

NATURAL BAST FIBERS

Growing and processing natural renewable
BAST fibers for natural fiber composites

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Natural Bast Fibers

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- Bast fibers are produced from renewable agricultural crops grown with no pesticides and little or no herbicides.
 - Bast fibers have been used for thousands of years, before petrochemical fibers were developed and pushed them aside.
 - Bast fibers can **reduce cost, reduce weight, reduce manufacturing time, and improve safety** in automobiles. European automakers have adopted them and are expected to use up to 70,000 metric tons of fiber by the year 2005.

Natural Renewable Fibers

Cellulose Fibers

Bast Fibers

~Flax
~Hemp
~Kenaf
~Jute
~Ramie

Leaf Fibers

~Sisal
~Curaua
~Banana
~Pineapple

Seed Fibers

~Cotton
~Kapok

Fruit Fibers

~Coconut

Wood Fibers

~ Pine

How are Bast Fibers Different than other Natural Fibers?

- Bast Fibers grow in a very special way.
- Fibers surround a central core
- Hemp-Coarse
Kenaf – Coarse
Flax – Fine
Ramie – Very Fine



Photo Credit: www.hempline.com

- Can be processed to required fineness.
- Can be processed to desired length.

Why Use Natural Bast Fibers?

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- Lower Cost
 - Long Strong Fiber
 - Different finenesses possible giving varying aspect ratios
 - Renewable
 - Recyclable
 - Bio-degradable (if used with natural resins)
 - Environmentally Friendly – The ‘Green’ Factor
 - Ag. Residues are like Recycled Plastics, while Bast fibers are like Virgin Plastics.

Growing Bast Fibers

Bast Fibers must be grown for specific end uses.

Seed - Paper/Pulp - Composites - Textiles



Photo Credit: www.hempline.com

This involves the correct:

- Seed Selection
- Sowing Density
- Fertilization
- Growing Period
- Location

Bast Fiber Harvesting



Photo Credit: www.hempline.com

Retting Bast Fibers

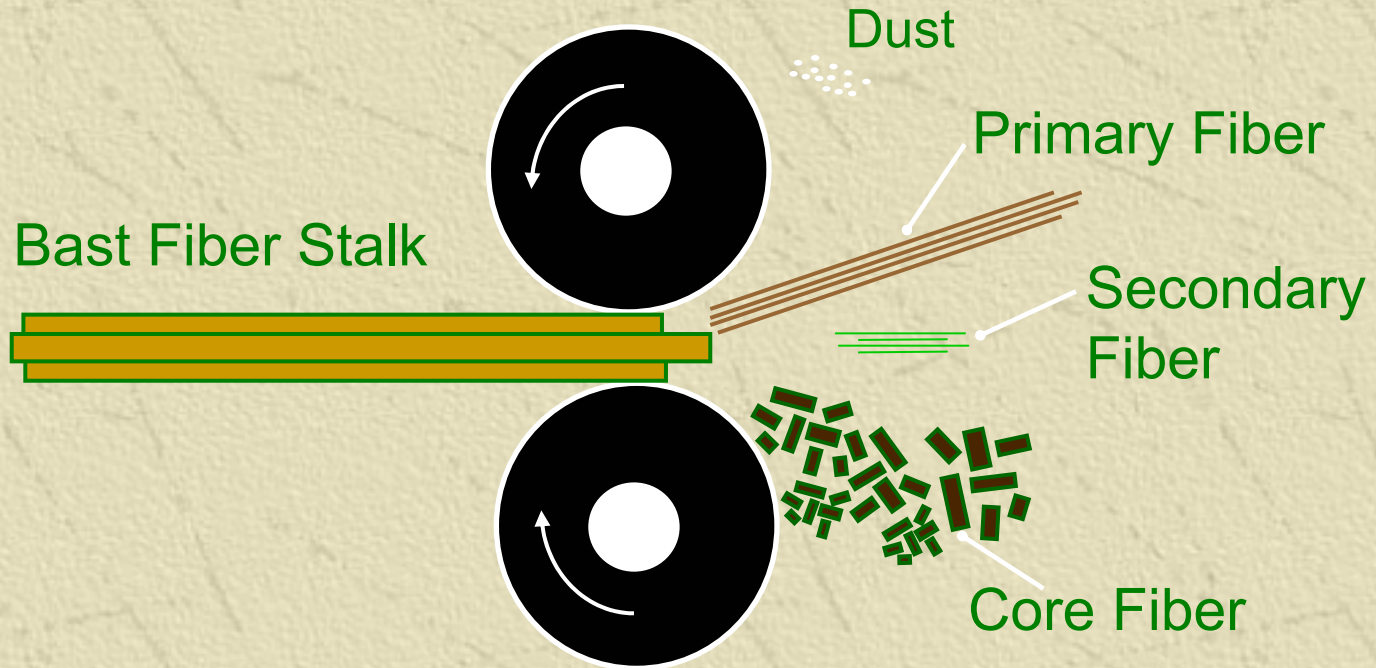
What is Retting?

Retting is the process of anti-microbial action on the pectins in the plant which bind the long fibers to the woody core material. This can be accomplished in many ways.

- Water-retting
- Dew-retting
- Enzyme-retting
- Other



Bast Fiber Separation Process



The component breakdown of the plant:

Primary Fiber	+/- 30%
Core	+/- 50%
Secondary Fiber	+/- 10%
Dust & Waste	+/- 10%

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Bale Opener



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Photo Credit: Greene Natural Fibers

Preparation Line



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Fiber Cleaning & Opening Line



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Core Separation



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Bast Fiber Bale



Photo Credit: www.hempline.com

Bast Fiber Properties

- Purity
- Fineness
- Strength
- Length



Photo Credit: www.hempline.com

All of the above depend on seed selection, growing methods, and separation/refining techniques used.

Can consistency of fiber quality be achieved?

Bast Core

- The Core Material is 50% of the weight of the plant.
- Absorbent short fibers (like balsa)
- 1mm, 2mm, 3mm fiber lengths
- Automobile uses for core:
 - ~ Injection molding
 - ~ Extrusion molding



Bast Fibers in Injection/Extrusion Molding

- Filler vs. Structural
- Fiber, Core, Fiber/Core
- Moisture Content
- Long Fiber/Elementary Fiber System
- New Tooling?
- Renewable source which adds strength and reduces weight



Photo Credit: www.hempline.com

Other Uses for the Core

- ~ Thermal Insulation
- ~ Acoustical Boards
- ~ Tackable Boards
- ~ Absorbency products
- ~ Geo-Textiles
- ~ Furniture & Furniture Batting
- ~ Animal Bedding (especially horse bedding)



Photo Credit: www.hempline.com


Fiber/Core Treatments

- Fire Retardant
- Anti-Mildew
- Hygroscopic
- Fiber modification to increase bonding

Advantages of Using Bast Fibers in Automobiles

- Lower weight parts due to lower density – up to 30% lower.
- Favorable mechanical and acoustical properties
- Reduced molding time
- Lower wear on tools
- One-step manufacturing possible
- Occupational health benefits compared to glass fibers
- Positive effects on agriculture
- Recyclable – EU End-of-Life Vehicle Directive 2000/53
- Lower cost material

Imported vs. Domestic Bast Fibers

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- Current Fiber Supply
 - Flax, Hemp Kenaf and Ramie can all be grown and processed in North America
 - High freight cost and exchange rate risk of imported fiber
 - Domestic growing/processing needs influx of investment capital
 - New Kenaf processing plant in North Carolina

Pricing of Bast Fibers

- 40 to 50% less than petrochemical fibers
- 60 to 70% less than fiberglass
- The fiber price, which is 30% of the plant, depends on how core and core/fiber markets are developed.
- New innovative processing technologies could reduce prices eventually.
- Volume usage will help reduce prices.

Bast Fibers - Conclusions

- America must take a leadership position in expanding the use of sustainable resources.
- Bast fibers can reduce cost, reduce weight, reduce manufacturing time, and improve safety in automobiles.
- Bast fibers can be grown and processed in North America to quality and consistency standards demanded by the auto industry.
- To insure an adequate supply of domestic bast fibers, the auto industry must understand that investment capital is needed in order to expand the growing and processing of bast fibers. With auto industry support, the investment dollars will be available.

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