

# ***The 10 Year Journey of a Biomaterials Company***

**Gurminder Minhas  
Managing Director  
Performance BioFilaments**





# about us

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- Performance BioFilaments Inc. is a biomaterials company focused on commercializing **Nanofibrillated Cellulose (NFC)** materials in performance-driven applications.
- NFC increases strength and enhances rheology while improving sustainability for concrete & mortars, polymers, nonwovens, industrial fluids, and other advanced materials & specialty chemicals.
- PBI's technical team is located at UBC Pulp and Paper Centre
- Commercial plant opened in January 2023, producing 21 tonnes per day, 7000 tonnes/year capacity (located in Quebec).



Vancouver based integrated forest products company with operations in Canada, USA, Germany, and Australia.

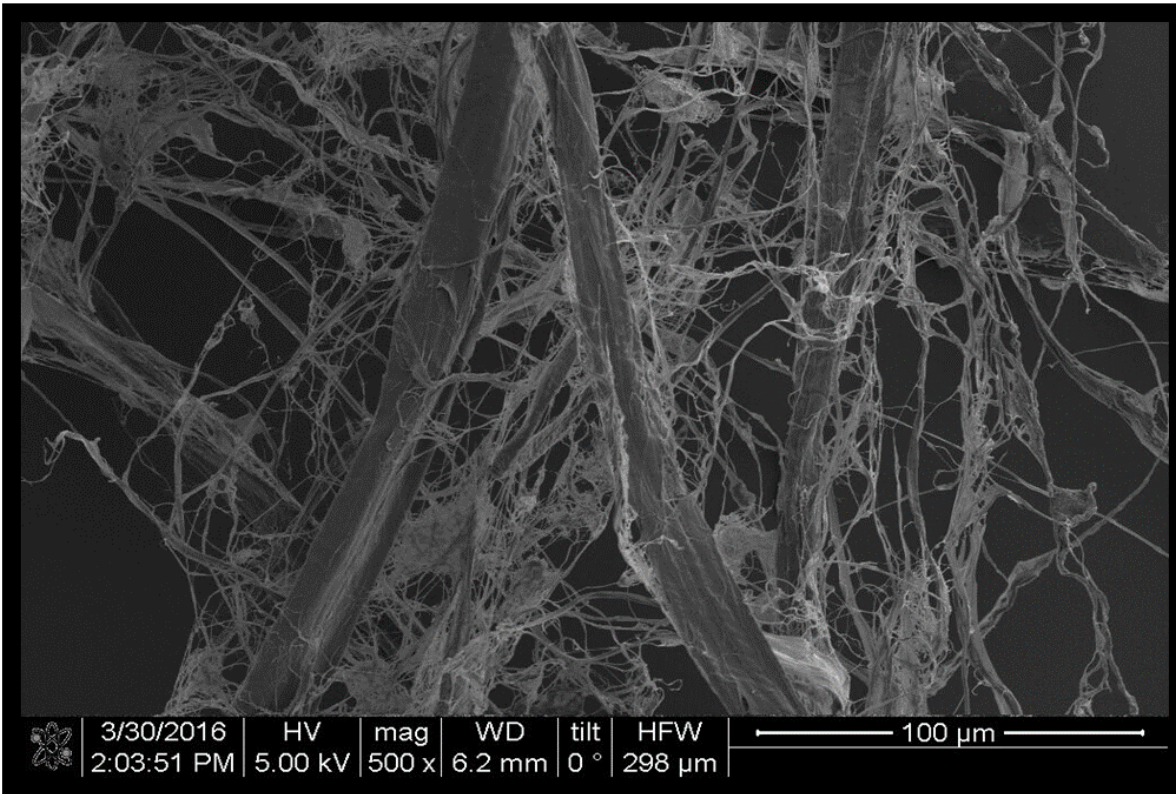
shareholders



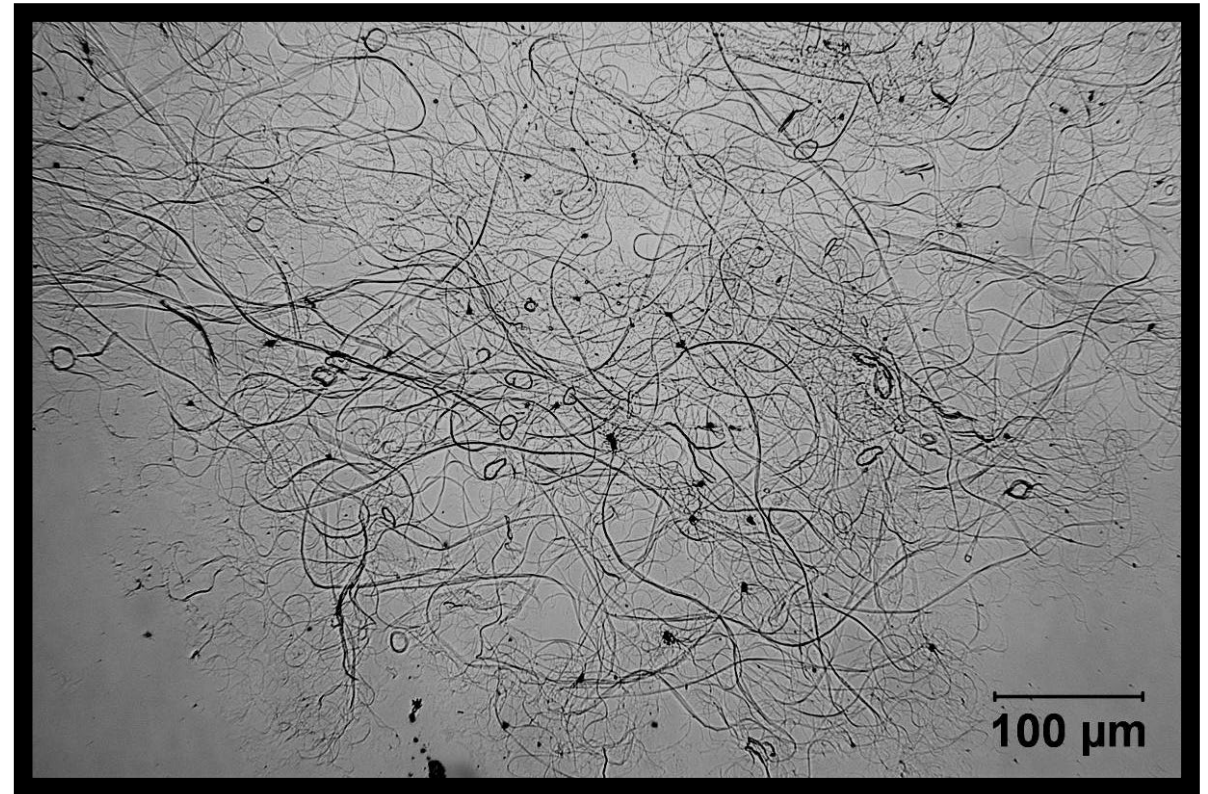
**resolute**  
Forest Products

Montreal based integrated forest products company with operations in Canada and the United States.

# nanofibrillated cellulose



Kraft “parent” fiber with NFC nano-fibrils



NFC fibrils at nano-scale widths

- NFC nano-scale fibrils are 80-300 nm in width X 100-500 μm length.
- Ultra-high aspect ratio of 800-1200 L/D and surface area of 150 m<sup>2</sup>/g.



# application areas



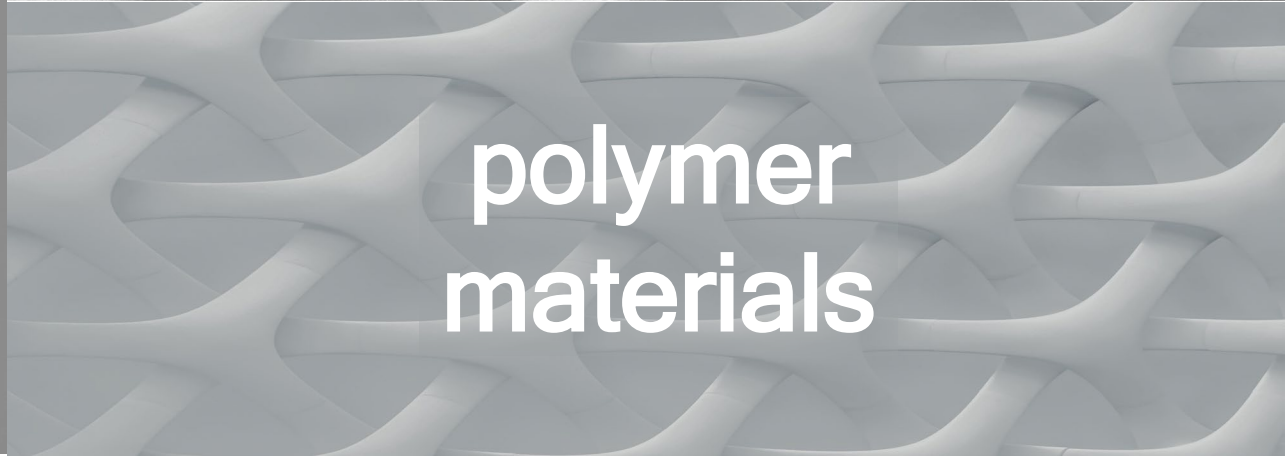
concrete  
& mortars

A grayscale background image showing a textured surface of concrete or mortar.

nonwoven  
materials

A grayscale background image showing a fibrous, nonwoven material structure.

industrial  
fluids

A grayscale background image showing several bubbles of varying sizes, representing industrial fluids.

polymer  
materials

A grayscale background image showing a complex, interconnected network of polymer chains or structures.

new opportunities in packaging, thin films, cosmetics  
and many other domains



# application areas

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concrete  
& mortars

nonwoven  
materials

**total available  
market of  
442,891 tonnes  
in NA and EU**

industrial  
fluids

polymer  
materials

new opportunities in packaging, thin films, cosmetics  
and many other domains

# collaborations



# TAPPI Nano - June 2014

## Forest Products Leaders, Mercer and Resolute, Join Forces to Commercialize Sustainable New Biomaterial

NEWS PROVIDED BY  
Mercer International Inc. →  
23 Jun, 2014, 08:00 ET



***From Lighter Vehicles to Stronger Building Materials, New Biomaterial from Canada Set to be a Game Changer***

VANCOUVER and MONTREAL, June 23, 2014 /CNW/ - Mercer International Inc. ("Mercer") and Resolute Forest Products Inc. ("Resolute") today announced a new joint venture company - Performance BioFilaments Inc. - focused on the development of commercial applications for cellulose filaments, one of the world's most exciting new biomaterials. Cellulose filaments have unique performance-enhancing properties with significant potential to improve a wide array of consumer and industrial products.

6/5/23, 9:13 AM

Resolute Forest Products - News Releases



### News Releases

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"The significance of this new biomaterial, derived from wood fibre, is tremendous from both an environmental perspective and the range of possible applications. It holds the potential to make a variety of products stronger, lighter, more flexible and more durable, while leveraging a sustainable and renewable resource," said Gurminder Minhas, Managing Director of Performance BioFilaments. "I can foresee lighter-weight, more fuel efficient vehicles, stronger more flexible building materials, and advanced composite materials in the realm of possible applications. Cellulose filaments are literally unlocking the foundation of nature's elements to make way for significant advancements in materials development."

Cellulose is one of nature's most abundant materials. Performance BioFilaments' cellulose filaments are made from wood pulp, processed using a proprietary technology licensed from FPIInnovations Inc., one of Canada's leading research organizations working in forest products research and development. The resulting cellulose filaments have exceptional strength and purity, with an extraordinarily high aspect ratio that is unique when compared to all other high-value, cellulose-based biomaterials. Cellulose filaments are completely renewable and have a low carbon footprint.

As a member company of FPIInnovations, Performance BioFilaments has access to all current and future cellulose filaments research, including production processes and applications, as well as the process technology, findings and production quantities being advanced at the Trois-Rivières mill - the world's first five tonne per day cellulose filament demonstration plant.

"Performance BioFilaments is looking to identify joint development partners for novel product applications of cellulose filaments, whereby we can together leverage FPIInnovations foundational research and our own proprietary work to create new and exciting products," said Gurminder Minhas, Managing Director of Performance BioFilaments. "These applications can be applied within a range of industries from automotive and manufacturing, to construction and high-end consumer products."

#### About Performance BioFilaments Inc.

Performance BioFilaments Inc., a joint venture between Mercer International Inc. and Resolute Forest Products, is focused on the development of commercial applications for cellulose filaments, one of the world's most exciting new biomaterials. Cellulose filaments can be used to enhance the performance characteristics of a wide variety of products. Derived from wood fibre - a renewable and natural resource - cellulose filaments optimize the strength, stability, flexibility and longevity of a variety of materials including composites, coatings and consumer products. For more information, please visit [www.performancebiofilaments.com](http://www.performancebiofilaments.com).

#### About Mercer International Inc.

Mercer International Inc. ("Mercer") is the world's largest producer of NBSK market pulp and has become a leader among forest products companies in embracing the bio-economy. The company has modern, large-scale pulp mills in both Germany and Canada. Mercer's shares are listed on the NASDAQ Global Market (MERC) and on the Toronto Stock Exchange (MRI.U). For more information, please visit [www.mercerint.com](http://www.mercerint.com).

#### About Resolute Forest Products Inc.

# plastic biocomposites

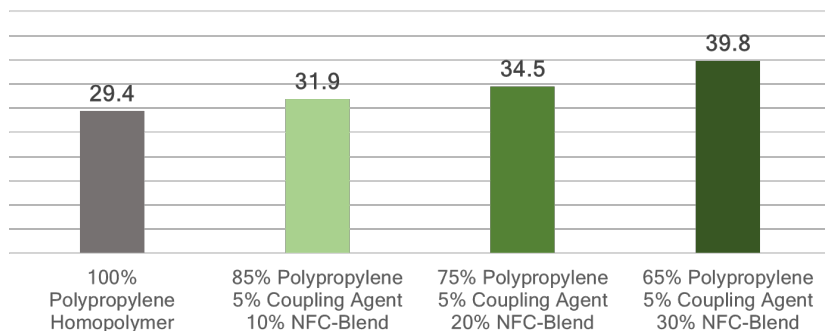
## Compounding Study 2014 -2016

- Project conducted with NRCC-Automotive & Surface Transportation Group.
- Industrial Biomaterials Group focused on lightweight & sustainable materials.
- Improvements in tensile, flexural, HDT and reduced density
- Slight reduction in impact strength



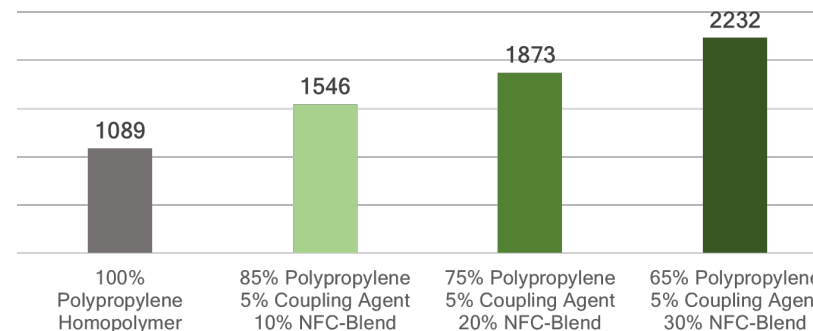
### Tensile Strength

MPa | ASTM D638



### Flexural Modulus

MPa | ASTM D790







# certifications and compliance

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- Nanofibrillated cellulose is a safe and sustainable biomaterial.



# certifications and compliance

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- Nanofibrillated cellulose is a safe and sustainable biomaterial.
- Completed
  - Updated Material Safety Data Sheet for NFC
  - NFC Certification for USDA BioPreferred Program
  - Benchtop Exposure Assessment of Abraded Air-Dried NFC
- In Progress
  - NFC Exemption from US EPA Toxic Substances Control Act for Nanomaterials
  - NFC Classification under US OSHA Combustible Dust Program
  - Life Cycle Analysis and Environmental Production Declaration for NFC

# concrete & mortars

**NFC improves internal curing, mitigates cracking, reduces rebar corrosion, increases long-term durability, and improves sustainability .**

# mining & waste water

**NFC improves material handling and strengthens underground structures.**

**NFC can treat mine tailings and other industrial process water streams.**



# cross sector collaborations

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In May 2023 the Canadian Cement and Concrete Association published its Action Plan to Net Zero by 2050.

- This includes including cutting carbon emissions up to 40% by 2030, 15 Million tonnes cumulatively.
- Biobased and natural admixtures have been identified as a pathway

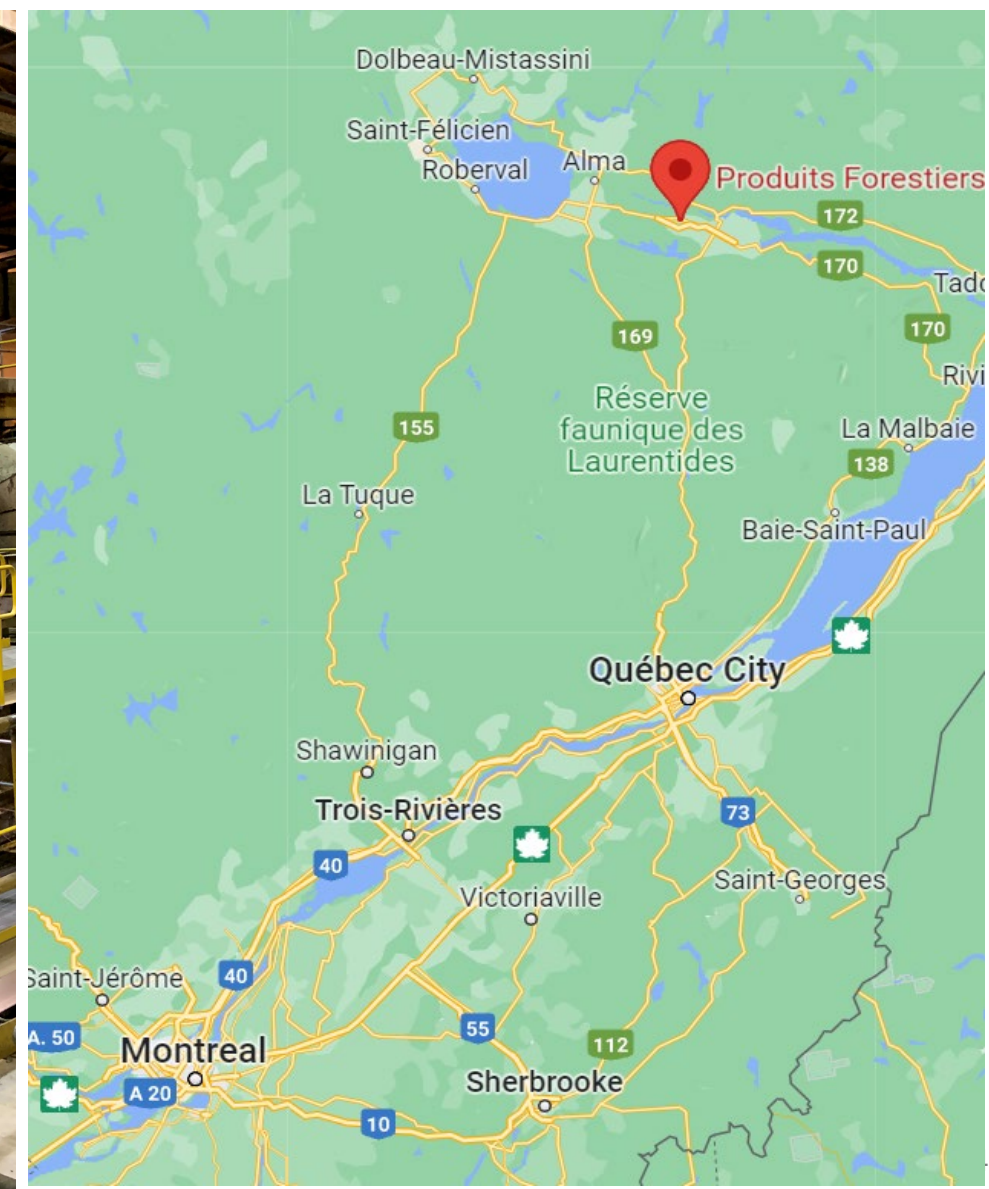
The Center for Excellence in Mining Innovation (CEMI) created the Mining Innovation Commercialization Accelerator (MICA) Network.

- MICA has been funded for \$112 Million (round 1) to support and accelerate new technologies to improve the sustainability of mining in Canada.
- Includes pathways to export technology to other jurisdictions

Similar initiatives in Europe and United States.



# commercial production





# commercial supply



Convert supersacs to customer ready packaging.

- IBC totes, drums, pails
- Custom solids content



**questions welcome**

**PBI is actively seeking partners for  
NFC innovation and commercialization  
within performance-driven domains.**

**[www.performancebiofilaments.com](http://www.performancebiofilaments.com)**