Applications for High Shear Mixers

Dispersion of Drilling Fluids

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Applications for Drilling Fluids

Drilling fluids, or drilling muds, serve many functions, including lubrication/cooling, removing cuttings from the wellbore, sealing the surrounding area of the drill, and controlling formation pressures.

Drilling muds are typically either an aqueous solution or an emulsion of water and oil, known as “inverts,” along with other components. Inverts are commonly used for deeper drilling operations, as they offer improved lubrication and cooling properties than simpler water based muds. Traditionally, diesel was the industry standard invert, though environmental concerns pushed for a replacement.

Mixing Process

Many components are added to a drilling fluid to modify properties. Xanthan gum [see coramix.com/learn] is a common rheology modifier used primarily to increase viscosity in water or brine based solutions. Two common ingredients in an invert are bentonite, a clay used as a viscosity modifier and sealant, and barite, a heavy mineral used to increase fluid density. The preparation of a drilling mud involves multiple requirements, including:

- Rapid incorporation and dispersion of ingredients.
- Bentonite particle size must be reduced enough for maximum contact with the surrounding liquid in order to achieve a gelling effect.
- Vigorous mixing must be maintained as viscosity increases, requiring a minimum degree of shear.
- Droplet size in water/oil emulsions must be adequately reduced to achieve a stable emulsion.

Mixing Issues

Traditional agitators carry a variety of problems in cutting fluid preparation:

- Components tend to agglomerate when added to the base fluid, which takes agitators a considerable amount of time to disperse.
- Agitators lack the minimum shear to effectively reduce the bentonite particle sizes. To compensate, the bentonite is hydrated beforehand, adding to the overall time.
- Insufficiently reduced droplet sizes result in an unstable emulsion.

Our Solution

Dispersion: Instead of slowly stirring the mixture until it is homogeneous, Coramix mixers use high-shear and mechanical design to disperse the drilling fluid, greatly reducing each batch's cycle time while eliminating any agglomerates.

Phase 1: The Coramix inline mixer is connected with the eductor assembly, as well as pipes from the tank outlet to the mixer inlet and from the mixer outlet to the top of the tank. Base fluid is added to the tank, and the mixer is started to recirculate the fluid.

Phase 2: The powder feed valve is opened, and the components are added directly into the hopper. The inline mixer pulls in the materials and deagglomerates them as they pass through the high shear mixing zone.

Phase 3: After all of the material is added, the valve is shut and mixing continues while additional ingredients are added.

Advantages

Coramix high-shear mixers provide many advantages over traditional agitators:

- High shear maintains vigorous mixing at high viscosities and is able to breakdown hard agglomerates.
- Rapidly deagglomerates and disperses, drastically cutting mixing times.
- Sufficiently reduces bentonite particle sizes to activate the gelling effect.
- Sufficiently reduces droplet size in water/oil emulsions, resulting in a stable emulsion.
- Increases yield, cutting raw material costs.