CURRENT RECLAMATION RESEARCHAND EVALUATION OF RECLAMATION TECHNOLOGIES

by

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SUMMARY

The National Mine Land Reclamation Center was established in 1988 to conduct and administer research projects, and also to coordinate large cooperative agency and industry projects. Three regional centers have been located at West Virginia University, Southern Illinois University, and North Dakota to concentrate on reclamation problems unique to each area. Several reclamation projects are being conducted in the eastern region by researchers at West Virginia University and Penn State University. These projects include research on phosphatic clay slurries for water control, wetlands, subsidence prediction and grouting material improvement, revegetation of acid sites, and AML prioritization for reclamation. Since numerous reclamation projects are conducted by a diverse group of researchers across many disciplines, agencies, and companies, it is proposed that handbooks be developed to review the findings on current reclamation problems and promising technologies. The handbooks could review the background and development of research on the technology and provide data on implementation and application of the technology in the field. Accumulating information on specific technologies may be of great benefit to enhance application of successful technologies in the field, and to stimulate regulation modifications and changes.

INTRODUCTION

Numerous institutions, federal and state agencies, consulting firms, and mining companies conduct reclamation research. Some research is very applied and occurs in the field on mine sites, while other projects are very basic and take place in the laboratory or greenhouse. The objective of most reclamation research is to develop new and/or improved methods and techniques, and to establish more cost-effective procedures for reclaiming lands. With the establishment of the National Mine Land Reclamation Center, regional research centers have

been located in three distinct mining areas (University of North Dakota in the West, Southern Illinois University in the Midwest, and West Virginia University in the East) to focus on land reclamation problems unique to each region.

One of the major goals of the Center is to coordinate large, fieldoriented projects where interested parties from industry, federal and state government agencies, and academic institutions can cooperate in a mutuallybeneficial reclamation project. One of the projects involving phosphate application to toxic material serves as a good model.

The application of phosphate has been documented to control the production of AMD in several small-scale experiments. It is necessary to apply this technology in the field in an actual, large-scale mining situation. Representatives of industry, state and federal agencies, and WVU have organized to move this technology into the field. Two coal companies have agreed to construct large piles of refuse and mix phosphate with the refuse as it is placed. The researchers at WVU will determine the amounts and rates of phosphate needed for amelioration and other technical aspects related to phosphate application. The researchers and coal companies are bargaining with the phosphate supplier (TexasGulf) and the railroad (CSX) to get the phosphatic material to the mine site. This project demonstrates the type of large-scale project that the Reclamation Center can help to organize and sponsor.

Because WVU serves as the eastern regional reclamation center (it also serves as the lead institution of the National Center), the projects conducted at WVU and Penn State are of importance to participants of the Task Force Symposium. Several small projects (less than $100,000 total budget) in this region are completely or partially funded, and administered by the Center. Some of these projects are highlighted in this paper.

CURRENT PROJECTS

The first project is entitled "Effectiveness of Using Phosphatic Clay Slurry to Control AMD from Reclaimed Mined Areas". The objective of the study is to determine the effects of different mixtures of phosphatic Clay to reduce water movement into toxic material. Preliminary results show that the clay did restrict water movement. Water restriction was better when the clay was mixed into the top several inches of refuse rather than placed as a layer on top of the refuse. Besides reducing flows through laboratory chambers, clay mixed with refuse also improved the quality of water percolating through the chambers.

A second project involves "Removal of Iron and Manganese from AND by Cattail Wetlands: Chemical and Microbiological Processes". A similar project is underway at Penn State. The project hopes to determine metal distribution, chemical composition of sediments, fate of metals in organic material deposited into wetlands, and microbial populations and distribution. Several simulated wetlands have been constructed in greenhouses at WVU and are being designed to collect the necessary data. Volunteer and man-made wetlands on mined lands will also be studied.

"Surface Subsidence Prediction Over Abandoned Mine Land" is another project at WVU. The researchers are using element analysis based on mine layout, age, rock strata and composition to predict the rate and timing of mine subsidence. In addition, another project is determining the effects of various mixtures of material used in grout when filling subsided areas in order to prepare a grout with greater strength, flowability, and cohesion.

A large project at WVU is utilizing sawdust, wood chips, and fly ash to reclaim mine sites. The project involves two phases. Phase 1 was conducted in the greenhouse and tested different rates and mixtures of sawdust and fly ash on the growth of plants. Phase 1 will be completed in May and soil and plant analyses will be conducted. In phase 2, large field plots will be established. The effects of the wood wastes and fly ash on minesoil chemical and physical properties, minesoil erodibility, and revegetation will be evaluated. A similar study in Pennsylvania uses sewage sludge in reclamation of abandoned refuse piles.

A couple of projects are attempting to develop a set of criteria to help prioritize AML sites for reclamation, remining, or those that should be left alone. It is relatively easy to prioritize sites that have obvious health and safety dangers. Projects that involve only environmental impacts are harder to prioritize because these impacts vary in their reclamation importance. Both projects will focus on prioritizing environmental problems on AML sites.

The projects will help us better understand the weathering and successional processes that occur on AML sites, which may help regulatory agencies to select sites with environmental problems that should or should not be reclaimed.

EVALUATION OF RECLAMATION TECHNOLOGIES

Land reclamation is a dynamic, rapidly-evolving field, and, as already noted, numerous reclamation research and demonstration projects have been conducted by federal and state agencies, academic institutions, and private companies. Many of the research results have been published in journals, proceedings, or other federal and state reports which are generally available for reading. However, some of the reports may have limited circulation and accessibility. Because researchers conducting experiments in reclamation are found in a variety of disciplines, the research results are scattered and may be located in assorted journals, articles, books, or other less-known publication outlets. In addition, many of the reports or articles are written in a technical fashion and, unless the reclamation person is completely familiar with the research, may not be understandable to those of us who want to read and apply the results.

On the other hand, many worthwhile reclamation projects and technologies are conducted by mining companies or consulting firms long before they are subject to testing by scientists and reported in the literature. Many of these trials and their results have not been published, nor are the results known outside of the particular company.

Part of the responsibilities of the WVU Extension Service is to present information generated by research in a form that is useful for field application. In addition, it is important that research or demonstration projects conducted by private companies be made known for the benefit of others who may be interested in the technology. Of course, if the project was conducted by a firm or private company and the results are confidential, it would not be appropriate to release this information. However, sharing information on mining and reclamation research or demonstration projects could be very beneficial to others. A good example is the willingness of Tiff Hilton of Leckie Smokeless Coal to share some of his experiences in AMD treatment at this Symposium.

I propose developing a series of articles or handbooks addressing many of the current, controversial topics in reclamation. Some of the topics may include:

1. Use of segregation and special placement of acid-producing materials during mining and reclamation.

    a. Effects on water quality.
    b. Effectiveness of clay caps.

2. Use of blending inert or alkaline material with acid-producing material during mining and reclamation.
3. Use of limestone in reclamation.

        a. Liming the pavement.
        b. Alkaline trenches for AMD neutralization/treatment.

    4. Use of bactericides.
    5. Injection of neutralizing material into backfills or deep mines.
    6. Phosphate application to toxic material.
    7. Use of Acid-Base Accounting for overburden analysis.

Each handbook will present a brief background on the development of the technology or practice, and then review the literature conducted on the technology in a practical manner. Finally, the document will examine the amount and level of field implementation, attempt to provide a survey of operators on its implementation in the field, and its impact on reclamation, water quality, or etc.

The most important part of these handbooks will be the section on field application and the technology's effect. As everyone knows, operators are the only people who know what technologies have been applied on mine sites and whether or not the application procedure was correct. I hope that mine operators will be willing to share information on some of these current reclamation topics so that we can better understand the techniques that have been attempted in the field, and the results that have been measured or that are perceived to occur. I ask and solicit your support and would greatly appreciate your help and cooperation relative to some of your mining and reclamation practices as we begin developing these handbooks.

The information presented in these handbooks would be a great benefit to the coal industry, regulators, and researchers involved in reclamation. Coal operators could evaluate these technologies and perhaps apply the practice on their sites. Researchers could also evaluate the use of the practice and suggest alternatives or improvements. Regulators could be kept apprised of the development and use of specific practices. As the methodology is advanced, agencies could change or modify regulations which will enhance implementation of successful practices.