

GRACE CONFIDENTIAL

CONSOLIDATED MONTHLY SUMMARY

DECEMBER 1971

This Consolidated Monthly Summary contains the technical information for December 1971. Because of the highly confidential nature of its contents, circulation is limited. Those receiving copies are requested to limit access to only those members within their organization who have a real need-to-know.

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W. R. GRACE & CO.



RESEARCH DIVISION

January 5, 1972

Washington Research Center, Clarksville, Maryland 21029

MONTHLY REPORT FOR DECEMBER 1971

CONSOLIDATED EDITION

GRACE CONFIDENTIAL

NOT TO GO OUTSIDE U. S.

This report contains information on the following activities at the Washington Research Center.

INORGANIC RESEARCH

- I-1 Clear POLISHING POWDER
- I-2 SEA WATER SCALE INHIBITOR
- I-3 FUSION BONDED VERMICULITE BOARD
- I-4 CERAMIC BONDED VERMICULITE BOARD
- I-5 COMMERCIALIZATION OF NUCLEAR TECHNOLOGY
- I-6 COCOA SURFACE CHEMISTRY
- I-7 GLAZING STUDIES/LEAF AUTOMATION
- I-8 NEW FOAM CONFECTIONS
- I-9 GRACE INORGANIC EXCHANGERS

ORGANIC RESEARCH

- O-1 PROJECTS OF INTEREST TO D&A
 - A. Can End Fastening System
 - B. Hampshire processes
- O-2 PROJECTS OF INTEREST TO CPL GROUP
 - Packaging Materials - Non-Halogenated Barrier Materials
- O-3 PROJECTS OF INTEREST TO EUROPEAN DIVISION
 - Wet Strength Agents
- O-4 PROJECTS OF INTEREST TO POLYFIBRON
 - Endura
- O-5 EXPLORATORY WORK
- O-6 ANALYTICAL RESEARCH
 - High Resolution Liquid Chromatography

PHOTOPOLYMER RESEARCH

- P-1 LITHOGRAPHIC PRINTING PLATES
- P-2 LETTERFLEX - IMPROVED PRINTING QUALITY
- P-3 SOLID LETTERFLEX PLATE
- P-4 DRY FILM PHOTORESIST
- P-5 SOLDER PHOTORESIST - WESTERN ELECTRIC
- P-6 LETTERFLEX RAW MATERIALS

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AGRICULTURAL & CONSTRUCTION MATERIALS RESEARCH

- A-1 WELLMAN-POWER GAS SO₂ RECOVERY PROCESS
- A-2 REFORMULATION AND EVALUATION OF MONO-KOTE
- A-3 VERMICULITE-MOSS PLANTING DEVICES
- A-4 UNIVERSITY SOYBEAN AGRONOMY RESEARCH
(NY Chem Group Office)

BIOCHEMICAL RESEARCH

- B-1 ADAPTED RUMEN MICROBES
- B-2 AMMONIUM ISOBUTYRATE AS A GRAIN AND SILAGE PRESERVATIVE
- B-3 SCOURS PREVENTATIVE
- B-4 FERMENTATION SCREENING
- B-5 CELLULASE ENZYME
- B-6 DIVISIONAL CONSULTATION (CONSTRUCTION PRODUCTS DIVISION)

OTHER ACTIVITIES

- OT-1 GRACE CANE SUGAR PROCESS

AGRICULTURAL & CONSTRUCTION
MATERIALS RESEARCHA-1 WELLMAN-POWER GAS SO₂ RECOVERY PROCESS (Project 6381)

The investigation underway for Wellman-Power Gas Inc. was set up in three phases:

Phase I was designed to establish the fate of sulfides; namely, H₂S, COS, and CS₂--after contact with the sulfite-bisulfite absorber feed--in a static system.

Phase II was designed to determine the dynamic effects of the tail-gas contaminants in the presence of NO₂ gas and dissolved Fe⁺³.

Phase III was designed to determine the efficiency of selected antioxidants in the prevention of sulfite oxidation to sulfate and thiosulfate in a dynamic system.

Phase I is essentially complete. Two-thirds of the data was reported to Wellman-Power Gas in a review on December 20, 1971 at Lakeland, Florida.

In late November, Wellman requested a change in schedule where Phase III work would be commenced before Phase II. A detailed experimental design was drawn up for this phase and results of this study were reported to Wellman on December 20. It was agreed by those present that the operating conditions originally selected for the test were too severe to permit evaluation of antioxidants, and a new experimental design has been drawn up and approved by Wellman. Results of this test are expected to be available the first week in February.

(Legal, Kraus)

A-2 REFORMULATION AND EVALUATION OF MONO-KOTE (Project 2659)

Research Division, by agreement with CPD, has undertaken a laboratory study of gypsum quality and its relation to bond performance of Mono-Kote. In like manner, CPD has begun work on the effects of vermiculite quality. The two parts are complementary by design and overlap to a limited degree for evaluations of interaction effects between gypsum and vermiculite. Our part of the program is divided into two parts:

- a. Determination of variability in gypsum quality received at each of 23 Mono-Kote manufacturing sites by a one-time analysis.

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- b. Determination of variability in gypsum quality at two locations on a continuing basis. Duration of the tests is dependent on results obtained; wide variations will necessitate a longer test period.

Two types of products will be tested:

1. Raw stucco, i.e. untreated calcined gypsum.
2. Formulated ZOU, i.e. stucco plus additives.

Specifications and test procedures for gypsum quality have been defined by CPD. Quality criteria will be established by laboratory performance of standard MK-4 formula by CPD and WRC. Materials of composition are #4 grade South Carolina vermiculite (expanded at Muirkirk, Md.), stucco or ZOU, Duponal WA Dry, and Cellufloc. A gypsum variability design is being prepared by Phil Press of the Operations Research and Analysis Department.

On December 17, 1971, P. L. Veltman and J. W. Kraus took part in a Mono-Kote Review held by CPD in Cambridge, Mass. This meeting included a review of the WRC Research accomplishments and conclusions which are summarized briefly as follows:

Most Important Accomplishments

- Small amounts of chemicals and reinforcing fibers have a great effect on Mono-Kote bond performance.
- Bond performance is predictable on the basis of composition, and performance results are repeatable.
- Correlation between laboratory and pilot tests, but not with large-scale tests, has been established.

Major Conclusions

- A systematic study of all factors affecting Mono-Kote quality is needed.
- Mono-Kote quality is subject to control and must be controlled.
- Relationship between laboratory and pilot-scale tests is predictable.

(Legal, Kraus)

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CONSOLIDATED MONTHLY SUMMARY

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W. R. GRACE & CO.
RESEARCH DIVISION



Washington Research Center, Clarksville, Maryland 21029

December 7, 1971

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- I-2 SEA WATER SCALE INHIBITOR
- I-3 CERAMIC BONDED VERMICULITE BOARD
- I-4 COMMERCIALIZATION OF NUCLEAR TECHNOLOGY
- I-5 LEAF AUTOMATION
- I-6 AUTO EMISSIONS CATALYST PROGRAM
- I-7 NUCLEAR MATERIALS - NPD-71-7437-B

ORGANIC RESEARCH

- O-1 PROJECTS OF INTEREST TO DEWEY & ALMY
 - A. Can End Fastening System
 - B. Overstripe Resin for Conoweld Side Seam
 - C. Hampshire Processes
- O-2 PROJECTS OF INTEREST TO CPL GROUP
 - A. Packaging Materials - Non-Halogenated Barrier Materials
 - B. Polystyrene Foam
- O-3 PROJECTS OF INTEREST TO THE EUROPEAN DIVISION
 - A. Sea Water Scale Inhibitors
- O-4 EXPLORATORY WORK
 - A. Hydrophilic Polyurethanes

CLP TASK FORCE RESEARCH

- C-1 CLP LITHOGRAPHIC PRINTING PLATE
- C-2 LETTERFLEX - IMPROVED PRINTING QUALITY
- C-3 SOLID LETTERFLEX PLATE
- C-4 DRY FILM PHOTORESIST
- C-5 SOLDER PHOTORESIST

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AGRICULTURAL & CONSTRUCTION MATERIALS RESEARCH

- A-1 WELLMAN-POWER GAS SO₂ RECOVERY PROCESS
- A-2 REFORMULATION AND EVALUATION OF MONO-KOTE
- A-3 SILICATE CONSTRUCTION MATERIALS
- A-4 VERMICULITE-MOSS PLANTING DEVICES
- A-5 UNIVERSITY SOYBEAN AGRONOMY RESEARCH

BIOCHEMICAL RESEARCH

- B-1 ADAPTED RUMEN MICROBES
- B-2 AMMONIUM ISOBUTYRATE AS A GRAIN AND SILAGE PRESERVATIVE
- B-3 SCOURS PREVENTATIVE
- B-4 ENZYMATIC TREATMENT OF FEEDLOT BLOAT

OTHER ACTIVITIES

- OT-1 GRACE CANE SUGAR PROCESS

AGRICULTURAL & CONSTRUCTION MATERIALS RESEARCHA-1 WELLMAN-POWER GAS SO₂ RECOVERY PROCESS (Project 6381)

The specific object of this project is to obtain information concerning the chemistry of the effect of various sulfur compounds other than SO₂ on the sodium sulfite SO₂ recovery system being exploited by Wellman-Power Gas.

An experimental program was developed in cooperation with Wellman and the work was divided into three phases: Phase I, study of the static system chemistry; Phase II, study of the dynamic system chemistry; and Phase III (originally to be considered later), study of antioxidants in the dynamic system. Total costs to Wellman were calculated at \$36,000 with billings to be made directly from the Washington Research Center (WRC) to Wellman-Power Gas.

A considerable amount of information has been collected on the Phase I static system chemistry and will be reported to Wellman December 15, 1971 at Lakeland, Florida.

Wellman has requested (and authorized) that the order of investigation be changed, so that Phase III will be undertaken before the work outlined for Phase II. It had been planned to erect a complete dynamic system for the Phase II study which could also be used for Phase III. This would entail a considerable amount of effort in erecting equipment. It is believed that a great deal of information can be obtained in a shorter period of time in a batch-cyclic system and without the mechanical control problems which undoubtedly would be found in any dynamic system. This program has just been started with preparation of an experimental design to be submitted to Wellman and erection of the batch-cyclic equipment.

A-2 REFORMULATION AND EVALUATION OF MONO-KOTE (Project 2659)

The purpose of this project is to assist the Construction Products Division (CPD) in developing suitable replacements for MK-3, which is alleged to be a health hazard because of contained asbestos, and MK-4, which is a problem because of poor fire rating. Laboratory work has shown that the properties of non-asbestos Mono-Kote formulas can be changed drastically by the addition of certain chemicals and/or materials. Several formulas developed by CPD and WRC show promise for success on blend decks. Two formulas have survived a 4-hour fire test on a 7' x 9' panel at U. S. Gypsum Laboratories. One contained 0.50% NTA with a direct manufacturing cost of \$0.0611/bd ft; the other contained 0.50% fiberglass and 2.0% polystyrene with a DMC of \$0.0467/bd ft (commercial MK-3 DMC is \$0.0452/bd ft).

Correlation of test results between Traveler's Rest and WRC generally has been good except that severe bonding problems have recently been encountered in field application and test programs of both commercial MD-3 and experimental formulas. A portion of the material is not curing during field applications and must be removed or, in some cases,

falls off decking. In essence, the same type of behavior is being experienced in the test program being conducted at Traveler's Rest. The precise reason for this failure is not known. It is suspected that it may be caused by (1) improper handling of applied Mono-Kote, and/or (2) variation in quality of gypsum used. The latter is the more likely reason. Accordingly, a program is being implemented to determine the causes of the bonding failure by implementing a better quality control program for Mono-Kote, and developing a better understanding of gypsum variability. It is planned to discuss this problem with CPD, December 2, 1971, with the objective of ascertaining the data already in hand by CPD and determining a future course of action.

A-3 SILICATE CONSTRUCTION MATERIALS (Project 2662)

The objective of this project is to assist CPD increase profitability of vermiculite by developing silicate-bonded vermiculite products and finding means of production at acceptable costs for spray- and cast-type products. An experimental program to obtain physical and chemical properties of materials made under various conditions has been completed. The data have been discussed with CPD at Cambridge, Mass. on November 18, 1971. It was the consensus that the silicate-bonded materials have properties which would appear to complement the present business. Costs are higher than the present line; however silicate-bonded products show outstanding thermal insulation properties, and other physical properties appear to be superior. CPD is currently reviewing product applications where the unique properties of the silicate materials can be advantageously marketed and will report results of this study about February 1, 1972.

A-4 VERMICULITE-MOSS PLANTING DEVICES (Project 2552)

The present objective of this project is determining means of modifying the process for manufacturing vermiculite-moss planting devices in order to minimize production costs. CPD is re-evaluating the economics of the product as an adjunct to the present loose Redi-Earth planting mix business which is increasing at a substantial rate.

Recent economic studies of the planting device have shown that lower production costs can be achieved by decreasing the compaction pressure and increasing the moisture content of the moss. Production rate can in effect be doubled by decreasing the compaction pressure from 3000 psi to 1500 psi and cost can be reduced by increasing the moisture content of the moss from 13% to 35%. Laboratory samples produced under these conditions show good strength and excellent re-expansion properties.

A pressing test in a 200-ton press at Mannesmann-Meer Inc, Easton, Penn, confirmed the laboratory data. A number of samples were made at various compaction pressures from 500 psi to 3000 psi. The products made at both 1000 and 1500 psi were essentially comparable to those at 3000 psi, the previously stipulated pressing pressure. The products were slightly thicker in the dry state, but re-expansion properties