

CMRC-NRC

*Institut des
matériaux industriels*

National Research Council Canada Industrial Material Institute

Christian Bélanger

Group Leader: Structural Polymers and Composites

Mission to Poland

March 2-6, 2009



Conseil national
de recherches Canada

National Research
Council Canada

Canada[®]

- Canada's principal public R&D organization carrying out scientific and technical work
- 19 research institutes
 - 3,200 R&D employees 1,200 guest researchers
 - \$600 million budget \$110 million income in R&D
- Industrial Research Assistance Program (NRC-IRAP)
 - 1,000 employees
 - \$230 million budget

■ Institutes



National Research Council Canada

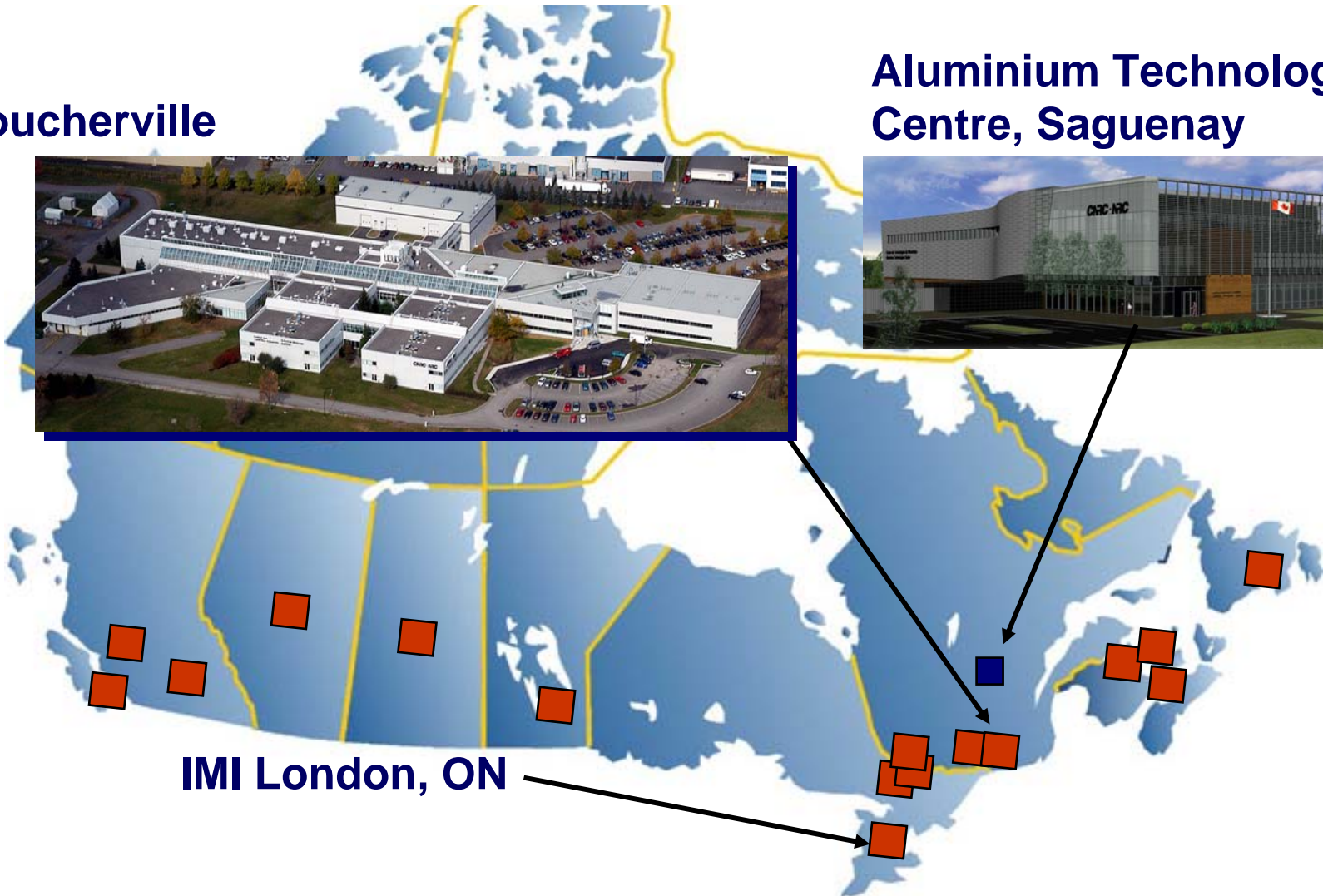
IMI Boucherville



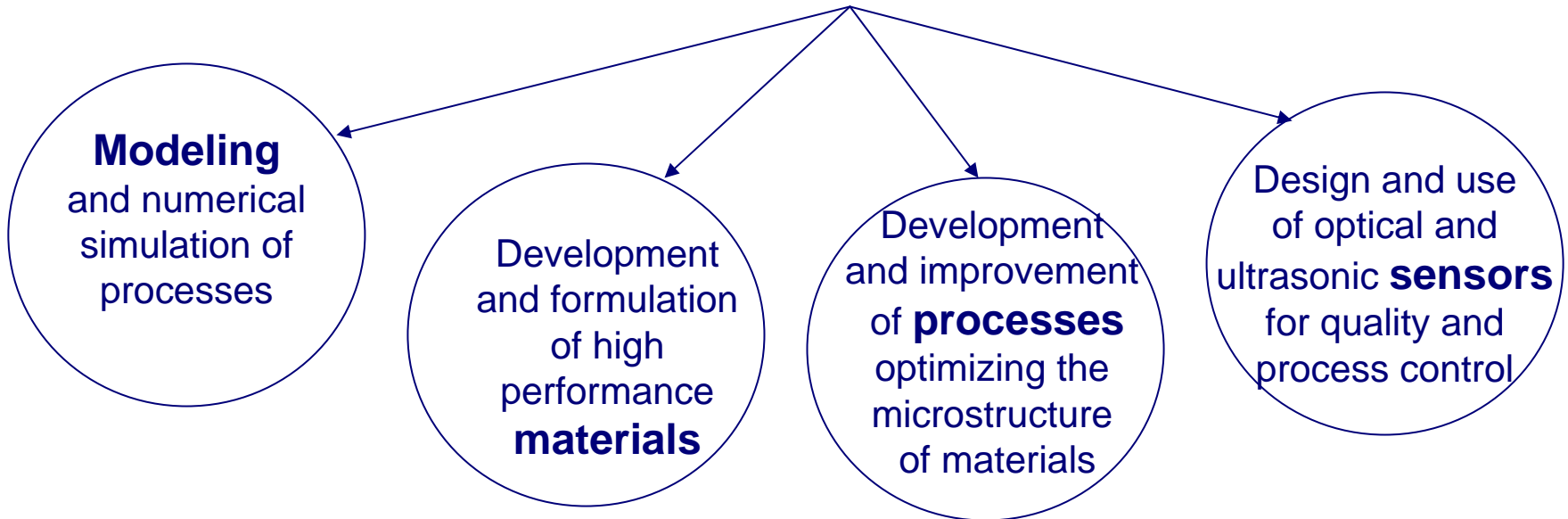
**Aluminium Technology
Centre, Saguenay**



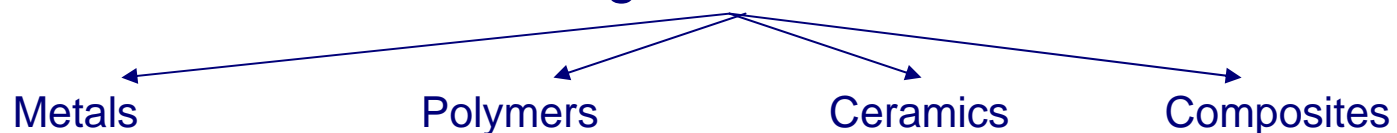
IMI London, ON



Material Behaviour and Performance



Target Materials



Structural Polymers and Composites Group

- **Mandate**

Development and formulation of high performance materials in polymers and composites for structural applications and in particular, for the transport, construction and consumer sectors.

- **Three main research areas**

- Structural Composites

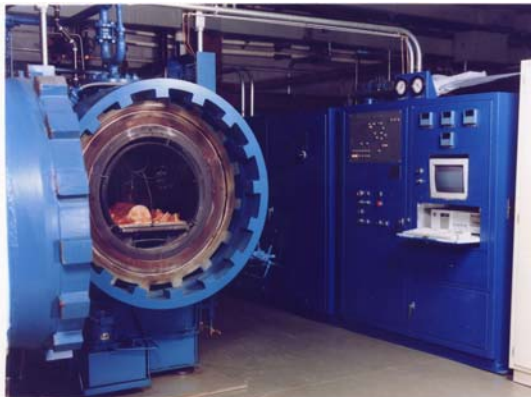
- Thermoplastics
- Thermosets

- Nano composites

- Polymers, nano-composites and composites from renewable resources

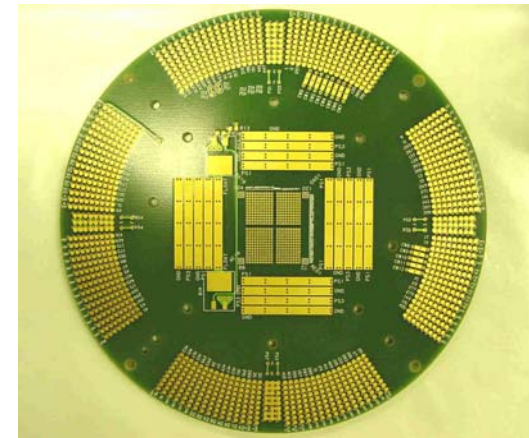
Processing technologies

- Compression Moulding
- Autoclave
- Vacuum Moulding
- Injection Moulding
- Thermoforming-Stamping
- Roll Forming
- Resin Transfer Moulding
- Extrusion
- Film Blowing



Characterization

- Thermal analysis (DSC, TMA, DMTA, TGA)
- Rheology
- FTIR
- Microscopy (SEM, TEM, AFM)
- Mechanical (impact, fatigue)
- Biodegradation (NRC-BRI)
- Permeability (CRDA)
- Flammability (NRC-IRC)



NRC-IMI Structural Composites

Thermoplastic Composites

Platform

1988 — 1995 — 1998-01 — 2005-10 →

Technologies
 projects

Internal
 Project

Space Arm
 Project

Multiclients

Roll Forming

Compression Molding
Resin injection
LFT

Industrial
 Sectors

Ground Transportation
 Aerospace



- Process development
- Material data base



IMI Thermoforming-Stamping Technology



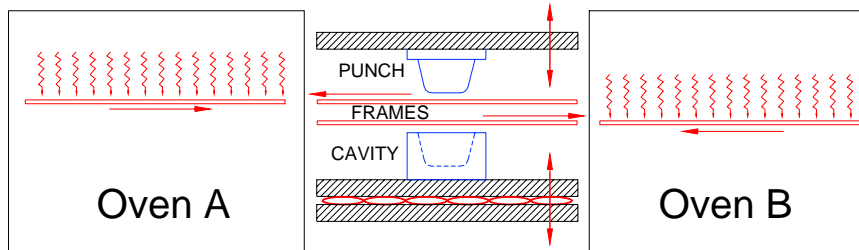
Tooling development

- Sheet handling support
- New molding concept for complex parts

Patented technology

Optimization of the processing parameters

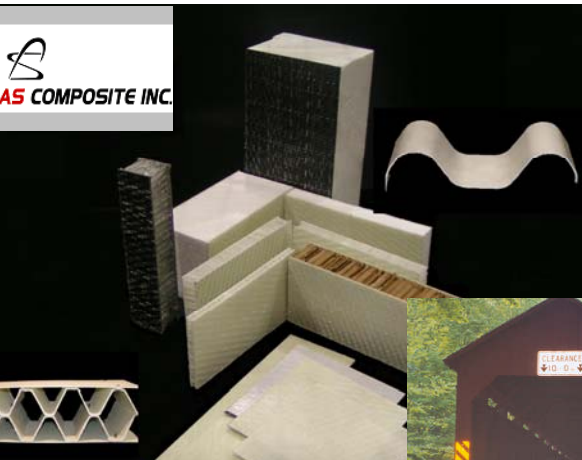
- Heating, time, cooling, pressure



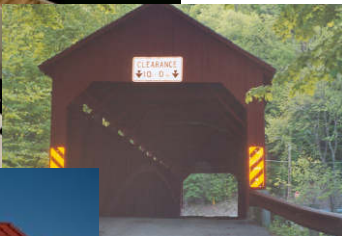
NRC-IMI Structural Composites: Success Story

Multiclient Project on Thermoplastic Composites (1998-2001)

- ADS Composites Group, Armtex, Bauer, Baycomp, Bombardier, Camoplast, FRE Composites, Graham FRP, Protectolite, René Matériaux Composites



Low Pressure
Air Distribution System (LPADS)
The Next Generation in Environmental Control Ducting



Nanocomposites

Platform

Nanocomposites (thermoplastic and thermoset)

2000

2003

2006-10

Technologies
Materials

Internal
Project

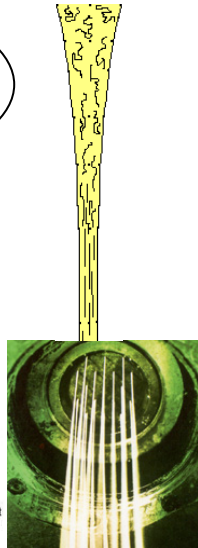
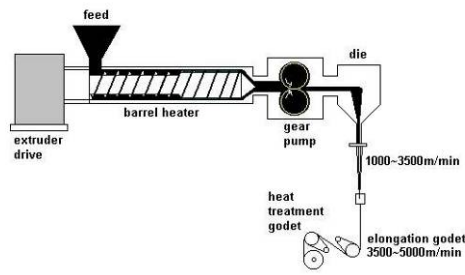
PNC-Tech (clay)
Thermoplastic
Epoxy

CNT

Industrial
Sectors

Ground transportation
Construction

- Surface treatment and interface
 - Formulation
 - Processing and fabrication
 - Characterisation and performance evaluation
 - Quality



NRC-IMI Structural Composites: Polymers and Bio-based Composites

Platform

Polymers and bio-based composites

2000

2005

2006-10



Technologies
and materials

Project
Wood-PP

Natural fiber composites
Thermoplastic starch
PLA nanocomposites

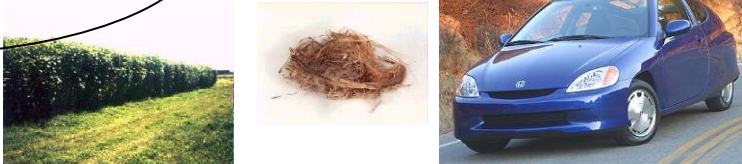
Nanocellulose, Flax,
Hemp, Triticale

Technology Group



Industrial
Sectors

Ground transportation
Construction



- Surface treatment and interface
 - Formulation
 - Processing and fabrication
 - Characterisation and performance evaluation

CNRC-NRC

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La
Science
— à l'œuvre pour le —
Canada



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Canada[★]