

Maintaining Kaolin Storage Tanks

A Helpful Guide to Assist the User of Kaolin Slurry

Introduction

Preservation from bacteria contamination is a costly process in nearly every industry, and the kaolin industry is no exception. Spoilage occurs when aerobic bacteria deplete the oxygen content and a kaolin slurry becomes anaerobic. When this happens facultative anaerobes like sulfate-reducing bacteria form hydrogen sulfide, which produces a foul smell and eventually forms iron sulfide that turns the clay gray to black. Proper cleaning and housekeeping along with early control of aerobic bacteria will prevent spoilage.

Thiele Bacterial Control Program

Thiele provides customers with bacterial control for shipping and normal usage of kaolin clay slurry for up to 30 days. Bacteria counts less than 100,000 cfu/ml at 30 days are maintained. Once the clay is unloaded into our customers' tanks, it is important that a contaminated tank does not cause spoilage of the product.

Because the majority of our products are used by the paper industry, any biocide we use must have special FDA certification for food contact applications. Significant thought goes into determining what biocides we use and how much is put into a slurry railcar. Thiele also wants to help inform our customers of the significance of maintaining good housekeeping of their systems and educate them on the procedure to treat a railcar or tank when bacterial contamination occurs.

Adding too much biocide to the slurry can lead to several serious issues. First, too much biocide can lead to chemical resistance of microbes within the tanks, so that later when higher levels are really needed, the biocide will not work. Secondly, an overabundance of biocide will increase the total cost of the product since biocides are among the most expensive chemicals added to a kaolin slurry. Lastly, we want to provide an environmentally friendly product so adding the correct amount of biocide is vital.

Thiele has developed a simple and effective approach to providing a preserved kaolin product. This is done by conducting 30-day lab studies to evaluate biocide levels and their residual effects on contamination and on slurry properties. This method allows Thiele to pinpoint the most effective dosage level so that we can insure we are not over or under-dosing.

The 30-day test period mimics the longest transit time to customer destinations all over the continent. Thiele not only analyzes the final product, but also performs test further upstream in the process to help reduce biocide demand.

While Thiele cannot assume full responsibility for bacterial contamination once the product gets into customers' storage tanks and systems, many measures can be taken at the customer site to ensure that bacterial control is maintained and monitored. A mill's biocide supplier must take an active role in preventing contamination of all storage tanks, raw materials, and related systems, not just in paper production.

Analytical methods are available to test residual biocide levels. Techniques used to measure and monitor aerobic bacteria growth include a standard plate count and a dip-slide method. The dip slide method is semi-quantitative and provides a quick test for the presence/absence of bacteria growth, whereas the standard plate count is more accurate and reliable. Conducting mill surveys to pinpoint contamination is also very important to maintaining good housekeeping. Thiele can help the mill with microbiological control and provide housekeeping guidelines and assistance when needed.

Tank Sanitation

After exposure to bacterially contaminated material, all exposed equipment (i.e. tank, hoses, lines, valves) must be sanitized with an appropriate solution such as sodium hypochlorite. The hypochlorite (10-12% active) is diluted with water at a 350:1 ratio of water to hypochlorite. Thiele recommends this cleaning be performed before introducing new material into the tank or system.

Treatment of Contaminated Kaolin Slurry

Hydrogen peroxide is used to treat slurry spoilage. Begin with 100 ppm active peroxide per slurry ton of clay and agitate for four hours to allow the peroxide to dissipate. This equates to one gallon of peroxide per ten dry tons of clay. One application should be effective, but if the slurry still appears spoiled, re-treat using 50 ppm active increments as needed. Once residual peroxide levels are under 20 ppm, an FDA approved biocide must be added at the manufacturer's recommended dosage to preserve the slurry.

Kaolin Storage Tanks - Housekeeping 101

Agitation - Storage tanks need to have agitation or recirculation. Once the biocide is depleted and bacteria grow, the dispersant can be depleted causing the clay to settle out. For new systems, agitator blades, operating at a speed no higher than 25 rpm, should be placed as close to the bottom of the tank as possible. As an alternative to continuous agitation, the agitator can be put on a timer to run for 15 minutes and be off for 45 minutes. This will keep the solution moving just enough to prevent any settling. Agitator suppliers can offer information on the size of agitator based on your specifications. Too much agitation will cause the clay to splash onto the sides of the tank and form clumps or deposits that will recontaminate the slurry when new cars are unloaded into the tank. This will result in rapid depletion of the residual biocide. When new cars are emptied into the tank, the clumps will isolate the bacteria from biocide contact. When this happens, bacteria will begin to grow and can reach levels where they recontaminate the slurry and start depleting the biocide.

Tank Cleaning - Tanks should be taken out of service at least once a year for proper maintenance. Tanks should be physically cleaned to assure no deposits remain in the tank. High pressure water is effective if the tanks do not have excessive build up. After the initial cleaning, fill the storage tank with water and some form of strong oxidizing agent (hypochlorite or peroxide). The solution must then be circulated for at least four hours including through the unloading and recirculation lines, if possible. If hypochlorite is used, enough should be added to obtain a 4-5 ppm (DPT test kit) free chlorine residual. If peroxide is used, enough should be added to get to 5-10 ppm peroxide (test strips) level. Both of these solutions can be neutralized with sodium carbonate before discarding to the treatment plant. Finally, the tank surfaces should be thoroughly rinsed with clean water prior to returning to service in order to prevent the oxidation of biocides.

Tank levels - Tanks should be kept 50% full to prevent drying and build up on tank surfaces. Covered tanks, though they help prevent scumming, must be well agitated to prevent anaerobic conditions. Any misting water or steam used to keep humidity high inside the tank can be a source of bacteria and must also be treated.

Biocide Additions - Biocide is used to treat both the clay and water portions of the slurry since bacteria associate with both; therefore, biocide additions should be based on the total weight of the clay slurry.

Sample Collection & Testing - Sample collection is a vital part of maintaining bacteria control. If the sample to be tested is contaminated even slightly, the test data can be invalid. To ensure accuracy and avoid contamination, sterile containers must be used, sample ports must be completely flushed, and the samples must be well-mixed. Use a standard plate count method for testing, which is accurate even for low levels of bacteria growth. Samples must be plated within 24 hours to insure accurate results.

Helpful Guidelines to Bacteria Control

Keeping tanks free from bacteria is an ongoing task, and it includes more than just the tanks. Most problems originate in the unloading portion of the system. Unloading lines should be thoroughly rinsed after unloading each car, especially if unloading frequency is low. For example, if you are unloading one car per week, the residual clay left in the line has a chance to become heavily contaminated with bacteria. When you unload the next car, this contaminated clay is the first thing that goes into your clean tank. At high enough levels, these inoculations will deplete the biocide in the fresh clay, and the tanks will rapidly begin to spoil. Once this happens, it is only a matter of time before the clay starts to darken, and problems arise.

If contamination is detected early enough, you can re-stabilize the clay by adding peroxide to reach a 20 ppm residual. To test the peroxide residual, semi-quantitative colorimetric strips are commercially available in which a sample of the slurry is centrifuged and the supernatant used.

Thiele - Excellence in Action

Thiele is one of the world's leading sources for processed kaolin clay. Thiele mines, processes, blends and delivers the full spectrum of kaolin coating and filler pigments, each tailored to meet your needs.



At Thiele, the way we conduct business is as important as the business we conduct. It is the human element that defines the most important aspects of the Thiele advantage - that fuels the innovation that sets Thiele apart. It is the hands-on attitude and individual commitments that ensure our long-term value to our customers. We call them, simply, the Thiele touch.

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