Handling of colloidal silica

Tank design, storage recommendations and cleaning procedures for bulk handling

Supplying the right solutions goes beyond selling products, that's why we also help our partners overcome challenges along the entire life cycle. Product stewardship is important to us and we want to ensure that our products are handled safely and in a proper way.

Safety

Colloidal silica products are aqueous dispersions of amorphous silica. Colloidal silica is not classified as harmful, but as mildly irritating. Because the products can have a drying effect on the skin, protective gloves should always be used. In case of skin contact, wash the area of contact with plenty of water. The use of safety glasses is always recommended. In case of eye contact, rinse with large amounts of water and seek professional medical advice. For further information, please reference the Safety Data Sheets for each product.

Tank design

When installing tanks and equipment for colloidal silica, it is important to avoid trapping product in low points in pipes and tanks to reduce the risk of organic growth. If allowed to dry, colloidal silica can also form silica deposits that are very difficult to remove. Dried silica solids can result in blocked pipes, stiff valves, etc.

Storage tank design and placement

The storage tank and containment/embankment should be installed in accordance to proper local engineering standards. The tank should be sized not only in accordance with local engineering standards, but also considering the requirements for operations. The tank should be located in a restricted area, with unloading access available for the delivering equipment. Emergency safety shower and eye wash as well as rinse water (for unloading cleanup) should be available at the unloading point.

The tank should be placed on a steady foundation, and the bottom of the tank should be sloped to allow for complete emptying. For smaller tanks, it is advantageous to have a conical base or dish bottom. The bottom connection flange should be placed as low as possible to facilitate draining and rinsing.

Construction materials

Tanks, pipe systems, instruments, pumps and other wetted equipment should be made of stainless or acid resistant stainless steel. Reinforced fiberglass (FRP) is also an acceptable material of construction, but FRP tanks are more difficult to clean. Compatible gasket materials are aramid, graphite, PTFE or FPM/FKM. A compatibility list of materials of construction is available upon request.

Dimensions and instrumentation

The loading pipe should be at least 80 mm in diameter and clearly marked with the Levasil product name. Avoid low points and pockets where the product can gather and remain standing. The loading pipe should be placed vertically and attached with a vertical coupling approximately 1,25 m above grade. The tank inlet should be at the top. An overfill pipe can be combined with a venting pipe, the diameter of which should be at least double the diameter of the filling pipe. The overfill pipe should open at ground level and be readily visible from the loading point. Butterfly valve or membrane valves should be used rather than ball valves. A 600 mm inspection cover should be installed at the top of the tank. A 600 mm manway for inspection and cleaning is also recommended on the side of the tank.

The tank should be fitted with a level gauge and a temperature meter. The connection flange for the thermowell and any other small diameter instrumental flanges should be sloped at an angle of 150º so that the area is self-draining. Stirring is not required for the tank, but the possibility to recirculate is recommended. If there is a risk of the ambient temperature falling below 0°C (32°F) for extended periods, the tank should be insulated. Extended exposure to high temperatures should also be avoided.

Levasil Colloidal Silica

Storage recommendations

Shelf life

The maximum shelf life of a colloidal silica product varies between the different products and is referenced in the product data sheets. Storage of the product longer than the shelf life or in unfavorable conditions could affect the performance of the product.

Temperature

Colloidal silica is a freeze sensitive material. If allowed to freeze, the product will irreversibly agglomerate or gel. If product has been frozen, it will most likely be rendered useless and must be disposed of. If exposed to high storage temperature for extended periods, the shelf life of the product may be shortened. To reduce temperature effects to colloidal silica products and maximize shelf life, they should be stored at a recommended storage temperature of 20°C (68°F). Ambient conditions of +5°C to 35°C (+40°F to 95°F) are generally also acceptable, but please refer to the product data sheets for individual product storage recommendations.

Disposal of product

If the product has started to agglomerate, due to contamination, exposure to heat or due to other reasons, we recommend disposing of the residues in the tank. Do not blend with fresh product as the total volume then can be affected.

Cleaning

Inspection

The storage tank shall be inspected annually to track build-ups of agglomerated or gelled colloidal silica on the walls and the bottom of the tank. Solids and gels can adversely affect flow and are excellent breeding grounds for organic growth. If there is any suspicion of organic growth in the storage tank, this could be indicated by flocculus floating on the surface or a biological odor. Regular sampling and testing for bacteria is recommended. Pipes, pumps, filters and valves that have contained colloidal silica must also be checked on an annual basis.

Cleaning

The simplest method of cleaning pipes, valves and pumps is to rinse them with water directly after use. Pay special attention to dead zones in the piping system. Avoid leaving pipes filled with product when not in use.

Tanks and vessels can retain large volumes of fixed deposits and should be cleaned as described below.

Tank cleaning procedure:

1. Empty tank and flush with water.
2. Drain flush water from tank and then close drain.
3. Use proper vessel entry procedures before entering the vessel and follow all safety procedures.
4. Inspect the walls and the bottom of the tank.
5. Use a water high-pressure spray to remove deposits and other signs of bacteria. Ensure that all solids and deposits are removed.
6. Drain the rinse water from tank and then close drain.

Tenacious deposits will require chemical treatment for removal – see below.

Chemical treatment with caustic solution

As with any cleaner, successful cleaning is dependent on time of contact, temperature of cleaning solution and on concentration (and pH) of cleaning solution.

It is assumed that all system components are resistant to strong bases and elevated temperatures and that all safety procedures/precautions will be followed when handling the cleaning solution. Caustic is a strong base so personal protective equipment including a full mask, helmet, rubber boots and goggles is necessary when caustic is used.

1. Fill tank with a 4-5 % caustic solution. If making the solution in the tank, add the water prior to NaOH to make desired solution strength and minimize heat evolution.
2. Start agitation or recirculation to achieve a homogenous solution.
3. If possible, heat solution in tank to 50-60°C (120-140°F)
4. Agitate or recirculate the solution for 3-5 hours. Very tenacious deposits or systems that cannot be heated could require up to 12 hours removing the deposits.
5. Drain caustic from the tank.
6. Rinse the interior of the tank with warm water, preferably 60°C (140°F), using a high pressure water spray to remove any loose deposits that may remain.
7. A thorough final rinsing of the tank and associated piping is very important for the removal of any residual alkali in the tank as caustic can be difficult to rinse away.
8. Drain the rinse water from tank and then close drain.