MINIFIBERS, INC.

The Technology of Fybrel™ Synthetic Pulp in Fiber Cement

Since asbestos is an excellent fiber that unites the properties of flame retardance, abrasion resistance, high tensile strength, and thixotropic properties, it is impossible to replace it with any other single kind of fiber.

In fiber cement production - such as slate boards, pipes, and roofing tiles - in which the Hatschek process (wet process) has been mostly used in Europe or in other countries, most manufacturers are using a mixture of reinforcing fibers and process fibers as an asbestos replacement recipe. Those are:

Reinforcing fiber: Polyvinyl alcohol (Polyvinylformal) fiber, Polyacrylonitrile fiber

Process fiber: Synthetic pulp, Cellulose fiber

Characteristics

	Reinforcing Fiber	Process Fiber
Advantages	- Mechanical strength	- Trapping of cement particles - Controlling of drainage
Disadvantages	- Unable to trap cement particles	- Unable to give mechanical strength

Fybrel™ percentage: May be 2-4% wt % / product

Grade: Mostly E620

Advantages of Fybrel™: Fybrel™ as a process fiber shows better weatherability and higher stability in qualities than cellulose fiber.

Introduction

Ever since it became apparent in the early 1970s through epidemiological studies in the United States that asbestos could become an induced cause of cancer of the respiratory system, the search for and research of substitute products for asbestos has been conducted extensively in the various areas where it is used industrially; e.g., the fields of fiber cement, paint, resin reinforcements and anti-sag agents. As a result, the 1984 U.S. consumption of asbestos (200,000 tons) had already decreased to one-third of the 1980 consumption.

We present below the basic data and blending illustrations pertaining to the replacement of asbestos utilizing fibrillated polyethylene pulp in the respective areas.

I. Properties of Fibrillated Polyethylene Pulp

The grades of fibrillated polyethylene pulp (trade name Fybrel™) used for asbestos substitution are as follows:

Trade Name	Fybrel™		
Grade	E600	E620	E380
Melting point (°C)	132	132	132
Specific gravity	0.96	0.96	0.96
Freeness (cc)	500	350	200
Fiber length (mm)	1.3	1.3	0.7
Water content (%)	60	65	68
Product appearance	Sheet		
Use area	Wet sheet-making area		

Please select the optimum grade according to the application area and combination with various types of materials. Grades other than those shown in the above table are also available.

II. Fiber Cement (Slating) Applications and Blending Illustrations

Since asbestos unites the properties of flame retardance, abrasion resistance, high tensile strength, and thixotropic properties, it is impossible to replace it with a single fiber. Generally, in the production of slating, asbestos served the functions mentioned below.

Asbestos Properties

Handling properties during sheet-making	(1) Trapping of cement particles
	(2) Drainage and water retention
	(3) Dispersibility
Product properties	(1) Mechanical strength
	(2) Durability
	(3) Dimensional stability

So far, synthetic fibers comprised of polyvinyl alcohol, polyolefins, aramids, polyamide, polyester and polyacrylonitrile, carbon fibers, and glass fibers have been examined as reinforcing fibers and already put to practical use. These reinforcing fibers, however, hardly contribute to the trapping of cement particles and control of drainage, which are required during the production of slating; and, in all cases, they are not used alone, so that they are always utilized in combination with another fiber or ancillary materials.

As an ancillary material uniting the trapping of cement particles, drainage and dispersibility, Fybrel™ fibrillated polyethylene pulp - a multi-branched synthetic fiber - has achieved wide recognition and use.

There is another method of adding natural pulp as an ancillary material, but this pulp has been pointed out as having problems with durability and alkali resistance.

A. Trapping of Cement

Being a multi-branched fiber, Fybrel™ has a large surface area (about 10 m^2/g); consequently, it shows an excellent cement-trapping property. Although the cement trapping of Fybrel™ varies substantially with the kind and ratio of addition of the secondary raw material with which Fybrel™ is combined, we cite one instance as follows:

Cement	Additive	Fybrel™	PVA Fiber	Ratio of Cement Trapping
92.5 parts	2.0 parts	4.0 parts	1.5 parts	56.9%
92.5	2.0	2.0	3.5	38.1
92.5	2.0	0.8	4.7	28.9
92.5	3.0	3.0	1.5	51.2
94.5	1.0	3.0	1.5	42.3

Notes:
1) PVA Fiber = Polyvinyl alcohol fiber
2) After adding water 20 times in quantity against the total solid content and mixing uniformly, the mixture is made into a sheet on a 150-wire mesh. Then it is dried for over 10 hours at 50oC.

B. Dispersibility

Fybrel™ is a multi-branched fiber and disperses easily in aqueous systems. Therefore, as it interlocks with the reinforcing fiber and disperses uniformly, it makes the production of homogenous slates possible.

Blending Illustration

Cement	89.5 % wt
Polyvinyl alcohol fiber	3.0
Additive	5.0
Fybrel™	2.5
	100.0

Fybrel™ Fibrillated Polyethylene Pulps available from

MINIFIBERS, INC.
2923 Boones Creek Road
Johnson City, TN 37615
Phone: (423) 282-4242
Fax: (423) 282-1450
www.minifibers.com