

PRODUCT DEVELOPMENT &
TECHNICAL SERVICES DEPARTMENT

Six Month Report
July through December 1973

PLAINTIFF'S
EXHIBIT

tabbies

WV-014714

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EXHIBIT

tabbies

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SIX MONTH SUMMARY

The last half of 1973 was marked by raw material shortages which usually resulted in crash programs to find alternatives. In some cases, the alternatives proved advantageous costwise. All the projects resulting in cost savings were as follow:

	<u>Projected Annual Savings</u>
1. Replacing titanium dioxide in Pre-Dec	\$120,000
2. Using off-grade starch products (1973 only)	3,000
3. Eliminating rock washing at Grand Rapids	55,000
4. Revising Dens-Cote formula	26,500
5. Converting Buchanan to continuous calcination	33,700
6. Increasing calcining capacity at Wilmington	73,000
7. Lowering raw material costs for Acme's non-asbestos joint system products	<u>58,500</u>
	\$369,700

There are other savings such as the wallboard quality improvements at Fort Dodge, and the improved loading procedures at Blue Rapids that are difficult to put a figure on. We had hoped to complete the project to eliminate the vermiculite in 1973, but U.L. is insisting on another fire test. The potential savings is about \$125,000 per year.

New products developed within the past five years contributed \$1,010,148 to net sales and \$419,876 to gross profits of the Division for the six months. The texture formula revisions, completed in 1973, show continued improvement in sales and profits. The analysis of sales and profits of new products and figures for the textures are shown on page 3. The following product developments are under investigation at the present time:

1. Firedoor filler - The U.L. test of the new Firedoor material will be held early next year. The future of Firedoor will ride on this test.

2. More efficient core waterproofing - The plant trials have been so encouraging we plan to have some plants begin to use the new method. Better product quality and lower costs are the potential benefits.

3. Dry joint compounds - Elimination of casein is a must and replacement of asbestos is highly desirable; both are primary objectives.

4. Ready mix joint compounds - Solutions to some current quality problems and development of a product with superior working properties are top priority projects. Success will be necessary to help marketing continue to expand ready mix sales.

Some process developments are underway, too:

1. By-product gypsum - Our evaluations of by-product gypsum from N.L. Industries indicate that this gypsum is comparable to high purity natural gypsum. Negotiations are in progress with their Canadian subsidiary which could result in a G-P wallboard plant in Canada.

2. Silicone treated paper - A thorough investigation of National Gypsum's silicone paper will be held in an effort to reduce starch levels and minimize bond problems. Recent price increases in starch have made this a more attractive proposition if it offers the benefits claimed by National Gypsum.

3. Ready mix container - The cost of our ready mix packaging (pails and boxes) are such a high percentage of the total cost that we have been searching for an alternate. A double-wall plastic bag seems to have some possibilities and field trials are being planned.

Some personnel changes were made during the past six months. George Fowler has assumed the job of co-ordinating joint system developments in the East and is headquartered at Marietta. Howard Schutte was hired in August and is a trainee who will be transferred to a plant in the future. All new technical applicants for the Gypsum Lab are hired on the basis of eventually being transferred to a plant. This policy provides people to assist with projects in Tigard while they are undergoing training for plant assignments.

The various cost savings and product or process development projects are detailed in the body of this report.

ANALYSIS OF SALES & PROFITS FROM NEW PRODUCTS

<u>Unit</u>	<u>Product</u>	<u>Sales Volume</u>	<u>List Sales Amount</u>	<u>Gross Profit Amount</u>
MSF	1/4" Sound Deadening Board	4,452	\$ 173,330	\$ 58,064
MSF	Pre-Dec Wallboard (all)	24,750	785,831	355,985
MSF	Shaft Liner Panel	--	--	--
MLF	Metal T Splines	78	15,191	1,500
MLF	L Runners & J Channels	22	2,088	(1,055)
BGS	Polystyrene Texture	11,132	33,708	5,382
			\$1,010,148	\$ 419,876

TEXTURE SALES & PROFITS 1972 & 1973

		<u>Wall Texture</u>		<u>Vermiculite Ceiling Texture</u>		<u>Polystyrene</u>	
		<u>Sales</u>	<u>Profits</u>	<u>Sales</u>	<u>Profits</u>	<u>Sales</u>	<u>Profits</u>
1972	1st half	\$ 87,951	\$(5,875)	\$ 12,090	\$ 2,321	\$36,065	\$7,887
	2nd half	107,633	(5,299)	111,566	29,242	4,602	455
1973	1st half	99,625	(2,593)	151,603	49,174	19,340	3,254
	2nd half	102,958	8,288	143,526	44,489	33,708	5,382

MANUFACTURING SERVICES SECTION

MANUFACTURING SERVICES

1. Wallboard

a) Rock washing at Grand Rapids - The rock washing was ceased last May in conjunction with a program of close checking of chloride content in the rock to be sure it doesn't exceed the level we believe to be critical. Almost daily communication was established with the plant initially, tapering off as the months passed. Now after eight months experience, rock washing may be a thing of the past at Grand Rapids.

It is estimated that the cost of rock washing was \$.70 per ton. At 500 tons per day and 300 days per year, the annual savings is projected at \$105,000.

b) By-product gypsum - NL Industries produces titanium dioxide by digesting ore called ilmenite ($\text{FeO} \cdot \text{TiO}_2$) in sulfuric acid. Dilute sulfuric acid effluent is discharged into nearby oceans or rivers. In the case of NL Industry's subsidiary, Canadian Titanium Pigments in Montreal, the acid is discharged into the St. Lawrence Seaway. The environmental interests are putting great pressure on NL Industries and others to stop this practice. One way to eliminate the sulfuric acid is to neutralize it with calcium carbonate. The resultant product is gypsum which would be produced at a rate of about 500 tons per day at the various locations. This would be sufficient to sustain a fair sized gypsum wallboard plant. The one location where we would have interest in a plant is the aforementioned Varennes plant of Canadian Titanium Pigments Ltd., near Montreal.

Small samples of the by-product gypsum produced from the Varennes effluent acid have looked very good, being comparable to natural gypsum in hydration rate, strength, etc. NL Industries has built a pilot plant at their South Amboy, New Jersey laboratory, from which 1400 pounds of by-product gypsum was produced and shipped to Tigard. We calcined this gypsum in our small kettle (100 lbs. capacity) and then made some runs on our pilot wallboard machine. The by-product gypsum responded to the salt treatment in calcination and, judging from the board runs, it would be equivalent to a high purity natural gypsum. These tests should be corroborated by a full-scale plant run. If an agreement with Canadian Titanium Pigments can be reached, they will furnish 40 to 50 tons of by-product gypsum for this purpose.

c) Less expensive 5/8" Type X wallboard - Blue Rapids manufactured 5/8" Type X board with and without vermiculite with Underwriters witnessing. These boards were shipped to U.L. in Northbrook, Illinois, and used in a floor-ceiling test to compare one against the other and to establish whether the Type X without vermiculite could be approved for the same designs as the present Type X which contains vermiculite. The test was conducted in November. For the first 70 minutes of the test the two boards performed similarly. After that, the board without vermiculite began to peel away, and this naturally caused the temperatures in the deck to rise. U.L. contends that the board without vermiculite had to perform as well or better than the regular Type X for the entire test duration to qualify for all the ratings. We are only requesting one-hour ratings, so our argument is that the comparable performance for the first 70 minutes was sufficient. U.L. refuses to consider the board without vermiculite for any individual ratings without opening another assignment and conducting a new investigation. The dispute is not settled, but our chances in getting all the ratings we want appear slim. We may get enough of the basic ratings to warrant manufacturing the board. On the other hand, it may be necessary to conduct another test.

The potential savings is \$125,000 per year based on the 200,000 M square feet of 5/8" X sold in 1973.

d) Bond task group - A task group consisting of John Moss from Eastern Operations, Dale Greve from Western Operations, Bob Thomson from Paper and Joe Watt from Tigard was formed to consider problems in bonding the paper to the core. This group has disseminated quite a lot of information to the plants, arranged to hold some special starch trials that have resulted in savings, and currently are involved in evaluating National Gypsum's silicone treated paper.

e) Chopped glass fiber - The increased sales of fire rated products has resulted in more glass fiber being used. Faster machine speeds have required greater quantities of glass fiber to be fed through our cutters. This has put a great strain on our glass cutting operation and is probably responsible for excessive delays from glass cutting problems. This situation has caused some interest in dispersing 1/2" pre-chopped glass fiber into the pulp system and feeding it in conjunction with the paper fiber. Some experiments have been conducted at Fort Dodge and Lovell with our assistance. Lovell has had some success in dispersing the chopped fiber in their stock chest and feeding it from there to the pin mixer and are continuing to use this system for 5/8" Type X board.

The chopped glass may be a partial answer for some plants, but more attention should be directed to improving our cutting operations as we continue to cut more glass fiber at higher speeds. Some help has already been provided by the change from 636 to 710 glass fiber because the 710 is easier to cut.

f) Plant assistance - During the past six months, the formula books and the raw material specifications have been updated, eliminating a considerable amount of obsolete pages, particularly old plaster and industrial gypsum formulas.

Joe Watt made several plant visits to review the calcination procedures and, in the case of Buchanan, to convert them to the continuous kettle calcination process. He also reviewed plant loading procedures when called upon to do so or in conjunction with another trip. In every case, there was some benefit for the plant involved either in cost savings, more efficient operation, or improved product quality.

g) Alternate starch adhesives - We have cooperated with Purchasing to evaluate some lower cost core adhesive products. These have resulted in some savings. Starch prices have been increasing so the search for lower cost substitutes will continue.

h) New Underwriters procedure for follow-up service - We decided to proceed with the new U.L. follow-up service procedure on the basis that it will save about \$40,000 per year. Since U.L. required plant operation and quality data, we have arranged to have Eastern Operations handle the project directly with U.L. One plant, probably Wilmington, will be converted first followed by the other plants if both parties are satisfied with the introduction of the new system at Wilmington.

2. Pre-Dec

a) Shortage of titanium dioxide - We had been aware of the shrinking world supply of titanium dioxide pigment, and an extender called Hi Sil was successfully tried and approved through U.L. in order to retain the flamespread rating. However, the supply became so short that even our allocation was in doubt, so other measures were necessary if we were to stay in business. Don Klus found a clay product that extended the use of TiO_2 even further. Originally one ton of TiO_2 was required for 230,000 square feet of Pre-Dec. Now 740,000 square feet can be manufactured with a ton of TiO_2 . There have been some significant savings in addition to keeping Pre-Dec in operation. The Hi Sil addition saved \$27,000 annually and the most recent formula is projected to save \$120,000 per year based on 1973 sales.

3. Joint System

a) Grit problem - Almost without warning, large crystals began forming in ready mix causing streaking and resulting in numerous complaints. In addition to the expense, our volume of business began to suffer. The crystal contains phosphate, so the Calgon dispersing agent was suspect since it is the only phosphate in the formula. Also somewhat suspect is the Dowicil preservative since the gritty crystals began to occur about the same time we eliminated the mercury preservative in favor of Dowicil. Under the scrutiny of the investigation, the Dowicil was found to be inadequate. In an all-out effort to eliminate the crystal formation, the Calgon was removed from the formula and the mercury preservative was put back in place of the Dowicil. Our retained samples and the absence of complaints indicates the source of the crystals has been found. However, complaints of shrinkage and hard working properties have taken the place of the grit complaints. These are now under investigation to determine whether formula changes to counteract the grit is responsible for the new problems. The testing prior to making the changes did not lead us to believe there would be any loss in quality.

b) SRA joint compound with Dow resin - Some further lab development was done at Dow's request, but we were unable to obtain better bonding to metal corner bead. The final phasing out of the unsuccessful SRA involved reclaiming a substantial inventory of raw materials and finished product. Dow Chemical took the resin adhesive back and agreed to reimburse us in methocel which will be used in Akron. We tried to rerun the SRA into one-gallon ready mix, but casein components from our blending system reacted with the ready mix. The SRA now is being rerun into our casein bedding and topping as a means to salvage what we can.

c) Polyvinyl acetate emulsion - Among the raw materials which are in short supply is polyvinyl acetate. DuPont has furnished us for years, but will discontinue their Elvacet emulsions in early 1974. This leaves us with one emulsion supplier, Reichold. Other suppliers either declined to bid or were too high in price to consider.

As soon as we learned of this situation we arranged to investigate DuPont's 1875 Elvace which is a co-polymer. The Elvace is priced higher but we have found that less adhesive is required. Small quantities (several drums) of Elvace have been sent to Akron, Marietta, and Milford and plant batches of ready mix were made. To date, some pails have been taken out to the job but no conclusive results

have been determined. We have requested that the plants, particularly Akron, make some limited shipments, but thus far this has not been done. The interest in the Elvace is to develop an alternate emulsion source in the event that we have problems with Reichold.

d) Limestone sources - We urged that Milford use James River limestone because other sources might not be able to keep us supplied and the price of the James River was less. We also felt that if we got well established with Thompson Weiman, which is whiter, it might be very difficult to make the change at a later date. Milford made very gradual transition to be sure there were no adverse comments, and are now using 100% James River limestone.

e) Preservatives - Since mercurial preservatives have come under scrutiny by environmental people, we have been looking for other suitable candidates. We had switched to Dowicil but were not completely satisfied with its effectiveness. Bill Gettel made a comparison of 19 different preservative possibilities. Out of these, three products emerged as having equal or near equal fungicidal and bacterial protective properties as the phenyl mercuric acetate we had used for many years. A plant batch with each of the three preservatives will be mixed and further testing will be done. It is imperative that a suitable preservative system be found since the mercurials will have to be phased out eventually and the Dowicil has not been satisfactory.

4. Analyses

We have continued to conduct chemical analyses of rock samples as requested from the various plants. Analyses have been particularly important for Akron and Grand Rapids where the purity is marginal or elsewhere when an investigation was being made into a calcining operation. Also analyzed were by-product gypsum specimens and complaint samples.

MARKETING SERVICES SECTION

MARKETING SERVICES

1. Pre-Dec Shear Tests

After much frustration trying to get U.L. to move, the dies for the combination structural/fire hazard labels were received and are being used by the plants. We are not aware of any other company that is using this combination label, so perhaps it will give us a sales advantage. Also, it is no more costly to apply the combination label than it was for the fire hazard label we had been using.

2. Complaint Investigations

We have assisted on some complaints concerning Dens-Cote plaster, texture, ready mix, and vinyl covered fiberboard. In most cases, only a field investigation was involved.

3. Joint System Market Survey

A comparison was made of our basic products with those of competition which were sent in from the various markets at our request. As a result, we have a better knowledge of what our competition is doing and where we need improvements. At least four important facts were learned from the survey:

- a) We need to improve the working characteristics of our ready mix at Acme. This confirms what Sales has been telling us.
- b) The competition is ahead of us in the development of non-casein products. Some competitors have abandoned casein completely.
- c) Most of the companies are still using mercurial preservatives in ready mix. We had the impression that everyone had gotten away from mercurials, but this is not the case.
- d) Competitors are apparently not making much progress in the elimination of asbestos from the products. We are probably ahead of our competition in this respect.

We will urge our Sales and Production people keep sending in competitive samples so that surveys can be made on a regular basis. We are now requesting competitive textures to compare how our textures stack up against the competition.

4. Fire Tests

We furnished assistance to our Canadian licensees Domtar and Westroc in the testing of a composite steel and concrete roof deck system protected by 5/8" Type XXX Firestop. They were successful in attaining a two-hour rating from Underwriters of Canada and Underwriters in the United States. Since Domtar and Westroc operate under our license, we will be listed under this new design.

We also co-operated with Chicago Metallic Corporation by furnishing them with some sheets of 5/8" XXX from a special run we made for one of our own tests. Chicago Metallic was successful in achieving a two-hour rating for a concrete and steel bar joist deck protected by a monolithic wallboard ceiling with light and vent penetrations. We understand that this is the first construction of this kind to have a two-hour rating.

Even though we are doing very little testing ourselves, Firestop is well recognized and people who are testing, use it in their tests.

PRODUCT DEVELOPMENT SECTION

PRODUCT DEVELOPMENT

1. Firedoor Filler

The latest firedoor cores basically consisting of 65% perlite, 15% gypsum, 15% portland cement, 3½% polyvinyl alcohol, and formed under pressure were processed into some test doors at Walled Lake Door Company in Indiana. These doors were tested in our pilot furnace and, based on the results, a full-scale test at Underwriters was recommended. This material performs well in the hose stream test since it does not erode away like previous gypsum firedoor compositions.

With Underwriters witnessing, twenty-eight 20" x 37" x 1-9/16" slabs were processed using a rented press in Portland. This firedoor material has a 300 psi compressive strength at 24 lbs./cu. ft. and is regarded as the best we have made on the basis of strength and handling properties. The slabs were shipped to Walled Lake who have agreed to fabricate the doors for the U.L. test. We anticipate that the doors will be made in January and the test will take place in February or March.

2. Water Resistant Wallboards

Laboratory tests and plant runs have now conclusively proved that the combination of polyvinyl alcohol and asphalt/wax emulsion provides much better water resistance than the emulsion alone. The optimum quantities of each ingredient or the exact type of polyvinyl alcohol have yet to be determined. More plant experience is needed to finalize the tests and to pinpoint the quality and economic advantages. Our paper is so absorbent it is difficult to measure the improvement precisely. It has been decided to attain the best possible results for the core and attack the paper problem separately. It may be necessary to have equipment to dissolve the PVA prior to its use. We plan to convert two plants to the PVA-asphalt/wax waterproofing. Tentatively they will be Sigurd and Brunswick. This will provide a better assessment of the new waterproofing before a total transition is made.

3. Non-asbestos Joint System

All of the dry products now being produced at Acme are asbestos free. As previously noted, the attendant savings were \$.15 per bag. Based on 1973 sales of 390,000 bags, the total anticipated savings is

\$58,000 annually. A casein version was formulated and some plant batches were blended at Akron. The field trial results in Rochester, Cleveland, Detroit, and Wilmington were favorable. Market testing in Detroit seemed to be favorable. Meanwhile, the Akron plant was under pressure from OSHA to discontinue the manufacture of dry compounds with asbestos or else reduce the airborne fiber content in the mill. Manufacturing and Sales recommended making the change to the non-asbestos formula and we concurred. Almost as soon as the product hit the market, the complaints started. The non-asbestos products did not have sufficient body or anti-sag which is the property furnished by the asbestos. An attagel clay, which is being used as an asbestos replacement in the vinyl formulas at Acme, is apparently not as effective or as reliable in the casein formula. Also, the price of casein has begun to accelerate again so we appear to be whipping a dead horse. Our time will be better spent concentrating on a non-casein product without asbestos for the Chicago and Akron plants.

Recently casein products were phased out of Marietta and vinyl formulas substituted, but it is too early to determine the effect. Since casein bedding and topping are relatively low volume items at Marietta, the risk in making the change there was minimal.

4. Improve Dens-Cote Plaster

The project to reformulate Dens-Cote was undertaken to a) eliminate Denscal which can be sold industrial accounts, and b) to build in better working properties. U.S.G. has made changes in recent years which have increased the acceptance of their veneer plaster. They have eliminated Hydrocal from their Imperial veneer plaster without substantially reducing the compressive strength. We believe U.S.G. may be using a sophisticated calcining method, but we prefer to avoid this. Sigurd was having particular difficulty getting Denscal from Blue Rapids, so an interim formula was released after a few successful field trials. We are continuing to work on the formula since the compressive strength is lower than we would like. Blue Rapids also made some Dens-Cote without Denscal and has shipped it to Wilmington for evaluation in that market.

We have estimated that the raw material and freight savings in the case of plants other than Blue Rapids will approximate \$26,500 annually if we are successful. Also, over 400 tons per year of Denscal, formerly used in Dens-Cote, will be available for sale to industrial customers.

5. Houston Formula Ready Mix

We have not been able to achieve complete acceptance of our Acme ready mix in the Southwest, and Houston in particular. A recent market survey showed that several competitive products from the market have better working properties than our ready mix. Our new quality supervisor trainee, Howard Schutte, has developed a formula which appears to have comparable working properties to the best competitive product. We are getting the necessary raw materials to Acme to prepare a plant batch of this ready mix for evaluation in Houston.

INDUSTRY REPRESENTATION SECTION

INDUSTRY REPRESENTATION

ASTM

The primary matters being considered by ASTM C11 which affect us most are as follow:

1. Specification for gypsum wallboard (C36) and test methods (C473) - The proposed revision in the standard will eliminate wallboard weight as a criterion and will relax the cross-direction strength requirement. In the future we may wish to manufacture board lighter than 1700 lbs./M for 1/2" and 2250 lbs./M for 5/8", and the lower cross-direction strength is more realistic. This standard will be voted on in January, and if there are no delays it will be in effect by March or April 1974.

2. New definition for Type X wallboard - The gypsum industry has been seeking a bench test which will supplant the full-scale fire test as the means to distinguish between regular and Type X wallboard. A so-called two burner test was tried but found to be unreliable. A flexure test, developed by Joe Watt, is superior to the two burner test but another test was developed at the National Bureau of Standards and is better yet. The next step in the evaluation of the NBS method is a series of round robin tests.

3. Application of veneer base and plaster - These former ANSI standards are in the process of revision into ASTM format. When finally approved, both product and application standards will be under ASTM.

Gypsum Association

1. Technical Committee - The major items on the technical committee agenda are the industry fire and sound testing program, the field testing of joint system products which contain asbestos, metrication, the National Bureau of Standards fire research program and co-ordination of activities with the building code committee and ASTM. The fire test program is somewhat stymied because of failure to be able to reproduce test results of 15-20 years ago. This has caused some confusion which should be resolved so we can get on with business of providing the fire test data required by the industry. Failure to do so might stimulate another round of testing by all the major gypsum companies which could be to our disadvantage. The testing for airborne asbestos in the field use of joint compounds will be helpful in determining the urgency of

eliminating asbestos as a component. Since metric units are imminent, it is important to begin to explore how this will affect the weights and dimensions of our products.

2. Materials Handling - The value of pursuing this as an Association matter is to keep abreast of the developments in the loading of railroad cars and trucks. We have had some problems because of shipments not arriving in good condition, so we want to do everything we can to assist our plants in using loading procedures that are economical yet will prevent damage to the products enroute to our branches and customers.

PATENTS & LICENSING SECTION

PATENTS & LICENSING

1. Firestop Licensing

Our Firestop licensing program in the United States is now concluded and all former licensees have been advised that we will no longer provide code approvals and other information. We will continue to license Domtar, Westroc, Truroc, and Atlantic Gypsum Company until the Canadian Firestop patent expires in February 1975.

2. PVA/Asphalt Wax Waterproofing

Our investigation of Dale Greve's PVA/asphalt wax combination has begun to look encouraging based on the lab and plant testing. There is a synergistic effect evidenced by the combination waterproofing being better than the sum of the waterproofing of each of the two components. Since some board had been manufactured at Sigurd and sold in November 1972, it was imperative that if we had interest in a patent, it must be filed prior to November 1973. This necessitated some last minute testing to compile enough data to write the application. It may be necessary to file a continuation application after more background and data is developed providing there is still a good basis for proceeding with the patent. There may be some licensing opportunities if a patent is obtained.

3. Round Edge Wallboard

We had previously decided to appeal the patent examiner's decision not to allow the round edge patent claims. Our case was presented to the patent appeal board and we are awaiting their decision.