

Effects and Mechanization of a High Gradient Magnetic Separation Process for Particulate and Microbe Removal from Ballast Water

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Abstract : As a pretreatment process of ballast water treatment, the performance of high gradient magnetic separation (HGMS) technology for the removal of particulates and microorganisms was studied. The results showed that HGMS process could effectively remove suspended particles larger than 5 μm and had ability to resist impact load. Microorganism could also be effectively removed by HGMS process, and the removal effect increased with increasing magnetic field strength. The maximum removal rates for *Escherichia coli* (*E. coli*) and *Staphylococcus aureus* (*S. aureus*) were 4016.1% and 9675.3% higher, respectively, than without the magnetic field. In addition, the superoxide dismutase (SOD) activity of the microbes decreased by 32.2% when the magnetic field strength was 15.4 mT for 72 min. The microstructure of the stainless steel wool was investigated, and the results showed that particle removal by HGMS has a common function by the magnetic force of the high-strength, high-gradient magnetic field on weakly magnetic particles in the water, and on the stainless steel wool.

Keywords : HGMS, particulates, superoxide dismutase (SOD) activity, steel wool magnetic medium

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