ABSTRACT

Use of Steel Slag for the Treatment of Acid Mine Drainage

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In the past passive treatment of acid mine drainage (AMD) has relied almost solely on the dissolution of limestone to increase water pH and alkalinity and precipitate metals. However, many of these systems have met mixed success due to their susceptibility to metal precipitation or their inability to completely treat highly acidic or high flow discharges. Needed is a reliable, inexpensive alkaline source that can be applied to these highly acidic, high flow discharges. Laboratory and field studies indicate that high alkaline steel slag may be the solution.

Steel slags with varying neutralization potentials were leached with AMD of a known quality using an established laboratory procedure. Leaching continued for 60 cycles and leachates were collected after each cycle. Leachates were analyzed for pH, alkalinity/acidity, Fe, Al, Mn, Ca, Mg, Ag, As, Ba, Be, Cd, Cr, Cu, Hg, Ni, Pb, Sb, Se, Tl, V, Zn. Results from the tests showed that very little of the metals in the leachates originated from slag leaching, even under acidic conditions. These results indicate that many metals present in slag may be bound in unsoluble forms that remain stable under a variety of pH ranges.

In October 2000 steel slag leach beds were constructed at the abandoned McCarty Highwall site in Preston County, West Virginia. The leach beds were constructed as slag check dams below limestone-lined settling basins. Acid water was captured in limestone channels and into the basins where it would leach through the slag dams and discharge into an unnamed tributary of Beaver Creek. Since installation the system has been consistently producing net alkaline, pH 10 water. Samples taken 1/2 mile downstream, after the treated water encounters several other acid seeps, show that water at this point is still net alkaline and has stabilized at a neutral pH.

Biographical Details

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Paul Ziemkiewicz is a native of Pittsburgh, PA. He received a B.S. and M.S. from Utah State University in biology and range ecology respectively. He then received a Ph.D from the University of British Columbia in Forest Ecology in 1979.

In 1978 he joined the Alberta Government's Department of Energy. There he directed its reclamation research program in coal and oil sand mining. He also served on Alberta's regulatory review committee and served as the research manager of the Province's coal technology research program. In 1988, he came to West Virginia University to serve as the director of the National Mine Land Reclamation Center and the West Virginia Water Research Institute.

He presently serves on a number of federal, state and industry advisory panels on environmental remediation.

Dr. Ziemkiewicz has over 70 publications on the topic of mine land reclamation, acid mine drainage and coal ash application in mines.

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