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PRODUCT DEVELOPMENT

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Subject: Prefeasibility Capital Estimates for a Manufacturing Plant to Produce Coalinga Alteration Products
File No. 10971

The Product Development Group began a study in 1983 to investigate the commercial feasibility of generating non-asbestos products from the Coalinga ore body. Several options survived the initial idea-screening process, the principle option involving the calcination of Coalinga ore to form forsterite. This material has potential uses in a multiple number of industries.

The attached study, prepared by Darden Holt, describes the capital and operating costs required for a facility capable of producing 150,000 TPY of calcined material, ie., forsterite. At this prefeasibility level of definition the capital costs were estimated to be $14.6MM. Operating costs were estimated to be $40 per ton of bulk, low iron forsterite. A variation was investigated, wherein iron was not removed from the Coalinga ore, which reduced the capital to $12.6MM and operating costs to approximately $37 per ton. The operating costs are based on a bulk ton of material at the plant site.

It must be emphasized that we are only in the preliminary stages of investigation. The attached prefeasibility estimates represent an important step torwards identifying end uses that will provide sufficient gross margin to warrant further consideration. For example, we have learned that bulk calcined material will be too expensive to replace dolomite as the primary Mg feed stock at the Alcoa facility. Instead of a 150,000 TPY Mg feedstock commodity the potential has lowered to 10-15,000 TPY to serve as a silica replacement and a Mg feedstock sweetener in the Pidgeon process.

Commercial viability at this level of operating costs and capital varies with anticipated end use. Potential uses that are being investigated, including a guesstimated selling price range, are shown on Table 1. Undoubtedly, some of the potential uses will disappear as we more fully characterize the product. To accommodate some of the contemplated applications additional processing costs, including bagging, must be added to the stated $40 per ton processing costs. King City personnel have rightfully expressed concerns over the logistics of handling large quantities from the mine site. Related problems will most likely raise the unit operating cost.

For analysis purposes we will be incrementing the estimated $40 per ton operating costs, F.O.B. mine site, to $60 per ton in anticipation of additional expenses for royalties, road maintenance, personnel transportation, and material transportation to rail head. For bagged calcined product we will be assuming a cost of $100 per ton which should accommodate costs for special sizing and packaging considerations.

Our future efforts will be focused on determining end use characteristics for the calcined material. Once the experimental MSDS has been approved samples of material will be provided to potential end users and outside laboratories for characterization studies. No further prefeasibility estimates are planned until we have identified a commercially viable end use through experimentation.

D. F. Kapral

/mau
Attachment

TABLE 1

Potential Uses for Coalinga Altered Products

Industry	For Use As	Replacement For	Price Range $/Ton	Domestic Market Tons/Year
Magnesium	Mg Source	Dolomite/Silica in Pidgeon Process	60-90	15,000
Foundry	Casting Sand	Zirconite and Some High Quality Silica	150-200	50,000
Tire Manufacture	Filler and Reinforcer	Carbon Black and Silica Powders	300-500	40,000 at 10% Penetration
Ceramics	Refractory Brick and Gunning Material	Zirconia - ZrO_2	300-400	10,000
Optical and Metallurgical	Polishing Powder	Pure Alumina	$2-15 per pound	unknown