



WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: Improving the Recycle of Class C Steel Slags by Treatment with Acid Mine Drainage

Focus Categories: SW, TRT

Descriptors: Acid Mine Drainage treatment, Steel Slag Recycle

Duration: 2 years.

Fiscal Year 1999 Federal funds:

- Total: 38,174
- Direct: 38,174
- Indirect: 0

Non-Federal funds allocated:

- Total: 85,888
- Direct: 59,604
- Indirect: 26,824

Principal Investigator: Paul Ziemkiewicz, West Virginia University

Congressional District: 1st. West Virginia

Critical Regional or State Water Problems to be Addressed

The West Virginia Coal Industry generates acid mine drainage (AMD). The State's steel industry generates large volumes of slag which, in turn, generate excess alkalinity. AMD is treated with alkaline chemicals and the alkaline drainage from slag storage areas is treated with acid. The project researchers have done considerable work in developing methods for using steel slag to treat acid mine drainage; the key issue is making the process economical and practical. High iron slags (Class C slag or C fines) are a particular disposal for the steel industry since they contain too much iron for cement manufacture and their iron content lowers the total alkalinity available for AMD treatment. As a result enormous stockpiles (upwards of 300,000 tons) of C fines are stored at just one steel mill at Weirton WV. While the iron content of C fines (~30%) would make them attractive for feed into a blast furnace or electric arc furnace, the small particle size causes the fines to be entrained in the gas stream and carried out of the furnace. Sintering is one solution, but it is expensive.

Preliminary investigations at WVU have shown that using C fines as a filter bed allows direct treatment with AMD. Eventually the iron in the AMD filters out in the slag and

turns the mass into a solid block. It should be possible to crush the blocks, classify them and feed them into a furnace. As a side benefit, the iron content of the slag is increased due to the AMD. In the meantime, a highly alkaline leachate is generated. This project will scale up the laboratory experiments to a full field scale demonstration, large enough to allow testing of the product in a trial furnace melt. leachate. The project has been discussed with a major slag reprocessor: International Mill Service, Inc., and a major coal producer: Consol, Inc. Both are willing to participate and make major contributions to the project.

Results, Benefits and/or Information Expected

The conclusion of this project should be a commercial process which enables the economical recycle of C fines while treating AMD. If successful, the slag producers would transport C fines to an AMD treatment site, build several cells, and after a cell is plugged off, remove it, crush the product and take it to the mill. The Coal Producer would get low cost AMD treatment without the need to dispose AMD sludge.

Nature, Scope and Objectives of the Research

The objective of the research project will be to identify, under field conditions, potential of C fines AMD treatment beds to treat AMD, while producing a product which could pay for the much of the AMD treatment cost.

The water treatment potential of a C fines AMD treatment bed: effluent quality, alkalinity load generation, acid and metal loadings treated, effluent metal contents.

The life cycle time of a C fines AMD treatment bed. Life cycle time is expected to be a function of metal and acid loading.

The recycle potential of treatment bed product. Key parameters will include: hardness, crushability, final particle size consist, chemical composition, moisture and recoverable metal contents.