

Minerals Research Laboratory

Research Projects 2006-07

MRL is located in Asheville, NC and was established in 1946 to assist in the development of North Carolina's mineral resources through research and development. Over the years the activities of the laboratory have expanded to include R&D work for sponsors in all fifty states and throughout the world. The MRL conducts minerals research and supporting activities for the state of North Carolina, for government organizations and for private industry. Industrial research is usually considered proprietary and is held confidential to the company sponsors. The main focus of MRL's research activities is the beneficiation of industrial minerals. The MRL's collective and historical experience in the beneficiation of industrial minerals is unmatched by any university laboratory in the United States. Principal activities include: Developing beneficiation and hydrometallurgical processes for economic treatment of ores and mineral products, processing of waste materials from mining and similar industries and natural resources to develop commercial by-products, providing a mechanism for the transfer (disseminating) of technical, economic, environmental, and educational information from the academic community to the public sector, assisting the minerals industry in meeting the financial and environmental challenges of today through improved technology, more efficient operations, reduction in costs, and public awareness

MRL's state-of-the-art facility is equipped with mineral processing equipment for batch and continuous pilot plant research. The laboratory complex entails three buildings with a total space of about 35,000 square feet. Process development typically begins with bench scale testing in the laboratories. Over the years, MRL has developed numerous beneficiation processes for industrial minerals ranging from high purity quartz to talc. These processes have included: Gravity Separation, Crushing, Flotation, Electrostatic Separation, Thickening, Filtration, Magnetic Separation, Sizing, and Grinding.

The strength of the MRL is its ability to design and operate continuous pilot plant tests from bench scale laboratory data, and subsequently obtain reliable operating data for commercial plant flowsheet design. Pilot plant testing up to 1,000 pounds per hour is available to establish design criteria, operating parameters, cost, process efficiency, and the economic feasibility of the entire flowsheet. The MRL's extensive inventory of equipment enables it to simulate virtually any flowsheet in a meaningful fashion. The pilot plant is often used to provide a bulk sample for product evaluation in the marketplace. MRL has an excellent track record in scaling up from pilot plant studies to commercial design. Success in this area is attributed to the skills and experience of its technical support personnel

As an extension arm of a Land-Grant Institution, service to the public is part of MRL's mission. MRL eagerly responds to requests from individuals, educators, and the press for information concerning mining and mineral processing industry. To promote this outreach further, MRL has established an educational program known as DOWN TO EARTH. This program is now in its fifteenth year and has grown tremendously with the following objectives: to help meet the science needs of the various school systems in the

area, to provide training and resources for teachers so that they can approach earth science teaching with confidence, to interest, excite and educate students and teachers about earth science. Other educational outreach opportunities include industry seminars and student internships.

For the first time in its history, the MRL has offered a college level academic course in mineral processing at the Department of Environmental Studies at UNC-Asheville. The title of the course is "Separation Science and Technology" and was offered for the first time in the spring 2007 semester. The MRL plans to offer this course every year in the spring semester.

Integrated Pilot Plant for Coal Combustion By-product's Conversion

Robert Mensah-Biney
 CAP Consortium (NCDENR, Progress Energy Carolinas, Duke Power, Full Circle Solutions, Land of Sky Regional Council, WRP, MRL)
 \$327,000
 July 2005 - March 2007

This project is part of the Carolina Ash Product (CAP) Consortium's effort in the utilization of nearly 100% coal combustion byproducts and organic biosolids through value added product creation. The goals for the program were to generate a family of products equivalent or surpassing commercial products made from virgin materials. The pilot plant processed 20 tons of coal ash by a wet separation process to recover bottom ash, unburned carbon, and low loss-on-ignition (LOI) fly ash. In addition, the program has produced about 4000 lb of green pellets from a mixture of coal ash and organic biosolids that will be fired in a rotary kiln to produce synthetic lightweight aggregates (LWA). Bulk quantities of recovered products, bottom ash, unburned carbon, low LOI fly ash and LWA have been generated from the pilot plant and will be evaluated for their physical and chemical characteristics for use as saleable products and for market evaluation. The operation data generated from the pilot plant runs will provide reliable operation data for commercial plant design. These specific data include design criteria, operation parameters, cost, process efficiency, and preliminary economic feasibility of the process flowsheet. This project was completed in December 2006 and a technical report was issued in March 2007.

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