

SEMI-PASSIVE TREATMENT OF MINE DRAINAGE WITH A WATER POWERED DRY CHEMICAL FEED SYSTEM USING PEBBLE LIME¹

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Abstract. Semi-passive treatment was used at two mine sites in Pennsylvania. At the first site, located in Schuylkill County, mine drainage flowing at approximately 2600 L/min (700 gpm) and containing 5 - 10 mg/L of iron was treated using the influent water to power a dry chemical feed system (using lime) and a four-cell wetland (0.40 ha = 1 acre). Prior to lime addition, pH remained virtually unchanged and iron was not significantly removed with typical iron removal being about 1 mg/L or less. After the addition of pebble lime (CaO) using an Aquafix™ system, the pH of the mine water increased from approximately 5 to between 7 and 8. Total iron concentrations were lowered to less than 0.5 mg/L at the effluent. Iron removal rates within the first wetland cell were less than 1 $\text{gd}^{-1}\text{m}^{-2}$ without lime addition and ranged between 6 and 11 $\text{gd}^{-1}\text{m}^{-2}$ with lime addition. This system used a split of the influent water to turn a water wheel that is geared to a screw feeder located at the bottom of a hopper containing the lime. Lime was added at a rate of about 75 kg/day (165 lb/day). A wireless remote monitoring system was installed at this site to monitor the addition of lime by tracking the speed of the water wheel and posting this information to a web site on a daily basis. In addition, selected individuals were notified by phone when the lime bin was nearly empty. The second site is located in Butler County. Influent water at this site is pH 2.7 and contains 117 mg/L iron, 46 mg/L aluminum, 65 mg/L manganese and 780 mg/L of acidity (as Ca CO₃). Water flows at approximately 120 L/min (32 gpm). Treatment with pebble lime will begin shortly and the results will be discussed in the poster. For both semi-passive treatment sites, cost estimates, maintenance requirements and lessons learned will be presented.

Additional Key Words: lime, water powered devices, water wheel, wetlands, iron removal

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