

A vertical flow reactor for removal of iron from zinc-rich AMD

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Abstract

This paper presents data showing the applicability of a vertical flow reactor (VFR) for removing iron from an acidic mine water discharge in Wales, UK. A VFR was developed previously (Sapsford and Williams 2009) and field trialled, demonstrating effective removal of iron and manganese from circum-neutral mine water, this paper examines the applicability of the same system operating under acidic conditions (pH 3). A 1m³ VFR was deployed for a period of 4 months at a mine water discharge in Mid-Wales. The discharge is typically circa pH 3 with concentrations of Zn and Fe typically 50 - 90 mg/l and 50 - 120 mg/l respectively. Initial results show that the VFR system consistently removed 60-70% Fe from the acidic discharge. The Fe removal mechanism is thought to be filtration of colloidal Fe(III), microbially-catalysed Fe (II) oxidation within the accumulating bed of ochre, followed by precipitation of hydrous ferric oxide with settling properties of a high density sludge. This study demonstrates the potential use of VFRs as 'prefilters' to remove problematic iron for passive systems designed for removing zinc (and other metals) from acidic mine waters.