

FALCONBRIDGE NICKEL MINES LIMITED

INTER-OFFICE MEMORANDUM

DATE: August 28, 1978

TO: D.J. Emery

COPIES TO:

FROM: P.J. Raleigh

SUBJECT: PROCESSING AND SALE OF ARSENIC
IN STORAGE AT GIANT YELLOWKNIFEIntroduction

During our July visit to Yellowknife we reviewed records of the mine's previous arsenic production, partly to get a feel for the trend in the production of this commodity for on going discussions with Koppers Corp., who propose to buy current production.

The technical history of volumes stored and physical location are recorded in some detail in a volume titled:

"Collection & Storage of Arsenic Dust
at
Giant Yellowknife Mines Limited"

and is correct up to January 1, 1977.

At that time, a total of 176,166 Tons of dust was stored in 13 excavations. During 1977 and 1978 to-date, an additional 8,000 Tons have been stored, for a total of 184,000 Tons. Current production is in excess of 3,500 Tons per year with a grade of less than 0.1 oz Au/ton. Historical records indicate that grades of dust stored have decreased through the years, with initial volumes having gold grades of over 1 oz/ton. The average grade of material in storage is + 0.5 oz/ton currently.

Marketing

Prior to 1978, attempts to sell the arsenic in the state in which it is recovered from the process have been made on a sporadic basis. All of these attempts have been unsuccessful because of either poor quality or long freight hauls for the material.

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The situation in mid 1978 indicates a more favourable climate for arsenic sales, and Giant has been approached by Koppers Co., Ltd., with the object of investigating the possibility of having Giant supply Koppers with all their current production of As_2O_3 for a price as yet to be negotiated, but expected to be $\pm 3\text{¢}/\#$ As_2O_3 equivalent.

Negotiations are proceeding on the basis that Giant would supply a minimum of 3,000 Tons/Year, for a minimum of 5 years. Grades should be $\pm 90\%$ As_2O_3 .

Studies by the F.N.M. marketing and confirmed by the Koppers group indicates a near term shortage of As_2O_3 in the North American market, due to expanded use of the material in products including: wood preservative, glass, pharmaceuticals, pesticides and growth inducing animal food additives. The wood preservative market for which the Giant product should be suitable has an annual growth rate of $\pm 10\%$.

Production Requirements

Koppers or any other purchaser who needs assurance of a long term supply of suitable product should be assured, that it is available from prospective suppliers. In Giant's case this assurance can be provided satisfactorily in two ways.

1. Demonstrate an ore reserve, definitely in excess of 5 years.
2. Demonstrate that an economical system is available to recover and upgrade a minimum of 3,000 Tons/Year and a probable maximum of 10,000 Tons/Year of As_2O_3 from visible reserves.

Item #1 - Probably cannot be developed in time to satisfy the needs for a near term sales agreement.

Item #2 - The potential of the upgrading of the reserves in Yellowknife can be determined with a laboratory investigation of a few weeks duration, cost in the range of $\pm \$20,000.00$.

Economics

Records available in the Giant mill indicate that the 180,000 tons of dust stored in the Giant stopes has the following average quality.

As_2O_3	- 85%
Au	- $\pm .5$ oz/Ton of Dust
Ag	- Not Available

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The market values of the main items at \$0.05/# of Arsenic, @ 95% contained As_2O_3 and \$200/oz of Gold is \$185.00 per ton of dust. If recovery of both gold and arsenic are 90% which is conservative with regard to present practice, value at the mine would be \$166.50.

Gross value of material stored would be in excess of $\$30 \times 10^6$.

Operating Costs for gold and arsenic recovery, using a hydraulic recovery system to raise the dust to the mill and a fuming system based on the present roaster to upgrade the arsenic and a cyanide system to recover the gold from residual dust, based on the present dust cyanidation circuit, are estimated to cost $\pm \$50.00$ /Ton of dust handled.

Operating profit indicated is \$116.50/Ton of dust.

It has been suggested that 10,000 Tons per year of As_2O_3 can be moved out of Yellowknife to users. An operating profit from this operation of \$1,165,000 per year can be anticipated for a period of up to 15 years, based on volumes now in storage.

Development Proposal

A commercial scheme may develop over a period of time with any one of three objectives being economically attractive.

1. Recover Gold only (no As_2O_3 sales, return As_2O_3 Underground) operating profit of ± 40.00 /Ton of dust treated.
2. Recover As_2O_3 only (no gold recovery if metallurgy is unsolvable) (Operating profit $\pm \$26.50$ /Ton of dust treated).
3. Recover As_2O_3 and Gold as shown in section under economics. Operating Profit $\pm \$116.50$ /Ton of dust treated.

Arsenic sales have not been firmed up-to-date and it appears that shipments will not start before the spring of 1979. The early requirements for low grade material can be met out of current production, but larger volumes of sales will require supplementary production or markets may be lost. To be in a position to supply the market as it develops, some preliminary research is indicated.

It is proposed that research be carried out in three main areas:

1. Processing - As_2O_3 may be separated from the gold bearing material using one of several systems including:
 - (a) Fuming using a modified roaster of the type currently in place in the plant (or)
 - (b) Using a water leach system relying on tankage in place, in the plant plus a heating and cooling process. Both systems should produce a high purity premium grade product. Research is required to determine the most practical and economical processing method to be used for As_2O_3 upgrading.

2. Gold Recovery - Investigations of the plant modifications, if any, for the recovery of gold from the residual should be done.

Final waste product is expected to be suitable for disposal into the normal tailings pond, if shown to be undesirable it may be returned to an empty storage stope.

3. Mining - The recovery of As_2O_3 dust from existing storage. This may be done using either a dry, (Vacuum recovery system) or wet, using a wash system to repulp the dust for delivery. Either system can be made environmentally acceptable. Development work is needed to select a system that may be applied, followed by test work. This research may be delayed several years depending on the availability of above ground arsenic supplies.

Old areas should be approached first, as gold grade is higher and crown pillars above the stopes have high gold in rock values.

Capital Costs & Financial Features

The current anticipation of capital requirements for the proposed recovery system would depend on production targets and may be as follows:

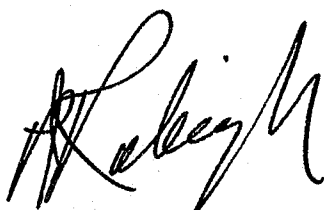
1. To initiate arsenic (As_2O_3) shipping from current production \$300,000 Total. Annual return from sales and reduction in storage costs - $\$180,000 + 75,000 = \$255,000.00$ Koppers initial supply can be met from this source.
2. To recover and upgrade 3,000 T/Y of As_2O_3 product for sale - \$400,000.00.

Total after Item #1 has been achieved.

Annual net return from sales of material recovered from storage would be - \$348,000.00. This material would meet Koppers expanded requirements and 1500 T/Year to F.M.C. if this developes.

3. To recover and upgrade 10,000 T/Y of As_2O_3 product for sale \$1,000,000 Total, after Item #1 has been achieved.

Annual net return from the sale of 10,000 Tons of material recovered from stopes would be \$1,160,000. This would involve a significant market penetration as current sales potential is about 5,000 tons/year to two major users.



P.J. Raleigh