Screening-Level Specific Conductivity Testing of Drill Core Strata

Tessa Monday
Mining Engineering Department, University of Kentucky, Lexington, Kentucky

Richard C. Warner
Biosystems and Agricultural Engineering Department, University of Kentucky, Lexington, Kentucky

ABSTRACT

New federal restrictions on the specific conductivity of water discharge have inhibited the permitting of hollow fills in the Kentucky and West Virginia states of the Appalachian coal field. The objective of this applied research was to develop/modify and evaluate a screening-level testing protocol that may assist mines in determining the propensity of selected geologic strata to generate low, medium or high levels of specific conductivity. The method of overburden field leach testing utilizes geologic exploration cores to perform a comparative analysis of potential generation of specific conductivity. The test was modified from a USGS field leach test that simulates the reactions that occur when materials are leached by water. The overburden field leach test is inexpensive, easy to perform without the need for reagents other than distilled water and hydrogen peroxide and assessments can be rapidly completed. The results of this screening-level testing procedure, based on five cores from three mines in Kentucky and West Virginia, have indicated the potential capacity of identifying geologic strata that requires isolation from oxidation processes. This test can assist in selective mine spoil placement to reduce the specific conductivity of water discharge. Furthermore, strata has been identified that can be used for French underdrains and for isolating materials if rock durability and permeability engineering specifications are respectively satisfied. There are preliminary indications that test results can be regionally extrapolated to gain knowledge of strata—conductivity relationships. Leachate samples can be brought to a lab for further chemical analysis to identify which constituents are contributing to lessened water quality. This test can assist mining companies in obtaining the necessary permits for hollow fills, provide guidance for mine planning and operations associated with material handling and in meeting specific conductivity restrictions on water quality.

ACKOWLEDGMENT

This study was sponsored by the Appalachian Research Initiative for Environmental Science (ARIES). The views, opinions and recommendations expressed herein are solely those of the authors and do not imply any endorsement by ARIES employees, other ARIES-affiliated researchers or industrial members. Information about ARIES can be found at http://www.energy.vt.edu/ARIES.