It has been demonstrated that increased levels of technical grade Mg\(^{2+}\) improve bioflocculation according to the divalent cation bridging theory (DCBT). This theory states that negatively charged sites on exocellular biopolymers are bridged by divalent cations such as Ca\(^{2+}\) and Ma\(^{2+}\) (Higgins and Novak, 1997). This bridging helps to stabilize the microbe-biopolymer floc matrix [see illustrations below]. The ratio of the monovalent (Na\(^{+}\), NH\(_4\)\(^{+}\), K\(^{+}\)) to divalent cations (M/D) can be used as an indicator of potential sludge settling and dewatering problems. When this ratio is above approximately 2, which can occur when using caustic soda for pH control, settling and dewatering problems occur. The settling problems can be overcome by reducing the M/D ratio, which:

1.) Increases the divalent cation concentrations.
2.) Decreases the monovalent cation concentrations.
3.) Does both by replacing monovalent cation with divalent alternatives.

Higgins et al. (2004) demonstrated that replacing of sodium hydroxide with technical grade magnesium hydroxide at an industrial wastewater treatment plant significantly improved the settling and dewatering properties of the floc. While using NaOH, the M/D ratio was 48, which decreased to 0.1 when using technical grade Mg(OH)$_2$.

During treatment with technical grade magnesium hydroxide, the sludge volume index, effluent total suspended solids, and effluent chemical oxygen demand were all reduced by up to 63%. Alum and polymer dose used for clarification were also reduced by approximately 50 and 60%, respectively. The dewatering properties of the activated sludge also improved, which resulted in an increase in filter cake solids. These combined improvements led to significant annual savings in sludge handling and disposal, by switching from caustic soda to technical grade magnesium hydroxide.

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Ask me how the **NEW Thioguard Omega-S** program can help you take advantage of Thioguard benefits while addressing struvite and nutrient management needs. Call 1-800-227-4287 today for details.