



Addressing Supply Chain Gaps & Technology Gaps in Biocomposite Product Development

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Solution Providers for the Composites Industry

COMPOSITES INNOVATION CENTRE FOCUS

In partnership with industry, government and academia, the CIC develops and commercializes innovative composite technologies for aerospace, ground transportation, biomaterials and industrial applications that are more cost effective, environmentally friendly and offer enhanced performance.



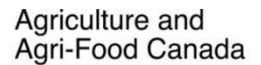
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ACHIEVING GLOBAL LEADERSHIP THROUGH ADOPTION OF ADVANCED COMPOSITE / CLEAN TECHNOLOGIES



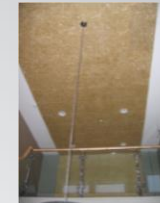
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Disruptive Technologies

Through a synchronized **program's approach**, develop and commercialize technologies that produce **differentiated capabilities** and **supply chains** that directly support **clean technology/advanced manufacturing** priorities:

- Biomaterials



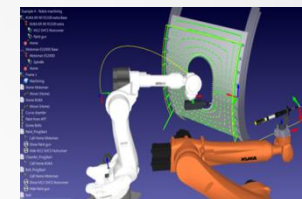
- Lightweight Structures



- Advanced Aerospace Technologies

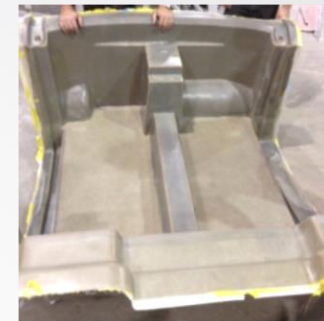
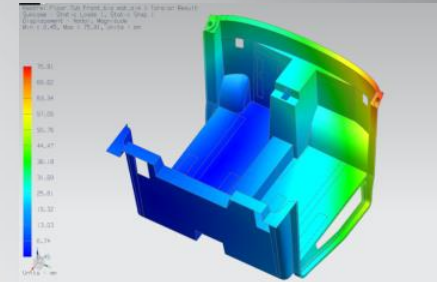


- Industry 4.0 Advanced Manufacturing Technologies



CIC is a composites solutions provider that includes focused technical services:

- Feasibility Assessment/Business Planning
- Design & Finite Element Analysis (FEA)
- Material & Process Development
- Bio-Fibre Technology Development
- Prototyping – Tooling & Products
- Testing
- Industry & Student Training / Technical Sessions
- Project Management



Addressing Supply Chain Gaps & Technology Gaps

Resin
Developers/
Suppliers



Material
Distributors



OEMs

Composite
Fabricators



Mat
Producers



Test Facilities



Strategic Tactics:

- Supply Chain Development
- Technology Innovation
- Product Development & Commercialization



Plant
Breeders

Farmers



Decorticators

National Supply Chain Network

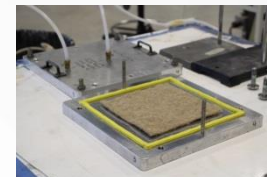
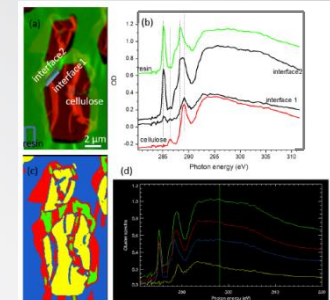


Supply Chain Development

- Seed **producers** for dual-purpose crops (seed variety)
- **Agronomic best practices** – growing, harvesting, retting
- **Fibre grading systems** for crop quality – support additional revenue streams for farmers & rural business development
- **Farming machinery** – handle dual-purpose crops
- Effective and economic **fibre separation methods** (decortication)
- N. American manufacturers of tows, yarns, mat; spinners, weavers
- Generate **biomaterial databases** for industrial design
- Create **in-field sensor technologies** – precision agriculture
- Support a **biomass brokering** system

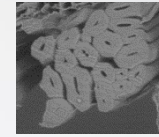
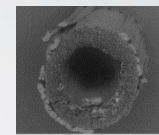
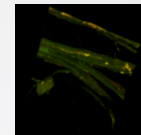
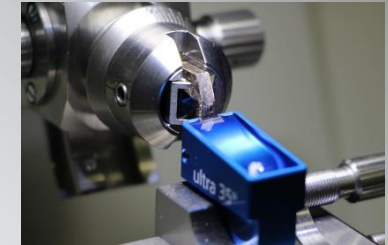
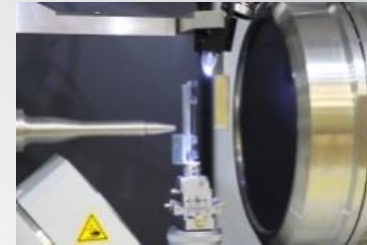


- **Technology gaps** that need to be addressed for biocomposite materials & bioproducts to realize full potential:
 - **Fibre properties & variability**
 - Appropriate **fibre/mat forms** depending on **manufacturing processes** (infusion molding, injection molding, compression molding)
 - **Fibre-to-resin interface** – optimizing compatibility
 - Thermoset/thermoplastic **resins**
 - **Thermal degradation** during manufacturing
 - Long term **durability** (weathering)
 - **Impact** resistance
 - **Moisture** uptake
 - **Application** specific requirements





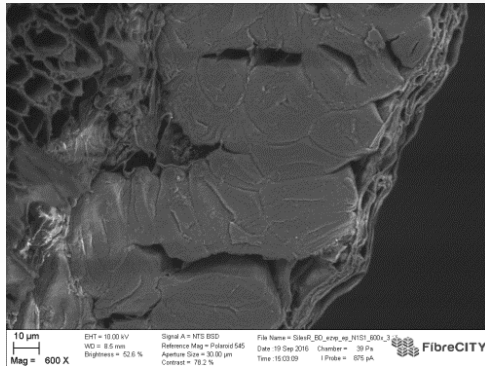
- Straw Processing & Fibre Grading/Testing



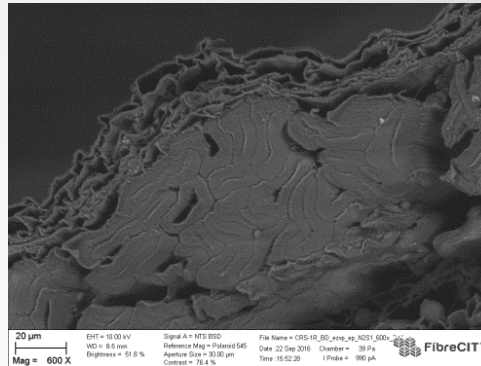
SEM of Hemp Stem Cross-Sections

Variety Type – Growing Location

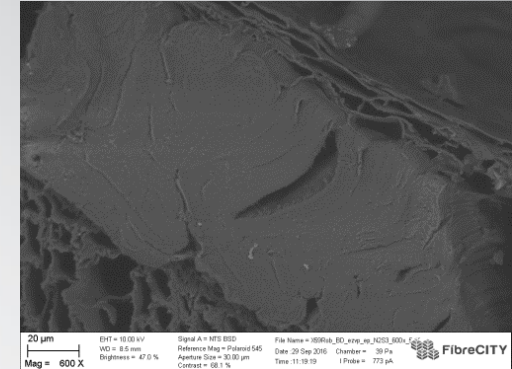
Silesia - Roblin



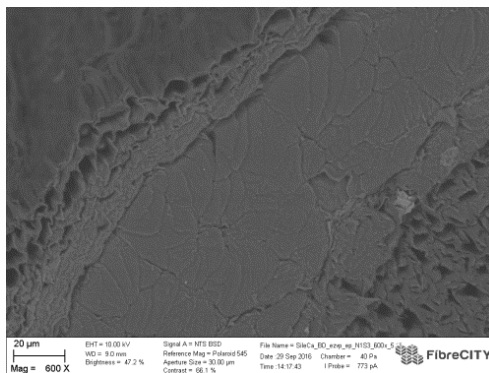
CRS-1 - Roblin



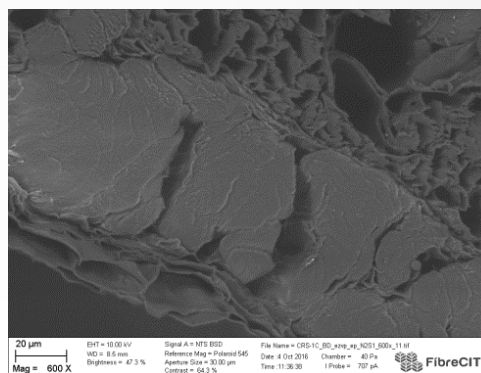
X-59 - Roblin



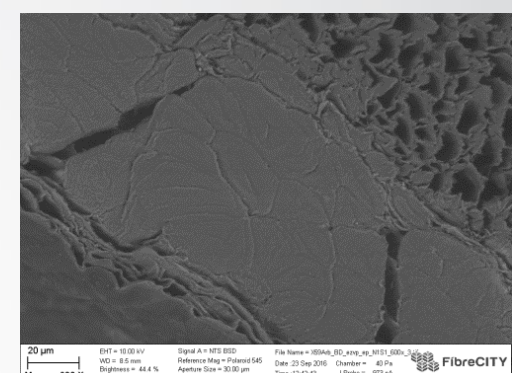
Silesia - Carberry



CRS-1 - Carberry



X-59 - Arborg



Hemp Decortication



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2x rollers, 2x
rollers + short
shaker, 1x long
shaker, 1x
roller, short
and long
shakers

Unretted

starting

after roller
crusher

1x roller
crusher &
short shaker

2x roller
crusher &
short shaker

2x roller
crusher &
short shaker,
long shaker



hurd

starting

after roller crusher

after roller crusher
& short shaker

after roller crusher,
short & long shakers

hurd

Retted



Biocomposites: Technology Gaps

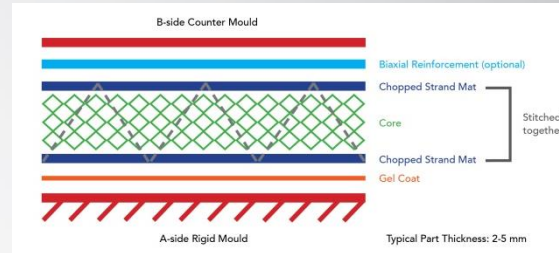
- Improving the properties and durability of biocomposites



**Fibre Sizings /
Treatments**



**Reinforcement
Architecture**



Resin Systems



**Modifiers /
Additives**



Resin Infusion Process



Biocomposite Parts

Project Partners:

C2renew (US)
National Research Council (Cdn)
Sunstrand (US)
University of Queensland (Aus)

Material Suppliers:

Arkema (France)
BASF (US)
BioComposites Group (Cdn)
Chomarat (France)
Ecotechnilin (France)
Dow (US)

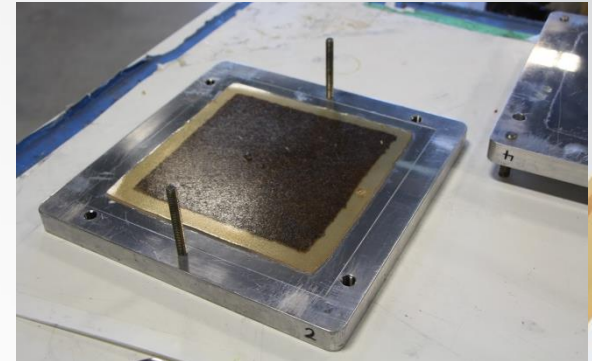
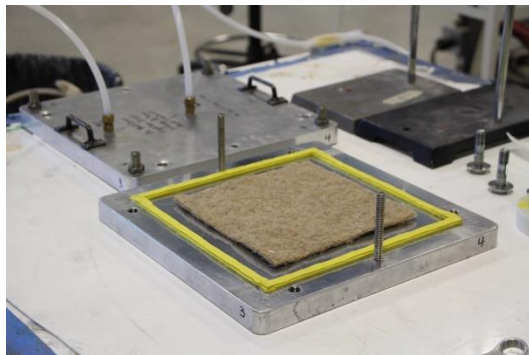
EcoPoxy (Cdn)
EcoSynthetix (Cdn)
Groupe Depestele (France)
Michelman (US)
Polynt (US)
Sicommin (France)
Safflin (France)

Flow Media Results

Conformability test

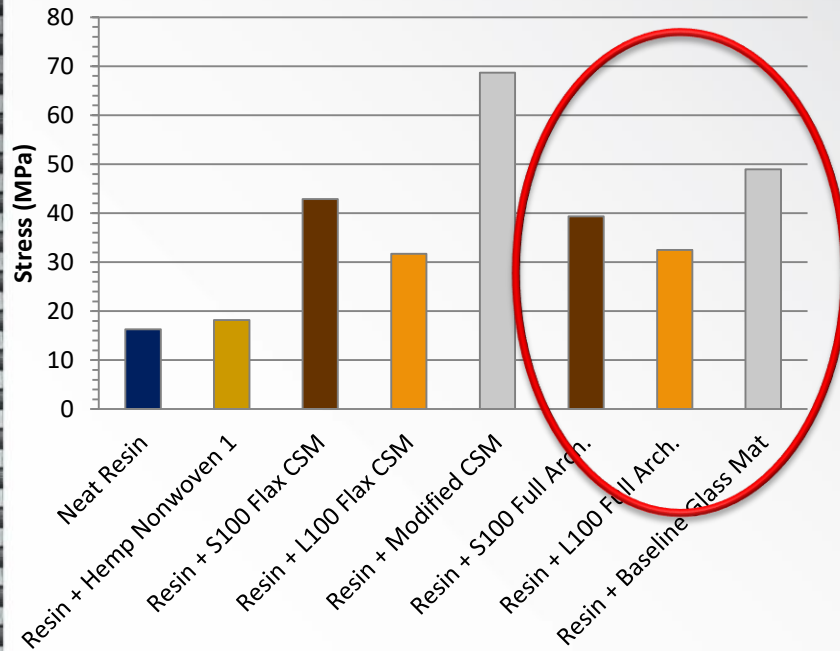


Infusion test for resin flow



Initial Mechanical Results

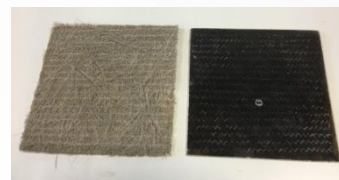
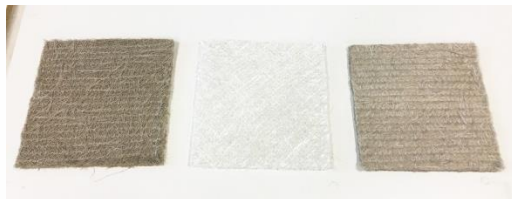
Tensile Strength



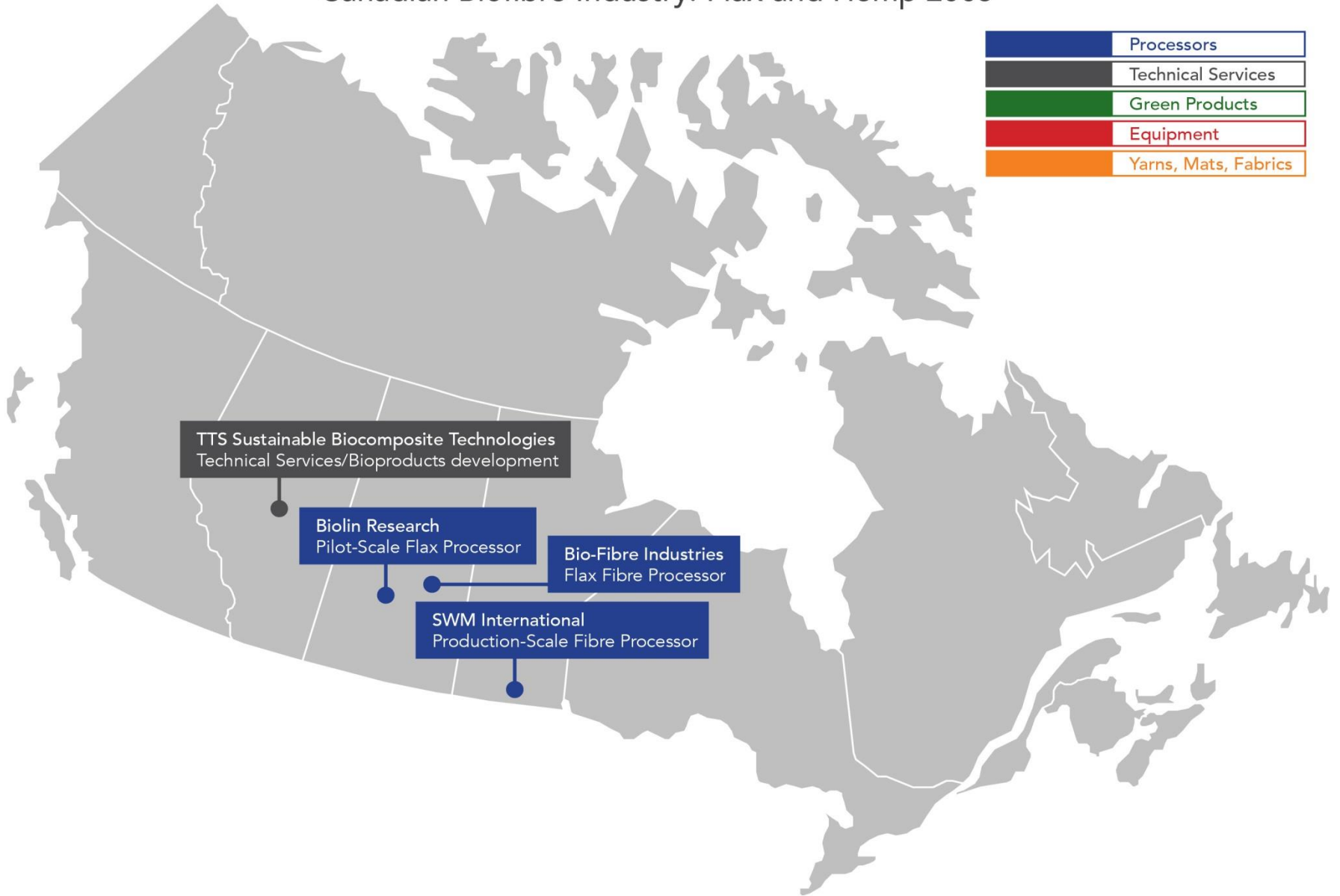
Tensile Modulus



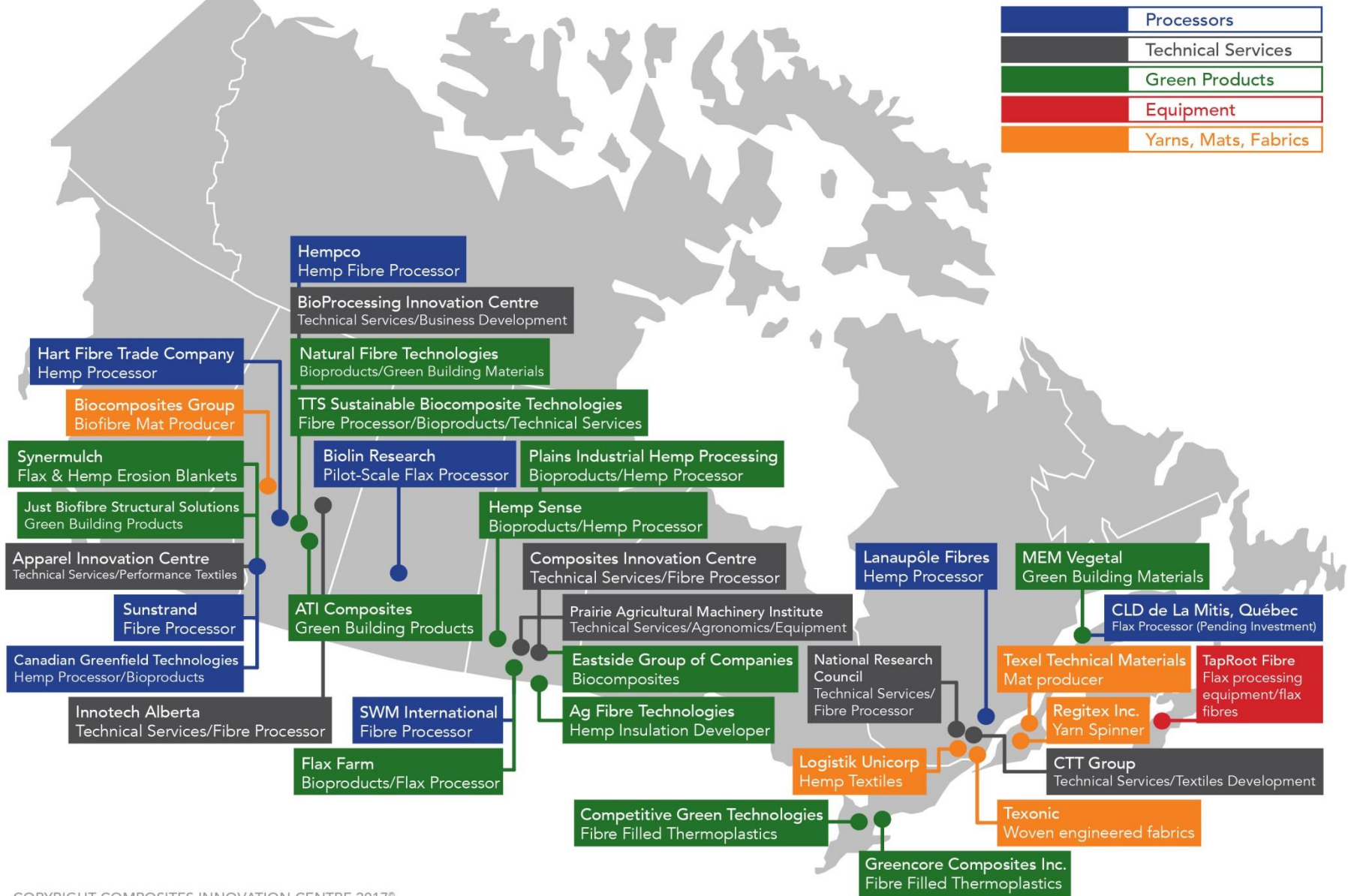
- Overall trends as expected
- Flax full architectures show promising results



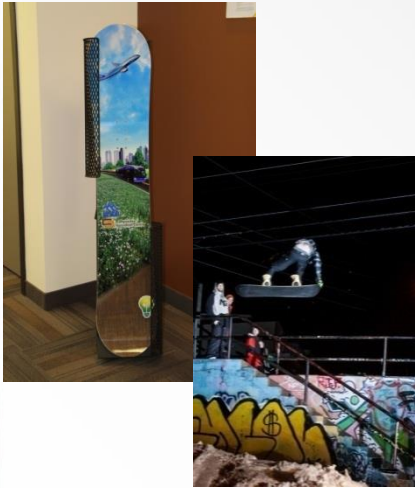
Canadian Biofibre Industry: Flax and Hemp 2005



Canadian Biofibre Industry: Flax and Hemp 2017



Product Demonstrators



Snow Board



**Tractor Hood,
Fenders, Air Intake**



Full Scale Electric Vehicle Body



Mid Range Speaker



Ecocycle Fuel Tank and Fender Panel

**Bus Door,
Sidewall and
Floor Panels**



Commercial Bioproducts



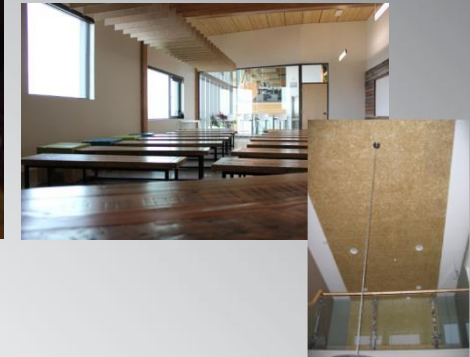
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Biocomposite Gazebo Roof
Eastside Composites



**Hempcrete;
Building Blocks**
TTS, Just BioFiber



Ceiling Dividers/Tiles
TTS



Absorbent Pellets
HempSense



Hemp Furniture
TTS



Building Signage
Hemp Oil Canada



**Noncontinuous Fibre
Mats**
BioComposites Group

Contact Information



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