THE DEVELOPMENT OF A DEMONSTRATION PASSIVE TREATMENT SYSTEM FOR REMOVING SULFATE AT A SITE ON VANCOUVER ISLAND, BRITISH COLUMBIA[1]

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Abstract: Sulfate is beginning to gain attention and be regulated in mining influenced water (MIW) discharges worldwide. Currently, the effective options are limited, with reverse osmosis (RO) filtration and/or chemical precipitation most commonly implemented. These systems are burdened by high capital costs (equipment, construction) as well as high operational and maintenance (O and M) costs (power consumption, chemical usage, sludge production, and operations staff). There is a need to develop an alternative technology that can economically remove sulfate from MIW and achieve compliance with these anticipated regulations.

Until recently, anaerobic passive treatment cells such as biochemical reactors (BCR), also known as sulfate reducing bioreactors (SRBR), successive alkalinity producing systems (SAPS), and reducing alkalinity producing systems (RAPS), have primarily focused on increasing pH to circum neutral levels and removing metals (aluminum, cadmium, copper, iron, mercury, nickel, lead, selenium, thallium, uranium, vanadium, zinc, among others). In contrast, a hybrid passive demonstration system has been built at a coal mine site on Vancouver Island, British Columbia for the primary purpose of removing sulfate from MIW. The demonstration system was based on bench test results.

The demonstration hybrid passive treatment system has a design flow rate of approximately 70 gallons per minute (4.5 L/sec) and consists of a BCR, a separate sulfide polishing cell, and an aerobic polishing system. Power is required to pump MIW influent from an underground mine pool to the BCR and for active aeration and mixing in the aerobic polishing system. Active aeration is being used in lieu of a constructed wetland due to space constraints on the site. During bench testing the system removed an average of 80% of the influent sulfate once steady state was reached, with a maximum of 99.9% sulfate removal. In addition to bench testing results, construction of the demonstration system will be presented, and demonstration system start-up data will be discussed.

Additional Key Words: passive treatment, biochemical reactor, sulfide polishing cell, aerobic polishing system, sulfate removal, sacrificial iron

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