A Case Study Evaluating Effluent Quality Following Chemical and Electrochemical Precipitation for Metals Removal from Acid Mine Drainage Water[1]

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Abstract: Treatment of acid mine drainage water streams is critical to meeting water quality goals in mining regions. A case study was conducted on mine water series of treatability tests on acid mine drainage water, specifically for the reduction in metals and water clarification. Testing included conventional chemical precipitation using calcium hydroxide and sodium hydroxide, independently, for metals precipitation. BakerCorp's patented electrocoagulation system (EC) was tested for metal precipitation. The EC results were compared to conventional chemical precipitation using calcium hydroxide and sodium hydroxide. The conventional chemical precipitation raised the pH of the acid mine drainage water to a neutral pH level using calcium hydroxide and sodium hydroxide, respectively. The EC treatment investigated influent pH ranges, treatment flow rates, and post treatment pH ranges for the precipitation of metals in the acid mine drainage water. The conventional chemical injection did reduce metal concentrations in the acid mine drainage water, confirmed by a third party NELAC certified analytical laboratory. Specifically, aluminum and iron concentrations were reduced to <0.1 mg/L and <0.02 mg/L, respectively. After conventional chemical precipitation was completed and solids separation was conducted the conductivity of the acid mine drainage water increased from the original raw water. The EC system did reduce metal concentrations in the acid mine drainage water, confirmed by a third party NELAC certified analytical laboratory. The EC treatment was able to reduce aluminum and iron concentrations to the same effluent levels of the conventional chemical injection process. Results conclude the EC treatment process has the ability to reduce metals concentrations to lower levels compared to conventional chemical precipitation. Metals include, but not limited to: manganese, nickel, silicon, and zinc. The conductivity of the effluent water decreased compared to the influent raw water, whereas conventional chemical precipitation increased the effluent conductivity.

Additional Key Words: Chemical coagulation, Electrocoagulation, Total Dissolved Solids, Iron, Aluminum, manganese, nickel, zinc.

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