I’ll start by congratulating all the drillers out there during these trying times. Having to function in these unprecedented times brings its shares of challenges, and I have nothing but respect for the work drillers do as an essential service. If it can help in any way, I’d like to share some expertise on bentonite products for drilling, well development and completion.

When planning to drill a well, whether for water or environmental monitoring, in geology that dictates mud rotary, success depends on properly matching the drilling fluids to the soil conditions. A contractor who knows the soil conditions can calculate: the amount of bentonite drilling fluid products to have on site; along with clay inhibitors to deal with reactive clays and shales; PAC polymers for gravel or coarse zones; and, in some instances, a surfactant to help prevent bit balling when drilling in sticky clays.

Once drilling operations finish and the project is ready for well development, contractors add a gravel/sand pack and, often, there can be a decrease or even complete loss of return flow. The same bentonite filter cake that forms on the walls of the borehole during the drilling process to lower fluid loss and help maintain an open hole, can plug up well screens and gravel packs. A common method to deal with this is to flush with fresh water; and try to wash out bentonite, along with native clays. But this may require a secondary water source, which can be costly.

Phosphate-free polymer-based thinners are commonly used to dramatically reduce the time and water needed for well development; reduce viscosity and gel strength; promote filter cake breakdown; and break down accumulated native clays. Normally, thinners designed for this type of application can be flushed out using sodium hypochlorite. This can be done with air sparging or with pump-method development. Make sure the thinners used for well development are certified to NSF/ANSI Standard 60 for drinking water treatment chemicals.

Another popular product, bentonite mud remover, is a phosphate-free granular product designed to remove bentonite, as well as native clays in older wells (2 weeks or older), which can be difficult to remove. It is highly concentrated and decreases development and/or rehabilitation time and costs, as it separates and disperses clay particles. Dosages, directions and flushing may vary from one manufacturer to another. Again, ensure that the product you use is certified to NSF/ANSI Standard 60 for drinking water treatment chemicals.

Once the well has been drilled, gravel/sand packed, and then developed (cleaned the screen and gravel pack zone), the next step is grouting and/or sealing. This prevents surface contamination from migrating down into aquifers, as well as the co-mingling of aquifers. Regulations vary between water wells and monitoring wells or environmental wells, and from one state or province to another. Educate yourself on local regulations and make sure to have the products on hand to properly grout or seal the annular space between the borehole and the well casing, and protect aquifers for future generations.

Almost all jurisdictions prohibit the use of natural soils to seal off a well. Grouts are products that must be mixed and pumped into the annular space via a tremie line. Common grouts include cement, cement/bentonite mixes, high-solids bentonite grouts (20 to 30% solids), granular bentonite and polymer grouts (aka, two-step grouts) and thermally-enhanced grouts. Bentonite sealants are products that do not have to be mixed and pumped down a well, such as bentonite chips, tablets or pellets, as well as granular bentonite. The advantage to high solids bentonite grouts is that they are easy to mix and pump, and one 50-pound bag of 20% high-solids grout mixed with 24 gallons of water can yield 3.5 cubic feet of grout. The disadvantage to 20% high-solids bentonite grouts is that they are 80% water and can desiccate (dry out) in vadose zone areas.

According to the Nebraska Grout Study, thermally-enhanced grouts with silica sand and bentonite chips perform much better in vadose zone areas when the ground is dry for most of the year. In certain applications, such as environmental wells, contractors may need sodium bentonite tablets or pellets, coated bentonite tablets or pellets, or bentonite chips to form a seal above the gravel pack and well screen, and below the concrete or tremie line. Common grouts include cement/bentonite mixes, high-solids bentonite grouts (20 to 30% solids), thermally-enhanced grouts with silica sand, and Bentonites bentonite grouts (20 to 30% solids), cement/bentonite mixes, high-solids bentonite grouts (20 to 30% solids), granular bentonite and polymer grouts (aka, two-step grouts) and thermally-enhanced grouts. Bentonite sealants are products that do not have to be mixed and pumped down a well, such as bentonite chips, tablets or pellets, as well as granular bentonite. The advantage to high solids bentonite grouts is that they are easy to mix and pump, and one 50-pound bag of 20% high-solids grout mixed with 24 gallons of water can yield 3.5 cubic feet of grout. The disadvantage to 20% high-solids bentonite grouts is that they are 80% water and can desiccate (dry out) in vadose zone areas. According to the Nebraska Grout Study, thermally-enhanced grouts with silica sand and bentonite chips perform much better in vadose zone areas when the ground is dry for most of the year. In certain applications, such as environmental wells, contractors may need sodium bentonite tablets or pellets, coated bentonite tablets or pellets, or bentonite chips to form a seal above the gravel pack and well screen, and below the concrete or tremie line.

CETCO Drilling Products photos

Bentonite chips float down the borehole in a seesaw motion and do not hydrate as fast as uncoated tablets. Source: CETCO Drilling Products photos

Bentonite tablets are made from very pure bentonite. They hydrate quickly, which may cause bridging or gaps if used in deep wells.

**REGULATIONS VARY BETWEEN WATER WELLS AND MONITORING WELLS OR ENVIRONMENTAL WELLS, AND FROM ONE STATE OR PROVINCE TO ANOTHER.**

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