

PRODUCT DEVELOPMENT &
TECHNICAL SERVICES DEPARTMENT

Six Month Report
July through December 1973

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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

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.

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.