

A TWO-STAGE PROCESS USING RECYCLED ACIDIC AND BASIC
SLUDGES
FOR TREATING ACIDIC ROCK DRAINAGE

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ABSTRACT

A two-stage (I and II) treatment has been studied at lab-scale using recycled acidic and basic sludge to treat acidic rock drainage (ARD) containing high levels of heavy metals. In stage I, ARD is partially neutralized to pH 4–5 with a mixture of lime and recycled basic sludge to generate acidic sludge. The acidic sludge is then separated for disposal as nonhazardous wastes as classified by TCLP testing. In stage II, the pH of water is further raised to 9–10 with lime neutralization, in the presence of lignosulfonates. Aeration, followed by adding small amounts of recycled acidic sludge, or its mixture with ferrous solution, or injection of ferric solution decreases the pH of water to 8.5–9.5. Thus, metals are removed from water as a basic sludge, which consists mainly of metal hydroxides. The basic sludge is separated from the effluent in stage II and entirely recycled to stage I, where its unstable metal components are leached into the water. It now changes into acidic sludge that is composed of metal complexes with a low TCLP leachability at pH 5. This recycling allows the neutralization potential of basic sludge to be completely utilized. The separation of acidic sludge from the system not only can minimize lime scale formation but also avoid consuming additional lime to increase wastes. The application of lignosulfonates provides lubrication, which promotes the smooth flow of both liquid and solid wastes. This two-stage process can produce a high quality effluent in addition to saving >20% of sludge amounts in comparison with the conventional lime neutralization process.

Key words: acidic rock drainage; lignosulfonates; lime scale; acidic and basic sludge

Published in:

ENVIRONMENTAL ENGINEERING SCIENCE

Volume 25, Number 2, 2008, pp. 275-287.