000555

BC RESEARCH

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October 30, 1987
Our File: 4-07-419
Snake Bay Project

Property File
092GNW 052

Mr. E. H. Bentzen
Ore Sorters (North American) Inc.
Suite 220, Irongate 1
777 South Wadsworth Boulevard
Lakewood, Colorado 80226
USA

Dear Mr. Bentzen:

Re: CANAMIN WOLLASTONITE TESTWORK

Please find enclosed copies of the initial set of whole rock analyses for the wollastonite ore samples you tested, and tabulated carbonate contents. For cost control reasons, I did not have analyses done on the second/third magnetic products. Considering the rather moderate level of precision indicated by duplicate whole rock analyses, and the preliminary nature of the tests, I don't consider it worthwhile to have complete analyses done on the remaining samples.

My general assessment of these data is that - for material represented by the test sample - there is a reasonable prospect of generating a satisfactory product by dry processing with magnetic separation.

The analytical data suggest that material coarser than (about) 0.5mm is inadequately liberated, so I would anticipate comminution to this top size. Also, since the coarser fractions of crushed ore contain higher levels of impurities than -0.5mm fines, I think it is necessary to confirm that further grinding and magnetic separation will result in acceptable product quality.

I will forward you results on acicularity and whiteness of ground product when they are available. In this regard, if you are aware of a generally acceptable procedure for acicularity measurement, I would appreciate receiving a reference or copy.

.../2

I have advised our client that - subject to satisfactory results of our further analyses - I will be recommending further magnetic separation testwork. I expect that the client will contact you directly in this regard; he is aware that further testwork will be chargeable. I have recommended that he send a representative to view the testwork and discuss options with you.

I certainly appreciate your co-operation in this project.

Yours very truly,

B.C. RESEARCH

R. O. McElroy
Group Leader
Extractive Metallurgy
Industrial Chemistry Division

ROM/md
Enc.
cc: Mr. A. Savage, Canamin

Property File

092G NW 052

TRI-SIL MINERALS INC.

PROJECT REPORT

BENEFICIATION TESTWORK AND
PRODUCT QUALITY ASSESSMENT
FOR THE SNAKE BAY
WOLLASTONITE DEPOSIT

BC RESEARCH

Report

TRI-SIL MINERALS INC.

PROJECT REPORT

BENEFICIATION TESTWORK AND PRODUCT QUALITY ASSESSMENT FOR THE SNAKE BAY WOLLASTONITE DEPOSIT

Prepared for: TRI-SIL MINERALS INC.

Canamin Resources Limited
Suite 220, Quayside Plaza
145 Chadwick Court
North Vancouver, B.C.
V7M 3K1

15% ownership of TRI-SIL

Prepared by:

R. O. McElroy
Group Leader, Extractive Metallurgy
Industrial Chemistry Division
B.C. Research
3650 Wesbrook Mall
Vancouver, B.C.
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March 1988
4-07-419

TABLE OF CONTENTS

1.0 SUMMARY

Results of beneficiation tests and product quality analyses are presented for a wollastonite sample from the Snake Bay deposit.

The bulk sample was crushed and dry screened. Results of high intensity dry magnetic separation tests by Ore Sorters Inc. indicate that comminution to a top size of 0.5 mm (30 mesh) is required to obtain adequate liberation of wollastonite from accessory minerals.

For raw material represented by the test sample, magnetic separation test data on <0.5 mm material indicate 70-80 wt% recovery of feed to an acceptably clean (<1% iron as Fe_2O_3) non-magnetic product with wollastonite contents in the range of 97.6-99+ % range.

Carbonate contents of non-magnetic products from <0.5 mm feed were in the range of 0.3-0.6 wt% as CO_2, which indicates an acceptably low loss on ignition for magnetically beneficiated product.

Optical brightness measurements (Elrephro) on magnetically beneficiated material indicates whiteness (Elrephro) in the range of 80-83% vs MgO which is comparable to commercially available materials.

Measurements of acicularity (particle length:width ratio) by optical microscopy indicate particle acicularities in the 3-5 range, regardless of the grinding technique used. These acicularity values are comparable to those of standard commercial grades of wollastonite.

Overall, results of the test program indicate that - for material represented by the test sample - a relatively simple process sequence comprising comminution to <0.5 mm, dry screening and dry magnetic separation could produce marketable wollastonite at about 70-75 wt% yield.

2.0 INTRODUCTION

2.1 BACKGROUND

A geological report (Goldsmith and Logan [1]) describes wollastonite ($CaO.SiO_2$) occurrences in the Sechelt area.

Initial testwork [2] on handpicked samples from the deposit confirmed that wollastonite of commercially acceptable grade is present within the known occurrences.

On the basis of geologists' identifications of impurities (garnet, diopside, minor calcite and quartz), a beneficiation test program was proposed [3] to obtain basic information on treatment of the raw material and product quality.

2.2 OBJECTIVES

Specific objectives of the test program were:

- to evaluate dry magnetic separation of raw material with respect to product yield and quality.
- to determine specific properties (carbonate content, acicularity and brightness) on non-magnetic wollastonite concentrates.
- to investigate froth flotation for wollastonite-calcite separation.

General objectives included development of a data base on beneficiation technologies used for wollastonite, and other aspects such as markets, etc. revealed by a literature search.

3.3.4 Acicularity

Acicularity measurements were made by optical microscopy using a calibrated reticule.

Measurements were made on non-magnetic concentrate, before and after grinding using: a dry ball mill, impact mill and mortar/pestle.

Overall, the chemical and optical analysis results indicate the material has a high (80-90+%) wollastonite content; identified impurities are not well liberated at particle sizes >30 mesh.

4.2 MAGNETIC SEPARATION

Results of dry, high intensity magnetic separation tests by Ore Sorters Inc. are presented in Appendix 2.

Whole rock analyses of non-magnetic and selected magnetic fractions from these tests are presented in Appendix 1.

The 4 x 8 mesh material allowed production of a marginally acceptable (1.0% Fe_2O_3) non-magnetic concentrate at relatively low (~73%) recovery.

For 8 x 18 mesh material, acceptably low iron levels were obtained in both tests:

TEST	NON-MAGNETICS		
NO.	Wt%	% Fe_2O_3	% Al_2O_3
1	82.2	0.89	1.5
2	71.1	0.75	1.5

although iron rejection was better at the lower recovery.

For 18 x 30 mesh material:

TEST	NON-MAGNETICS		
NO.	Wt%	% Fe_2O_3	% Al_2O_3
1	77	0.66	1.3
2	66	0.60	1.1

In terms of project development, this implies that a relatively simple sequence of:

° crushing/dry screening
° dry magnetic separation

could produce a commercially acceptable bulk non-magnetic concentrate at (about) 70-75% overall recovery and ~0.8% Fe_2O_3.

This approach to processing would have a minimum number of unit operations and thus seems to present an opportunity for intial production with relatively low capital cost. In assessing this option, it would obviously be critical to determine the amount of such high quality raw material which could be provided from documented reserves by selective mining.

Magnetic rejects from dry processing should be stockpiled, since wollastonite contents (50-75%) of rejects would probably be recoverable by further comminution and wet magnetic separation. Alternatively, some additional recovery could be obtained by dry grinding/magnetic separation of the coarse (4 x 30 mesh) fraction of primary magnetic rejects.

4.3 CARBONATE CONTENTS

Carbonate contents of selected non-magnetic and feed samples are presented in Table 2. These data indicate that CO_2 contents (i.e. loss on ignition) of the raw material and all non-magnetic products are below 1%.

Qualitative microscopic observations indicate that some carbonate is present as a "cement" holding together small crystals or agglomerates of garnet, which may account for the apparent rejection of a fraction of carbonate by magnetic separation of coarse (8 x 18 mesh) material.

In the context of initial commercial development of the deposit, acicularity values in the 4-5 range for crushed or impact milled material are in line with those of materials produced and marketed as commodities, as opposed to specialty products.

4.5 CARBONATE FLOTATION

The carbonate content of the test sample was too low to be useful for even preliminary testing of carbonate flotation.

In Finland, where selective wollastonite/calcite flotation is practiced, good recoveries are reported [5] for conventional, neutral fatty acid flotation of calcite, followed by wet magnetic separation of garnet and diopside. If free silica is present, sequential calcite- wollastonite flotation is practiced.

It should be noted that good liberation is required for these selective separations, and that testwork would be required for zone(s) of the Snake Bay deposit containing appreciable calcite.

4.6 BRIGHTNESS

Results of Elrephro brightness measurements on selected wollastonite samples are presented in Table 4. Comparison of these data with commercial product specifications is imprecise, since available information on commercial products was generated with a GE instrument which is more commonly used in the ceramics industry whereas the Elrephro instrument is standard for paper coatings and some plastic fillers.

Tabulated brightness values (vs MgO) of 80.5-82.6% are considered to be in the commercially acceptable range.

important consideration for a new development, or - in the longer term - could provide a profitable outlet for the wollastonite content of primary magnetic rejects.

A significant research/development program would be required to establish wollastonite derived material as an acceptable component in paper manufacture; close collaboration would be required between the mineral processing and papermaking aspects of the study.

4.8 LITERATURE SURVEY

Computer printout (abstracts) and copies of selected library documents from the literature review are presented as Appendix 3 (volume 2 of this report).

A comprehensive review of wollastonite was published by Industrial Minerals Magazine in 1986 [7].

4.8.1 Beneficiation

Singularly few references were found to technology for processing of wollastonite ores. This may be due to the fact that there are only a few large scale commercial producers who prefer to keep their technology confidential, or at least unpublished.

In the USA, NYCO Inc. uses dry magnetic separation followed by either pebble milling (for ceramic grade product) or ". . . specialized attrition grinding techniques . . . to needle shaped particles with aspect ratios 15-20". It cannot be determined from literature citations whether this "specialized" technique is uniquely applicable to NYCO ore or generally applicable. The US Bureau of Mines has developed technology for autogenous attrition grinding [8] which is likely to be a component of the NYCO process, possibly in conjunction with dilute acid leaching to remove carbonate "cement" or otherwise liberate relatively long fibres from coarse crystalline wollastonite.

Although the technology does not appear to be used commercially, wollastonite can be used with phosphoric acid to make fast setting cement [9].

4.8.3 Markets

The USA is the dominant wollastonite producing country; 1985 actual production (100% of capacity) was 100,000 tonnes, of which 28% was exported [10]. Other important producing countries (10,000-20,000 tonnes/year as of 1983) include Finland, Mexico and India.

The most important current market for wollastonite is in ceramics manufacture. In this (relatively) low growth market, wollastonite must compete on a cost-benefit basis with other available and proven raw materials. Increased penetration of this market may be dependent on availability, since limited supplies have been reported [10] as inhibiting market development.

In the area of plastic filling and reinforcement, 1985 wollastonite use in the USA was only 4000 tonnes/year (~8% of production), but rapid growth (~14%/year) suggests a 1990 USA market volume of ~15,000 tonnes/year. Numerous plastics trade journal articles refer to favourable results using wollastonite alone or as a partial replacement for chopped fibreglass. At least part of the plastic reinforcement market requires fairly sophisticated manufacturing technology, due to need for high acicularity ("specialized" mineral processing) and also to use of chemical precoating with silanes, titanates or other materials which improve various aspects of both manufacturing processes and product properties.

Other areas of wollastonite application such as paints and coatings, and insulation board are relatively small in relation to total quantities of material produced.

Results of this project have not identified suitable technology for preparation of highly acicular product from the Snake Bay material, and it is possible that properties of this material are not suited to production of highly acicular material. However, it is considered more probable that grinding techniques used were not appropriate. Wet attrition grinding, possibly with use of acid (see above) to accelerate breakup of fibre bundles, should be investigated in this regard.

It is also possible that NYCO would licence its manufacturing technology. However, since the literature review did not identify relevant patents, it seems probable that NYCO has chosen to protect the technology by keeping it commercially confidential.

5.3 FURTHER DEVELOPMENT/RESEARCH

5.3.1 Short Term

For market testing purposes, bulk (0.1-1 tonne) processing of raw material may be required. This would also be desirable to obtain scale-up information for treatment plant design.

Assuming that adequate reserves of high quality raw material (i.e. represented by the test sample) are available, no further testwork would be necessary to demonstrate the viability of processing technology tested.

If material containing significant amounts of calcite and/or free silica as well as diopside and garnet must be included in reserves to make the deposit economically viable, flotation testwork should be done to confirm that acceptable product quality and yield can be obtained, and to define process conditions for cost estimation purposes.

5.3.2 Intermediate Term

Further work on process technology for manufacture of highly acicular material may be justified on the basis of higher product values. Such work would have to be described as research, since current results do not confirm feasibility of production of highly acicular material.

5.3.3 Long Term

Coating technology for highly acicular plastic reinforcing grade wollastonite is a suitable area for long term research, since coated materials have significantly higher prices and an access markets not available to untreated products. Before entering this area, it would be necessary to confirm that highly acicular product can be prepared from Snake Bay raw material.

6.0 REFERENCES

1. Goldsmith, L.B. and J.M. Logan, Geological Mapping and Diamond Drilling of Wollastonite Occurence, Report to Tri Sil Minerals Inc. May, 1987.

2. B.C. Research, letter report to Canamin Resources Ltd., 1987.

3. B.C. Research, Proposal, Beneficiation Testwork on the Snake Bay Wollastonite Deposit, 1987.

4. Wylie, A.G. and P. Schweitzer, Effects of Sample Preparation and Measuring Technique on the Shape and Shape Characterization of Wollastonite, Environmental Research (New York), 27:1, 1982 p. 52-73.

5. Strotjohann, K., Hoechst Canada Inc., letter of September 11, 1988.

6. Vukovich, M.S., K. Burnham and E. Wainer, Wollastonite Wet Magnetic Beneficiation, Wet Grinding, Wet Classification, Indications of New Products, Adirondack Development Corp., Contract Cc5970, PR-30, Project No. 300, May, 1964.

7. Power, T., Wollastonite-Performance Filler Potential, Industrial Minerals, January, 1986, p. 19-34.

8. Stanczyk, M.H. and I.L. Feld, Comminution by the Attrition Grinding Process, US Bureau of Mines, Bulletin 670, 1980.

9. Cemler, C.E., Development of a Quick Setting Wollastonite Cement, American Ceramic Society Bulletin, November, 1986, p. 983-985.

10. Anon., Chemical Marketing Reports, February 25, 1985, p. 27.

TABLE 3: ACICULARITY DATA ON WOLLASTONITE

PREPARATION	SIZE FRACTION (Mesh)	(Micron)	AVERAGE DIMENSION (Microns) L	D	ACICULARITY (Mean)	STANDARD DEVIATION
None						
(sieved	30 x 48	550 x 298	940	260	4.12	2.28
crushed	48 x 100	297 x 149	775	175	4.57	2.19
ore)	100 x 200	149 x 80	465	55	9.55	4.39
Mortars and	270 x 325	53 x 44	20.4	3.8	5.86	2.37
pestle	325 x 400	44 x 37	10.5	3.5	5.70	4.00
(rubbing)	Pan	37 x 0	6.5	1.1	6.70	3.01
Ceramic dry	270 x 325	53 x 44	15.8	3.9	4.00	1.51
ball mill	325 x 400	44 x 37	13.9	3.8	3.88	1.42
	Pan	37 x 0	7.0	2.4	3.18	1.75
Ring	270 x 325	53 x 44	-	-	-	-
Pulverizer	325 x 400	44 x 37	11.0	2.1	11.6	9.45
	Pan	37 x 0	6.8	2.0	3.53	1.69
Impact mill	270 x 325	53 x 44	16.5	3.7	4.63	1.98
	325 x 400	44 x 37	10.2	2.4	4.65	2.09
	Pan	37 x 0	7.6	2.1	3.80	1.52

TABLE 4: ELREPHRO OPTICAL BRIGHTNESS OF GROUND SNAKE BAY WOLLASTONITE

SAMPLE	BRIGHTNESS (Filter #8) (% vs MgO)
Calibration plaque	84.1
Ring pulverized wollastonite	82.6
Mortar ground wollastonite	80.5
Acid decomposed wollastonite	87.3

APPENDIX 1

CANTEST WHOLE ROCK ANALYSES

can test ltd.

REPORT ON:	Laboratory Testing
REPORTED TO:	B.C. Research 3650 Wesbrook Mall Vancouver, B.C. V6S 2L2
	Att'n: Mr. R. O. McElroy
FILE NO.:	5312G
DATE:	November 2, 1987
P.O.#	16511

We have tested the 20 samples of mineral submitted by you on October 6, 1987 and report as follows:

SAMPLE IDENTIFICATION:

The samples were identified as shown under "Results of Testing" and are described as "Wollastonite" samples.

METHODS OF TESTING:

Preparation: Ceramic Pulverizer
Digestion: Closed Vessel Teflon Bomb.
Analysis: Plasma Spectroscopy (ICP) and Atomic Emission Spectrophotometry for sodium and potassium.

RESULTS OF TESTING:

See the attached Plasma Certificates.

Notes:

1. Samples "5312-11" to "5312-15" were not as easily dissolved as the others. Oxide totals range 94 to 96%. Insoluble residue noted.

2. During preparation, pulverizer problem led to some loss and possible contamination of "5312-17". Later, part of the pulverizer ceramic was included in sample "5312-19" yielding a dilution effect.

3. Data for P205 has not always been reliable.

CAN TEST LTD.

Robert G. Hunter, B.Sc.,
Supervisor
Industrial Chemistry Dept.

RGH/csd

can test ltd.

B.C. Research
File No: 5312G
Page No: 3

PLASMA SPECTROGRAPHIC ANALYSIS CERTIFICATE

We hereby Certify that the following are the results of plasma spectrographic analysis made on mineral samples submitted.

SAMPLE I.D.		5312-6 CT2 NM3	5312-7 DT1 NM3	5312-8 DT2 NM3	5312-9 ETI NM3	5312-10 ET2 NM3
Major Components - Percent (%)						
Silica	SiO_2	49.5	50.0/50.3	49.8	49.5	48.8/49.7
Alumina	Al_2O_3	1.12	0.91/1.03	0.78	0.99	1.16/1.08
Iron	Fe_2O_3	0.60	0.56/0.56	0.67	0.86	0.65/0.63
Calcium	CaO	50.0	50.0/48.5	48.4	48.5	48.3/48.4
Magnesium	MgO	0.21	0.18/0.18	0.16	0.17	0.18/0.19
Sodium	Na_2O	0.02	0.02	0.02	0.02	0.02
Potassium	K_2O	0.01	0.01	0.01	0.01	0.01
Trace Components - Parts Per Million (P.P.M.)						
Barium	Ba	85.	75.	75.	75.	75.
Copper	Cu	350.	300.	400.	400.	425.
Manganese	Mn	700.	700.	680.	710.	700.
Phosphorus	P205	3100.	2500.	3400.	5600.	6500.
Strontium	Sr	50.	50.	50.	50.	50.
Titanium	Ti	440.	450.	350.	550.	610.

L = Less than

can test ltd.

B.C. Research
File No: 5312G
Page No: 5

PLASMA SPECTROGRAPHIC ANALYSIS CERTIFICATE

We hereby Certify that the following are the results of plasma spectrographic analysis made on mineral samples submitted.

SAMPLE I.D.		5312-16 MC 2-1	5312-17 MD 1-1	5312-18 MD 2-1	*5312-19 ME 1-1	5312-20 ME 2-1
Major Components - Percent (%)						
Silica	SiO_2	45.1/45.8	46.0/46.9	46.0	33.7/33.6	45.0
Alumina	Al_2O_3	4.59/4.66	4.60/4.75	4.01	3.19/3.20	3.45
Iron	Fe_2O_3	1.83/1.89	2.73/2.76	2.23	2.24/2.21	2.63
Calcium	CaO	43.1/44.0	45.0/45.5	46.0	31.7/31.6	44.1
Magnesium	MgO	0.72/0.77	1.28/1.28	1.05	0.96/0.99	1.24
Sodium	Na_2O	0.02	0.02	0.02	0.02	0.02
Potassium	K_2O	0.02	0.02	0.02	0.02	0.02
Trace Components - Parts Per Million (P.P.M.)						
Barium	Ba	110.	90.	100.	110.	90.
Copper	Cu	400.	470.	490.	450.	480.
Manganese	Mn	470.	900.	820.	720.	890.
Phosphorus	P_2O_5	1.42%/1.31%	1.23%	1.25%	0.98%	1.16%
Strontium	Sr	70.	70.	70.	50.	75.
Titanium	Ti	1500.	19600.	1720.	1300.	2100.

L = Less than
*Note: Contaminated by Ceramic Pulverizer

APPENDIX 2

ORE SORTERS MAGNETIC SEPARATION TEST DATA

407-419

Ore Sorters (North America) Inc.
Irongate 1, Suite 109
777 South Wadsworth Blvd.
Lakewood, Colorado 80226
Telephone (303) 985-0238
TWX 910-937-0374

September 14, 1987

Mr. Rod McElroy
B. C. Research
3650 Wesbrook Mall
Vancouver V6S 2L2
CANADA

Re: PERMROLL® magnetic separation of Wollastonite samples.

Dear Mr. McElroy:

We have completed the magnetic separation studies on five samples provided and the results are presented in this letter. The object of the study was to increase the quality of the material by dry magnetic separation. The scope of the work involved dry magnetic separation of samples at the particle size provided.

The five samples provided were assigned OSNA Sample numbers 87087 A through E and corresponded to the screen size designations 4 X 8, 8 X 18, 18 X 30, 30 X 48 and 48 X 0 respectively. No mineralogy or chemical analysis of the feed material was provided.

Chemical analysis of the final products were not conducted. For chemical evaluation of the results we have shipped the products back via U.P.S. Table 1 summarizes the results of the studies, while details of the magnetic separation test are presented in Exhibit 1.

Table 1
Magnetic separation results

OSNA Sample No.	Material Identification	Test No.	Feed Rate Tons/Hr/Meter	Product	Wt. %
87087 A	4 X 8	1	5.5	Nonmag 3	84.1
		2	2.2	Nonmag 3	72.8*
87087 B	8 X 18	1	6.7	Nonmag 3	82.2
		2	3.8	Nonmag 3	71.1
87087 C	18 X 30	1	4.8	Nonmag 3	76.9
		2	2.3	Nonmag 3	65.7
87087 D	30 X 48	1	4.8	Nonmag 3	81.0
		2	2.5	Nonmag 3	71.8
87087 E	48 X 0	1	1.9	Nonmag 3	76.9
		2	2.3	Nonmag 3	83.1*

* PERMROLL® equipped with a 100 mm roll. Other tests employed a 71.5 mm roll.

EXHIBIT 1

MAGNETIC SEPARATION TEST NO 1

PURPOSE: To remove the contaminates from sized wollastonite material.

SAMPLE: Approximately 1250 gr of OSNA Sample #87087 A, 4 X 8.

PROCEDURE: The sample was treated on a permanent-magnetic roll separator at the following conditions.

	Pass 1	Pass 2	Pass 3
Feed Rate, T/Hr/M	5.5	4.7	4.9
Roll Type	Nd 4:1, 71.5mm		
Belt Type	GIK		
Roll Speed, RPM	200	180	160
Splitter Position	0	6	10
Feeder Setting	59	59	59
Feed to Pass	Feed	Nonmag Pass 1	Nonmag Pass 2

Results:

Product	Weight %	Chemical Analysis		Percent Distribution		
Feed (Analyzed)						
Feed (calculated)	100.00					
Magnetics, Pass 1	7.61					
Magnetics, Pass 2	3.92					
Magnetics, Pass 3	4.39					
Nonmag, Pass 3	84.08					

EXHIBIT 1

MAGNETIC SEPARATION TEST NO 1

PURPOSE: To remove the contaminates from sized wollastonite material.

SAMPLE: Approximately 1250 gr of OSNA Sample #87087 B, 8 X 18.

PROCEDURE: The sample was treated on a permanent-magnetic roll separator at the following conditions.

	Pass 1	Pass 2	Pass 3
Feed Rate, T/Hr/M	6.7	6.5	6.5
Roll Type	Nd 4:1, 71.5mm		
Belt Type	GIK		
Roll Speed, RPM	220	200	180
Splitter Position	0	0	5
Feeder Setting	61	61	61
Feed to Pass	Feed	Nonmag Pass 1	Nonmag Pass 2

Results:

Product	Weight %	Chemical Analysis		Percent Distribution		
Feed (Analyzed)						
Feed (calculated)	100.00					
Magnetics, Pass 1	4.91					
Magnetics, Pass 2	6.86					
Magnetics, Pass 3	6.06					
Nonmag, Pass 3	82.17					

EXHIBIT 1

MAGNETIC SEPARATION TEST NO 1

PURPOSE: To remove the contaminates from sized wollastonite material.

SAMPLE: Approximately 1250 gr of OSNA Sample #87087 C, 18 X 30.

PROCEDURE: The sample was treated on a permanent-magnetic roll separator at the following conditions.

	Pass 1	Pass 2	Pass 3
Feed Rate, T/Hr/M	4.8	4.8	5.0
Roll Type	Nd 4:1, 71.5mm		
Belt Type	GIK		
Roll Speed, RPM	200	180	160
Splitter Position	8	8	11
Feeder Setting	58	58	58
Feed to Pass	Feed	Nonmag Pass 1	Nonmag Pass 2

Results:

Product	Weight %	Chemical Analysis		Percent Distribution		
Feed (Analyzed)						
Feed (calculated)	100.00					
Magnetics, Pass 1	8.74					
Magnetics, Pass 2	8.00					
Magnetics, Pass 3	6.34					
Nonmag, Pass 3	76.92					

EXHIBIT 1

MAGNETIC SEPARATION TEST NO 1

PURPOSE: To remove the contaminates from sized wollastonite material.

SAMPLE: Approximately 1250 gr of OSNA Sample #87087 D, 30 X 48.

PROCEDURE: The sample was treated on a permanent-magnetic roll separator at the following conditions.

	Pass 1	Pass 2	Pass 3
Feed Rate, T/Hr/M	4.8	4.8	4.9
Roll Type	Nd 4:1, 71.5mm		
Belt Type	GIK		
Roll Speed, RPM	200	180	160
Splitter Position	8	10	13
Feeder Setting	58	58	58
Feed to Pass	Feed	Nonmag Pass 1	Nonmag Pass 2

Results:

Product	Weight %	Chemical Analysis		Percent Distribution		
Feed (Analyzed)						
Feed (calculated)	100.00					
Magnetics, Pass 1	9.21					
Magnetics, Pass 2	5.74					
Magnetics, Pass 3	4.08					
Nonmag, Pass 3	80.97					

EXHIBIT 1

MAGNETIC SEPARATION TEST NO 1

PURPOSE: To remove the contaminates from sized wollastonite material.

SAMPLE: Approximately 1250 gr of OSNA Sample #87087 E, 48 X 0.

PROCEDURE: The sample was treated on a permanent-magnetic roll separator at the following conditions.

	Pass 1	Pass 2	Pass 3
Feed Rate, T/Hr/M	1.9	1.8	1.9
Roll Type	Nd 4:1, 71.5mm		
Belt Type	GIK		
Roll Speed, RPM	220	200	180
Splitter Position	16	17	19
Feeder Setting	56	56	56
Feed to Pass	Feed	Nonmag Pass 1	Nonmag Pass 2

Results:

Product	Weight %	Chemical Analysis		Percent Distribution		
Feed (Analyzed)						
Feed (calculated)	100.00					
Magnetics, Pass 1	9.44					
Magnetics, Pass 2	7.99					
Magnetics, Pass 3	5.63					
Nonmag, Pass 3	76.94					