

# Recycling of Fiberglass for 3D Printing and for Composite Materials

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PROJECT UPDATE

FEBRUARY 7, 2019



# Project Partners



## McGill

- Larry Lessard
- Pascal Hubert
- Abdolhamid Akbarzadeh



## ETS

- Martine Dubé



## Poly

- Marie-Claude Heuzey
- Abdellah Aji

## External

- Kazem Fayazbakhsh
- Peter Mitschang

## Industry

- Matthew Wadham-Gagnon

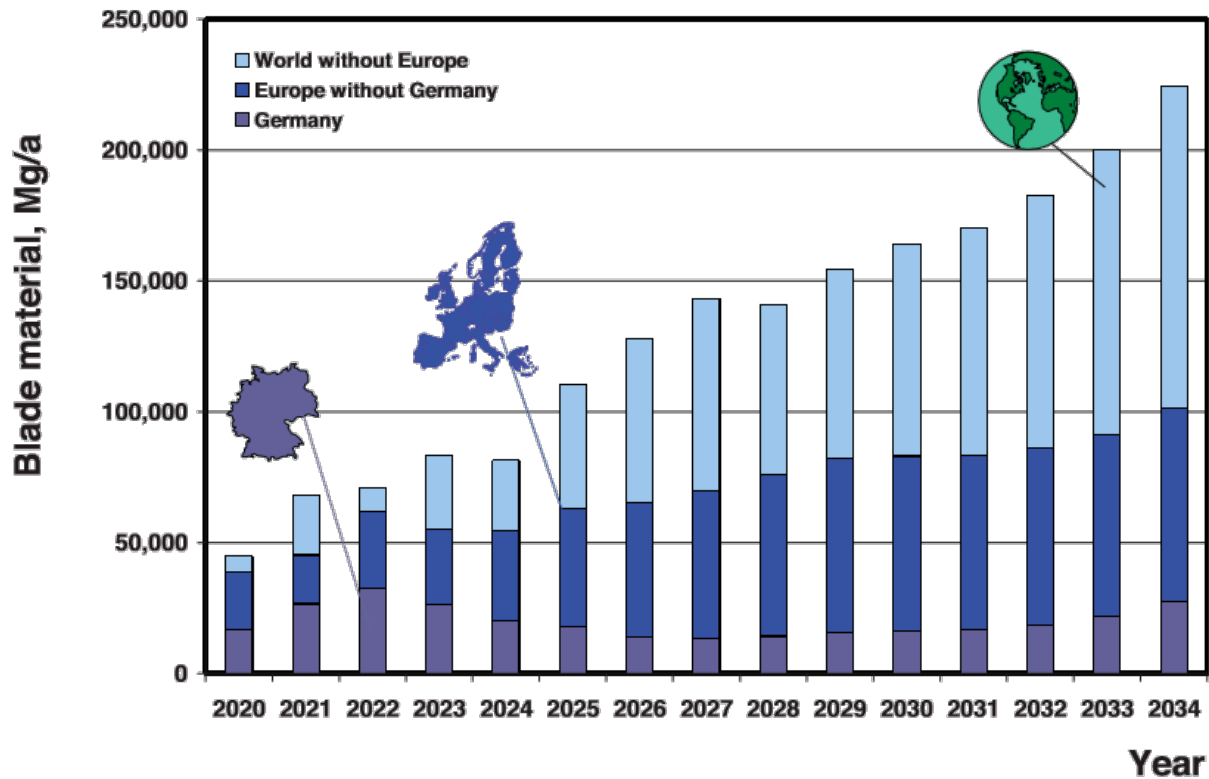
Ryerson  
University



NERGICA

# Wind Turbines Fiberglass Use

10-15 tonnes/MW of composites



# Main Objectives

## To find ways to recycle waste fiberglass



### **Old fiberglass parts (65-80% of the waste)**

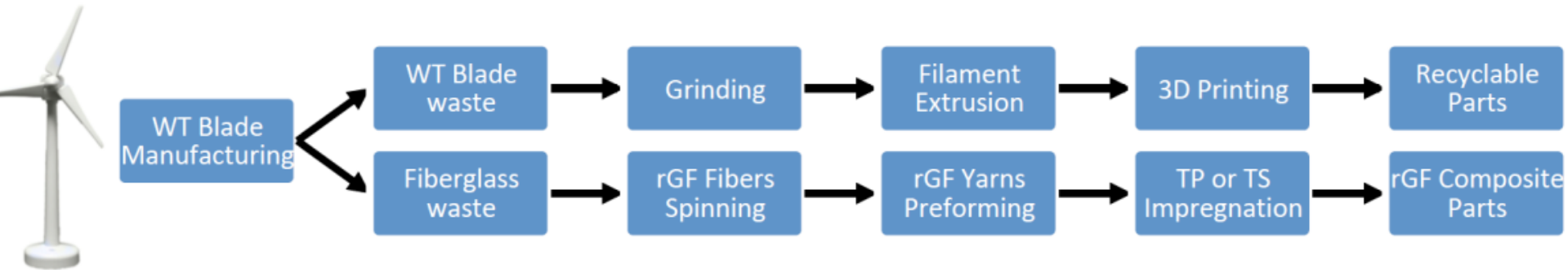
- use end of life parts
- recover the fibers
- use the fibers in the 3D printing process

### **Layup trimmings (20-35% of the waste)**

- use manufacturing scrap
- recover the fibers
- turn them into new fiberglass material

# Approach

## Recycling of Fiberglass for 3D Printing



## Recycling for Composite Materials

# Recycling of Fiberglass for 3D Printing

## Partners:



**McGill**

**ÉTS**



**POLYTECHNIQUE  
MONTRÉAL**

**Ryerson  
University**

**ENERGICA**

Renewable  
Energy Research  
and Innovation

## • Challenges

- efficient reduction of fiberglass parts to fibers
- compatibility with filament polymer
- optimization of 3D printing parameters

**Principal contact: Larry Lessard**

# Progress - Funding

## Developing contacts for industrial funding

- Matthew Wadham-Gagnon/Nergica
- Andrew Csinger/Assero

**NERGICA**









Renewable  
Energy Resear  
and Innovati



## Current challenges

- Many Wind turbine makers and wind turbine operators
- Each has different goals

# Progress - HQP

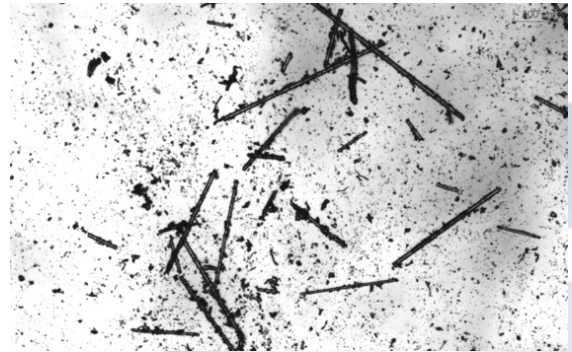
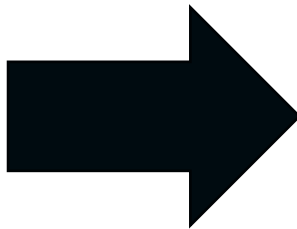
Student	Registered	Co-supervision
Amir Rahimizadeh (PhD) September 2017	 <b>McGill</b>	
Mazin Tahir (Meng) September 2018	 <b>McGill</b>	
Rodolphe Henri (Master) October 2018	 <b>McGill</b>	 <b>POLYTECHNIQUE MONTRÉAL</b>
TBD (Master) Summer 2019	 <b>POLYTECHNIQUE MONTRÉAL</b>	



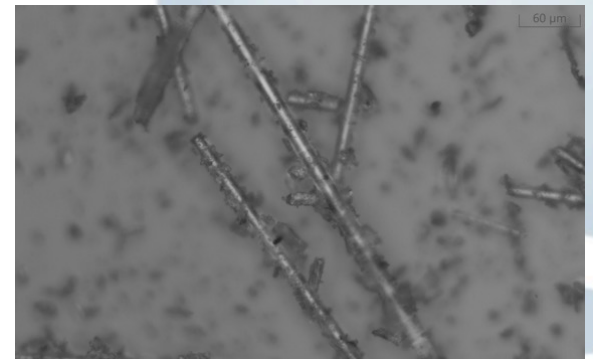
# Progress - research

**Making recycled fiberglass**

**Making and testing 3D printing filaments**



**fibers**

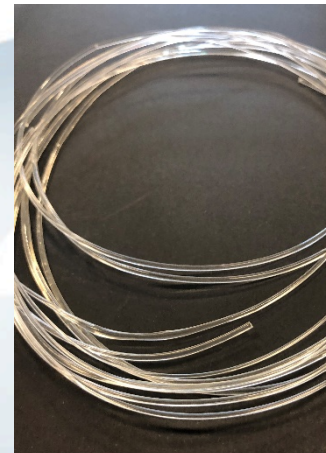
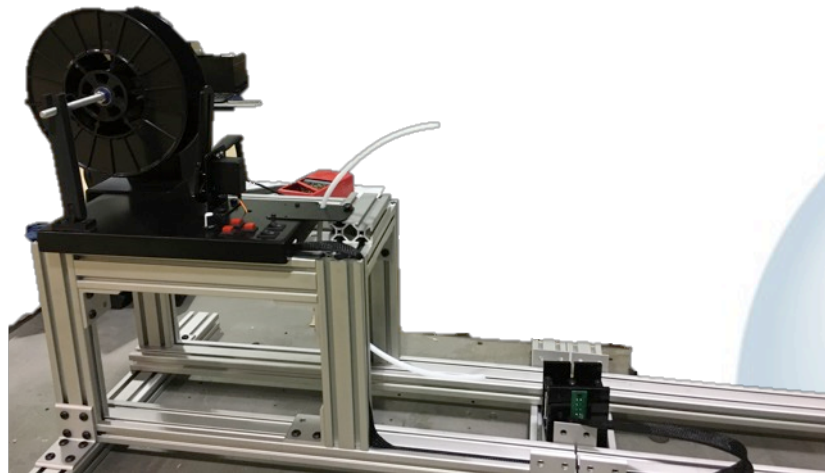


# Progress - Research

**Mixing fibers with PLA:**



**Making reinforced filament:**

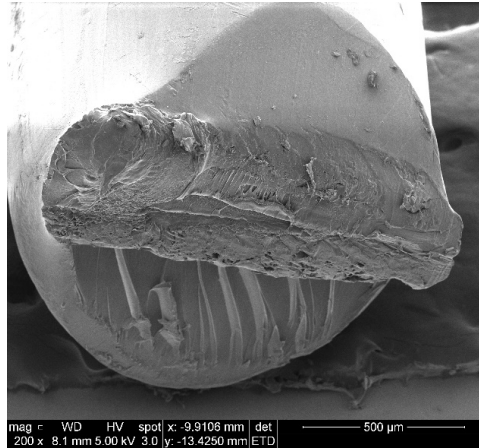


# Progress - Research

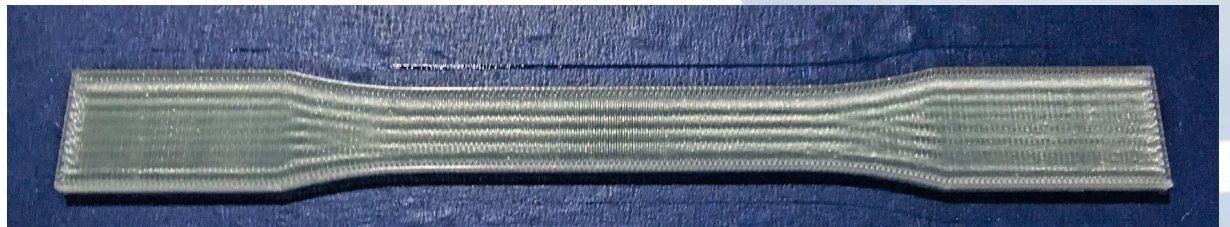
**Testing filaments:**



**Microscopy:**



**Testing coupons made by 3D printing:**



# Challenges - Joint Sub-projects

Efficient reduction of fiberglass parts to fibers



McGill



Compatibility with filament polymer



POLYTECHNIQUE  
MONTRÉAL

Fiber/PLA mixing using twin-screw extruder



McGill



POLYTECHNIQUE  
MONTRÉAL



# Recycling for Composite Materials

Partners: **ÉTS**



## • Challenges

- efficient transformation of recycled fiberglass
- optimization of the spinning process
- sizing and impregnation of the recycled fiberglass

**Principal contact: Pascal Hubert**

# Progress - Funding

## Developing contacts for industrial funding

**BOMBARDIER**



**STELIA**

**TEIJIN**

**SOGEFI**

**PRIMA letter of intent submitted**

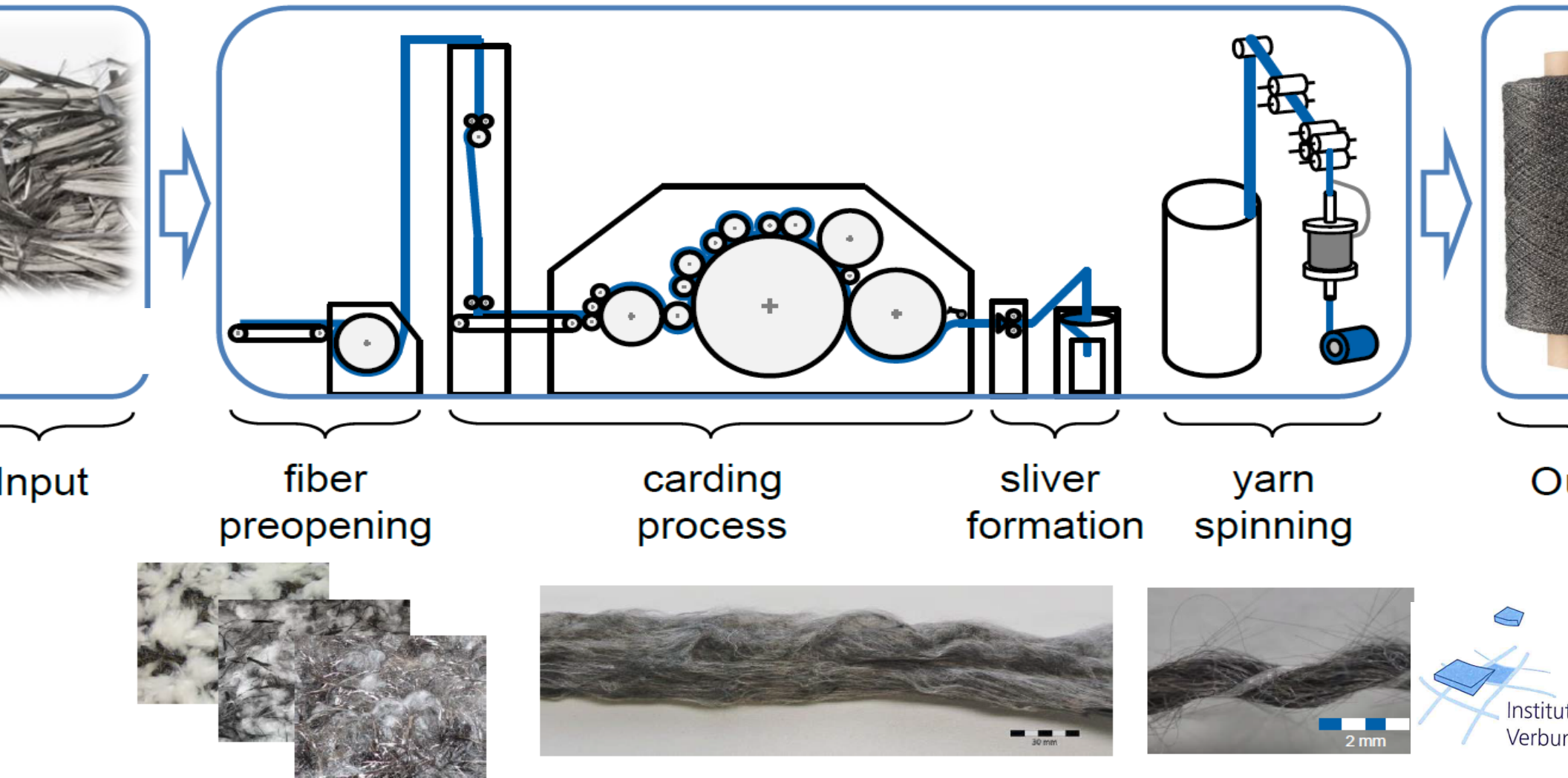
## Current challenges

- Obtain cash support
- Develop business case

 **HUTCHINSON**



# CF Staple Fiber Yarn Manufacturing



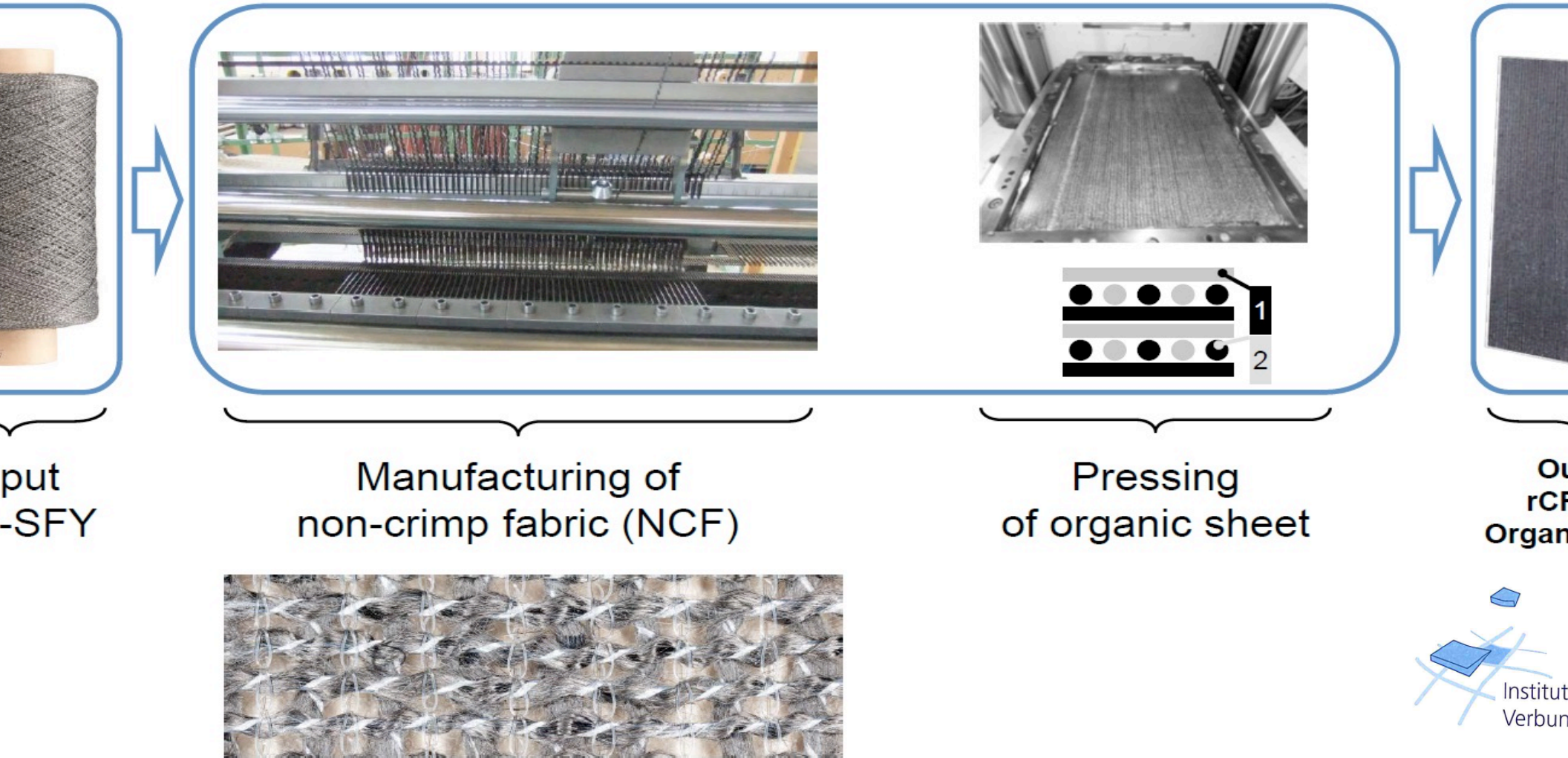
# CF-SF Fabric



**Same process for glass fibers**



# rCF Organic Sheet Manufacturing



# Summary / Future Challenges

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## **Good start on research**

- Experiments progressing
- Collaboration established

## **Within six months**

- Finding industrial support
- CRD grant/Prima Quebec

