
Passive Treatment of Bentonite Slurry Using Coagulants and Flocculants

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EXTENDED ABSTRACT

Horizontal directional drilling (HDD) is often used to avoid impacts to high quality wetlands and streams with minimal impact on the surrounding area. A potential environmental impact associated with HDD centers on the inadvertent return of the drilling fluid such as bentonite slurry to the surface via naturally occurring fractures or fissures. This study investigated a range of coagulants and flocculants for treating the bentonite slurry differing in solid content (weight/volume; w/v). Tested coagulants included aluminum sulfate, aluminum chloride, ferric chloride, lime, and gypsum, while water-soluble linear polyacrylamides (PAMs) differing in charge (anionic, neutral, or cationic) and biopolymer were tested as flocculants.

Laboratory jar tests on 1% (w/v) bentonite slurries indicated that a volume reduction of 50–60% can be achieved using a series of chemical treatments (Fig. 1). The resulting supernatant was relatively clear. Higher bentonite concentrations (up to 5%) had only 10–20% volume reduction for any treatment tested (Fig. 1). Tests on more diluted bentonite (0.4%) suggest that PAMs alone may not be effective in settling bentonite suspension, but adding gypsum in a combination with anionic PAMs can enhance the flocculation reaction (Fig. 2). The biopolymer performed relatively well in flocculating bentonite slurry. However, settled bentonite flocs appeared to be very loose and dispersible, suggesting that physical dewatering systems would be needed for slurry volume reduction. Our pumped water test (Fig. 3) confirmed that biopolymer or a combination of gypsum and anionic PAMs could be an effective passive treatment in treating diluted bentonite suspensions (Fig. 4), which might arise from inadvertent return of bentonite slurry into streams.

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