Lime Softening

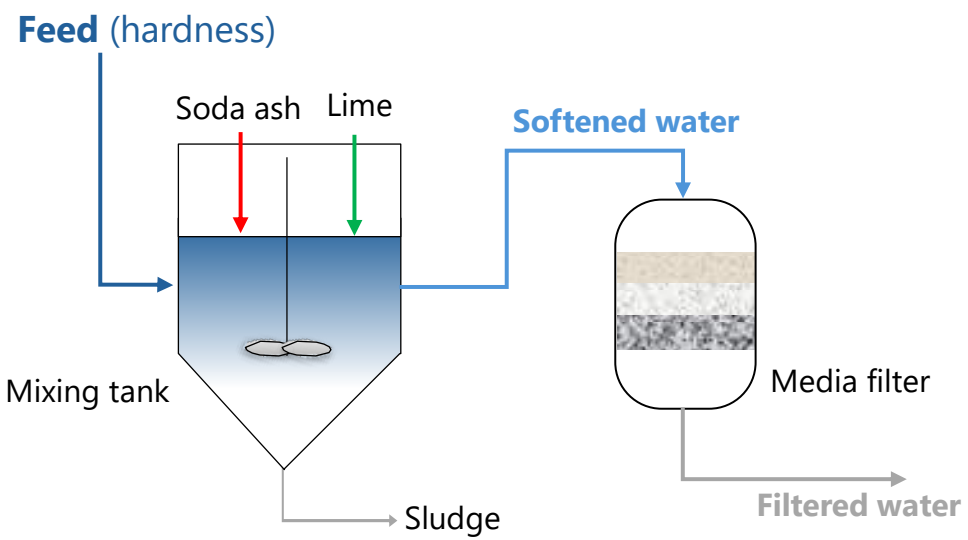
Process Description

Lime softening is a chemical precipitation process that uses lime (calcium hydroxide, $Ca(OH)_2$) to increase water pH and convert dissolved hardness, alkalinity, and soluble silica into insoluble precipitates. Calcium and magnesium are removed primarily as calcium carbonate ($CaCO_3$) and magnesium hydroxide [$Mg(OH)_2$], which are separated through sedimentation and filtration.

For waters containing significant non-carbonate (permanent) hardness, such as calcium and magnesium sulfates or chlorides, soda ash (Na_2CO_3) may be added to promote additional calcium carbonate precipitation and enhance hardness removal. Alternatively, soda ash can be used in combination with caustic, which may reduce sludge production compared to conventional lime-soda softening.

Lime softening is classified as cold, warm, or hot based on operating temperature and is widely used for scaling control and pretreatment. However, the process generates large volumes of sludge, requiring appropriate handling and disposal, which can limit its application in some settings.

Process Schematic



Publications

- Osmotically assisted reverse osmosis: assessing pretreatment on hypersaline produced water (Link)
- Experimental comparison between low salt rejection and counter flow reverse osmosis for produced water desalination (Link)

For further information, please contact us at email: GWSC@conocophillips.com