Opportunity Assessment
for
Copper/Copper Alloy Products

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OPPORTUNITY ASSESSMENT FOR COPPER/COPPER ALLOY PRODUCTS

Department of Economic Development; Mines and Small Business
CONTRACT
GN-94-07-3014-00187

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Background

Western Copper Holdings Ltd.(TSE) and Thermal Exploration Company(ABE) plan to operate a copper project, the Carmacks Copper Project, near Carmacks. The companies reported the completion of a positive feasibility study in September 1994, and are currently in the permitting process. It is anticipated that the project will receive approval to proceed and the necessary licences in late-summer 1995. If permitting is successful and the project is able to raise the necessary funds, the plans have construction commencing in the summer of 1995, with production to commence mid-summer 1996.

The capital costs for the project are estimated to be $57,000,000 (Canadian), inclusive of expenditures for plant and equipment, engineering and construction management and contingencies. The Carmacks Copper Project will produce an average of 45 tons of copper per day over the approximately 9 year mine life through a solvent extraction electrowinning process(SXEW). Using a copper price of US$1.20 per pound, the feasibility study reports a net cash flow of CDN$78,000,000, providing a rate of return of 28%.

It is planned that ore will be mined at a rate of 10,600 tons per day, 200 days per year. The ore will be crushed and delivered via conveyers to a leach pad. Leaching will occur year round. The SXEW process is in essence two closed chemical circuits and an electrolytic process. The first, has the copper rich leachate scrubbed against kerosene. The copper migrates from the dilute acid solution to the kerosene. The now copper empty acid solution is returned to the leaching process. The copper rich kerosene is scrubbed against extremely concentrated sulphuric acid. The copper migrates into the acid solution leaving copper-empty kerosene for further scrubbing of leachate. The copper rich acid is then treated in electrolysis baths and electroplate the cathodes with

99.99% pure copper. Sheets approximately one meter by one meter weighing about one hundred pounds are removed from the cathodes periodically and shipped to tidewater. The cathode sheets are destined to integrated copper mills in the Pacific Rim and elsewhere, where they are used as input to processing directly from cathode into pipe, wire or other similar products.

Typically, in the Yukon, mining activity produces a concentrate that is shipped elsewhere for smelting into a form useful to adding value in an industrial setting. This has resulted in a typical limitation to primary production in the Yukon. This dominance of primary product results in fewer job opportunities as virtually all value-added activities take place outside the Yukon. As well, the general economic opportunities of a mine for the territory are limited to the direct and spin-off benefits of the mining activity itself. Ideally, any mining activity in the Territory would produce economic opportunity both as a result of mining and as a result of value-added activities. The question at hand focuses on pursuing the possibility; that because copper-cathode has not been produced in the Territory before, and because it has different characteristics than concentrate; perhaps it is possible to take advantage of this mining product and add value to it here in the Yukon.

PROBLEM STATEMENT

As discussed briefly above, the focus of this analysis is to determine whether it may be feasible to entertain any economically viable prospect for adding value to the copper cathode produced at the Carmacks Copper Project. The analysis is to attempt to uncover any commercially viable potential for adding value to the copper cathode.

APPROACH

Initially the approach was conceived as having at least two stages. The first, was an industry overview along with a listing of potential products for consideration here in Yukon. The second, was the preparation of a preliminary feasibility assessment of the products.

Each stage was to be completed through the accumulation, synthesis and analysis of detailed information obtained by interviewing key informants in the copper industry and in government and by reviewing relevant documents. It was intended that meetings at the completion of each stage would provide the client with an opportunity to review work to date and possibly direct the future research effort.

Unfortunately, during the course of data gathering for the first stage of analysis it became clear that a second stage would be unnecessary. When this was communicated to the client representative it was agreed that the research would be truncated at the end of the first stage and a final report submitted.

The basis of the report was primarily interviews with experts and secondarily review of published material. People interviewed included:

Ron Chambers	Economic Development DIAND Yukon
Joseph Lazarovitch	Mining DIAND Ottawa
Don Law-West	Mining DIAND Ottawa
Gaff Bokova	Industry Specialist ISTC Ottawa
Arnold Knapp	Cdn Copper and Brass Dev. Assn. Don Mills
Bob Quartermain	Western Holdings Limited
Ken McNaughton	Western Copper Holdings Limited

Several publications were reviewed including:

Copper, chapter in Canadian Minerals Yearbook, 1993

Several issues of Canadian Copper

Several issues of Standardization News

60 Years of Copper Standards Development, ASTM, 1989

Copper in Canada, Energy, Mines and Resources Canada, 1991

Copper, Canadian Copper and Brass Development Assoc., 1973

Annual Reports, Western Copper Holdings Limited

Feasibility Study, Western Copper Holdings Limited

FINDINGS

In general the research and conversations uncovered a clear but unfortunately "opportunity poor" situation for value-added activity here in Yukon.

In essence the copper products industry is becoming increasingly integrated, with final product producers utilizing copper cathode as a direct input to the production process. They do not any longer use intermediate products like copper bars derived from copper cathode in their processing, opting rather to a fully integrated strategy which has the formation of such bars integrated in their "line". Thus there is no market for such copper bars from the Yukon.

There have been virtually no efforts to utilize copper cathode directly in product production, with one exception, an attempt to fabricate copper roofing shingles from coper cathode in Australia. Since it is extremely unlikely that such a new/untried product in the North American market place would make sense for production here in Yukon, no efforts were expended to track down further information on this example.

Several interviewees suggested that local crafts people might be able to utilize

cathode in the production of trinkets for the tourism market. Since the gauge of the cathode is quite thick (approximately 1/4") it is unlikely that production of this sort of products is feasible in a sufficiently inexpensive way to make such products profitable. Local crafts people may well innovate products when they have had a chance to handle cathode sheets and may approach the Department for assistance with product development at that time.

RECOMMENDATION

It is recommended that no further effort be expended in pursuing opportunities for adding value to copper cathode here in Yukon unless product development initiatives associated with the local crafts market emerge.

Unless directed, this research will terminate without undertaking the second stage(involving travel expenses) and this report should be considered the final report of the contract .