

SUSTAINED TREATMENT OF AMD CONTAINING AL AND FE³⁺ WITH LIMESTONE AGGREGATE¹

Neil Wolfe² Bob Hedin, and Ted Weaver

Abstract: Limestone aggregate is a preferred alkaline reagent for the treatment of acid mine drainage (AMD) because of its low cost, its non-hazardous nature, and its natural solubility limits. Its use for AMD treatment has been limited because the reactivity of the limestone is commonly compromised by the accumulation of metal solids. Limestone aggregate is particularly prone to fouling by AMD containing dissolved Al and Fe³⁺. This paper describes our experiments into the use of limestone aggregate to passively treat mine water with 3.0 pH, 226 mg/L acidity, 27 mg/L Al, 8 mg/L Fe, and 15 mg/L Mn. The AMD was introduced into two 30 CY roll-off containers containing 32 tons of limestone aggregate and equipped with AgriDrain Smart Drainage systems. The limestone aggregate was 0.5 – 1.0 inch diameter with 97% CaCO₃ content. Two side-by-side units were operated in parallel. Flow rate and drainage frequency were experimentally modified. Samples of the effluent from the units were collected and analyzed for pH, alkalinity, acidity, total and dissolved metal concentrations. The limestone beds were able to produce a sustained alkaline discharge with low metal concentrations. The best short-term performance was obtained when the bed was fully flooded and acted as a vertical flow reactor. However, the effluent from this configuration became acidic within 30 days of continuous operation. Draining the bed every 3-7 days eliminated the short-term performance decline. The optimal configuration occurred when the system operated as fully flooded vertical flow system and was drained empty every 7 days. One unit, which has received AMD for 26 months, has operated for this mode for the last 14 months and produced an average effluent with pH 6.9, -69 mg/L acidity, 0.7 mg/L Fe, 1.8 mg/L Al, and 1.9 mg/L Mn. The paper will describe the experiments and discuss their importance for AMD treatment.

¹ Paper was presented at the 2010 National Meeting of the American Society of Mining and Reclamation, Pittsburgh, PA *Bridging Reclamation, Science and the Community* June 5 - 11, 2010. R.I. Barnhisel (Ed.) Published by ASMR, 3134 Montavesta Rd., Lexington, KY 40502.

² Neil Wolfe Bob Hedin, and Ted Weaver are with Hedin Environmental 195 Castle Shannon Blvd Pittsburgh, PA 15228.