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FOREWORD

This report covers the activites and accomplishments of the Research Department for the first six months of 1966.

The annual research budget for 1966 is $210,000. As of June 30, the research expenditures stand at $80,470. The main reason that we are trailing the budget is that the projects for acoustical tile and synthetic gypsum have been dropped and $43,000 has been budgeted for them. However, a $75,000 investment in a molded grainboard process has been approved for 1966, and if this becomes a reality the figures will change substantially in the last half of the year. The distribution of research expenditures are shown on the two following pages, in two different ways. The figures shown are only for the six month period and cannot be projected for a full year. One reason is that certain projects emphasized during the period can influence the figures greatly. Another factor is that most of our fire and sound test expenses, which represent a formidable part of our budget, are invariably incurred in the last half of the year. The figures therefore, are indicative of the six month results only.

On page four is a compliation of the net sales and gross profit for the past six months emanating from new products which have been developed. This total represents 3.9% of the Division net sales and 2.9% of the operating profit for the period. The lower profit figure is almost entirely due to the ready mix and Bestex texture products where $336,113 worth of sales produced only $312 profit. This unfavorable economic situation should be helped measurably by the new ready mix plant which is being installed at Akron and the texture reformulation work which is aimed at cost reduction.

Research activites which cannot be accurately evaluated are those of a service nature to either the Sales or Manufacturing Departments. Fire and sound testing is a large portion of the work which is done as a service to Sales to promote the sale of board products, particularly Firestop. The fact that 1/2" Firestop sales for the first six months are up 158% and 5/8" Firestop sales are up 23% over the same period last year, is a strong indication that we are getting a good return from our fire and sound test expenditures. Last year quite a lot of time and money was spent in the improvement of our present joint system products and in the development of Triple Duty. Our joint system sales (excluding ready mix) are up 52% over last year, so this would indicate that an emphasis on this product line last year was well placed.

The main section of this report is devoted to the progress of the various projects. A new format has been established for this section. Instead of being divided into projects completed, nearing completion, and underway, it is being separated into- Process and Product Inprovement; Sales Service; New Products Development; and Fundamental Investigation, Laboratory Service and Testing.

Market Performance of New Products for 1966 (First six Months)

Product	Sales Volume	List Sales	Estimated Gross Profit
Dens-Cote Base (all)	8,605 M sq. ft.	$364,828	66,841
Tile Backer Board (all)	1,278 M sq. ft.	102,303	37,420
Tru-Grain Wallboard	358 M sq. ft.	25,049	2,185
One Day Joint Compound	279 T	46,895	7,976
Ready Mix Joint Compound	64,956 pails	258,998	41
5 gallon	60,171 pails		
1 gallon	4,785 pails		
Triple Duty Joint Compound	21,450 T	232,519	57,548
Grabit Adhesive	65 T	9,598	3,185
Bestex A	29,869 bags	57,052	870
Bestex B	793 bags	3,269	133
Bestex C	4,241 bags	16,794	(752)
Dens-Cote Plaster	1,591 T	91,360	13,152
Dens-Cote Tape	8,561 rolls	10,952	4,468
Tile Backer Vinyl Tape	164 rolls	1,172	790
Model Densite	4 T	186	68
Tooling Densite	1 T	82	28
High Expansion Plaster	30 T	1,921	516
TOTALS		$1,222,978	$194,469

5. Scoring and Breaking Properties of Gypsum Wallboard - R&D 298

At the request of Manufacturing, a project was undertaken to improve the scoring and breaking properties of gypsum wallboard. This subject is the source of a great deal of argument on quality between Sales and Manufacturing. The first step was to devise a positive method of being able to distinguish between board which has good, fair, or poor scoring and breaking properties. After a method was found, the effect of various conditions and additives were evaluated. It was found that perlite fines in the amount of 2 CU FT/M sq. ft. of board would improve the scoring and breaking. Furthermore, it was found that if the perlite were expanded to 4 lbs./cu. ft. it would actually be possible to save on costs at the same time.

A plant trial was held in which regular grade perlite was used. This was unsuccessful im improving the scoring and breaking properties, but seemed to permit a much lighter weight board to be produced. This will be repeated with the perlite fines, but now will be widened in scope to evaluate the effect of perlite as a means to reduce the weight and improve wallboard economics in addition to improving the scoring and breaking.

6. Accelerator Grind - R&D 2

Some time has been devoted to evaluation of grinding equipment and particle size analysis of gypsum which is used for wallboard accelerator. The objective is to find a less expensive accelerator than the ground block which is currently used. This is being handled by the Technical Department with our assistance.

Joint System

1. Protein Joint System Formulation - R&D 275

When the price of casein escalated sometime ago, a crash program was put into effect to reduce the cost of our Joint Compound, Bedding, Topping, and All-Purpose. The emphasis was placed on the larger volume items and did not include the smaller volume texture products. At the same time such a small quantity of texture products were sold, we could not justify spending a great deal of time to reduce costs. Our texture business has grown, however, and now it does behoove us to work on the cost structure of these products.

The re-formulation work to date appears to be very encouraging. This involves the substitution of starch for part of higher priced casein. If this is successful, an annual savings of $7,000 will be realized.

Industrial

1. Denscal Plant - R&D 2

Assistance has been provided in the planning of the Denscal equipment and its installation at Blue Rapids.

FUNDAMENTAL RESEARCH, LABORATORY SERVICE AND TESTING

1. ASTM and Gypsum Association Work - R&D 4

Through our membership in the Gypsum Association and ASTM we are obligated to assume our fair share of this test work which is carried out by the Technical Committee. In addition to our industry obligation we will receive the benefits of the various test programs which reduce our own efforts. In many instances the testing done by the Association is far less expensive because the cost is shared by other companies.

During the past six months we made exploratory tests of the method for defining type X wallboard. This method was originated by us. Another series of tests to evaluate combustibility by the potential heat method was farmed out to an independent Laboratory. Tests to develop a performance standard for wallboard are just beginning. A proposal has been made to ASTM by National Gypsum Company to reduce the minimum weight of 1/2" board to 1700/M and 5/8" board to 2100/lbs. M. We are supporting this proposal.

2. Patent Application Data - R&D 6

The patent application on processing of synthetic gypsum was rewritten on the basis of the examiners comments. This necessitated tests to establish limits of the amounts and types of neutralizing agents which are claimed.

The patent application on Grabit masonry adhesive was abandoned on the basis of the expense necessary to continue our case as compared with the minor importance of the product.

Our patent application on the One Day Joint Compound formulation has also been abandoned as a result of the examiners rejection. Since our application was filed, a patent has been issued to Shawinigan Resins Corporation, which covers a formula very similar to our One Day Formula. Shawinigan Resins (now a division of Monsanto) furnishes the resin binders used in One Day. They patented a number of compositions involving the binder, as well as the binder itself.

Application in which no action has been received from the patent office are those on Dens-Cote and Dens-Cote base.

We are considering patent protection for one new idea which is the improved Firestop formula. The necessary tests have been started so that an application can be prepared as quickly as possible. An improvement patent is sought so that we will retain our technical advantage on fire rated wallboard. This may enable us to continue receiving the royalty payments we are presently enjoying. The preparation of this data will require a lot of research time but we believe the long term advantage justifies the time which will be spent.

3. Synthetic Gypsum - R&D 221

An economic study was made to allow us to decide whether it would be feasibl

SUMMARY

The last six months net sales and estimated gross profits resulting from products developed through research were $1,222,978 and $194,469 respectively. Other sales increases during the period which we feel have been influenced by research acheivments are: 1/2" Firestop - up 158%; 5/8" Firestop - up 23%; and dry joint system products - 52%. These figures are based on the first six months of 1965.

The most notable accomplishment during the past six months was the development of a new 5/8" Firestop, significantly lighter in weight and with greater fire resistance. This is considered a major breakthrough, offering potential annual savings of $48,000 and increased future sales of 5/8" Firestop. Another outstanding acheivement was the design and assembly of an instrument to accurately measure and record the increase in temperature of a gypsum product during the hydration from $CaSO_4 \cdot 1/2H_2O$ to $CaSO_4 \cdot 2H_2O$. This gives us a valuable tool to study the hydration reaction, which is the basis of the wallboard manufacturing process.

Services to others occupied quite a bit of Research and Development time. Some of these were: the coordination of Laboratory rennovations, and the establishment of the Quonset Hut as a pilot plant for the Chemical Division group who will be here September first; a series of tests on wallboard and foil adhesives to assure Sales that we could meet the specifications of National Homes, Inc.; testing of a metalclad wall system of Donn Products; and the accumulation and organization of the technical data concerning all of the ramifications of the Dens-Cote system.

In the last six months of 1966 we expect our research program to proceed along the following lines:

1. The 1966 fire test program will be completed, with the reduction in weight of 1/2" Firestop and the development of a 3-hour floor-ceiling rating having high priority. We will be spending a lot of time testing and collecting data to help us process a patent application on the new Firestop formula.

2. The 1966 sound test program will be completed, and of particular interest will be the evaluation of 1/4" gypsum board as a sound deadening component.

3. Providing an agreement can be made with U. S. Mold Coatings, Inc., the development of this molded grainboard will have a high priority.

4. Product development of Ram Process plaster, gypsum/plywood studs, and the gypsum firedoor filler will continue. Likewise, the efforts to improve our grainboard line and Dens-Cote smooth finish plaster will continue.

5. Some manufacturing oriented projects which are underway include the investigations to reduce wallboard weight, improve scoring and breaking properties, and reduce accelerator costs. Other

wallboard investigations include the ASTM and Gypsum Association work which is currently in progress to develop performance specifications for gypsum wallboard.

6. Some fundamental work included in our plans are microscopic observations, temperature rise studies, and some differential thermal analyses. This work is expected to teach us more about hydration and calcination which are basic to gypsum manufacturing processes.

Through the Personnel Department we have hired two Drexel students under their co-op plan. We feel that we are gaining both long and short term benefits from participation in this program. We are seeking a chemist or chemical engineer as a replacement, and a mechanical engineer as an addition to our staff. We are attempting to build more experience into the Department in the areas of analytical type research and structural systems. If this can be accomplished, we should have a well balanced and capable staff which can handle all of the current items and serve as the basis for future growth.