Treatment of Mining-contaminated Waters with an Iron Ferrite–Magnetite Process

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Abstract

Hazen is developing a mine water treatment process using iron ferrite–magnetite. Because of its interest in developing technologies for treating acid mine drainage, the EPA agreed in September 2010 to fund a 4-d continuous pilot campaign to demonstrate the process on samples from the Gregory Tunnel site water in Black Hawk, Colorado. The objectives of the program were to determine the contaminant removal efficiencies that could be achieved by the process, to minimize the volume of sludge generated, and to gather engineering data that could be used for scale up to 350 gaL/min.

Hazen operated a 250–450 mL/min iron ferrite–magnetite pilot plant for 4 d in October 2010. During the operations, eight experiments were conducted, i.e., the conditions or the process configuration were changed eight times in attempts to lower the contaminant levels in the discharge water and to reduce the volume of sludge produced. Very effective metals removal rates were noted with a retention time of as little as 27 min. In all cases, the effluent contained less than 10 µg/L Cd, less than 5 µg/L Cu, less than 100 µg/L Fe, less than 50 µg/L Pb, less than 100 µg/L Mn, less than 50 µg/L Se, and less than 30 µg/L Zn. Minimizing sludge generation was another goal of the pilot. The process that produced the least amount of sludge was adding lime and magnetite seed in the conditioning tank, while maintaining a pH of 10. Although retention time varied within these parameters, the filtered sludge volume was reduced by 49% over traditional lime precipitation. It is anticipated that this process could be scaled up to treat more than 350 gaL/min.

References

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