

CONSOLIDATED EDITION

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February 16, 1971

AGRICULTURAL RESEARCHA-1 REFORMULATION AND EVALUATION OF MONO-KOTE (Project 2659)

Experimental results from the Mono-Kote project, obtained at the Washington Research Center from November 30, 1970 to January 27, 1971, were reviewed with the Construction Products Division on January 28, 1971. A Cambridge, Travelers Rest, WRC effort is underway with the first objective of producing a Mono-Kote product that will pass the UAL fire test, and be at least the equivalent of the old MK-3 formulation, without the inclusion of asbestos. Because of the asbestosis hazard to workers, sprayed asbestos-containing products are being barred in major U. S. cities. When asbestos was removed from the original MK-3 formulation, adhesion to metal was unsatisfactory. WRC undertook to find bond promoting materials, and to develop tests for measuring effectiveness. As of this writing, the several facets of this program are on schedule.

Laboratory studies using the V-K Cup Fire Test indicate that at 75°F, a force of 46 lbs. is required to rupture the cohesive bond of the original Mono-Kote formulation (MK-3) whereas the new Mono-Kote formulation (MK-4) bond ruptures at 22 lbs. The addition of 2% sodium alumino-silicate to the MK-4 formulation increased the bond strength to 44 lbs. The addition of Cafco fireproofing compound (a mixture of mineral wool, gypsum and Portland Cement) added to the MK-4 formulation at a level of 4%, increased bond strength to 58 lbs. in the one test performed to date.

At higher temperatures (800°F) the Mono-Kote MK-3 bond ruptures at about 15 lbs. in the V-K Cup Fire Test compared with 6.2 lbs. for the MK-4. The addition of $\text{Na}_2\text{B}_4\text{O}_7$ (1%) increases the MK-4 bond strength to 12.6 lbs.

It is believed that these studies prove conclusively that bond promoters in Mono-Kote do improve bonding properties to galvanized steel and indicate that reinforcing fibers may improve performance. Testing of formulations containing $\text{Na}_2\text{B}_4\text{O}_7$, sodium alumino-silicate and mineral fibers along with other additives will be continued.

This program has resulted in bringing raw materials under better control. Selected formulations are now scheduled for test at Travelers Rest and at UAL, to prove out whether the laboratory predicted results can be confirmed on commercial scale.

(Kraus, Veltman)

D009453

A-2 VERMICULITE-MOSS PLANTING DEVICES (Project 4815)

A meeting between members of Chemical Group Research, Patent Department and Construction Products Division and the top executives of Keyes Fiber Co. was held January 21, to discuss possible licensing arrangements whereby Keyes would manufacture and market Grace's planting devices.

June 14, 1971

AGRICULTURAL & CONSTRUCTION MATERIALS RESEARCHA-1 UNIVERSITY SOYBEAN AGRONOMY RESEARCH (Project 4834)*Confidential*

Dr. deMooy of Iowa State University reported that the test plots of soybeans have been planted. These tests are designed to determine the effectiveness of iron and zinc chelates in improving yields.

(Legal)

A-2 VERMICULITE MOSS PLANTING DEVICES (Project 4815)

The Keyes Fibre Co. has decided against producing the moss vermiculite planting device. Based on their findings, they have reluctantly concluded that the project would be too risky in relation to projected return on investment. No further activity is planned on this project.

(Legal, Kolbe)

A-3 FORMULATION AND EVALUATION OF MONO-KOTE (Project 2659)

The immediate objectives of the Mono-Kote program at WRC are (1) to determine the optimum composition for super Mono-Kote to achieve optimum bond performance and (2) relate WRC laboratory data with data obtained from large scale testing by CPD. Super Mono-Kote is defined as an asbestos-free vermiculite gypsum system to which has been added a chemical composition of a synthetic asbestos cement (C). The preliminary conclusions from the analysis of the data in the factorial design outlined in last month's summary indicates that bond strength is directly proportional to vermiculite-gypsum ratio, i.e., higher gypsum gives higher strength; water content is an important function, both too little water and too much water can give poor bonding strength; addition of cement (C) sharply improves bonding strength; and reinforcing fibers (glass or mineral wool) with cement (C) gives further improvement in some instances. These data were reviewed with CPD on May 5 and 6. CPD is planning to test four different experimental Mono-Kote compositions on 9' x 7' panels at U.S. Gypsum Laboratories, starting about May 25. Cement (C) will be included in two of the compositions. Cement (C) will be included also in fabrication of 4' x 4' test panels at Travelers Rest.

A cooperative testing program between WRC and CPD is planned whereby laboratory sized samples will be taken during the U.S. Gypsum and Travelers Rest tests and returned to WRC for small scale testing. This should provide a method of comparing laboratory results with larger scale results. This type of data is not available at the present time.

(Kraus, Legal)

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A-4 SILICATE CONSTRUCTION MATERIALS (Project 2662)

The objective of this project is to assist the Construction

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than 5 hour test time - comparable to MK-3. Accordingly, it is anticipated that at least one of these experimental formulas should be able to pass the blend deck test on larger scale. CPD is moving ahead with arranging a test program at U. S. Gypsum in September and at Ohio State University in October.

Twelve tests at WRC on various compositions are virtually completed. It is anticipated that results will be reviewed with CPD in the middle of September and the most promising candidates will be tested at Traveler's Rest on 4' x 4' panels and possibly at U. S. Gypsum if results are outstanding.

(Kraus, Legal)

A-3 SILICATE CONSTRUCTION MATERIALS (Project 2662)

Intensive work with the sodium silicate-sodium silicofluoride-vermiculite compositions were temporarily delayed to comply with special requests from ACG, but resumption of full scale testing is scheduled for the week of August 30.

Fifteen of the planned 27 test compositions have been prepared and partially evaluated to date.

(Legal, Kolbe)

A-4 CHATTANOOGA PHOSPHATIC RAW MATERIAL (Project 4860)

Samples of normal superphosphate and triple superphosphate were prepared from Chattanooga phosphatic raw material and submitted to Farmers Co-op, Nashville, Tennessee and ACG, Memphis for evaluation, with the expectation that the material might be used to produce superphosphate and/or complete fertilizer.

A report, "Superphosphate from Chattanooga Phosphate", was published August 17, 1971, describing the preparation and analysis of superphosphates prepared at WRC from Chattanooga raw material. This showed that a triple superphosphate containing 46.7% APA (at 2.9% H₂O) and a normal superphosphate containing 17.7% APA (at 5% H₂O) could be prepared from the Chattanooga material. The raw material, on a calculated basis, contains 11% Ca(OH)₂, 9% CaCO₃, and 9% free NaOH. Presumably, better control of the precipitation reaction and washing would reduce these values low enough to yield a normal superphosphate containing 19-20% APA. Samples of about 1000# each will be supplied to both ACG and Farmers Co-op when the Chattanooga operations start up later this year.

(Legal, Kolbe)

D009455

PROBLEM WITH MONO-KOTE

- CONTAINS ASBESTOS, ALLEGED TO BE CARCINOGENIC AND TO CAUSE ASBESTOSIS.

REFORMULATION OBJECTIVES

- ELIMINATE ASBESTOS.
- MAINTAIN PRESENT YIELD, RAW MATERIAL COST, AND PHYSICAL PROPERTIES.
- OBTAIN UNDERWRITERS LABORATORIES LABEL SERVICE ON NEW COMPOSITION IN REGARDS TO FORMULATION, APPLICATION, SURFACE FLAMMABILITY, THERMAL INSULATION AND BOND TO STEEL.

D00944C

PROGRESS TO DATE

THROUGH A SERIES OF OVER 50 PILOT FIRE TESTS INVOLVING FORMULATION, APPLICATION, CURING, COSTING AND EXPOSURE TO ASTM E-119 TIME-TEMPERATURE CURVE, WE HAVE:

RESEARCH

- DEFINED FUNCTION OF ASBESTOS, AS A WATER ADSORBANT TO IMPROVE YIELD, AND TO REDUCE PUMPING PRESSURES.
- DETERMINED THAT ORGANIC AGENTS MAY BE SUBSTITUTED.
- RULED OUT CERAMIC, MINERAL AND GLASS FIBERS BECAUSE OF COST, UNADAPTABILITY OR AS CONSTITUTING HEALTH HAZARDS.
- RULED OUT MINERAL FILLERS AS CLAYS, BENTONITES, DIATOMACEOUS EARTH, EXPANDED PERLITE AND COATED ASBESTOS BECAUSE OF POOR YIELD AND BOND, OR OF EXCESSIVE ABRASION TO MIXERS AND PUMPS.
- RULED OUT TEXTILE FIBERS AS COTTON, NYLON, RAYON, ETC., SINCE THEY ARE ESSENTIALLY NON-HYGROSCOPIC. WOOD FLOURS WERE UNACCEPTABLE BECAUSE THEIR WATER AFFINITY WAS OF A LOW ORDER.

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PROGRESS TO DATE (cont'd)

- SELECTED CELLULOSE SULFITE PULP AS AN ACCEPTABLE REPLACEMENT.
- EXPERIENCED LIMITED SUCCESS WITH A GRANULAR WATER SOLUBLE CELLULOSE (METHOCEL H.G.).
- OBSERVED THE EFFICIENCY OF DAXAD 30 IN ELIMINATING CRACKING TENDENCIES OF MONO-KOTE DURING EXPOSURE TO FIRE TEST.
- EXPLORED FUNCTION OF VARIOUS AGGREGATE SIZES.
- EXPLORED WATER REQUIREMENT VERSUS YIELD ON SELECTED COMPOSITIONS.

THE AFOREMENTIONED RESULTS WERE OBTAINED IN A CO-OPERATIVE PROGRAM INVOLVING PERSONNEL IN CAMBRIDGE, TRAVELERS REST, SOUTH CAROLINA, AND LOS ANGELES.

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FIELD TESTS:

BEGINNING MID-DECEMBER, 1969, THE FOLLOWING PRODUCTION AND FIELD TESTS HAVE BEEN COMPLETED:

- DECEMBER 1969 - 45 BAGS FORMULA 1165 @ 4.09% SULFITE PULP MADE @ KEARNEY FOR DEVELOPMENT WORK AT TRAVELERS REST. PRODUCED 29.1 FBM VERSUS 30.96 FOR STANDARD MONO-KOTE.
- APRIL 1970 - 27 BAGS FORMULA 1165 @ 4.55% PULP MADE AT KEARNEY UNDER U.L. INSPECTION AND APPLIED TO TWO CONSTRUCTIONS IN CHICAGO FOR FIRE TEST. ONE TEST, A FIRE HAZARD CLASSIFICATION TEST WAS SUCCESSFUL. THE OTHER, USING 2.0 INCHES OF THE NEW MONO-KOTE ON A 14 WF 228 STEEL COLUMN WILL BE TESTED SHORTLY.
- APRIL 1970 - 45 BAGS FORMULA 1165 @ 4.55% PULP, PRODUCED IN OUR TRENTON PLANT. APPLICATION ON JOBS IN PHILADELPHIA AREA SUCCESSFUL BUT ACCURATE YIELD VALUES NOT OBTAINED.
- MAY 1970 - 42 BAGS FORMULA 1165 @ 4.55% PULP PRODUCED IN OUR BLUE ISLAND PLANT AND APPLIED TO 5TH FLOOR, IBM BUILDING IN CHICAGO, WITH 3% LOWER YIELD THAN STANDARD MONO-KOTE.

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FIELD TESTS (cont'd)

- MAY 1970 - 45 BAGS FORMULA 1165 @ 4.55% PULP, PRODUCED IN OUR NEW CASTLE, PENNSYLVANIA PLANT - APPLIED TO 31ST FLOOR, U. S. STEEL BUILDING IN PITTSBURGH, WITH 8% HIGHER YIELD THAN STANDARD MONO-KOTE.
- MAY 1970 - FORMULA 1165 WITH 4.55% PULP, MADE IN LOS ANGELES PLANT, JOB TESTED WITH 9% LOWER YIELD.
- JUNE 1970 - FORMULA 1165 WITH 4.55% PULP, MADE IN NEWARK, CALIFORNIA (SAN FRANCISCO AREA), JOB TESTED WITH OVER 10% DROP IN YIELD.
- JUNE 10, 1970 - 45 BAGS FORMULA 1165 WITH 4.55% PULP, MADE AT KEARNEY, SOUTH CAROLINA, AND FIELD TESTED THE FOLLOWING DAY IN BIRMINGHAM, ALABAMA WITH 2% DROP IN YIELD (DATA PHONED IN ON JUNE 12, 1970).

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U. L. TESTS:

- FORMULA 1165 APPLIED MAY 2ND TO CEMENT ASBESTOS
BOARDS FOR A U.L. FIRE HAZARD CLASSIFICATION TEST
WHICH WAS SUCCESSFULLY FIRE TESTED JUNE 8.
- FORMULA 1165 APPLIED APRIL 28-29 to 14 WF 228
COLUMN AT U.L. - YET TO BE TESTED.
- FORMULA 1165 (OR A MODIFIED VERSION) TO BE APPLIED
TO FULL SCALE SPECIMEN (FLOOR-CEILING) THE WEEK OF
JUNE 22 OR SOONER.

D009445

PATENT STATUS:

- SEARCH CONDUCTED BY A. McMILLIAN AND VERBALLY REPORTED ON JUNE 11 SHOWS NO PRIOR PATENTS INVOLVING CELLULOSE SULFITE PULP.
- SAME INVESTIGATION EXPOSED U.S. PATENT NO. 2,993,016 OF 1961 BY GLEN SUCCETTI COVERING USE OF METHOCEL IN PLASTER TYPE COMPOSITIONS, BUT AT LEVEL 2X THAT WHICH WE HAVE USED. ALSO, SUCCETTI USES UREA-FORMALDEHYDE TO PROMOTE INSOLUBILITY OF THE METHOCEL WHEREAS WE DO NOT. A WRITTEN OPINION WILL ISSUE ON ABOVE POINTS.
- ON JUNE 10, I ASKED R. ROTHFELDER TO SUBMIT A PATENT DISCLOSURE ON CELLULOSE SULFITE PULP IN MONO-KOTE.

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FORMULA COST:

- IN MOST PARTS OF THE UNITED STATES, NEW PRODUCT IS EQUAL TO OR 2 TO 3 CENTS/BAG OVER PRESENT MONO-KOTE COSTS.
- IN LOS ANGELES WHICH ENJOYS LOWEST ASBESTOS COSTS IN THE UNITED STATES, THERE IS AN 8 CENT/BAG PREMIUM ON THE NEW PRODUCT.

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