

The current status of the research on municipal wastes is as follows: Mechanical separation methods have been devised to separate the residue into several components. Some of these would be saleable to scrap processors without further treatment, while other need additional processing to enable them to be fully utilized. Work has been started on the development of methods for this processing.

#### TAILINGS

Tailings are materials rejected during concentration of minerals and there are hundreds of millions of tons of such material throughout the country. Because of the varying composition of tailings piles from different sources, no one process can be found to solve the total problem. We are working on several techniques that can be broadly applied to the majority of tailings piles.

There are tailings that contain minerals which should be extracted and utilized from the standpoint of conservation. A prime example of this type is the red muds generated during the production of alumina from bauxite. These muds (now being generated at the rate of over 5 million tons per year) contain large quantities of iron, aluminum, and titanium. We have already worked out a process for recovering part of the aluminum along with significant quantities of soda (added during the processing step) and returning them to the process. Work is currently directed toward recovery of the remaining aluminum and iron. Other research on tailings involves the possible use of these wastes as a component of bricks, building blocks, or other construction material.

Many tailings piles are composed of relatively barren material. In these, the originally desired mineral has been efficiently extracted and there are no accompanying minerals worth removing. For these tailings, the only solution is disposal in an efficient and unobjectionable manner. We are investigating two methods for doing this. One involves chemical treatment for temporary stabilization, followed by fertilization and seeding with selected seeds to provide a permanent cover of vegetation which will minimize or prevent wind and rain erosion and the accompanying air and water pollution. The scenic blight caused by barren tailings dumps is also minimized by this procedure. The other approach to disposal involves injection of slurried tailings into underground strata. This technique has been shown to be technically feasible even for relatively coarse material, and the economics are now under investigation. In addition studies are in progress to develop costs of solid waste disposal at selected mineral and fossil fuel mining and processing plants and to develop guideline and expertise for disposing of solid wastes that may accumulate in the future. Particular attention is given to mined-land-reclamation practices which start with the opening of the mining and/or processing plant, continue through the period of active operations, and provide for reclamation or restoration of the mined-out area to a useable condition after active operations have ceased.

#### SCRAP

Although the scrap processors are generally quite efficient at returning scrap metals to industry for reuse, there are some types of scrap that are not used to their full potential. Low-grade iron scrap, contaminated by nonferrous attachments, appears to be one of the major problem areas in the scrap picture. The largest source of this type of scrap is the obsolete automobile, although large appliances such as refrigerators, stoves, and washing machines also fall in this category.

We have developed a process by means of which nonmagnetic taconite (an iron-bearing mineral now being put in waste piles around taconite plants) can be converted to useable magnetic iron ore by roasting with low-grade iron and steel scrap. In the process the scrap, while converting the taconite to useable form, is itself converted to high-grade iron ore. We have successfully operated the process on a small scale using automobile scrap, old refrigerators, tin cans, and other forms of scrap.

Another segment of our scrap research is concerned with the development of hydrometallurgical or chemical leaching methods for producing clean scrap from automobiles or from byproducts of auto-scrap processing yards.

#### FUTURE PLANS

Now with this description of our research in municipal wastes, tailings, and scrap in mind, let me take just a few moments to tell you something of our fu-