Udy Process

Applied To Copper Slags

There are some 10 million tons of iron in the slag dump at the abandoned Clarkdale smelter in Arizona—and similar amounts in other dumps around the world. If recovery by the Udy technique proves feasible, an important new source of iron will result.

SELECTIVE smelting by the Strategic-Udy process, already demonstrated on a pilot-plant scale for low-grade ferromanganese and lateritic ores (see JOURNAL OF METALS, March 1957, p. 340, and May 1959, p. 311), is soon to be applied to iron-bearing copper slags located at Clarkdale, Ariz. The result will be a small integrated plant, the first in Arizona.

Undertaking the project are two subsidiaries of Webb & Knapp Inc.: Webb & Knapp Strategic Corp., (partially owned by Strategic-Udy Metallurgical and Chemical Processes, Ltd.) which will construct the plant, and Zeckendorf Steel Co. which will operate it. The latter company's name derives from an Arizona pioneer, who was the grandfather of William Zeckendorf, now president of Webb & Knapp. Koppers Co., closely associated with Strategic-Udy, is conducting the engineering program that will lead to construction of the Clarkdale mill. Buildings and facilities of the abandoned smelter will be used as much as possible. The plant is expected to cost about \$15 million and take two years to complete. A Koppers official said that the old smelter was in a remarkable state of preservation, due to the arid climate of the area.

Plant to produce 500 tpd

The Clarkdale slag contains about 33 pct Fe, 0.5 pct Cu, and 2 pct Zn. The process is capable of extracting all of these values, and the remainder, called *slag-slag*, will be processed into building materials. Initial steel capacity of the plant is scheduled to be 500 tpd, which can be expanded to 1000 tpd as demand increases. At this rate, the slag pile will last 30 to 60 years. The building materials plant will have a capacity of 1000 tpd. The integrated facility will concentrate on reinforcing rods and other merchant products. A Webb & Knapp official said that more than one-third of the output of the plant has already been contracted.

Udy process modified

The Strategic-Udy process, developed by the late Marvin J. Udy, is a direct reduction process which employs the principle of selective smelting. As adopted for slag treatment, the process uses an oil or gas-fired furnace to melt the slag, in combination with coal, lime, and reducing agents. Bath temperature is about 2600°F, which volatilizes most of

the zinc present, and copper is matted out leaving a copper-free iron-bearing slag. This slag is treated in a Udy-type electric furnace, which gives a semi-refined steel. A third furnace, also electric, finishes the steel to standard specifications. The ferro-copper matte is treated separately to recover the copper values. The residue is processed in the building materials plant into rock wool insulation and concrete building products.

Cost of power unsettled

While power costs in Arizona tend to be high, substitution of the oil- or gas-fired furnace for the tunnel kiln in the melting stage of the process should result in substantial power savings over that previously reported for the Udy process.

The cheapest electric power being supplied to industrial concerns by Arizona Public Service is 8¼ mills at present. While the project will go ahead at this rate, Mr. Zeckendorf feels that an agreement will be reached at 5¾ mills or lower. He cites the inevitable industrial expansion which accompanies steel producing facilities, in addition to the fact that Clarkdale, a ghost town since closing of the smelter six years ago, will be born anew. An unknown factor in the power question is that extensive oil and natural gas drilling is presently going on in the Clarkdale region, with prospects termed hopeful.

Other projects planned

While the Clarkdale unit is the first project, Webb & Knapp also announced that it has contracted with The Anaconda Co. to purchase slag from that company's Anaconda, Mont., property. A plant at this site is scheduled for completion in 1963. In addition to the 40 million ton pile there, the contract includes provisions for the purchase of hot slag, which should result in a further power saving. Other deals are pending with Phelps Dodge Corp. and Kennecott Copper Corp., both of which own large slag dumps.

Webb & Knapp, widely known for spectacular real estate deals rather than metal production, feels that the major economic significance of the process lies in the possibility of building relatively small integrated steel plants in any part of the world where high-grade ores are not available, and where a country or region is dependent on imports for its steel requirements. J. J. Burke