Removal of iron and suspended solids in mine water treated by vertical flow reactor

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Extended Abstract

Mine drainages with dissolved iron and suspended solids (SS) contaminate streams in mining areas. A vertical flow reactor (VFR) with iron ocher could be used to remove iron in mine drainages due to filtration of iron hydroxides particles, surface-catalysed oxidation of ferrous iron and subsequent accretion of iron hydroxide [1]. This study was carried out to evaluate contaminant removal capacity of VFR treating mine water of circum-neutral pH on site.

The VFR 1 and 2 were 1.5m wide, 1m long and 1.4 m deep. Mine water flowed down through a 1.5 m^2 bed of gravel which sat on porous stainless steel plate 10cm afloat from bottom of the reactor. Another horizontal flow reactor with baffles, control, was prepared to compare between vertical and horizontal system. Water flow of the control was horizontal such as oxic wetlands in passive treatment systems. The control had no function of filtration through the iron hydroxide and just flowed horizontally by baffles.

The influent flow rates of VFR 1 and 2 were around 1500 mL/min and the control 1000 mL/min. Maximum retention time of VFRs was less than 5 hours and the control was about 25 hours. Difference of retention time arose from level of outlets even though dimensions of reactors were almost same. Water samples of influent and effluent were collected periodically and analyzed using standard methods. Water parameters like pH and EC were measured on site

Concentration of Fe and SS in influent showed changes over monitoring period. Concentration of non-filtered Fe in effluent at VFR 1 was around 1mg/L and VFR 2 was below 1 mg/L **(Figure 1)**. The iron content in effluent of control showed changeable reflecting fluctuation of iron in influent and ranged from 1 to 4 mg/L except for some periods. Concentration of SS in effluent at VFR 1 and 2 were measured about 5 mg/L. Contents of SS in effluent of control was around 10 mg/L. Removal pattern of VFR were more stable than the control regardless of iron and SS content. It is concluded that VFR with layer of iron hydroxide could be applied for removing iron and SS in mine drainage as an passive treatment system. The decrease in permeability in VFR might be related to longevity of the system.

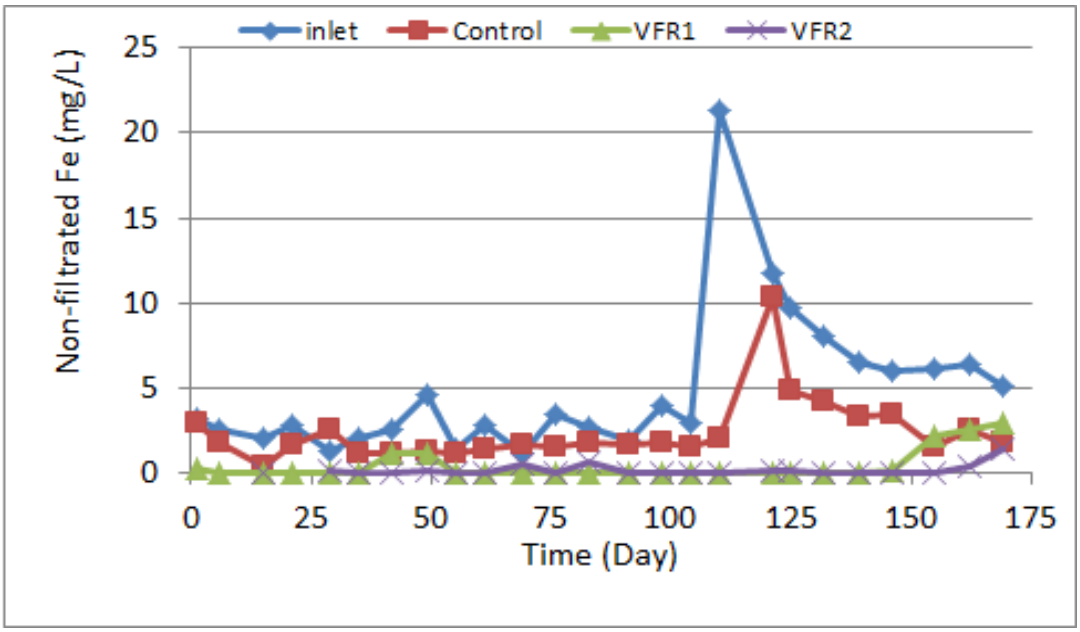

Figure 1 *Comparison of non-filtered iron concentration in inlet and effluents*

Key words: mine drainage, vertical flow reactor, iron, suspended solids

Acknowledgements

Financial support for this study was provided by Korea Institute of Geoscience and Mineral Resources Program (16-3414) and MIRECO.

References:

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