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Calcium Chloride *Market Reviews*

Industrial Uses

10 Paper Deinking

Calcium chloride ($CaCl_2$) provides the calcium ions needed to effectively adjust water hardness during the deinking of secondary fiber at paper mills and paper recyclers for use in recycled newsprint and other papers.

DESCRIPTION

The North American paper industry uses recycled content in many of its products. But before mills can make use of postconsumer recycled paper, they must have recycled fiber. And before they can reuse fiber, the fiber must be deinked to improve brightness. Ink content as a percent of furnish weight is typically 1.5% to 2% for newspapers and 1% to 7% for magazines.

Deinking seeks to maximize the removal of ink and contaminants and minimize fiber loss. A major deinking method proven over many decades involves froth flotation with soap-calcium chemistry. It is effective for a broad range of inks - letterpress, lithography, offset and laser printing inks - with particles of 10 to 400 microns. The process involves defibering, flotation and separation.

To begin with, newsprint and other papers gathered by recycling efforts are pulped in an alkaline solution and mechanically agitated to fragment paper into discrete fibers. This also removes ink from the fiber through fiber swelling and saponification of the ink vehicle. Flotation then gathers ink particles from the ink-fiber-water mixture by having ink particles attach to very small air bubbles that float to the surface where the foam they form is removed.

In the flotation cell, a soap or fatty acid collects ink particles from the ink-fiber mass. The hydrophobic end of these long-chain molecules attach to ink particles while their hydrophilic ends face outward, forming a hydrophilic mass. Calcium added to the system reacts with the hydrophilic ends to form a stable calcium soap precipitate. The calcium ions also destabilize the suspension by reducing zeta potential, so the precipitate adheres to the injected bubbles.

APPLICATION

Calcium chloride is usually introduced at the flotation cell inlet. The rate of calcium addition depends on water hardness. System hardness should be 180 to 220 ppm $CaCO_3$ at 120 to 150°F (49 to 66°C).

Careful control of hardness aids flotation cell efficiency by ensuring that enough calcium is available to react with ink and air bubbles. Total water hardness may be monitored with a specific calcium electrode and continuous or batch titration linked to a computer-controlled alarm. Monitoring can also limit the presence of reactive calcium in the system to help control scaling.

Use of $CaCl_2$ avoids the special handling procedures needed with some other calcium sources, e.g., calcium hydroxide. Also, $CaCl_2$ solutions can be adjusted to freeze at a low temperature, so they can be stored in unheated, outdoor tanks.

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