

PYROLUSITE TREATMENT PLANT FOR IMPROVING WATER QUALITY OF AMD-AFFECTED KIBLE CREEK IN OHIO¹

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Abstract. The Kimble Creek abandoned coal mine site, located on National Forest System land in southeastern Ohio, drains to Kimble Creek that ultimately flows into the Ohio River. Releases of hazardous substances are occurring at the site, which include pollutants from Acid Mine Drainage (AMD). Surface water contains concentrations of metals (Iron, Aluminum, Manganese & others) and net acidity known to be detrimental to aquatic life.

Pyrolusite Process AMD treatment system is a microbiological water treatment system where specific metal oxidizing bacteria adsorbed on limestone are utilized to remove metals and pollutants and increase the pH of the water. A pilot plant was constructed at the site to evaluate the efficacy of the system. A four-cell limestone bed was inoculated with a mixture (4 different species) of metal oxidizing bacteria and flow rate was maintained at 3 gal/min. Influent, effluent water and water from different cells were examined at regular intervals for pH and iron content (Fe^{+2} & Fe^{+3}). Analyses were also done to measure dissolved oxygen, temperature, conductivity, concentrations of other metals (Al, Mn, Mg, Mn, Zn, Ca), hardness, sulfate and chloride contents, acidity, alkalinity and dissolved solids. Results showed that the system was able to consistently increase the pH of effluent water to above neutral levels (pH of influent water varied from 1.5 to 4.0). The iron and aluminum levels, which were as high as 72 mg/L and 37mg/L, respectively, were not detectable in the effluent water.

Scanning Electron Microscope (SEM) and DNA analyses of rock samples showed growth and increase in the density of the of inoculated bacteria. Metals contained in the sludge were mainly iron (predominantly Fe^{+3}), aluminum and small amounts of zinc, magnesium and managanese.

Based on the performance of the pilot system, a full-fledged system is being constructed for the treatment of AMD at the Kimble Creek site.

Additional Key Words: Acid mine drainage (AMD), hydrology, water treatment.

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