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D. Martinelli

R. S. Nutter Jr.

R. Larry Grayson

Missouri University of Science and Technology, [graysonl@mst.edu](mailto:graysonl@mst.edu)

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Longwall Electrical Control Issues: A Hazardous Waste Containment Application

Roy S. Nutter, R. Larry Grayson, and David Martinelli  
West Virginia University  
Morgantown, WV

ABSTRACT

The isolation of chemical and radioactive contaminants from groundwater supplies is a topic of increasing concern and urgency. Contamination of groundwater supplies has already occurred in hundreds of sites in this country and is a threat in many more. Remediation strategies have typically involved one of two techniques: excavation and retrieval, or in-situ containment. Excavation is a slow and dangerous job. The contents of containers are often unknown, and may be flammable, explosive, and toxic. Excavation equipment may puncture rusting containers spreading the contents. Excavation usually generates airborne contamination in the form of dust and vaporized volatiles. Large volumes of soil must generally be removed and treated along with the waste materials, adding to the cost and complexity.

In-situ containment of hazardous wastes is preferable if it can be reliably and safely accomplished. A wide variety of techniques have been considered, ranging from steam or chemical injection to implantation of biological agents to vitrification of the soil by massive electric currents. *This paper presents a novel approach to the strategy of in-situ containment by employing longwall mining technology. Longwall mining equipment would be adapted to allow tunnelling under and around a waste site, and construction of an inert, low-permeability barrier.* The barrier will prevent the horizontal and vertical spread of leachates from the waste site by isolating them from ground water flows. A leachate collection system placed along the bottom of the containment would pump collected liquid to the surface for treatment.

*The hazardous waste containment application however, poses challenging control issues on the longwall system employed.* Shield alignment, mine surface texture, contaminate detection, remote operation, integration with liner transport and placement, and backfill efficiency are only a few of the complications associated with this application. In the paper, we identify the key *electronic control issues derived from these complications and discuss proposed modifications* to the longwall system design and operation. For example, to adequately control both the position and attitude of shields, additional actuators and sensors must be installed on the shield and incorporated in the control scheme.

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