FILMTEC Membranes

Water Chemistry and Pretreatment: Scale Control

Lime Softening

Lime softening can be used to remove carbonate hardness by adding hydrated lime:

$$Ca(HCO_3)_2 + Ca(OH)_2 \rightarrow 2\ CaCO_3 + 2\ H_2O$$

$$Mg(HCO_3)_2 + 2\ Ca(OH)_2 \rightarrow Mg(OH)_2 + 2\ CaCO_3 + 2H_2O$$

The noncarbonate calcium hardness can be further reduced by adding sodium carbonate (soda ash):

$$CaCl_2 + Na_2CO_3 \rightarrow 2\ NaCl + CaCO_3$$

The lime-soda ash process can also be used to reduce the silica concentration. When sodium aluminate and ferric chloride are added, the precipitate will include calcium carbonate and a complex with silicic acid, aluminum oxide, and iron.

With the hot lime silicic acid removal process at 60–70°C, silica can be reduced to 1 mg/L by adding a mixture of lime and porous magnesium oxide.

With lime softening, barium, strontium, and organic substances are also reduced significantly. The process requires a reactor with a high concentration of precipitated particles serving as crystallization nuclei. This is usually achieved by upflow solids-contact clarifiers. The effluent from this process requires media filtration and pH adjustment prior to the RO elements. Iron coagulants with or without polymeric flocculants (anionic and nonionic) may be used to improve the solid-liquid separation.

Lime softening should be considered for brackish water plants larger than 200 m^3/h (880 gpm). More details are described in water treatment textbooks. /3, 4, 5/

FILMTEC™ Membranes
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