

Recovery of Rare Earth Elements from Acid Mine Drainage Using Geotextile Tube Containment and Dewatering Technology

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Background/Objectives. Rare earth elements (REEs) are critical to the global economy because of their use in the telecommunication, aerospace, defense, and energy industry sectors. Areas to mine REE are limited and their recovery is becoming extremely expensive. However, by adapting relatively simple technologies, what is a contaminated waste stream has transformed into a valuable commodity.

In the Appalachian region of the US there is a huge and continuing problem of dealing with acid mine drainage (AMD) from existing and abandoned coal mines. The damaging impact of this waste stream on the environment is well documented. Standard treatment of AMD involves introduction of alkaline chemistry to precipitate metals and other solids. However, this treatment creates millions of tons of high water content sludge that is difficult and expensive to manage.

Approach/Activities. West Virginia University, in conjunction with the state Department of Environmental Quality, has conducted a multi-year pilot study using geotextile tubes to contain and dewater this AMD high water content slurry to the state that REEs can be recovered economically. 814 AMD samples were collected from 140 sites in four states. Both untreated raw AMD, and solid precipitated AMD sludge were analyzed. A full-scale geotextile tube dewatering and containment operation was installed at one site to facilitate capture of 100% of the sludge generated that contained high concentrations of REE.

Results/Lessons Learned. This paper will present the methodologies incorporated and phases of the pilot project that were conducted to create the proof of concept. Second, the paper will detail how the pilot project was scaled to a production facility for economical capture of REE at an abandoned mine site. Finally, this paper will present the cost of the operation, the economic feasibility, and the long-term positive economic opportunity for the Appalachia region that is offered by the application of the REE recovery technologies that have been developed.