

## Retrofitting a Lime Doser with Automatic Siphon and MixWell System<sup>1</sup>

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**Abstract:** An existing tipping-bucket lime doser active treatment system was retrofitted with and automatic dosing siphon and MixWell system, including a trompe-powered airlift mixing tank (A-Mixer), to decrease maintenance and increase treatment efficiency. An acidic (~300 mg/L hot acidity), metal-laden (12 mg/L Fe, 2 mg/L Mn, 21 mg/L Al) discharge from an abandoned coal mine with flows ranging from 0.2 to 24.1 L/sec (3 – 382 gal/min) was captured in a forebay and directed to a lime doser where calcium oxide is added at the top of a mixing channel leading to a series of two settling ponds and a wetland. The variable flow required frequent site visits to meet treatment goals and avoid undertreatment or overtreatment. Poor lime dissolution achieved in the mixing channel resulted in accumulation of unreacted lime in the settling ponds. A steady flow rate was established using a Fluid Dynamic Siphons Model 523 automatic dosing siphon to initiate periodic flush events that drain the forebay. The outlet of the siphon is plumbed to the center pipe of a MixWell with a nozzle that restricts the flow to 8.8 L/sec (144 gal/min), which is roughly the 88<sup>th</sup> percentile flow of the raw discharge. A small portion of the siphon discharge is drawn off prior to the MixWell and directed to the tipping-bucket lime dispenser that feeds lime to a sluice. The calcium oxide drops from the sluice into the top of the MixWell chamber. The lime-water mixture is then conveyed through a section of the existing mixing channel to the A-Mixer. The effluent of the A-Mixer tank flows through a 100 mm (4 inch) trompe that generates compressed air to run the airlift. Overall system performance has been enhanced through reduced maintenance needed to reach treatment goals and increased lime utilization efficiency.

Additional Key Words: Acid mine drainage, passive mixing, active treatment,

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