UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

OFFICE OF
REGIONAL DIRECTOR

REGION IV

224 NEW CUSTOMHOUSE
DENVER 2, COLORADO

July 23, 1951

Memorandum

To: Tom Lyon, Chairman, Coordinating Committee
Defense Minerals Administration

From: DMA Field Team, Region IV

Subject: DMA 1192, Application of American Chem-Metal & Electronics Lab's, Inc., Denver, Colorado

Herewith are enclosed the original and two copies of reports by the field team, G. H. Schack and G. M. Potter of the Salt Lake City Metallurgical Division and A. T. Brent of the Metallurgical Division field office, Denver, Colorado, as requested in your memorandum of June 22, together with comments by S. R. Zimmerley, Chief, Metallurgical Division, Region IV.

The reports indicate that the proposal has little merit. It is recommended that assistance be denied.

The original brochure is being attached.

J. H. East, Jr.

A. H. Koschmann

A. H. Koschmann

Attachments

1d

cc: Koschmann
DMA

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
1600 EAST FIRST SOUTH STREET
SALT LAKE CITY 1, UTAH

REGIONAL DIRECTOR'S
OFFICE
REGION IV
JUL 11 1951
BUREAU OF MINES
DENVER, COLORADO

July 9, 1951

Mr. J. H. East, Jr.
Bureau of Mines
224 New Customhouse
Denver 2, Colorado

Dear Mr. East:

Attached are five copies of a memorandum report by G. M. Potter and C. H. Schack of the Salt Lake City station staff on the subject of DMA Docket 1192. I have reviewed their report and DMA Docket 1192 and concur in the observations and conclusions they have made.

Most of the application is a discussion of custom smelter schedules and is of little value in forming an opinion of the proposed process. The only technical information given in the application is an incomplete schematic flow sheet and a general operating cost estimate. The flow sheet indicates a complex roasting and hydrometallurgical process will be employed; however, no data are presented supporting the company's claims for high efficiency and low capital and operating costs. Under current high construction and equipment costs, any hydrometallurgical plant will be expensive to build and operate. This applies to a 50-ton per day plant, as well as the smaller pilot plant for which a grant of $15,000 is asked. It is our opinion that the cost estimates furnished by the company for both the large plant and the pilot plant are unrealistic.

We note that the company suggests the pilot plant be constructed at or near a Bureau of Mines' field office or laboratory so that Bureau of Mines' assistance and supervision would be available to aid the company proving the process. We feel that a serious study should be made of the consequences of such a program before any commitments are made whereby we become, in part, technically associated and responsible for the outcome of the company's program.

Should you have any questions concerning the attached memorandum report or need a more detailed analysis of the proposal, please write me again.

Sincerely yours,

S. R. Zimmerley

S. R. Zimmerley

Enclosures 5

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
1600 EAST FIRST SOUTH STREET
SALT LAKE CITY 1, UTAH

July 9, 1951

Memorandum

To: S. R. Zimmerley

From: C. H. Schack and G. M. Potter

Subject: DMA Docket 1192

We have studied DMA Docket 1192 with the object of evaluating the technical aspects of the process developed by the American Chem-metal and Electronics Laboratories, Inc. and the proposal of the company to build a pilot plant to prove the process.

None of the details of the process are given in the application, and none of the claims made for the process are supported by factual data. Without information on grades and types of ores that are to be treated, on reagents employed and the chemical reactions involved in dissolving the ores, and precipitating the several metals as pure marketable compounds, it is only possible to discuss the proposal in general terms making numerous assumptions as to technical details.

The outline flow sheet of the process indicates the process is complex, involving the roasting of sulfide ores to produce oxidized calcines and hot sulfur dioxide gases used to heat finely ground ore pulps and leach the metals from the roasted ore. Since lead is also to be dissolved, hydrochloric acid or both salt and sulfuric acid presumably are also used in the process, though the flow sheet and process description do not mention these reagents. After an undetermined period of agitation leaching, the pregnant solution and residue are separated and the residue washed by an undisclosed number of countercurrent wash steps. Other than an indication that lead is precipitated by cooling the solutions, no mention is made of how the metals are separated from one another and in what chemical form the metals are recovered. If the leaching is accomplished as assumed, then the end products probably would be oxides, hydroxides, chlorides, or sulfates. None of these products would be readily marketable without further refining and processing; thus, it is doubtful the end products could be sold for the full price of the respective refined metals as is claimed in the application. In any event, the proposed process appears to encompass an involved processing of complex ores requiring an elaborate and fully integrated plant much more complicated than a three-product flotation

mill. The proposed hydrometallurgical plant will include corrosive-proof equipment and a large number of unspecified items of equipment for controlling and integrating the flow, treatment, and purification of ores and solutions continuously. These facts indicate that the cost of building and operating a plant using this process will be high and probably 100 or more percent higher than estimated in the application.

As no facts are given on the equipment to be purchased and installed for the proposed pilot plant to test the process, it is difficult to more than comment on this phase of the proposal. A pilot plant producing 1 ton of finished metal a day would need to treat at least 10 tons of low-grade ore per day. A suitable roaster with accessory, flue system, dust collector, feeder, burners, and control equipment for roasting 10 tons of ore a day would cost considerably more than $15,000 at present-day costs. Thus, the request for a grant of $15,000 to purchase and construct a complete pilot plant and to pay for supervising and operating costs is not realistic. Experience of the Bureau of Mines in constructing and operating small pilot plants would indicate that the initial plant and construction costs probably would be many fold higher than $15,000, and, if the plant were to be operated continuously for 6 months, an additional sum would be required for operating expenses and purchases of supplies and additional equipment.

In summary, our opinion is:

1. The process is complex, requiring considerable special equipment and the integration of numerous difficult metallurgical operations. For these reasons, the cost estimates furnished by the company for a 50-ton per day plant probably are much too low.

2. The requested grant of $15,000 to build and operate a pilot plant to produce 1-ton per day of finished product is wholly inadequate and the actual requirements would be many fold $15,000.

3. Virtually no factual technical data specifically describing the process or the laboratory results obtained are given in DMA Docket 1192. Without data supporting the numerous claims of low cost and metallurgical efficiency of the process, it is necessary to rely on experience with similar roasting, leaching, and refining practices to draw the conclusion that the proposed process, while it may be metallurgically feasible, will at best be expensive as to plant and operating costs and applicable to only select type ores.

C. H. Schack

C. H. Schack

G. M. Potter

G. M. Potter

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
DENVER, COLORADO

Region IV

Building 2-A
Denver Federal Center
Denver 14, Colorado

July 12, 1951

REGIONAL DIRECTOR'S
OFFICE
REGION IV
JUL 13 1951
BUREAU OF MINES
DENVER, COLORADO

Mr. J. H. East, Jr.,
Executive Officer
Field Team, Region IV
Defense Minerals Administration
224 New Custom House
Denver 2, Colorado

Dear Mr. East:

Attached hereto are the original and seven copies of the metallurgical report on the Hout leaching process for docket DMA-1192, American Chem-Metal & Electronics Lab's Inc. This report has been prepared in accordance with the instructions contained in your letter of July 3, 1951.

Yours very truly,

Andrew T. Sweet

Andrew T. Sweet, Metallurgist
Colorado Field Office
Metallurgical Division

attachments

UNITED STATES
DEPARTMENT OF THE INTERIOR
OSCAR L. CHAPMAN, SECRETARY

DEFENSE MINERALS ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION IV

DMA-1192, American Chem-Metal & Electronics Lab's Inc.

Andrew T. Sweet, Metallurgist
Bureau of Mines

July 12, 1951

AMERICAN CHEM-METAL & ELECTRONICS LAB'S INC.

HOUT LEACHING PROCESS

Metallurgical Report

By Andrew T. Sweet
Metallurgist
Bureau of Mines

HOUT LEACHING PROCESS

METALLURGICAL REPORT

By

Andrew T. Sweet

The Hout Process was brought to the attention of Mr. J. H. East, Jr., Regional Director, Region IV, Bureau of Mines, on July 10, 1950, by Mr. Chas. E. Sutton. Mr. East ordered a Field Office investigation.

Two inspection trips were made and a flow sheet drawn and studied. A preliminary report was made September 8, 1950, recommending further study.

The process is hydrometallurgical. It is designed to extract and recover base and precious metals from sulfide and telluride ores. In theory, the finely divided ore is digested with nitric acid under controlled temperatures and pressures. This action results in the oxidization of sulfur and the production of sulfates of the base metals. In complete reaction the lead sulfide (galena) is converted to lead sulfate as follows:

$$3PbS + 8\,HNO_3 > 3PbSO_4 + 8\,NO + 4\,H_2O$$

This insoluble sulfate remains in the residue.

In like manner the several copper sulfides are converted to copper sulfate; sphalerite and marmatite, zinc sulfides, are converted to zinc sulfates. These sulfates are soluble. This is also true of the contained cadmium, germanium, and other impurities associated

with the zinc. No provision has been made for their extraction and recovery. The decomposed nitric, driven off as NO, is oxidized automatically in air and returned to the towers for re-use in digesters. No factual data are available to prove complete recovery.

The leach residues are treated for the extraction of the insoluble sulfates and then washed for treatment in the gold recovery plant.

In the work to date the attention of the inventor has been concentrated on the recovery of gold and an iodine-iodate leach is the feature of this phase of the process.

The residues of the sulfate leach are washed and subjected to digestion in the iodide liquor, filtered, and washed. These reagents are costly and, as in the case of the nitric acid handling, no factual data are available.

The pilot plant consists of stage steps and no completely cyclic flow sheet proving the process has been presented.

To summarize, each of the several steps has some merit but a complete operation from which quantitative data can be obtained and analyzed is lacking.