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Office Memorandum • UNITED STATES GOVERNMENT

TO : J.K. Gustafson, Director, Division of Raw Materials

DATE: August 4, 1948

FROM : F.W. McClave, Jr., and M.G. McGrath

SUBJECT: CONCENTRATION OF CARNOTITE ORES BY VANADIUM CORPORATION OF AMERICA

Symbol: RM:FWM:MGM

The modern accepted laboratory research practice to develop the lowest cost and most efficient method of mineral dressing is, first, to attempt concentration of the ore minerals, with subsequent treatment of the concentrated product. It is only after thorough research efforts of concentration have failed that treatment of the total ore is considered. The benefits of concentration are several-fold and include lower plant initial capital investment and lower plant operating costs as the major achievements.

Problems related to the concentration of the Colorado Plateau uranium-vanadium ores should receive the same consideration that is normally awarded mineral dressing research efforts directed toward the concentration of any type of ore.

Concentration of the Colorado Plateau ores is not new, as an early study of the occurrence of the uranium and vanadium minerals disclosed the fact that concentration could be obtained by grinding the sandstone to individual grain size to liberate the uranium and vanadium minerals. Attrition grinding and scrubbing of the sand grains was found effective in liberating the vanadium and uranium and subsequent separation of the sands and slimes resulted in an appreciable concentration of the ore minerals in the slime portion.

From 1919 to 1923, approximately 22,000 tons of ore were intermittently milled in a 35 ton per day plant by wet grinding and classification. It is reported that initial recovery of the uranium was approximately 78%, with a 3:1 ratio of concentration. Retreatment of the weathered tailings from this operation yielded an additional 10.6% recovery, making an overall recovery of 88.6%. The high uranium recovery is a reflection of the high grade ore milled rather than the efficiency of method employed.

In recent years the Vanadium Corporation of America attempted development of a new method of mechanical concentration by the use of scrubbers on the ground ore pulp. This company should be awarded credit for reviving interest in concentration of these ores.

At a meeting in your office, Mr. Bransome, President of VCA, outlined the investigations his company had conducted to find a solution to efficiently concentrate these ores. It was suggested by us that the AEC would consider a plan whereby VCA would be reimbursed for expenses incurred in the development of its concentration project, providing a thorough investigation by the AEC proved such reimbursement justified. Further discussion of a general nature included the possibility of employing VCA to design, build, and operate a concentrator.

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TO : J.K. Gustafson

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FROM : F.W. McQuiston Jr., and M.G. McGrath

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Mr. Bransome telephoned this office from New York and said he was willing to send us a complete report covering all phases of investigations and the research work his company had performed. It was definitely stated that we could not accept this report if in so doing we were committed in any way. Mr. Bransome assured us that his company was completely covered through patent applications and that the Commission assumed no obligations through receiving this report.

The report sent by Mr. Bransome was accompanied by a letter showing an expenditure, related to the development of the VCA concentration project, of $186,661.94. This report was thoroughly reviewed by both of us and the New York office of the Raw Materials Division. An investigation was made of available literature pertaining to this subject. The concentration work done by VCA can be broken down into the following divisions:

1. Research work at the Bridgeville, Pennsylvania laboratory. (July 1944 through September 1946.)

2. Research work at the Colorado School of Mines Experimental Station, under the direction of Mr. Arthur Weinig. (July 1944 through January 1948.)

3. Batch testing of concentration methods at Naturita to January 1947.

4. Operation of a 35-ton continuous pilot concentrator at Naturita. January 1947 thru April 1947.

5. Mixed concentrate-ore roasting operations on plant scale at Naturita.

6. Construction and operation of a 50-ton concentrator at Mexican Hat

VCA submitted to us a figure of $252,452.43 for the total cost of their concentration program. A breakdown of these costs is attached to this memo. A review of the work done under the VCA concentration project quite definitely indicated that the work following batch testing at Naturita was not related to research work for the development of a concentration process. This phase of the work was not well directed and is not in the channel in which we are particularly interested. The research work done at Bridgeville and under the supervision of Weinig, together with the batch testing at Naturita, was well done. The actual cost for this work was as follows:

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1. Laboratory research conducted at Bridgeville, Pennsylvania under the direction of Mr. H.E. Dunn, during period July 1944 thru September 1946.	$ 10,517.35
2. Experimental work at Golden, Colorado with Dr. Weinig on development of the Weinig scrubber for the period of July 1944 thru January 1948	27,195.26
3. Expense in connection with patent applications	4,572.09
	$ 42,284.70
4. Batch testing of Concentration at Naturita to January 1947	64,100.63
Total	$106,385.33

It is proposed that VCA be paid the sum of $50,000 which is less than 50% of the actual cost of this work. Approximately $27,000.00 was spent at the Colorado School of Mines under the supervision of Arthur Weinig. It is believed that this phase of work done for VCA was capably performed and probably at a lower cost than the AEC could have had it done.

The following proposition was discussed with Mr. Bransome in New York on June 3, 1948: In consideration of the sum of $50,000.00 paid by the AEC to VCA for the work performed, VCA will sell to AEC certain patent rights, metallurgical results, "know-how", and all other data pertaining to the subject of mechanical concentration of carnotite and roscoelite ores.

It was rather difficult to appraise the money value of the VCA work, as it was indicated more emphasis should have been put on attrition grinding rather than on scrubbing; however, the Colorado School of Mines attempted to develop a scrubber for these ores, and as Mr. Weinig is an outstanding metallurgical engineer and has been a practicing metallurgist in the State of Colorado for over 40 years, he undoubtedly selected this method of concentration as presenting a more favorable solution than attrition grinding.
The offer of the VCA is liberal and we believe the AEC will be compensated for this expenditure by obtaining the VCA concentration report along with the "know-how" of its technical staff and through discussion with Mr. Weinig.

The proposed expenditure of $50,000.00 appears to be justified by the obtaining of a substantial portion of a carnotite ore dressing program in the form of completed research work by a reputable company. The value of patents now held or possibly granted to VCA do not appear as important to the AEC as the "know-how" and results obtained from their concentration project.

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By the utilization of the ore concentration data and results of VCA, an AEC program for carnotite concentration would be advanced by possibly a year and should yield information which could be of immediate value.

It is anticipated that a carnotite ore dressing or concentration research program will be instituted by the AEC and that the VCA concentration methods and data will be used as the starting point to avoid repetition or back tracking.

cc:
Roland Anderson, Chief Patent Branch, Rm 50-c
W.A.W. Krebs, Rm 360
JCJ
EFW
M.G. McGrath, Colorado
FWM