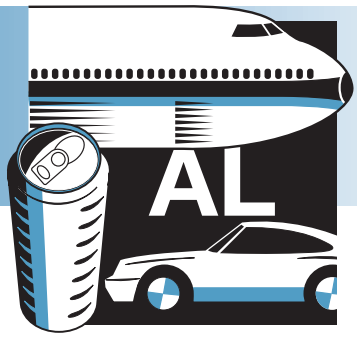
ALUMINUM

Project Fact Sheet



Processing and Recycling of Aluminum Wastes

Benefits

- Potential diversion of one million tons annually of salt cake from landfills to useful feedstock
- Potential energy cost savings of $125 million annually in the U.S. by 2010
- Potential energy savings of nine trillion British thermal units (Btu) annually in the U.S. by 2010
- Increased recovery of aluminum metal
- Decreased disposal costs and landfill use
- Avoidance of salt from aluminum wastes contaminating local ground water

Applications

Processing aluminum wastes into valuable feedstock materials would increase aluminum recovery and recyclabilty, reduce energy consumption, decrease landfill use, and increase competitiveness of all U.S. aluminum producers.

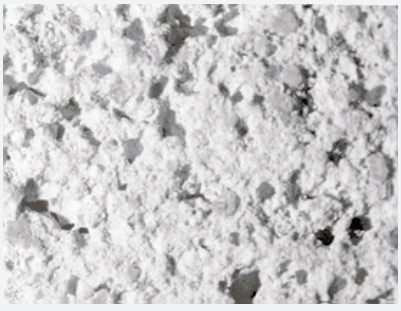
Salt Cake Tratment Will Increase Aluminum Recovery and Reduce Energy Consumption and Pollution

Aluminum is a critical material for the U.S. construction, packaging, and transportation industries. Currently, the U.S. produces about eight billion pounds of primary aluminum per year. The U.S. produces an additional eight billion pounds of aluminum coming from recycling per year. Because aluminum is very reactive with oxygen, salt is added. Thus, a by-product is generated when mixed bauxite is smelted and when aluminum cans/products are remelted for recycling. Called dross or salt cake, depending on the smelting process used, this by-product has amounted to about one million tons per year and is primarily disposed in landfills. Salt cake is a concern because of the energy and material wastes as well as the disposal problems it presents.

Conventional salt cake treatment technology consists of grinding the salt cake, screening to recover the aluminum metal, and leaching to dissolve the salt from the residue-oxide, which is recovered by filtering. The salt is recovered from the process brine by evaporation technology. Valuable aluminum metal, oxides, salts, and other materials have been wasted because of the lack of viable processing technologies to convert this material to useful products. The *Aluminum Industry Technology Roadmap* has identified enhancement of aluminum recycling technologies as one of the seven major performance targets for the Primary Products Sector of the industry. Michigan Technological University has demonstrated that salt cake can be processed to become a unique additive for concrete manufacturing which can make the concrete lighter and help it to cure faster.

This project focuses on the development of a technology to divert the salt cake into valuable feedstock materials for the manufacturing of concrete products such as lightweight masonry, foamed concrete, and mine backfill grouts. By using the unique properties inherent in the aluminum salt cake, this by-product can function as a foaming (air entraining) agent, and fine aggregate for use in concrete. The technology is expected to benefit the aluminum, concrete, mining, and construction industries. The aluminum industry will be able to increase its recovery of aluminum metal while reducing energy consumption and pollution.

Low-Density Concrete



Photograph of a low-density concrete [density is 0.49 grams (g) per cubic centimeter (cc); strength is 450 pounds per square inch (psi)] made from aluminum waste.

Project Description

Goals: Develop a commercially viable technology for using aluminum smelting by-products as foaming agents in the production of low density concrete products.

The Institute of Materials Processing at Michigan Technological University recently completed a preliminary study exploring the cellular/foam concrete concept. The results have been published in the August, 1997 issue of the Journal of Metals (JOM). As part of the preliminary study, a salt cake slag sample was processed and utilized to manufacture foamed concrete and cellular concrete.

This project will develop a total system for collecting and processing large quantities of salt cake to reduce the potential problems before implementation of the process in the aluminum plants. The system would include a salt cake and dross residue processing subsystem aimed at improved recovery of aluminum while producing appropriate feedstock for lightweight concrete manufacturing, and a lightweight concrete manufacturing subsystem aiming at assurance for a quality controlled product, in supplement with market, economic, and environment analyses.

The technology development effort, which will be undertaken to achieve this project goal, will consist of the following objectives:

1. Process by-product waste streams from several aluminum smelters and optimize the processing required to convert wastes into products suitable for use as concrete additives;
2. Develop and demonstrate the processing required to effectively utilize the processed by-products developed for the production of mine backfill grouts;
3. Develop and demonstrate the processing required for lightweight aggregate/masonry block production utilizing the processed by-products developed; and,
4. Document the environmental acceptability of the smelting by-products used as concrete additives and assess the environmental acceptability of the low density concrete products made using these additives.

Progress and Milestones

- Complete Lab Scale By-Product Processing (Fall 1999)
- Complete Environmental Acceptance Testing on the As-Received Smelting By-Product Materials (Fall 1999)
- Define Environmental Acceptance Testing Requirements for Concrete Product Forms to be Produced Under the Project (Fall 1999)
- Complete Smelting By-Product Processing Pilot Work and All Material Analysis (Fall 2000)
- Complete Backfill Grout Formulation and Lightweight Aggregate Production (Fall 2000)
- Complete Smelting By-Product Assessment and Concrete Product Assessment (Fall 2000)
- Complete Engineering Aspects of By-Products Processing (Spring 2001)
- Complete Engineering and Large-Scale Testing of Concrete Products (Fall 2001)
- Complete Commercialization Assessment of Technology (Fall 2001)

Commercialization Plan

The overall commercialization strategy for the project is to develop a commercially viable salt cake processing/aluminum foaming additive technology. If the project is successful, the initial commercial introduction is expected in 2004.

Additional Project Partners:

- Besser Company, Alpena, MI
- Down Stream Systems, Inc., Folsom, CA
- Golder Associates, Golder Paste Technology (PasteTec), Denver, CO
- Masters Builders, Inc., Cleveland, OH

Project Partners

Alcan Aluminum Corporation
Mayfield Heights, OH

EBC Industries
Santa Barbara, CA

IMCO Recycling, Inc.
Irving, TX

Marport Smelting L.L.C.
East Chicago, IN

Michigan Technological University
Institute of Materials Processing
Houghton, MI

TST, Inc.
Fontana, CA

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