

BESTWALL GYPSUM COMPANY

R&D REPORT FOR 6 MONTH PERIOD ENDING DECEMBER 31, 1964

<u>TABLE OF CONTENTS</u>	<u>PAGE NO.</u>
Foreword -----	1
Market Performance of New Products, Patent Data -----	2
Distribution of Total R&D Expense -----	3
Distribution of R&D Salary Expense -----	4
Design of First 2 Hour Fire Rated Wood Floor-Ceiling -----	5
 <u>PROJECTS COMPLETED</u>	
2 Hour Fire Rated Wood Floor & Ceiling -----	6
1 Hour Fire Rated Wood Stud Partition with Sound Deadening Board and Firestop -----	6
Sound Test Program -----	7
New Wood Grain Products -----	7
Particle Size Studies -----	8
High Expansion Densite -----	9
Dens-Cote System -----	10
Pre-decorated Wallboard -----	10
Use of Polystyrene Beads in Wallboard -----	11
Job Mixed Thincoat Plaster -----	11
 <u>PROJECTS NEARING COMPLETION</u>	
Joint System Textures -----	13
New Glass Fiber -----	13
Analysis of National Gypsum Super-X Fireshield -----	14
1 Hour Fire Rated Lath & Plaster Partition -----	14
2 Hour Fire Rated Metal Stud Partition -----	15
1 Hour Fire Rated Resilient Wood Stud Partition -----	15
Competitive Thincoat Plaster Evaluation -----	15
Use of Synthetic Gypsum for Wallboard Mfg. -----	16
Hummer Systems -----	16
Tooling Densite -----	17
 <u>PROJECTS UNDERWAY</u>	
Ram Process Plaster -----	18
Vinyl Joint Compounds -----	18
Prepared Trowel Finish -----	18
Radiant Heating Panels -----	19
Gypsum Acoustical Tile -----	19
Protein Joint Compounds -----	20
Dimensional Changes of Gypsum Products at extremely high temperature -----	21
Cooperative Research Program with J-M -----	21
2 Hour Fire Rated Concrete Floor with 1/2" Firestop Ceiling -----	22
Self-Sealing Adhesives -----	22
1 Hour Fire Rated Gypsum Stud Partition with Sound Deadening Board -----	22
Pre-Coating of Gypsum Wallboard -----	23
Ready Mix Joint Compound -----	23
SUMMARY -----	24 & 25

FOREWORD

This is a report of the activities of the Research Department for the last six months of 1964. During this period there were no personnel changes in the department. The major change which did take place was the restoration of the Research & Development test facilities in a new building. Our large scale testing facilities had been removed during the consolidation of Bestwall's general offices in Paoli. In the new building, better equipment and more space have been provided for us to perform our function.

The 1964 expenditure is estimated by the Cost Department at \$133,880 as opposed to the figure of \$150,000 which had been projected for 1964. In 1965, more reliable figures will be available because of the new accounting system which will be in effect. A better analysis of research expenses will therefore be possible. With the information available this year, the chart on the following page was prepared and shows the approximate distribution of research costs in 1964.

Also included in this report is a record of the market performance of products which have resulted from the efforts of the Research Department. There is no sure method of evaluating certain accomplishments, such as fire rated constructions or sound rated constructions which were developed to provide assistance to Sales. The fact that our sales of 1/2" Firestop are up 48.7% in 1964 and our sales of 5/8" Firestop are up 34.2% in 1964 over 1963, are indications that we are reaping some benefits from this work.

This report is divided into three sections:

- Projects Completed
- Projects Nearing Completion
- Projects Underway

These sections appear in the order named and indicate the progress to date for the projects within each section.

*1964 MARKET PERFORMANCE OF NEW PRODUCTS

<u>PRODUCT</u>	<u>SALES VOLUME</u>	
	<u>Last 6 Mos</u>	<u>Year</u>
FIRESTOP 120	251 M sq. ft.	557 M sq. ft.
GRABIT ADHESIVE	53 T	75 T
ONE DAY JOINT COMPOUND	284 T	548 T
DENS-COTE PLASTER	911 T	1,629 T
DENS-COTE BASE	4,952 M sq. ft.	8,774 M sq. ft.
DENS-COTE TAPE	7,302 rolls	13,764 rolls
READY MIX	13,203 cans	15,617 cans
TILE BACKER BOARD	321 M sq. ft.	345 M sq. ft.
TILE BACKER TAPE	139 rolls	139 rolls
MODEL DENSITE	4.5 T	4.5 T
TOOLING DENSITE	0.8 T	0.8 T
HIGH EXPANSION DENSITE	2.1 T	2.1 T
BESTEX "C"	527 bags	527 bags

TOTAL

PATENT INFORMATION

Patents Issued - None

Patents Applied For - None

Patent applications previously submitted:

Processing of Synthetic Gypsum

One Day Joint Compound

Grabit Adhesive

Dens-Cote Plaster

Dens-Cote Base

MILL BASE SALES		ESTIMATED GROSS PROFIT	
<u>Last 6 Mos</u>	<u>Year</u>	<u>Last 6 Mos</u>	<u>Year</u>
\$ 34,380	\$ 76,751	\$ 9,875	\$ 22,432
10,048	14,259	5,778	8,181
45,826	92,459	11,862	24,346
49,124	88,032	8,478	16,228
209,280	370,667	79,988	143,909
7,465	13,770	3,129	5,801
57,488	68,496	8,662	10,279
25,058	26,742	9,344	10,390
1,273	1,273	769	769
158	158	63	63
41	41	14	14
99	99	25	25
<u>2,848</u>	<u>2,848</u>	<u>1,018</u>	<u>1,018</u>
443,088	755,595	139,005	243,455

ost figures computed by the Financial Department from the machine
accounting records.

PROJECTS NEARING COMPLETION

1. JOINT SYSTEM TEXTURES * R&D #261

Objective: To develop a complete line of textures suitable for spray application.

Investigation: Earlier field trials of a formula in the Fort Dodge market were unfavorable. It was found that the texture, when applied & dry, had a sheen which under certain types of light appeared like shiny spots on the ceiling. This was overcome with a revised formula, and a series of trials in the Brunswick area and elsewhere were conducted. These trials were moderately successful, but the texture still lacked adequate hiding properties. It was found that the texture as applied piled up in local areas instead of flattening out and resulted in small areas which were not covered by texture. The necessary formula revisions were made, and another series of trials were conducted. This time we returned to Kansas City, where some of the earlier unsatisfactory trials were held. The simulated acoustic texture was given the most attention, since this type is the most popular. Field trials of the simulated acoustic texture have all been quite favorable, and it has been released under the trade name of Bestex C. Other proposed products for the spray texture line are currently undergoing field performance trials. These are:

Bestex A - Non-aggregated texture for spray application. This texture is often applied to walls when one of the other textures is used on the ceiling.

Bestex B - Sand finish type texture for contractors who prefer a lighter texture.

Bestex D - Coarse, rust inhibiting texture for direct application to concrete slab ceilings.

A great deal has been learned in the course of this investigation which adds to our experience in the application of decorative materials. If the current field testing meets our expectations, the Bestex A, B, & D should be released within the next few months.

2. NEW TYPE OF GLASS FIBER - R&D #131

Objective: Evaluate Owens-Corning's fine filament 636 glass fiber for use in our wallboard products.

Investigation: The 636 glass fiber consists of .00026" diameter filaments. This compares to 710 fiber which has .00040" filaments and 799 fiber which is a mixture of the two filament sizes. There are twice as many individual filaments per pound of 636 glass fiber than there are of 710 glass fiber. This

PROJECTS UNDERWAY

1. RAM PROCESS PLASTER - R&D #132

Objective: To develop a special pottery plaster for use in ram pottery making process. One of the requirements for the product is that the molds can be purged of excess water with air at 120 p.s.i.

Investigation: This project has been marked with a number of unsuccessful attempts to produce an acceptable product. Another experimental formula was tried at Phaltzgraff Pottery in York, just recently, and again our product did not quite pass the requirements, as it was unable to withstand the 120 p.s.i. purging for the full 15 minutes. This is a test used by the pottery people to be sure the castings will not explode and injure someone while they are in actual use. The casts made with our material withstood the purging for only a few seconds at 120 p.s.i. This is the closest we have ever gotten to a successful product, and it is believed that further efforts are justified, since we are so close to having an acceptable product. It is our understanding that the volume of ram process plaster and particularly the regular pottery plaster sold along with it is substantial.

2. VINYL JOINT COMPOUNDS - R&D #211

Objective: To develop joint system products with vinyl binders instead of casein binders.

Investigation: This has been under investigation for some time, but the economics has always favored the protein binders. Also the inability of obtaining an adequate bond at low temperatures (below 45°F.) with the vinyl products has slowed the progress. A vinyl base topping compound was developed, but when presented to Sales their survey showed little interest in this product, particularly in view of the premium price we would have to ask for it. This work has recently been intensified, in view of the price instability of casein and the present sharply higher casein prices. Our objective is a vinyl base joint compound (for taping & finishing) which can be sold at the same price as the casein counterpart. This product can also be used as a finishing material over One Day Joint Compound, if we are successful. We have experienced some incompatibility problems in using our present products to finish over One Day joint system.

3. PREPARED TROWEL FINISH PLASTER - R&D #228

Objective: To develop a finish plaster which can be used in lieu of the conventional lime-putty finish. USG is presently supplying a product in the Houston market, so the chief purpose of this product is to meet that competitive situation.

small acoustical tile specimens of various formulations were made. The Standing wave tester was repaired so that specimens could be compared acoustically with tiles of known sound absorption properties by comparing normal incidence sound absorption values. It was found that an inter-connecting cell structure was possible, and this, of course, gave better sound absorption. The 7/8" thick tile samples compare favorably with competitive acoustical tile having an NRC of 65-75. Painting the surface of these tile samples with a non-bridging paint does not change the absorption. A cast density of 16-18 lbs/cubic foot has been used thus far. A study of the effect of density, the effect of different resins, and the effect of 1" glass fiber will be the next steps in the tile project. Following the establishment of a preliminary formula, a fire endurance test in our small furnace and an absorption test at a recognized acoustical testing laboratory will be recommended. We are shooting for a 2 hour fire rated lay-in tile with an NRC of 70 or better. Raw material costs of this proposed tile should be less than 4¢ per square foot 1" thick. No estimate of manufacturing costs has been made as yet. It does, however, appear that the economics can be favorable, in view of the selling price of more than 20¢/sq. ft. for this type of tile (Armstrong's 2 hour rated Fire-Gard).

6. PROTEIN JOINT COMPOUND FORMULATIONS - R&D #275

Objective: To make revisions or improvements where advisable in our Joint System product formulations.

Investigation: Previous work consisted mainly of the substitution of hydroxyethyl cellulose for alginate as the water retention agent in joint system, and the testing of a new alkali system which consists of soda ash and borax. The hydroxyethyl cellulose (Hercule's Natrosol) offers improved mixing & application properties, and the borax provides quicker solution of the casein and a more efficient binder system. In the old formulas, borax was not compatible with the alginates, so its use was dependent on our ability to use Natrosol as the water retention agent. Other hydroxyethyl cellulose products had been tried in the past, but their hygroscopicity always prevented successful use. This adverse characteristic has been overcome in Natrosol.

Even before this work was completely finished, a casein shortage developed, and the price of casein began to skyrocket. Starting at 19¢/lb. in December, the price will reach 36¢/lb. by March. Because of this, we were directed to intensify the work being done and to start a search for binder substitutes for casein. Since the new alkali system offers a quicker method of reducing cost by reducing casein content, it will be given first priority. The other approach involving binder substitutes and binder combinations has also been started, but this is a longer range program and will be given secondary attention.

Investigation: The details of the construction have been worked out, and the test has been arranged to be run at Ohio State. All of the materials are at Ohio State, so this partition can be tested as soon as we can get on the schedule.

12. PRECOATING OF GYPSUM WALLBOARD - R&D #286

Objective: Apply a coating of joint system material to the surface of the wallboard as an in-process operation.

Investigation: It was found that a thin uniform layer of joint compound could be spray applied over a wallboard surface. In certain cases, the area of the wallboard is given a coating of joint material as the last step in its installation and before painting. This operation was initiated by Mr. E. B. Hummer, and its prime purpose was to bring the surface textures of the wallboard & the surface covering of the joints, nailheads, etc. closer together. In other words, the shear coat provides a more nearly monolithic surface. Other advantages to be gained, from our standpoint, are that more paper defects could be tolerated - and perhaps a lower cost (grayback instead of ivory) paper could be used. The major problem is how to apply such a coating in the proper thickness and sufficient uniformity in our manufacturing process. However, before that stage is reached, a more precise appraisal of the coating and any problems it may present must be assessed. We are in the very early stages of this investigation and, at the moment, our attention has been diverted to other projects of higher priority.

13. READY MIX JOINT COMPOUND - R&D #211

Objective: Reduce the formula cost of our Ready Mix, in order to improve the profit on this item.

Investigation: A comparison of Bestwall Ready Mix vs. ESG and other competitive products revealed that the competitive products have lighter weight pails. A difference of about 4 lbs/5 gallon pail was found. In exploring this, it was found that substitution of 3% highly absorbent Attagel Clay for 10% Kaolin Clay reduced the pail weight by 4½ lbs. In the process, more water is required; and the net result is a 10% reduction in raw material usage. A series of tests is underway to evaluate this new formula, and indications thus far are that some quality advantages will be gained in addition to the improvement in Economics.

S U M M A R Y

The last 6 months in the Research Department have been highlighted by the reinstallation of our large-scale testing equipment in a new building, which was provided for that purpose. The major accomplishments during this 6-month period were:

1. The first 2-hour fire rated wood floor & ceiling assembly was granted to Bestwall, from our successful test of this construction at Underwriters' Laboratories.
2. The first 1-hour rated wood stud partition with 1 layer of fiberboard and 1 layer of 5/8" Firestop was achieved as a result of another successful test; this time at Ohio State University.
3. A sound test program was completed which gives us a full range of sound transmission class (STC) values, to promote wood stud, metal stud, and gypsum partitions.
4. A new line of striated wood grain products has been readied for release early in 1965.
5. A vastly improved high expansion plaster has been developed and added to our industrial product line.
6. A series of particle size analyses has been completed recently. This study has provided our first knowledge of the particle size & gradation of our materials in the subsieve (finer than 44 micron) range. This is the start of a build-up of information that can be a basis for future developments.

Having our equipment restored and some newer facilities which we did not have available previously, will enhance our ability to undertake developments and furnish information that can serve as a basis for the immediate & future growth of Bestwall Gypsum Company. A budget for next year in the amount of \$170,000 was prepared. This includes \$60,000 for new fire & sound test programs, as well as continuing our present programs on the same basis as last year. Also, allowance has been made for the addition of one new man to the Research Department staff.

The present plans for early 1965 call for the following work to be undertaken:

1. A large scale run of synthetic gypsum which will provide the final basis for deciding the future use of this process development.
2. The release of a full line of spray textures.
3. An extensive exploratory fire test program using our small furnace and the subsequent scheduling of large scale tests at U. L. and Ohio State based on our findings.

4. The reduction of the glass fiber usage in regular wallboard based on experience with the finer filament glass fiber.
5. The pursuit of a cost reduction program in the joint system product line, by means of formula revision.
6. The search for new binders to supplant casein in joint system products.
7. The development of comparative information on a dozen different thincoat plaster products which have been submitted.

Projects absent from the present schedule are the particle size studies, the gypsum acoustical tile, the pre-coating of gypsum board, and other more basic work. It is our fervent desire to pursue this work, as soon as time can be spared from areas of higher priority. These higher priority items are of more immediate significance to the Company, but spending our entire effort here completely ignores the projects which protect our future. It is our opinion that the longer term projects, when successful, result in far greater potential than the projects designed to fulfill immediate needs. It is our hope that a program encompassing both the immediate & future needs of the Company will be possible.