



ENGINEERED WITH  
**FIBREX<sup>®</sup>**

A HIGH PERFORMANCE, HIGH VALUE  
BIOFIBER POLYMER COMPOSITE TECHNOLOGY

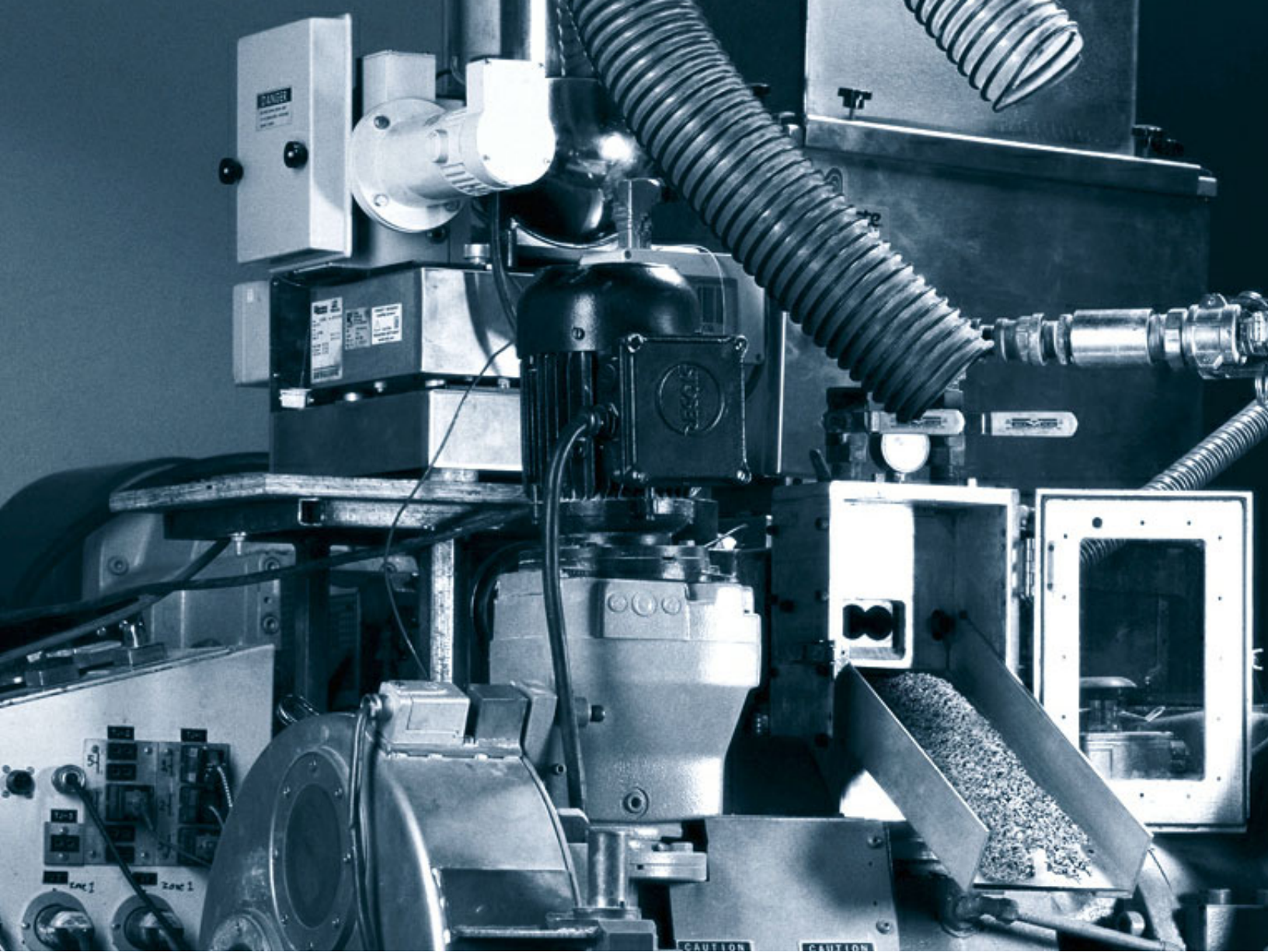




At a time when more and more industries are looking to alternative building materials Andersen Corporation and Aspen Research introduces Fibrex®, a revolutionary structural material composite technology that blends the very best attributes of thermoplastics and bio-fibers. Durable and versatile, you can count on Fibrex® material for strength, appearance and performance — in a wide variety of applications. Already in use for ten years in many Andersen® products, it performs extremely well in all weather and environmental conditions. Best of all, Fibrex® technology can utilize “reclaimed” wood fiber and polymer from post production processes, helping to save on natural resources. Fibrex® is a strong cost-to-benefit option for your product needs.

**FIBREX®**  
A SUPERIOR COMPOSITE



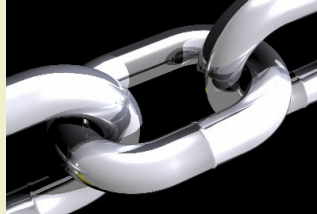


FIBREX®  
ENGINEERED FOR PERFORMANCE



## FIBREX MATERIAL PLATFORMS

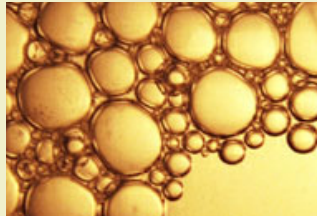
SUPERIOR HIGH STRENGTH



STRENGTH & STABILITY



FOAMED



WATER RESISTANT



FASTER PROCESSING



BONDABLE



### A MATERIAL TECHNOLOGY PLATFORM

Our portfolio of material formulations continues to grow. Your products have unique performance, processing and design requirements. We continue to create new material platforms because we know a “one-size-fits-all” approach does not work for your business. We will develop application-specific formulations by working with your design team to ensure the best result.

The design versatility of Fibrex® material is enhanced by its exceptional physical properties. Parts made from Fibrex have a high flexural and tensile modulus, low moisture absorption, a higher heat distortion temperature than rigid PVC and a low coefficient of thermal expansion.

Fibrex® material can be extruded or injection molded into functional components. Extruded profiles can be solid or hollow, machined and joined using mechanical fastening, thermal welding and vibratory weld tacking. Profiles can be extruded with a weatherable capstock, enabling color options and color fastness and allowing the surface appearance to be optimized for a specific application.

## COLOR

Fibrex® material can be coated throughout or coated with capstock. Our coloring technologies can provide surface and appearance durability at your desired level, available in essentially an infinite number of colors.

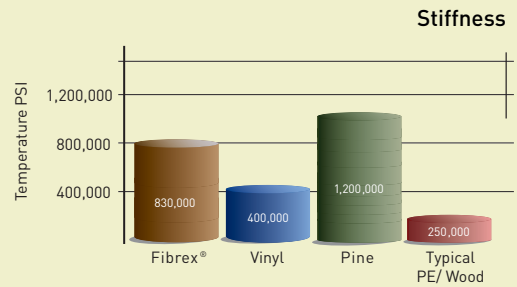


A number of other appearance and performance coatings can be used with Fibrex® materials:

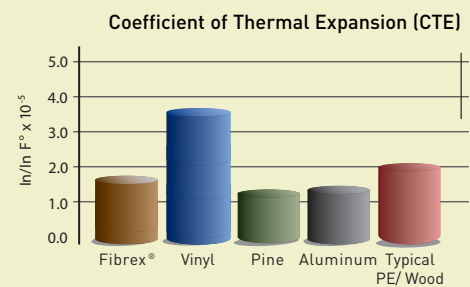
- Laminates
- Solid Wood Veneers
- Streaking Packages
- Printed

## STRENGTH & STABILITY PLATFORM PVC-BASED FORMULATION

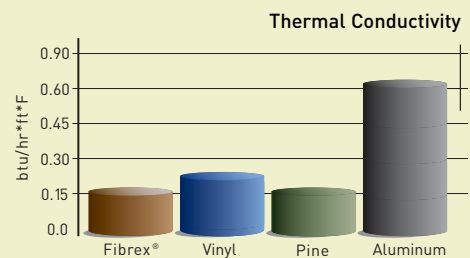
**STIFFNESS** Modulus is the scientific term for a material's stiffness. The higher the number, the stiffer the material. The average modulus for Fibrex® is over twice the average for vinyl, making it a far more stable and rigid material. And though wood's average stiffness is higher, it is far less predictable than Fibrex®, since wood has natural variations such as grain, knots and moisture content.



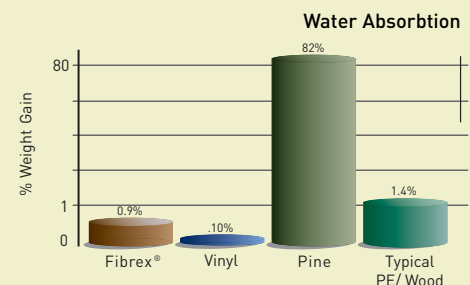
**THERMAL EXPANSION** Thermal expansion is the degree to which a given material expands and contracts with changes in temperature. Pine has a very low thermal expansion rate. With a rate of 1.6, Fibrex®, like aluminum, expands and contracts very little. Vinyl, with a thermal expansion rate of 4.0, expands and contracts at a rate twice that of Fibrex®, resulting in bowing and cracking over time.



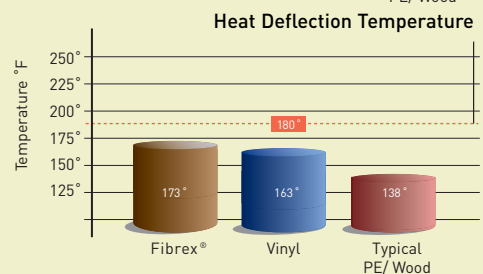
**CONDUCTIVITY** Fibrex® has a very low thermal conductivity ratio. Its insulating properties can be put on par with pine or vinyl. Unlike aluminum, Fibrex® resists the transfer of heat or cold.



**MOISTURE RESISTANCE** The special polymer formulations in Fibrex® surround, coat and fill the cell structure of each wood fiber in the manufacturing process, ensuring unsurpassed resistance to rot.



**HEAT RESISTANCE** High temperatures can result in distortion. At high temperatures, vinyl can bow or sag. In tests, Fibrex® remains rigid and stable to a temperature of 78°C (173°F).



STRENGTH & STABILITY PLATFORM - PVC-BASED FORMULATION

MEASUREMENT ASTM UNITS MATERIAL VALUE

Tensile Modulus, 77° (25°C)	D3039	psi (MPa)	
Extrusion direction			950,000 (6,550)
Cross-extrusion direction			750,000 (5,200)
Tensile Yield Strength, 77° (25°C)	D3039	psi (MPa)	3,000 (21)
Tensile Strength (UTS), 77° (25°C)	D3039	psi (MPa)	
Extrusion direction			5,500 (38)
Cross-extrusion direction			3,800 (26)
Tensile Strain at Failure, 77° (25°C)	D3039	%	
Extrusion direction			1.3
Cross-extrusion direction			0.9
Poisson's Ratio	D630	—	0.342 @ 70°F 0.236 @ 160°F
Flexural Modulus, 77° (25°C)	D790	psi (MPa)	830,000 (5,700)
Compressive Modulus, 77° (25°C)	D695	psi (MPa)	571,000 (3,900)
Modulus of Rupture, 77° (25°C)	D790	psi (MPa)	10,000 (69)
Maximum Flexural Strain (Emax)	D790	%	1.7
Impact Strength, Gardner, 77° (25°C)	D3029	inch • lbs(J)	5.0 (0.56)
0.1" sample thickness			
Izod Notched Impact, 77° (25°C)	D256	inch • lbs/inch(J/m)	7.0 (28)
Maximum Allowable Dynamic Stress	*	psi (MPa)	16,000 (110)
Extrusion Shrinkage	D3679	%	0.2
Specific Gravity	D792	—	1.4
Hardness, Rockwell "L", 77° (25°C)	D785	—	92
Hardness, Rockwell "M", 77° (25°C)	D785	—	66
Static Coefficient of Friction vs. Neolite std.	F1679-96	—	0.60 wet
Extrusion direction			0.85 dry

FIBREX® ENVIRONMENTAL PROPERTIES

Measurement ASTM Units Material Value

Moisture Absorption	D570-84	%	0.9
Termite Resistance	—	Weight Loss (g)	
C. formosanus			0
R. flavipes			0
Fungal Decay	D1413		None
Moisture Expansion	D1037	inch/inch/%ΔMC*	1.14x10-3

FIBREX® THERMAL PROPERTIES

Measurement ASTM Units Material Value

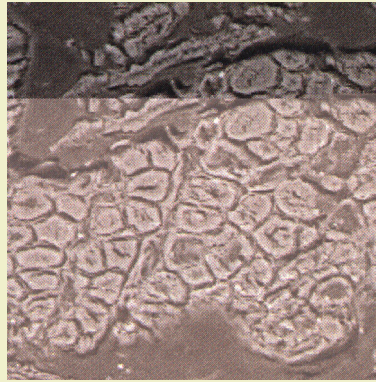
Heat Deflection Temperature,	D648	°F (°C)	
264psi (1.82 MPa)			173 (78)
66 psi (0.46 MPa)			221 (105)
Coefficient of Thermal Expansion	D696	inch/inch/°F (m/m/°C)	1.6x10-5 (2.9x10-5)
Thermal Conductivity	F433	Btu/hr•ft•°F (W/m•K)	0.1 (0.17)
Specific Heat	—	Btu/lb•°F (J/kg•K)	0.4 (1674)
Flash Ignition Temperature	D1929	°F (°C)	644 (340)
Self Ignition Temperature	D1929	°F (°C)	716 (380)
Flame Spread Index	E84-94		10
Smoke Developed Index	E84-94		580
Average Flame Spread Index	E162-94		22.73
Average Optical Density of Smoke	E662-94		
Flaming mode			472.32
Non-flaming mode			439.24
Average Time of Burn	D635-91	sec.	<5
Average Extent of Burn	D635-91	mm	<5
Final Oxygen Index	D2863	%volume	31.3

**FIBREX® MATERIAL ADVANTAGE**

Special polymer formulations surround and fill each wood fiber — ensuring top performance.



Fibrex®



Polyethylene Wood-Fiber Composite

**FIBREX® PATENTS**

5,205,102	6,122,877	5,948,524	5,539,027
6,357,197	6,054,207	5,932,334	5,518,677
6,346,160	6,015,612	5,882,564	5,497,594
6,342,172	6,015,611	D402,770	5,486,553
6,280,667	6,004,668	5,827,607	5,441,801
6,265,037	5,985,429	5,773,138	5,406,768
6,210,792	5,981,067	5,695,874	

\*Additional patents pending

**FOR INFORMATION ON LICENSING PLEASE CONTACT:**

Aspen Research  
 651-264-6000  
[www.aspenresearch.com](http://www.aspenresearch.com)

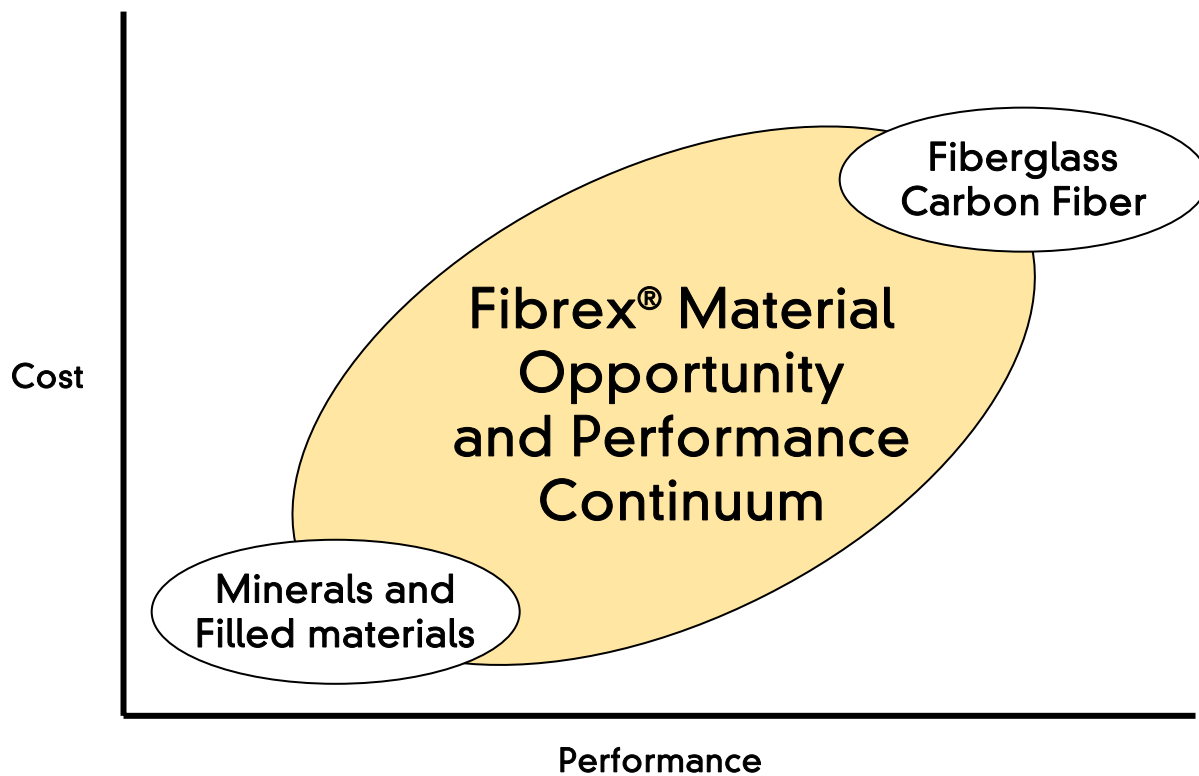


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## The Value of Fibrex® Material

A FAMILY of composite materials having a variety of flexible manufacturing and material physical property characteristics that may be “designed in” for different customer requirements.

### Engineered and Filled Materials *Cost-Performance Range*





FIBREX®  
RENEWABLE, RECLAIMABLE, RESPONSIBLE

