CellGuard® OP Magnesium Hydroxide Slurry as a Replacement for Caustic Soda and Sodium Silicate in Mechanical Pulp Bleaching

CellGuard® OP Magnesium Hydroxide Slurry is a high purity, aqueous suspension that functions as an alkali and stabilizer in peroxide bleaching of mechanical pulp such as SGW, TMP and CTMP. Since CellGuard OP provides alkalinity and a buffering effect, replacement of caustic soda (NaOH) and sodium silicate (Na_2SiO_3) in mechanical pulp bleaching is feasible.

CellGuard OP Magnesium Hydroxide Slurry is a slow release alkali that activates hydrogen peroxide to the perhydroxyl ion at a controlled rate, allowing more efficient use of the peroxide as compared to caustic soda. By reducing the concentration of perhydroxyl ions at any given moment, CellGuard OP also reduces the potential for self-decomposition caused by the perhydroxyl ions reacting with hydrogen peroxide. At the same peroxide charge, the CellGuard process results in higher residual peroxide as compared to the conventional caustic soda process. Recycling the residual peroxide or reducing the initial peroxide charge results in significant cost savings for the mill. Additionally, due to the controlled release of hydroxyl ions by CellGuard OP, peroxide bleaching occurs in the pH 6.5 to 8.0 range, reducing the potential for alkali darkening.

CellGuard OP Magnesium Hydroxide Slurry has an equivalent weight of 29 grams as compared to 40 grams for caustic soda, indicating that 28% less CellGuard OP by weight is needed to activate the same amount of hydrogen peroxide. Also, sodium silicate can be eliminated or reduced in the CellGuard process without affecting pulp quality since magnesium hydroxide provides a buffering effect.

These two factors combine to reduce the anionic trash, as measured by conductivity, by as much as 50%, which should result in a significant drop in consumption of retention aids in downstream papermaking operations. BOD/COD are also reduced in the CellGuard process due to a reduction in the solubility of organic components, either by the lower pH or by the tendency for magnesium salts of organic compounds being less soluble than their sodium counterparts. The result is potentially a higher pulp yield.

Since the magnesium ion is divalent as compared to the monovalent sodium ion from both caustic soda and sodium silicate, there is a potential to improve sludge settling in downstream wastewater treatment systems. Multivalent cations have superior coagulating properties compared to monovalent ions.

CellGuard OP Magnesium Hydroxide Slurry has been proven in laboratory studies and mill trials to be cost effective in replacing caustic soda and sodium silicate for peroxide bleaching of mechanical pulp. Mill trials have shown that significant cost savings can be achieved while maintaining or improving pulp properties.

CellGuard® OP Benefits

Compared to bleaching processes that use caustic soda and sodium silicate in mechanical pulp bleaching, the CellGuard OP process provides the following benefits:

CellGuard OP Magnesium Hydroxide Slurry serves a dual function by providing both alkalinity and a buffering effect, thus replacing caustic soda and sodium silicate. Bleach costs are improved at equivalent or higher pulp brightness by eliminating or reducing the amount of caustic soda and sodium silicate required. Typical bleach cost savings of $5 - $10 per ton of pulp can be achieved.

- Bleach costs are improved by the more efficient use of hydrogen peroxide, potentially reducing the amount required by up to 20% through recycling while achieving the same pulp brightness. Bleach costs are improved by increasing pulp yield and reducing wastewater treatment requirements as indicated by the reduction in BOD/COD by as much as 40%.
- Bleach costs are improved by reducing consumption of retention aids in papermaking operations as a result of a reduction in anionic trash by as much as 50%.
- The potential for scaling is reduced due to the reduction or elimination of sodium silicate.
- Pulp bleached by the CellGuard process has the same or improved properties as pulp bleached by the conventional process. For example, an improvement in bulk or freeness can be achieved.
- The CellGuard process bleaches under near neutral conditions resulting in reduced tendency for alkali darkening.
- CellGuard OP Magnesium Hydroxide Slurry is safe to handle since it is non-hazardous and non-corrosive.
- The CellGuard process requires minimal capital changes to the conventional bleaching system.

Since bleaching conditions and quality goals are specific for each mill, Martin Marietta Magnesia Specialties can conduct laboratory tests using the mill's pulp and process conditions to determine the optimum CellGuard formula while meeting the mill's objectives.

Martin Marietta's Application Group can design and supply handling and metering equipment for trials and permanent installations for CellGuard® OP Magnesium Hydroxide Slurry, CellGuard® MH Magnesium Hydroxide Powder, and CellGuard® 35 Magnesium Oxide Powder.

To learn how the CellGuard OP process can reduce bleach costs in your pulp mill, give us a call at (800) 648-7400 or (410) 780-5500, or e-mail us at: MagChem@martinmarietta.com.

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