Mr. [illegible],
[illegible] Inc., U.S.A.

X3220

16th October, 1972.

D.G. [illegible].

Mr. [illegible].
Mr. [illegible].
Mr. [illegible]
(U.S.A.)
File.

[illegible] Cationic Fibre.

We have compared the X-Ray diffraction pattern given by this product with that of raw material chrysotile asbestos. The two patterns were very similar. All the major characteristic lines of chrysotile were present. The only differences were intensity variations between certain of the subsidiary lines. However, I should point out that all the serpentine family of minerals, of which chrysotile is only one member, give generally similar patterns.

The chemical formula quoted in the brochure for the [illegible] fibre ($3MgO.2SiO_2.2H_2O$) is identical to the basic formula for the serpentine minerals although I understand that the term lizardite is being used by the sales representatives. I have spoken to Professor Zussman, the Geology Professor at Manchester University, who is the U.K. expert on these minerals and the position which has emerged following this discussion may be summarised as follows:

(1) Lizardite is a member of the serpentine family of minerals. By definition, it is non-fibrous.

(2) Chrysotile is always defined as fibrous serpentine.

(3) The term "asbestos" is a general one used to cover all forms of fibrous mineral silicates.

The [illegible] cationic fibre does not appear fibrous to the naked eye but, when viewed under the microscope, a number of short fine fibres can be seen. There is also a considerable amount of non-fibrous dust. From the above definitions, since the product contains a proportion of fibres, it cannot be entirely free of chrysotile asbestos. However, the dusty material could well be regarded as lizardite or serpentine rather than chrysotile.

Cape Asbestos literature in our possession states that the amphibole varieties of asbestos such as amosite and crocidolite are weakly negatively charged, whereas chrysotile asbestos is much more strongly positively charged. Chrysotile asbestos could thus also be described as a cationic fibre.

see also [illegible] report Book #578 pg 3

PLAINTIFF'S EXHIBIT FOS-357

1288

FOS-00-0000002454

CROBAUGH LABORATORIES

RESEARCH • ANALYSIS • TESTING

3800 PERKINS AVENUE CLEVELAND, OHIO 44114

216 · 881-7320

Foseco, Inc.
P.O. Box 8728
20200 Sheldon Road
Cleveland, Ohio 44135

Attention: Mr. R.W. Gutzman

Reporting Date... October 17, 1972
Lab. No......... S 2708-1 & 2
Date Received... October 13, 1972
Material........ White powder
Marked.......... A and B
P. O............ 84022
Req'n. No. L-30

KEY A = LIZARDITE (X-322...
B = RM 319

REPORT

X-ray diffraction analysis on the subject samples gave the following data:

S-2708-1
Sample "A" - Chart #3255 (attached)
Major component is clino-chrysotile. ASTM #10-381 $Mg_3Si_2O_5(OH)_4$.

There are indications of minor amounts of other forms of magnesium silicate which are not sufficiently abundant to give identifiable patterns.

S-2708-2
SAMPLE "B" - Chart #3256 (attached)

Major component is clino-chrysotile as above.

The strong peak at 18.8° is due to antigarite (serpentine) ASTM #7-419. The composition of this form is identical with the clino-chrysotile, $Mg_3Si_2O_5(OH)_4$.

Microscopic examination of Sample "A" shows numerous fibers with diameters ranging from 10 to 15 microns and lengths of from 250 to 300 microns. The bulk of the material appeared to be in the form of particles having a maximum diameter of 10 to 15 microns.

Respectfully submitted,

CROBAUGH LABORATORIES

R.W. Loofbourow

RECEIVED
OCT 18 1972
TECHNICAL DEPT.

hk

FOS-00-0000002455

HEDMAN MINES LIMITED

P.O. BOX 500
TIMMINS, ONTARIO, CANADA

X-3220

KRD

"Hedman Fundamental Cationic Fibre"

October 5, 1972

Fiberite Corporation
501 - 559 W. Third St.
WINONA, Minnesota 55987, U.S.A.

Attention: Mr. Peter McCamley, Chemist

Gentlemen:

With reference to your letter of September 27, 1972 we are pleased to advise you that Hedman Cationic Fibre is a natural compound consisting predominantly (95% to 80%) of non-asbestos minerals belonging to the magnesium silicate family. The small amount of very short Canadian chrysotile asbestos fibre inherent in the product consists almost entirely (over 99.8%) of fibres which are 5 microns in length or shorter, which as you probably know are not classified as a health hazard by OSHA.

This is in sharp contrast to straight asbestos fillers, and Hedman Cationic Fibre is not classified as such. It could be classified, under OSHA regulations as a product containing (a small amount of) asbestos.

Electron micrograph studies and actual official dust counts in our own plant indicate that due to its special characteristics Hedman Cationic Fibre has a far greater chance of meeting OSHA specifications than any straight asbestos fillers on the market. Comparative membrane filter tests carried out at your plant would easily confirm this, and we'll be pleased to make sample material available to you for that purpose.

You may be interested to know that government health regulations concerning asbestos dust have not affected the steady growth of consumption of Hedman Cationic Fibre by the U.S. plastics industry.

Thank you for your interest in Hedman Cationic Fibre. Please let us know if we can be of any further assistance.

Yours very truly,

HEDMAN MINES LIMITED

RRD

1 copy to File

Stuart Charbula
Executive Assistant to the President

FOS-00-0000002456

Name: [illegible] LIMITED	Emergency Telephone No.: 705/[illegible] and [illegible]-37[illegible]
Address: BOX 590	City, State, & Zip Code: TIMMINS, Ontario, Canada
Chemical Name and Synonyms: Hydrous Magnesium Silicate	Trade Name: [illegible] Cotienic Fibre
Chemical Family: Mineral Silicate (no free Silica)	Formula: $Mg_3 [Si_2 O_5] (OH)_4$

SECTION II - HAZARDOUS INGREDIENTS

Paints, Preservatives, & Solvents		%	TLV (Units)	Alloys & Metallic Coatings		%	
Pigments	Not Applicable			Base Metal	Not Applicable		
Catalyst	" "			Alloys	" "		
Vehicle	" "			Metallic Coatings	" "		
Solvents	" "			Filler Metal plus Coating or Core Flux	" "		
Additives	" "			Others	" "		
Others	" "						

Hazardous Mixtures of Other Liquids, Solids, or Gases	%
" "	

SECTION III - PHYSICAL DATA

Boiling Point (°F.)	Not Applicable	Specific Gravity (H_2O=1)	1.57
Vapor Pressure (mm Hg.)	" "	Percent Volatile By Volume (%)	Nil
Vapor Density (Air=1)	" "	Evaporation Rate (..........=1)	
Solubility in Water	" "		
Appearance and Odor	Powdery		
	Odorless		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)	-	Flammable Limits	Non-Flammable	Lel / Uel

Extinguishing Media: Non-Flammable

Special Fire Fighting Procedures: Non-Flammable

Unusual Fire and Explosion Hazards: Non-Flammable and Non-Explosive

SECTION V - HEALTH HAZARD DATA

Threshold Limit Value: see below

Effects of Overexposure: None indicated after 10 years experience

Skin Contact:

Eyes:

Inhalation:

* Based on electron micrograph observations and the specially developed characteristics of the product, indications are that this material is likely to meet specifications concerning the level of airborne fibres under 1910.[illegible] of the Occupational Safety and Health Act. [illegible]
[illegible]

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SECTION VI - REACTIVITY DATA

...bility	Unstable		Conditions to avoid
	Stable	X	

...ompatibility (Materials to avoid) None

...ardous Decomposition Products None

...ardous ...merization	May occur		Conditions to avoid
	Will not occur	X	

SECTION VII - SPILL OR LEAK PROCEDURES

...ps to be taken in case material is released or spilled Vacuum-clean spillage; wet down when sweeping; repair broken bags.

...te Disposal Method Use normal methods, preferably in closed containers

SECTION VIII - SPECIAL PROTECTION INFORMATION

...piratory Protection (Specify type) see OSHA part 1910.93a, if required

...tion	Local Exhaust -	Special
	Mechanical (General) control with mechanical dust collection equipment	Other

...tective Gloves - Eye Protection -

...her Protective Equipment --

SECTION IX - SPECIAL PRECAUTIONS

...cautions to be taken in handling and storing Maintain good housekeeping practices. Store in closed contai...

...her Precautions Avoid prolonged inhalation of heavy dust concentrations.

...cautionary ...eling

R. 6/7

HEDMAN MINES LIMITED
P.O. BOX 500
TIMMINS, ONTARIO, CANADA

X3220

"Hedman Fundamental Cationic Fibre"

April 24, 1972

Technical Information

VISCOSITY BUILDING CHARACTERISTICS OF HEDMAN CATIONIC FIBRE

Hedman Cationic Fibre has significantly large viscosity building characteristics - it causes formulations to be very much SHEAR RATE DEPENDENT.

In other words, if Hedman Fibre is mixed at a high shear rate, the viscosity remains low. But at a low shear rate, the viscosity goes up.

Example: (1) Epoxy formulation with Hedman Fibre as sole filler (50%) - On No. 4 Spindle of Brookfield Viscosity Meter at ½ rpm (revolutions per minute) viscosity registered in the 80,000 to 100,000 centipoise range; but at 60 rpm, viscosity went down to a few thousand.

(2) Asphalt - cut back - on No. 7 Spindle of Brookfield Viscosity Meter

	CENTIPOISE			
	10 RPM	20 RPM	50 RPM	100 RPM
Asphalt - cut back	12,000	11,000	10,000	10,600
75% Asphalt - 25% HF	148,000	94,000	53,600	38,000
50% Asphalt - 50% HF				+ 40,000 -off scale

When shear is applied, the mix will flow; when there is no shear, it will hang and won't sag, an important characteristic in many applications.

This applies to any system with wetting, such as Polyester, etc.
In Thermoplastics in the melt phase at too high a shear rate the mix may squeeze out like water, and at too low a shear rate it will be almost unmoveable.
In Injection Molding situations the shear rate and pressures are extremely high, which may overcome the tendency to build up the viscosity.

With Hedman Cationic Fibre as filler, VISCOSITY IS STRICTLY A FUNCTION OF SHEARING. (This is in contrast to other fillers, such as a low oil absorption calcium carbonate for instance, which has little effect on viscosity - only to the extent that it is present - and no shear rate dependence.)

Source:
(1) Gulf + Western Industries, Inc., Research Division, Swarthmore, Pa., U.S.A.
(2) The New Jersey Zinc Company, Div. of Gulf, Research Div., Palmerton, Pa., U.S.A.

X 3220

TECHNICAL BULLETIN
7 HMI-5-72

Hedman Fundamental Cationic Fibre

$Mg^3 (Si^2O^1) (OH)^4$

CHEMICAL ANALYSIS—approximate:

MgO		38%
SiO^2		40%
FeO		2%
Fe^2O^3	less than	3%
Al^2O^3	less than	3%
CaO	less than	1%
H^2O or loss on ignition	less than	13%
Insoluble in acid	42.5 to	46%

Oil Absorption—71ml 100 grams and lower
Filtration or freeness—approx. 100 seconds

PHYSICAL PROPERTIES:

PRY

Screen—10 minute re-tap - dry - U.S. Standard
— 16 mesh — 100%
+ 70 mesh — 60-90%
—200 mesh — 1% to 5%

Bulk Density - 400 to 560 cc 100 grams	
Charge	Electropositive
pH	9.4
Refractive Index—parallel length	1.555
perpendicular	1.540
Specific Gravity	2.67
Brightness (E 610 Reflection Meter)	63 to 67

NET SCREEN - 99.5% - [illegible]%

Charge 7.9

CHARACTERISTICS:

Colour:	White
Grit:	Nil
Glass Spicules:	Nil
Unopened fibre bundles:	Nil
Mica:	Nil
Sand:	Nil above 200 mesh
Texture:	Uniform—Velvety feel - soft
Fibre: - uniformity:	Natural uniform fibre distribution
- range	Confined to a narrow range—no irregular lengths of fibre over a wide range
Adsorption:	Adsorption properties are good—facilitates control of flow
Moulding and processing:	Easy to mould and process—stability reduces warpage, deformation and shrinkage
Heat resistance:	Fireproof
Toughness and Strength:	In contrast to other fillers, Hedman FC Fibre imparts improved flex modulus, impact strength, flex strength, compressive strength and toughness.
Other characteristics:	Distinct Viscosity Building Characteristics, which are very much shear rate dependent, in plastic and asphalt mixes.

DESCRIPTION:

Besides being hydrous-inert, quick slurrying, faster filtering and more acid resistant, HFCF's loss on ignition at 1800°F is much lower than with customary raw materials.

A new concept, Hedman Fibrous Filler is designed to meet modern needs in automated continuous processing not formerly possible due to irregular lengths and diameters of fibres, unopened fibre bundles, and undesirable impurities. The basic characteristics of Hedman Fibres allows easier and more intimate blending for a more homogenous mix to produce consistently uniform products.

Magnesium silicate with 5 to 20% chrysotile. Discovered in 1956 (Luzenite)

Fibrous content < 5% - 99.5%

1294

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FOR HEDMAN CATIONIC FIBRE

To achieve maximum efficiency for the purpose intended technical assistance will be provided.

Cellulose Products (Paper and Board)	Newsprint, rotonews, printing papers Boxboard, screening board, folding board and other cylinder board grades
	Construction paper, crepe, filter paper, kraft paper for laminates, fire retardent roofing and deadening felt, match book board, moulded paper products, non-wovens, paper towelling, poster paper, surface coating, wall board cover paper.
	Depending on individual mill conditions and if used as directed Hedman Cationic Fibre can provide the following benefits: Improved opacity, printability, smoothness of finish, softness, moisture equilibrium, uniformity, heat resistance, as well as reduced picking, discolouration, curling and warping, shrinking. In boxboard applications, this low-cost, uniform, short-fibrous filler improves bulking, folding and sizing qualities under controlled furnish pH conditions.
	Hedman Cationic Fibre has been found to be one of the most efficient and economical Pitch Control Agents.
Friction Materials	Bonded brake shoes, disc brakes
Plastics	Phenolic moulding compounds, polyester moulding compounds Polyethylene, polypropylene and other plastic compounds Polymeric sealants and undercoatings PVA adhesives PVC drainage and sewer pipes PVC floor tiles
Welding Rods	Flux Coatings
General Uses	Asphalt paving, caulking compounds, cement products, dry wall cement, putties, insulating cement, floor coverings, wall coverings, acoustic ceiling tiles, panels, texture paints, primer paints, rubber, static coatings, undercoatings, fibrous greases, shaft grouting material, oil well drilling muds.

THOUSANDS OF TONS OF HEDMAN FIBRE ARE BEING USED ANNUALLY IN PRODUCTION CIRCUITS!

AVAILABILITY

Hedman Fundamental Cationic Fibre is available in UNRESTRICTED quantities as a "*Primary Product*" from large rich reserves via a new automated process in a newly designed milling circuit. This unique process assures the production of clean, uniformly short fibres of uniform diameter.

For the first time, long-term volume supply of such a LOW-COST fibrous material, which is competitive with other low-cost raw materials, is available as an incentive to pursue new ideas.

Particulars and samples of the size you request will be gladly provided for your specific application.