Peat Based Sorption Media – Passive Treatment of Trace Metals Without a Stink[1]

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Abstract: Mine drainage has been treated passively with biochemical reactors and wetlands for over 20 years but each approach has shortcomings. Both require contact times over 24 hours which requires large footprints, particularly for constructed wetlands. Biochemical reactors can remove trace metals from both acid and neutral mine drainage but often produce excess sulfide which can generate hydrogen sulfide. At a minimum, hydrogen sulfide can cause odor problems, but can also create hazardous conditions, particularly in confined or low-lying areas. BCRs also release elevated nutrients and organics during the start up phase. This water, if not properly managed, can cause downstream water quality problems. Wetlands can successfully remove trace metals from neutral mine drainage but in addition to the need for a large area, performance often decreases in the winter when water tends to channelize and the rate of biological reactions slow down. Peat sorption media is a granular engineered product made from natural reed sedge peat. It is lightweight, has a hydraulic conductivity similar to coarse sand, and can remove up to 1 -15% metal. The high permeability allows it to effectively treat 1 gpm/ft^2 with minimal head and the lightweight and granular nature of the material allows easy construction and media replacement. Other than a small amount of color in the initial pore volumes, there is no release of nutrients or organics. A pilot test was conducted at a base metal mine in North America. Three gravity flow biocells were constructed using 55 gallon barrels and operated at hydraulic residence times varying from 15 to 60 minutes. A small column was run concurrently so that removal could be evaluated as a function of depth and a removal capacity for the media could be estimated. The input mine water was circumneutral with average total metal concentrations of 2100 µg/l lead, 115 µg/l zinc and 0.8 µg/l cadmium; average dissolved concentrations were 150 µg/l lead, 70 µg/l zinc and 0.2 µg/l cadmium. Only the dissolved lead generally exceeded permit limits. Mine water was successfully treated for about 9 months. Lead removal varied from greater than 99% at the beginning of the study to over 80% when the test was stopped. Estimated lead removal capacity of the peat sorption media was greater than 0.5% lead

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