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Baymag magnesite project: looking northeast toward Eon Mountain; main magnesite outcrop is indicated

Magnesite has long-term potential in Canada

Among the projects of Mineral Resources International Limited is a 51% interest in Baymag Mines Co Ltd, which has a major magnesite property in British Columbia. (MRI holds more than 50% of Nanisivik Mines Ltd: WM Oct'77 p20). Refractory grades of dead-burn magnesite are used in the steel, cement, and other industries as a furnace or hearth lining.

The Baymag property is some twenty miles east of Radium Hot Springs, BC. It was explored by Canex Placer, under option, during 1972-4. The main deposit outcrops along a strike length of 6000 feet just above the valley floor along the lower flank of Eon Mountain.

Drilling outlined a wedge-shaped deposit open to the north, with a maximum thickness of 450ft. There is little overburden, and the deposit is suitable for open-pit mining. Indicated ore was reported (rounded-off in million-tons): low grade (90-95% MgO) 6.5; medium grade (95-97% MgO) 7.1; high grade (97%+) 7.7. Greater potential is expected.

The world market for dead-burn magnesite is several million tons a year, and in 1974-5 Baymag investigated, with others, the feasibility of a 200,000 ton/year dead-burn magnesite project, for which capital costs would have been of the order of $75-million. Because of the slow-down in world industrial growth and in the steel industry, Baymag suspended negotiations for bringing the project into production.

A study in 1976 showed a growing demand for non-refractory caustic burn magnesite, and further studies indicated that it may be feasible to bring into production a 30,000 tonne/year caustic burn magnesite operation. This could be followed by a 60,000 tonne/year dead-burn magnesite plant, to be integrated into the project as warranted by markets. The company is pursuing this possibility with other principals.

A longer-term marketing possibility is the supply of material to a magnesium plant. Magnesite (pure) contains 28.84% (wt) magnesium, and there is a potential for greater use of lightweight magnesium alloys in the automotive industry. Volkswagen have used considerable amounts of magnesium in their cars for some years, and demands for better fuel consumption could lead the large US car makers to use more light alloys.

Baymag have suggested a possible plant, in the future, located in Alberta or British Columbia, where there are reliable supplies of coal or coke, electrical power, and chlorine from the petrochemical industry. These materials could be used to produce anhydrous magnesium chloride as feedstock for the electrolytic production of magnesium metal.

Recent work: During the summer of 1977, Baymag worked on a road and bridge for access on the property. A 220-ton sample has been taken for various tests and evaluations.

Baymag magnesite: bulk sample pit

Baymag magnesite: an outcrop

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Prop File 82JNW001

INDUSTRIAL MINERALS

Baymag — high-purity magnesium oxide from natural magnesite

HAGEN B. SCHULTES
Vice-President
Baymag Plant
Calgary, Alberta

ABSTRACT

Refratechnik, a leading German refractory company, acquired a majority shareholding in Baymag in 1979. This acquisition included the mining rights for a magnesite deposit of exceptionally high purity in the Canadian Rocky Mountains.

The deposit, situated in the Kootenay region of southeastern British Columbia, is of Cambrian age and has ore reserves of 50 million m.t. of magnesite. The Baymag magnesite deposit is one of the purest in the world. The deposit was opened up and mining commenced in early 1982. Production of various caustic calcined magnesia products in a rotary kiln operation in Exshaw, Alberta, was started in mid-1982. The product application ranges from pulp and paper production, to the chemical industry, and to animal feed supplements. Since the end of 1983, Baymag has produced high-quality refractory grade fused magnesium oxide for specialty applications in the steel industry.

Introduction

Although magnesium is the eighth most abundant element in the earth and forms about 2.06% of the earth's crust, common knowledge about magnesium and especially magnesium oxide (MgO) as an industrial mineral is not widespread. The reason might be that, with the exception of magnesium metal as the element, magnesia products are not generally sold as final products to end-users, but rather are needed for the production of final products such as steel, cement, paper, etc. Therefore, some general comments are given about the different sources of MgO, the different products, world production and consumption, before Baymag specifics are addressed. Magnesium metal will not be discussed in this paper.

Hagen Schultes

Dr. Schultes attended the University of Goettingen, West Germany, where he received a diploma in mineralogy in 1976 and a Ph.D. in natural science in 1977.

He worked for Refratechnik GmbH in Goettingen from 1977 to 1982 where he held the position of manager of product development, and geoscience and raw materials. In 1983 Dr. Schultes became manager of research and development at the Baymag plant and is currently vice-president of the Baymag plant in Calgary, Alberta, where he is responsible for all aspects of mining, production, quality control, project management, and research and development.

Keywords: Industrial minerals, Magnesium oxide, Magnesite, Caustic calcined magnesia, Baymag, Ore processing, Development, Transportation.

Sources of Magnesia

While the element Mg is found in more than sixty minerals, only magnesite ($MgCO_3$) and to a much lesser degree, brucite, the natural form of magnesium hydroxide [$Mg(OH)_2$], are commercially used to produce MgO. In addition to the extraction of MgO from these natural sources, the synthetic production of magnesia from seawater and brines plays an especially important role for higher grade products.

Magnesite is mined in about 30 to 35 countries from more than 65 deposits. It occurs mainly in two forms; coarse crystalline and crypto-crystalline magnesite. It is difficult to compare MgO production from natural magnesite ores with a seawater magnesia operation, because the comparison is basically between a mining operation and a chemical plant. The process of obtaining MgO from seawater is decidedly more complex than the rather simple calcination of $MgCO_3$ to MgO. As shown in Table 1, it is necessary to start with a different mineral material limestone or dolomite, to obtain magnesium hydroxide sludge — after an ion exchange reaction — which is finally calcined to MgO.

The purity of the final product depends very much on the complexity of the chemical system and mainly on the purity of the limestone or dolomite. Boron oxide, which is a significant contaminant characteristic of seawater magnesia, is damaging to the refractoriness of a dead burnt MgO product.

World Market

As Table 2 illustrates, the world production capacity of caustic calcined and dead burnt magnesia adds up to about 7 million

TABLE 1. Magnesia production processes

Natural Magnesite process

$MgCO_3 \xrightarrow{T} MgO + CO_2\uparrow$

Seawater Process

a1. $CaCO_3 \xrightarrow{T} CaO + CO_2\uparrow$

a2. $CaO + H_2O \longrightarrow Ca(OH)_2$

b. $Ca(OH)_2 + MgCl_2 \longrightarrow CaCl_2 + Mg(OH)_2$

c. $Mg(OH)_2 \xrightarrow{T} MgO + H_2O\uparrow$

Paper reviewed and approved for publication by the Industrial Minerals Division of CIM.

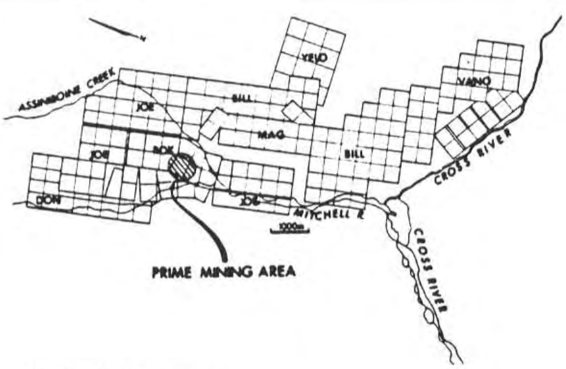

FIGURE 1. Claim map.

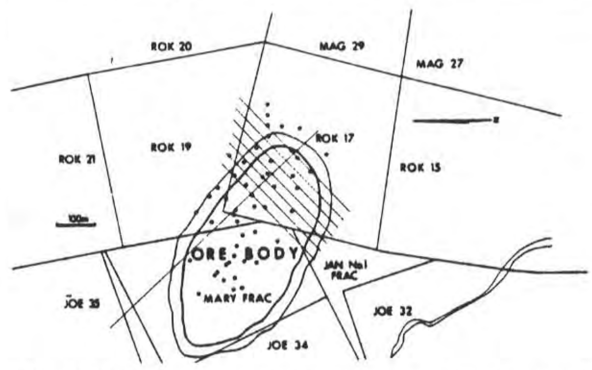

FIGURE 2. Main orebody and prime mining area, 1983-1987.

metric tonnes per year (mtpy) (excluding figures for the U.S.S.R. which vary between about 2 and 4 million mtpy), pointing out that dead burnt MgO is by far the leading product of the two.

While dead burnt MgO serves only as a raw material for the production of basic refractories (the consumption for steelmaking refractories being the leading application), caustic calcined magnesia's applications are of a much higher variety. Table 3 gives an idea of the more important applications. This diversity is the main reason for a higher stability of this smaller portion of the magnesia market.

Baymag — The Company

Baymag, a 100% German-owned company, has been commercially producing caustic calcined magnesia since June 1982. Baymag Mines Co. Limited was founded in 1971 in Calgary as an amalgamation of Baykal Minerals Ltd. and Brussilof Resources Ltd. Exploratory work and claim staking in the Mount Brussilof area near Radium Hot Springs, British Columbia goes back to the mid-1960s after the magnesite deposit was originally discovered by G.B. Leech of the Geological Survey of Canada in 1966. The first extensive feasibility study toward exploitation of the deposit, for production of up to 200 000 mtpy of dead burnt MgO, was carried out by Acres during the period 1970-71 and was based on a large diamond drilling program. The results of the study were very encouraging.

In 1973 to 1974 additional core drilling was carried out by Canex Placer Ltd., as well as preliminary technical research and development for the production of MgO products at Veitscher Magnesitwerke, Austria.

The contacts between Refratechnik, Baymag's parent company and Baymag go back to the year 1975. Refratechnik, a major German producer of refractory products, showed interest in the Baymag deposit due to the lack of deposits in Germany, and the possibility of securing a raw material source. Between these initial contacts and 1979, several research programs were carried out to develop modern technology for calcining and dead-burning Baymag magnesite.

In 1979 Baymag was finally acquired by its German owners and a major feasibility study was carried out by Techman and Kilborn. The positive outcome of the study, finished in 1981, led to large-scale industrial calcining testing of the Baymag magnesite in a rotary kiln at the Canada Cement Lafarge plant, Exshaw, Alberta, in the spring of 1981. The results of these tests, as well as an agreement between Canada Cement Lafarge and Baymag on the leasing of part of the Exshaw plant facilities (including two rotary kilns), formed the basis for Baymag's successful beginning in the caustic calcined magnesia market. In mid-1982, reconstruction of those facilities turned them from a cement to a magnesia production plant.

The Deposit

As mentioned earlier, the Baymag Mount Brussilof magnesite deposit was originally discovered in 1966 by G.B. Leech of the Geological Survey of Canada (GSC) during field mapping in the Kootenay region of southeastern British Columbia near the Alberta border. Leech indicated that magnesite occurs within the Cathedral Formation of Middle Cambrian Age along the west flank of Mount Brussilof, near the confluence of the Cross and Mitchell Rivers. The deposit lies on a west-dipping limb of a broad anticline. The beds strike north 30 degrees west and dip southwest at 20 - 40 degrees. No major faulting has been found. The exact geographical position is 115 degrees 39′ west and 50 degrees 49′ north. Magnesite was also noted to occur at the south end of the ridge between the Mitchell River and Assiniboine Creek, within the same formation. Grab samples collected and analyzed by the GSC were found to contain up to 97% MgO in the calcined product.

Shortly after, a claim staking rush occurred, involving several different companies and leading to the configuration shown in Figure 1, with 233 claims in total. This block extends from approximately eight miles north of the prime mining area to approximately ten miles south of the Cross River/Mitchell River confluence. Exploration carried out within the claims indicated that the magnesite ore is present throughout the block.

Exploratory core drilling to date consists of 59 holes varying in length from 32.3 m to 143.3 m and totalling to 5 255 m (17 239 ft) (Fig. 2). The drill hole spacing over the deposit is variable, with most of the indicated reserves being extrapolated beyond the drilled area. A total of 1 160 samples of core in predominantly 10-ft intervals (64% of samples) and 20-ft intervals (23% of samples), were assayed for MgO, CaO, Fe_2O_3, Al_2O_3 and SiO_2.

The proven (estimation variance 0 - 4%) and probable (estimation variance 4 - 8%) geological reserves in the vicinity of the prime mining area were calculated by Techman Engineering Ltd. to total approximately 9.5 million tonnes of high-grade ore of +95% MgO and 13.6 million tonnes of ore containing 93 - 95% MgO. An additional 17.6 million tonnes of possible (estimation variance greater than 8%) reserves with an average grade of 92.44%, have been identified within the deposit.

The precise geometry of the Mount Brussilof magnesite deposit cannot be defined due to inadequate exposure and incomplete penetration by diamond drilling. The deposit as drilled thus far is approximately 790 m in length (along a NW-SE axis) and 500 m wide (along a NE-SW axis). The maximum thickness of the orebody is at least 120 m.

The main lithologies present on the Baymag property include magnesite, dolomite with minor limestone, quartzite, shale and argillite. Magnesite occurs mainly as white, very coarsely-grained, massive, crystalline rock; it is quite resistant and weathers to light buff-coloured projections with overhanging cliffs. Dolomite and dolomitic limestone lenses occur within the magnesite. As well, thin irregular stringers of finely crystalline pyrite occur in fracture fillings.

TABLE 2. World production capacity of magnesia

Natural Magnesite*	
Caustic calcined magnesia	= 1.0 x 10^6 MT
Dead burnt magnesia	= 3.5 x 10^6 MT
Seawater/Brine Magnesia	
Caustic calcined and Dead burnt magnesia	= 2.5 x 10^6 MT

* U.S.S.R. figures not available.

TABLE 3. Applications of caustic calcined magnesia

1. Acid neutralization
2. Animal feed supplement
3. Cellulose acetate
4. Epsom salt
5. Fertilizer
6. Flue gas desulphurization
7. MgO-based cements
8. Pharmaceutical industry
9. Pulp and paper industry
10. Rubber/rayon industry
11. Sugar refinement
12. Uranium refinement
13. Water treatment

TABLE 4. Trace minerals in the Baymag deposit

Anberite Ca (Mg, Fe) $[CO_3]_2$
Pentlandite (Fe, Ni) $_9S_8$
Boulangerite $Pb_5Sb_4S_{11}$
Muscovite KAl_2 $[(OH, F)_2/AlSi_3O_{10}]$
Leuchtenbergite (Mg, Fe^{2+}, Al)$_6$ $[(OH)_8/Al_{>0.5}Si_{<3.5}O_{10}]$
Phlogopite KMg_3 $[(OH, F)_2/AlSi_3O_{10}]$
Talc Mg_3 $[(OH)_2/Si_4O_{10}]$
Palygorskite (Mg, Al)$_2$ $[(OH)/Si_4O_{10}]$ • $2H_2O$ + $2H_2O$

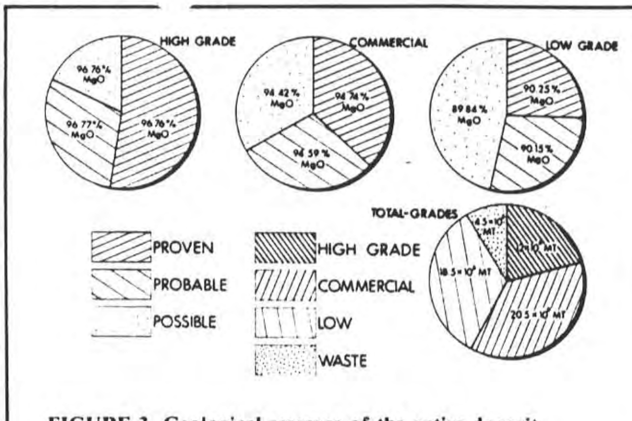

FIGURE 3. Geological reserves of the entire deposit.

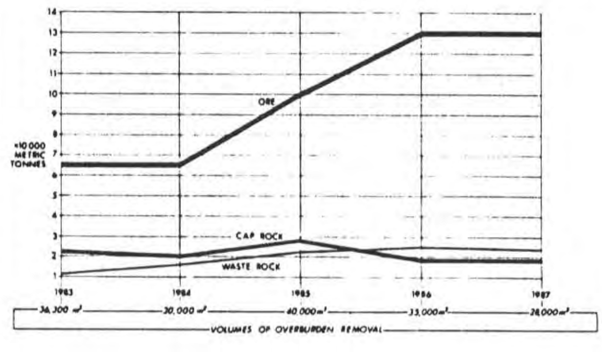

FIGURE 4. 1983-1987 production forecast.

Some controversy exists as to whether the origin of the magnesite is sedimentary or replacement. Although the deposit is rather massive and bedding is rarely seen, there are some sharp contacts with the surrounding dolomite. These contacts could be evidence that the deposit had a sedimentary origin. Conversely, the presence of many veins and veinlets, indicative of hydrothermal emplacement, and the presence of some gradational contacts with the dolomite, suggest that the magnesite might have resulted from replacement phenomenon. While magnesite is the most predominant mineral, with dolomite, pyrite and calcite present to a lesser extent, other minerals including leuchtenbergite, sericite and illite are present in minor quantities and constitute most of the alumina and silica content in the deposit, as shown in Table 4.

Ore quality and quantity as shown in Figure 3 were evaluated using a geostatistical computer program (Kriging method) and were based on the results from exploratory drilling. These results showed that the Baymag deposit is the largest and purest coarse crystalline magnesite deposit currently known in the western world, and that it would be possible to ensure a consistent ore quality for the production of magnesia with +97% MgO content by using strictly controlled selective mining, with no special ore treatment or beneficiation.

The Mine and Ore Transportation

The Baymag mine is an open-pit operation which is run year 'round and currently produces between 100 000 and 130 000 mtpy of high-quality magnesite ore. In 1981 Baymag entered into a contractual agreement with John Wolfe Construction Co. Ltd. to operate the mine and also be responsible for ore supply to the production plant at Exshaw.

During the pre-production period 1981-82, the following work had to be carried out:

— 5.4 km access road construction, including construction of three bridges;
— 42 km road upgrading of existing Forestry Road system — Cross River bridge to junction of Settlers Road and Highway 93;
— 65 ha logging and clearing — mine site, mine road, material handling area and dumps;
— 1,000 m mine road construction;
— 176 000 m^3 pit waste stripping and initial bench development; and
— installation of a primary crusher and screening system, stockpile, load-out facilities and truck scale.

Commercial-scale mining started in the second quarter of 1982 and has increased dramatically since then from about 35 000 m.t. in 1982 to more than 85 000 m.t. in 1984, with an expected tonnage of 110 000 m.t. in 1985. The mining operation consists of the following functions:

— stripping and stockpiling of top soil and overburden,
— drilling and blasting the ore and waste,
— hauling, crushing and screening the ore, and
— loading and hauling the ore for processing.

Figures 4 and 5 show the development of the mining operation up to 1987. As seen in Figure 4, it is obvious that the waste-to-ore ratio becomes more favourable at the higher production rate, mainly as a function of the mine still being in development. For the next few years, the "to-be-mined" area will be opened up further, meaning that year by year, there will still be an excessive amount of overburden and cap rock to be removed. Even at present, however, the waste-to-ore ratio has rarely exceeded 1:1. Comparing this to other magnesite mines, figures of about 10:1 are considered to be normal, going as high as over 100:1 at some Grecian deposits of cryptocrystalline magnesite.

Figure 6 shows the very simple layout of the mine site facilities. Before rock blasting, a selection of drill cuttings from blastholes is analyzed in Baymag's quality control lab in Exshaw to build the base for a selective mining. After blasting, the high-grade ore is loaded by backhoe into 20 m.t. end-dump mine trucks, hauled to the primary crusher area and dumped

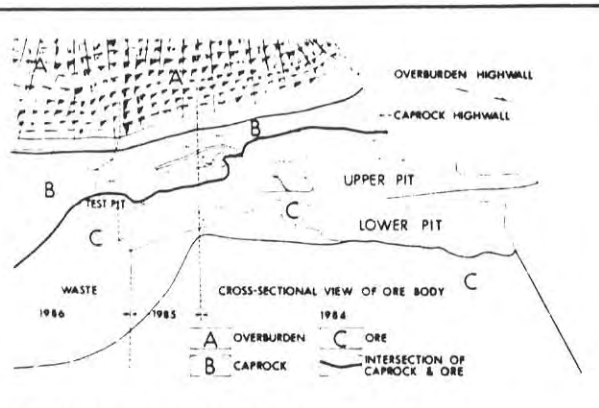

FIGURE 5. Development plan at end of 1984.

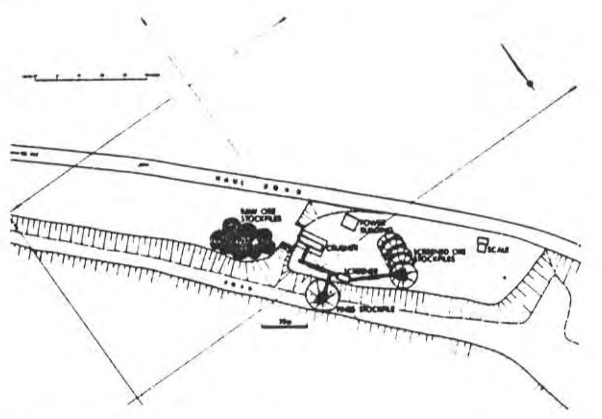

FIGURE 6. Mine site facilities.

either directly into the jaw crusher, which reduces the size to 6 in., or onto the raw ore stockpile. After primary crushing, the ore goes to a triple deck screener where the so-called "fines" (-1/2 in. fraction) are removed. This is an additional quality assurance measure, because it was found that most contamination from clay-filled cracks, dirt, and roadways ends up in this fraction. The 6 in. + 1/2 in. primary crushed ore is again stockpiled, to be loaded onto 38 m.t. payload trucktrailer units and hauled to the production facilities at Exshaw.

The route is highlighted in Figure 7. It is about 200 km in length and leads over about 40 km of forestry road from the mine to Highway 93 junction and from there another 160 km over Highway 93 and TransCanada Highway No. 1. While the mine site lies outside of the National Park boundaries, a fair bit of the 200 km long haul crosses the Kootenay and Banff National Parks and Baymag needed special permission to haul over the Settler's Road portion crossing part of the Kootenay National Park.

Hauling as well as mining is done year 'round with two exceptions: hauling stops from two to six weeks during spring breakup season; and hauling is restricted during the peak tourist season in July-August.

The Plant

The Baymag ore processing plant is situated in Exshaw, Alberta, on the grounds of the Canada Cement Lafarge plant. As stated earlier, Baymag is leasing a part of CCL's facilities, mainly consisting of two rotary kilns as well as the kiln building and necessary auxiliary equipment.

Before commencing production, Baymag had to add certain equipment to transform its part of the cement plant into an independently functioning MgO calcining facility: the ore storage pads, secondary ore crushing/storage, kiln feeding, product screens, air separator, controlled grinding circuit, general bulk handling equipment, storage and load-out facilities, as well as offices and a quality control laboratory.

The kiln is the principal piece of equipment in this production flowsheet. It is the facility which applies sufficient heat to the magnesite ore to set the CO_2 free and leave the MgO behind. This reaction theoretically starts at about 650°C and requires about 770 Kcal/kg for completion. Depending on the type of caustic calcined MgO to be produced, the calcining temperature in the kiln burning zone needs to be between 850°C and about 1 350°C. Heat consumption is about two to three times the theoretical, due to kiln shell and mainly off-gas heat losses.

Second in importance after the kiln are the sizing facilities. Chemical reactivity, a primary specification of the product, is influenced not only by the kiln burn but equally by the final fine grinding of the product.

One interesting phenomenon about Baymag magnesite is the decrepitation that occurs with calcination. The grain destruction at elevated temperatures is not easily explained, but is a major factor in the burning technology. The destruction works to Baymag's advantage, because the most common contaminants — calcite and dolomite — do not show this behaviour; therefore, beneficiation by selective screening can be used. This phenomenon is not unique to Baymag magnesite, but it is restricted to coarse crystalline magnesite and has not been observed in the crypto-crystalline type.

In simplest terms, a description for caustic calcined magnesia could be: MgO with well defined chemical reactivity, chemistry and sizing. Contrary to dead burnt magnesia, caustic calcined is "alive", and may change with age depending mainly upon storage conditions. This sensitivity makes it necessary to carry out a very detailed on-line quality control procedure. Baymag's production is permanently quality-controlled at up to eleven points before the product ends up in storage. Once it is finally shipped, a separate quality certificate is issued for each single shipment and a retained sample is kept for a minimum of six months.

The production capacity currently runs at about 60 000 mtpy. Ongoing technical improvements will increase it to 75 000 mtpy early this year.

The Products/Markets

Baymag's two main markets are the pulp and paper industry and the animal feed market (Table 3). In addition, Baymag is active in most of the mentioned market areas, offering a line of products in sizes from 95% minus 200 mesh, to special fractions for feed grade applications; MgO contents range from minimum 94% up to over 97%, and specially designed reactivities for various chemical applications are available.

The Future

In all studies completed so far, the future of Baymag has been connected to the production of mainly dead burnt MgO, with caustic calcined magnesia as a byproduct. Even so, in 1982 it made most sense to begin a pure calcination operation. There were two very good reasons for this decision: an overly saturated world market for dead burnt MgO, and the availability of existing facilities for calcining versus the need for a very high investment for dead burning.

After nearly three years in production and being one of the three leading caustic calcined magnesia producers in North America, the obvious question arises: Where does Baymag go from here? While Baymag will always be committed to the existing market for its calcined products and hopes to double sales in this area within the next five years, it cannot deny its parent company's "refractory heritage".

One year ago Baymag began to develop and market a brand new product, *fused magnesia*, especially developed and designed for refractory applications. A pilot plant at Exshaw was started up at the end of 1983 for trial production and soon it became necessary to upgrade it to produce commercial quantities because of the very strong market response. Fused magnesia becomes a unique refractory raw material due to its special method of production. It crystallizes out of molten magnesia at temperatures above 2 800°C, brought to these levels by an electric arc. This treatment makes the resulting product chemically superior to comparable dead burnt magnesias. With advanced steelmaking technology there is a need for top-quality MgO refractory raw materials. Baymag is in the process of carefully studying the possible expansion of its fusing capacity in 1986.

Summary

Baymag, founded in 1971, controls the purest coarse crystalline magnesite deposit in the western world. After intensive exploratory work on the deposit, which was discovered in 1966, and the final takeover in 1979 by the German owners, Baymag started producing caustic calcined magnesia in 1982. Since then, the company has become one of the three leading suppliers of high-quality caustic MgO in North America. Plans for building up a second production line for fused MgO are in progress.

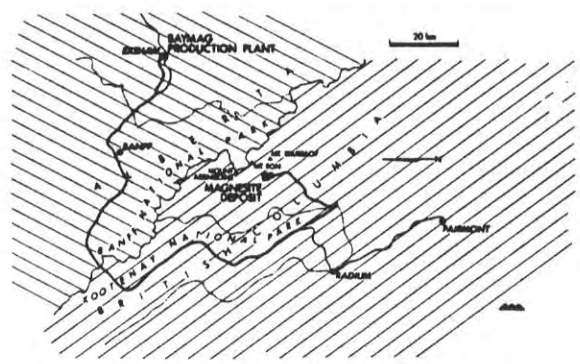

FIGURE 7. Transportation route to Exshaw.

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5th IFAC Symposium on Automation

IFAC Symposium on Automation in Mining, Mineral and Metal Processing is arranged for the fifth time this year in Tokyo, sponsored by the IFAC Technical Committee on Application. Organized by the Society of Instrument and Control Engineers, Japan, the symposium will be held on **August 24-29, 1986**.

The objectives of these symposia are to review the latest progress in the field and to offer an opportunity to discuss new areas of control as well as exchange experience at the international level.

Although the over-all program is arranged to cover almost all aspects of automation in mining, mineral and metal processing, International Program Committee has given a certain preference to contributions which present new automation applications and theories that have practical potentials. In addition to many advanced applications diffused in the organizing country, the symposium program is supported by visits to local industries. The technical program consists of the following: plenary sessions, technical sessions, round-table discussions, and exhibitions.

The official language of the symposium is English. Also, various tours to factories relevant to mining, mineral and metal processing have been planned.

For information, contact:
The Secretariat of IFAC—5th MMM 1986
c/o International Congress Service, Inc.
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Tokyo 103, Japan

CIM

Eighth Rapid Excavation and Tunneling Conference

A call for papers has been issued for the Eighth Rapid Excavation and Tunneling Conference (RETC), **June 14-18, 1987**, New Orleans, Louisiana.

The conference is designed to provide a forum for the exchange of new developments in the technology of underground rapid machine excavation and tunneling on a worldwide scale.

The RETC is jointly sponsored by the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) and the American Society of Civil Engineers (ASCE). The Society of Mining Engineers of AIME is coordinating the technical program.

On behalf of the Program Committee, a call for papers is issued covering the following topics:

Tunnel Boring Machine Histories and Developments; Soft Ground and Roadheader Case Histories; Large Diameter Tunnels and Underground Chambers Case Histories; Shafts and Inclines Case Histories; Geotechnical Data for Underground Projects; and Lining and Permanent Support Methods. Additional topics include: Improvements in Conventional Tunneling Methods; Underground Safety; Ground Water Control in Shafts and Underground Openings; Conventional and Mechanical Shaft Sinking; Shaft and Tunnel Lining Techniques; New Technology in Underground Excavation; Design, Construction, and Support of Large Underground Openings; Difficult Ground Conditions and Unforeseen Occurrences; Underground Contracting Methods and Disputes, Recent International Experiences, and Computer Applications.

Abstracts of 100 words or less should be submitted by July 1, 1986, to Darline D. Daley, Assistant Conference Manager, RETC, Caller No. D, Littleton, CO 80127, U.S.A.

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Nanisivik project doing well N. Miner March 25th, 1976 DO N

MRI awaiting magnesite project decisio

With its Nanisivik Mines project on Baffin Island making good progress towards a production start this September, Mineral Resources International is also involved in another potential major mining project. Investigation of its Baymag magnesite deposit, located 20 miles northeast of Radium Hot Springs, B.C., should reach a stage where a firm production decision can be made some time in 1976, C. F. Agar, MRI president, tells The Northern Miner.

Since acquiring a 51% interest in Baymag Mines Co. in late 1975, MRI has been working at updating and upgrading its knowledge of the beneficiating and dead burning techniques required, Mr. Agar said. The company is also in discussion and negotiation with several major companies interested in either securing a long term supply of high grade magnesite products and/or participating in the development of the project.

The 223-claim Baymag property covers several bedded, high grade, magnesite deposits. On the one known as the Mt. Eon deposit, 1,500 ft. of 6,000 ft. of outcrops along strike have been drilled, to outline 21 million tons of magnesite in excess of a 90% MgO cutoff (on a dead burn basis) while the area is still open th the north.

Unique deposit

"To the best of our knowledge," Mr. Agar said, "the Baymag deposit is unique by world standards, being one of . . . the largest high chemical grade deposits in the world. It is, however, coarsely crystalline which introduces problems in achieving densification during the dead burning process not shared by producers of amorphous magnesite or lower chemical grade crystalline magnesites.

"After a lot of work on this problem we now are achieving marketable bulk densities on a bench scale which appear achievable on a commercial scale. Burning tests of bulk samples will provide the data and fuel consumption criteria required for plant design and equipment sizing."

While flow sheets and plant size have not been finalized MRI is thinking in terms of an initial plant size between 70,000 and 200,000 metric tons per year, at estimated capital costs of $30 million and $150 million respectively.

Synthetic sources

In recent years producers of synthetic magnesites, from seawater and well brines, have been taking a larger share of the growing market. Both the capital costs and operating costs for such operations, which include very high fuel consumption, are considerably higher than for equivalent natural magnesite projects, Mr. Agar noted, yet it appears that in the future such synthetic sources will continue to be used, consequently setting relatively high selling prices.

"For this reason we expect always to be able to compete on a price basis despite our transportation disadvantage.

"Current high grade dead burn magnesite prices in Europe range from $200-$300 per metric ton. Such prices indicate the level of revenues our project will generate when it comes on stream."

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