PLAINTIFF'S EXHIBIT
Union Carbide 103
WV-0011 #7

UC 145-2

UNION CARBIDE

INTERNAL CORRESPONDENCE

PLASTICS DIVISION • RIVER ROAD, BOUND BROOK, NEW JERSEY 08805

To (Name)	Mr. J. W. Biddle ✓	- SC	Date: February 28, 1967
	Dr. F. B. Brown	- SC	
	Mr. W. T. Higgins (4)	- BB	Originating Dept.: R & D - Division 28
	Dr. R. L. Hoaglin	- SC	Answering letter date:
	Dr. F. Johnston	- SC	
	Dr. R. W. Quarles	- BB	Subject: Lab Program - Asbestos
	Mr. J. J. Smith	- SC	
	Mr. T. Welch	- TNY	
	Dr. F. J. Welch	- SC	
	Dr. F. E. Bailey	- SC	
	Mr. G. G. Himmler	- BB	
	Dr. J. W. Lynn	- SC	
	Mr. K. V. McCullough	- BB	
	Mr. N. H. Reinking	- BB	
	Mr. H. B. Robinson	- BB	
	Mr. J. K. Rose	- SC	
	Dr. F. W. Stone	- TNY	
	Mr. P. A. Thomas	- BB	
	Mr. R. G. Woolery	- NF	
cc:	Mr. F. D. Dexter (3)	- NY	
	Dr. R. A. Hard	- NF	
	Dr. A. E. Pufahl	- NY	

Gentlemen:

Attached for your information is a summary of the 1967 laboratory program on Asbestos carried out under the supervision of Mr. R. G. Woolery at Niagara Falls. It is our intent to investigate and implement, if found advisable, consolidation of some of these laboratory programs with other laboratory programs of similar objectives elsewhere in Group I. For example, in the New Application area described herein, consolidation with some water-soluble polymer programs at South Charleston appears warranted. Your comments on other areas of potential overlap and advisability of consolidation within these areas would be appreciated.

Very truly yours,

N. L. Zutty

NLZ/bsn
Attach.

RECEIVED
MAR. 3 1967
J. W. BIDDLE

LAB PROGRAM - ASBESTOS

R. G. Woolery

2/28/67

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NOMENCLATURE - KING CITY ASBESTOS PRODUCTS

High Purity Pellets	
High Purity Open	
Asbestos "T" Pellets)	H.P. Treated with TiO_2
Asbestos "T" Open)	
Standard Grade Pellets 100	
Standard Grade 144)	Opened (Ground) to
Standard Grade 130)	"% retained on 325M
Standard Grade 110)	Screen - 44%, 30% 10%"
Standard Grade Pellets 200	Super-Standard
Standard Grade 244, etc.	Super-Standard, Open
Standard Grade 201, 202, etc.	Super-Standard, Cracked Pellets
Resin Grade Pellets 100	H.P. - low moisture
Resin Grade 144, etc.	H.P. - low moisture, open
Resin Grade Pellets 200	Silica-Treated
Resin Grade 244, etc.	Silica-Treated, Open
Resin Grade Pellets 300	Calcined
Resin Grade 344, etc.	Calcined, Open
Resin Grade Pellets 400	100% Hydrophobic
Resin Grade 444, etc.	100% Hydrophobic, Open

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ASBESTOS RESEARCH & DEVELOPMENT ($112,000)

Surface Properties & Fiber Modification

Project 95304 | 1.5 - 1.75 Man-Years | $87,000

The objective of this project is to understand the chemistry and physics of chrysotile so that reasoned chemical modification of its structure can lead to new products of potential value to Union Carbide Corporation. It is exploratory in nature. For example, past work on surface modification has led to Invention Disclosures on Asbestos "T" and RG-200 (silica modified) and has shown potential for asbestos in oil-well drilling fluids. As can be seen below, once a product or phenomenon has been pointed out by work on this project, it is transferred to an applications area for final product definition. Some experimental and consulting time of personnel on this project is used in applications oriented projects where surface or rheological questions arise.

In 1967, plans are to explore the reaction of silica-modified asbestos with compounds of, for example, zirconium, antimony, aluminum, and titanium. It has recently been found, and somewhat surprisingly, that aluminum ion treated-silicated asbestos scatters light as efficiently as Asbestos "T". The reasons for this phenomenon will be investigated. Absorption characteristics of UCC asbestos with model pitch components will be studied possibly to extend the usefulness of this phenomenon in papermaking. The absorption of surfactants will also be studied with the twofold purpose of preparing hydrophobic products to thicken non-aqueous solvents, and elimination of BOD from water systems. Phosphate in absorption from aqueous solution will be studied aimed at a possible method of algae elimination by removal of this nutrient. Gas absorption by asbestos will also be examined.

Findings in all these areas will be coordinated not only with the applied programs at Niagara Falls but with other areas such as the paper, water treatment, thickening, and oil-well drilling fluid efforts in South Charleston, the thermosetting resin work at Bound Brook, and the water-soluble polymer effort at Tarrytown.

Along with the above surface chemistry studies, and also coordinated with other programs in the same manner, and for the same objectives, rheological studies are planned for 1967. Needed first as a baseline is an understanding of the rheology of dilute aqueous unmodified asbestos suspensions, including salt effects. Then, the rheology of co-flocculates of, for example, $BaSO_4$ and clays, partially as an aid to the oil-well fluid work, and the rheological effects of asbestos in combination with UCC water-soluble polymers such as HEC & CMC will be characterized.

S. Chwastiak
K. Park

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Consultant Services

Project 95305 — $10,000

Areas of potential utility for asbestos, in which UCC does not have the necessary program of technical skills, are explored within this project.

The major effort currently is a screening program in conjunction with Professor H. Lamprey of Alfred University on the effect of asbestos in ceramics. Renewal option for this study, which currently has shown possible improvement in ceramic compressive strengths when asbestos is included in the compound, is June 1967; the renewal option for the consultant himself is September 1967. Both will be reviewed 60 days prior to their option date.

In conjunction with Marketing and the leads they have provided, the advisability of joint technology efforts on hot top mixes and graphite suspendors in foundry sands, green strength improvers in Taconite pelletizing, and cooperative efforts with drilling mud suppliers (perhaps an oil-well servicing company) will be explored.

The remainder of consultant services are indicated and charged to projects that follow.

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General & Miscellaneous

Project 95306 **$15,000**

At Bound Brook, Dr. J. A. Faucher's group is exploring the general mechanism of reinforcement by UCC's asbestos and its modifications with polar, non-polar, and reactive polymers, following Niagara Falls leads that both tensile strength and elongation increase for rigid and flexible vinyls and ABS admixture with 5-20 phr unmodified UCC asbestos. A portion of this effort will be under this project.

Efforts with ASTM Committee D-30 "High-Modulus Fibers Subcommittee on Naturally Occurring Fibers" are under this project.

At South Charleston, F. T. Simon and J. E. Knap will explore the co-flocculation of asbestos with Fe_2O_3 during the preparation of Fe_2O_3 with the objective of determining if the positively charged asbestos will increase the efficiency of the negatively charged oxide when used as a pigment (analogous to Asbestos "T").

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ASBESTOS APPLICATIONS RESEARCH & DEVELOPMENT ($243,000)

Paper Products

Project 95351 — **2 Man-Years** — **$98,000**

Laboratory and consulting efforts, excluding technical service work, are carried out under this project. The project is highly market oriented and is aimed at developing markets and maximizing profits of asbestos and its modifications used in the paper industry. It will be coordinated with the Paper Chemicals Program at South Charleston.

The program involves:

(1) Asbestos "T" (titanated asbestos) - Initial effort is to quantify light scattering data showing the increased efficiency of Asbestos "T" when compared to TiO_2 in opacifying paper. At the completion of this effort and at the request of Marketing, the results will be published and will serve to promote, further, Asbestos "T" to technical personnel in the paper industry. The University of Maine will confirm these data as part of our consulting contract with them and ensure, via testing, that the current 65/35 asbestos-to-TiO_2 ratio is optimum for opacification.

(2) Pitch Control - A market development effort is well under way supported by a mill trial program (Project 95381) utilizing asbestos to control pitch in the paper mill. However, pitch control should take place, if possible, prior to the sheet-forming operation and, hence, studies in controlling pitch in the pulp mill are under way. The University of Maine is developing a depositable pitch test for UCC to aid in these efforts and to translate Niagara Falls pitch absorption data (Project 95304) to paper applications.

(3) Evaluation of the Al-Si-Asbestos co-reaction product in paper opacification following an exploratory lead.

Screening of other co-flocculated pigments, such as $CaCO_3$ and clay aimed at imparting opacity to paper while not interfering with the performance of optical brighteners and alkaline sizing agents as might be the case with Asbestos "T".

(4) The synergistic effects of unmodified asbestos with polymeric retention aids, drainage aids, grease-proofing agents, and wet strength additives for paper will be explored. If leads are found, confirmation will take place at the University of Maine, prior to mill trials. A specific project at Maine is to explore the applicability of asbestos in alkaline finishes.

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(5) Study the applicability of on-wire coatings using asbestos as part of the coating formulation in the secondary headbox of the Fourdrinier and for possible application in cylinder machines.

(6) Screening study of the use of asbestos and its modifications (eg. Sb_2O_3) as flame retardants for paper.

G. L. Dickson
B. L. Ingalls
F. H. Thompson
W. H. Blackwell

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Plastic Products

Project 95352 **1.25 Man-Years** **$73,000**

This also is a highly market oriented project aimed at capitalizing on leads both internal and external to develop uses for asbestos and its modifications in plastics.

The program is:

(1) Continue studies of asbestos and its modifications as reinforcing agents in epoxies, flexible and rigid vinyls, and ABS. Expand sales of RG-100 in 1967. This effort will be highly coordinated with Bound Brook Applications R & D areas and will, in part, follow leads developed by the Exploratory effort at Bound Brook described under 95306.

(2) In conjunction with surface chemistry studies (Project 95304) attempt to pinpoint the catalytic degradative effect of asbestos on polypropylene, so that if properly modified this catalytic activity will be minimized and asbestos-reinforced polypropylene will be a practical possibility.

(3) Coordinate the process development work (Project 95354) optimizing the production of SG-244 so that sales of this product for polyester thickening can begin in 1967.

(4) Synthesize and evaluate modified hydrophobic asbestos, following the leads developed in Project 95304, as hydrocarbon thickening agents for potential use in high use temperature greases.

(5) Evaluation of asbestos and its modifications in various systems where thixotropy could be required; e.g., plastisol coating, cycloaliphatic epoxies (where RG-144 seems ineffective).

R. E. Byrne
M. S. Kisiel

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New Applications

Project 95353 **0.75 Man-Years** **$34,000**

As can be seen below in most potential applications under this project, asbestos and its modifications compete with conventional water-soluble polymers. Hence, this effort must be closely coordinated with the analogous programs using water-soluble polymers at South Charleston and Tarrytown.

The program is:

(1) Continue development of components of oil-well drilling fluids; promise has been shown for asbestos as a carrier for barite in muds; a thixotrope to replace bentonite in fresh water and attapulgite in salt water muds; and as a thickener to help carry Linde's oil-well cracking heads (UCAR PROPS) in suspension. Some effort will be spent in evaluating asbestos as a thickener in oil-well completion fluids to keep holes clear while they are dormant. Field discussions of asbestos' utility are under way through Linde's Oil Well Products Department Patent Memoranda on the above uses are in the process of being written.

(2) Continue joint efforts with Monsanto and Arizona Agricultural Chemical Company on thickeners for ammonium phosphate fire-fighting solution to replace or synergize CMC. Continue joint contact with Ansul on the use of asbestos as a foam stabilizer.

(3) Continue exploration of the potential of asbestos as a sewage sludge coagulant; as a surfactant absorbent for BOD removal (see 95304); and as an aeration aid (both aerobic and anaerobic) to increase the surface, via absorption, of organic components of water to improve bacterial efficiency.

(4) The use of asbestos as an absorbent aimed at air pollution control will be briefly explored.

(5) If time permits, a cursory study may be made for use as a binding agent in Taconite pelletizing. It has been observed that it may serve to reduce the criticality of moisture content and particle size, thereby enabling automation of the pelletizing operation.

Union Carbide Corporation patents on the use of asbestos in thickening and foam stabilization and in waste water treatment issued.

J. E. Skvarla
E. J. Markiewicz

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Process Research & Development

Project 95354 — **0.5 Man-Year** — **$19.000**

This effort is closely coordinated between the Niagara Falls pilot plant and the mill at King City. The program is:

(1) Optimumization of the process for preparation of Asbestos "T". Where in the process is the best point of addition of TiO_2 to ensure maximum control of product composition?

(2) Optimumization of the process to prepare RG-244 (SiO_2 treated). How and where should the sodium silicate be added, at what pH, concentration, etc.?

(3) Investigate the possibilities of preparing more easily redispersed products.

(4) Investigate direct drying of filter cake to obviate need for extrusion and pelletizing. Explore alternate drying and pill and pelletizing procedures to aid in plant expansion design. An objective is a 50 $ft.^3$/ton product to minimize shipping costs. Ensure that any product produced is capable of being used with conventional bulk handling techniques.

(5) Recommend new product specifications in conjunction with Production and Marketing.

(6) Keep competitive product information up-to-date.

J. E. Skvarla
E. J. Markiewicz

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New Asbestos Products from Existing Plant Processes

Project 95355 | 0.5 Man-Year | $19,000

Due to the unique wet process by which Union Carbide Corporation asbestos is produced, there exists opportunity to tap various process streams and remove commercial quantities of asbestos at various stages of refinement (and cost). It is the objective of this project to ensure that the least refined and lowest cost product is made to fit specific end uses. For example:

(1) Aid in optimizing product economics for SG-200, which is a semi-refined product tapped prior to the final purification of High Purity Asbestos. It appears that it is sufficient in properties low enough in cost to supply to manufacturers of dry-joint cements.

(2) Based on feedback from current market development projects carry out similar analyses for the stage of purification needed for asbestos to serve in uses such as sound deadeners, drilling fluids, and caulking compounds.

J. E. Skvarla
E. J. Markiewicz

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ASBESTOS - TECHNICAL SERVICE ($180,000)

Paper Products

Project 95381 — 2.0 Man-Years — $107,000

This project includes work in support of marketing asbestos to the paper industry and is companion to Asbestos Applications R & D Project 95351 - Paper Products. Efforts charged to this project include:

Conducting of Mill Trials. Evaluation of Mill Trial results, both domestic and foreign. Travel at request of Sales. Preparation of Advance Technical Information Bulletins for Marketing support -- in 1966 these included Bulletins on the use of UCC asbestos in glassine, saturating paper, rosin sizing, and surface sizing. Assist at trade shows such as those sponsored by TAPPI. Handling inquiries from Sales (substantial time required here). Preparation of a monthly letter to foreign salesmen.

G. L. Dickson
B. L. Ingalls
F. H. Thompson
W. H. Blackwell

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Plastic Products - Technical Service

Project 95382 | 0.5 Man-Year | $24,000

This project currently involves mostly customer contact work in those areas described in Project 95352 advanced enough to require Market Development work. Currently, Market Development Programs using asbestos for polyester thickeners, mastic thickeners, and filled, calendered rigid vinyls (prepared at Wayne) are most active.

Plans are now being made to transfer on a mutual developmental agreement the F-100 pipe technology to Pacific Clay Products. All technical assistance required for an orderly transistion will be supplied to the Marketing Group involved.

R. E. Byrne

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Floor Tile Products - Technical Service

Project 95383 — $10,000

Project presently inactive. Personnel will be available to assist the Calendering, Flooring and Record Products Department when necessary. It is anticipated that some technical service work with Armstrong Cork Company will be required in 1967 as they have expressed interest in purchasing SG-200 (semi-refined material) crushed pellets.

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New Applications - Technical Service

Project 95384 — **$24,000**

This project involves mostly customer contact work at the request of Marketing in support of market development programs indicated in Project 95353.

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King City Mill Assistance

Project 95385 **$15,000**

This project is separate and distinct from Project 95355 in that it involves plant technical service work initiated by requests for assistance from King City personnel.

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