A Design & Build Active Treatment Plant for the Globe Mine High Strength Mine Drainage

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Abstract: The Globe Mine, owned by Vesuvius, U.S., is located on the hillslope of the Ohio River near the town of Newell, West Virginia. The Globe Mine is a closed refractory clay mine with two slope mine discharges, known as Mine 1 and Mine 2. The mine waters are low pH and high acidity (6,000 to 8,000 mg/L) containing high concentrations of dissolved iron (2,000 to 4,000 mg/L) and aluminum (100 to 300 mg/L). This high strength mine water poses a number of treatment challenges including neutralization demand, solids production, and coprecipitation of gypsum. Temporary treatment was installed to address the mine water chemistry. This temporary treatment changed over time in response to operational problems and the high costs of the temporary treatment. The temporary treatment plant was labor intensive, had high chemical requirements and high rental costs, was difficult to operate in cold weather, and produced high volumes of sludge, which was disposed of at an off-site landfill. Iron Oxide Technologies, LLC (IOT) and Joseph Maintenance Services, Inc. (JMS) were contracted to provide a permanent treatment plant to address most of the issues with the temporary treatment. The permanent treatment plant included: 1) modifications and improvements to the two mine entry pump systems: 2) an above ground storage tank into which the mine discharges are pumped and from which raw water is pumped to the treatment plant; 3) a permanent lime slurry storage tank; 4) a pH controlled lime slurry feed system; 5) a reactor system that dissolves the lime and oxidizes the ferrous iron in the mine water to produce a high-density sludge; 6) a flocculation system with polymer addition to form a settleable solid; 7) a lamella clarifier to separate suspended solids from the water and collect settled sludge; 8) a sludge holding tank to store collected sludge; 9) a plate & frame filter press to dewater collected sludge for off-site transport and disposal; and 10) a control system containing remote cellular-based monitoring and alarms for the various treatment plant components. The majority of the treatment components are housed in a pre-fabricated steel building. The presentation provides a description of the treatment approach and treatment plant components.