problems in the tremie pour pro-

cess if the grout sets too quickly. Even drillers using a residential water sources can experience similar problems. Hot water in hoses and hydrants can create the same flash-setting issues. Needless to say, make sure before you start grouting that you're not selling yourself short on time by using warm water.

Buttering the Tremie

Odds are if you are tremie-grouting with either hydraulic hose or poly-pipe, the color of that line is black. As we all know, the color black absorbs a lot of heat, especially when exposed to direct sunlight. In the summer, tremie pipe temperatures can exceed 100 degrees F. In order to avoid flash-setting your bentonite grout, it is good practice to get

into the habit of "buttering" your tremie line. This can be done with cool water or a cool-water/polymer mixture. Using synthetic polymers in cool water not only will cool the tremie line, but also will lubricate and reduce friction within the pipe, thus preventing flash-setting and greatly increasing the pumpability of high-solids or sand-enhanced grouts.

Tremie Pipe Selection

Tremie line selection always is important in the grouting process, but becomes even more so as temperatures increase. It is imperative that you use a tremie line with an inside diameter of at least 1¼ inches or larger when pumping a high-solids or sand-enhanced grouts. There are many types of tremie lines available, but poly-pipe and hydraulic line seem to be the most popular. Tremie pipe selection comes down to personal preference. However, you should remember that time is very important when dealing with a bentonite grout in warm weather. Whatever tremie pipe you choose should be efficient for you and your crew, not just cost-effective.

Sand Saturation

Any driller who has ever pumped a sand-enhanced geothermal grout will tell you that it is by far one of the most difficult grouts to pump. This is due to the high-solids content and increased labor time per batch. When pumping sand-enhanced geothermal grout, it is important always to use dry, high-silica-content sand. Sand has the ability to hold a significant amount of water. Therefore, if the sand is wet, you are throwing off the mixing ratios recommended by the manufacturer. But more importantly, for the purpose of this article, wet sand will further complicate the grouting process by increasing mixing time. For all intents and purposes, time is money, but time also increases your chance for success.

Downtime Issues

Downtime during the grouting process is not ideal, but can and will occur, so how you handle it is critical. Downtime can be caused from a variety of things, such as equipment breakdown, weather, lack of water, etc. When this happens, it is important to remember to purge your tremie line so that grout does not set up in your lines or grouter. It also is important to purge your tremie line if pumping a sand-enhanced grout with a single-stage mixer. If your operations are not quick enough on a hot day, there is a chance that your grout can set up in your tremie during the batching process.

These simple procedures will buy you some time, and help you beat the summer heat. Happy grouting. **ND**

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