



IRT M2P
Plateforme Composite
Route de Diesen
57890 Porcellette

General Presentation
COMPOSITE GROUP





TEAM

- 2 PhD
- 6 Ing
- 2 Tech
- 1 PhD student



INFRASTRUCTURE

- 200m² office
- 800 m² workshop (1600 m²)
- 9 M€ equipments



PROJECTS

- 4 running projects
- 17 partners
- 20+ M€ budget



THEMATICS

- High cadency processes
 - Dry preforming
 - Injection processes
 - Pultrusion
- Reactive thermoplastic

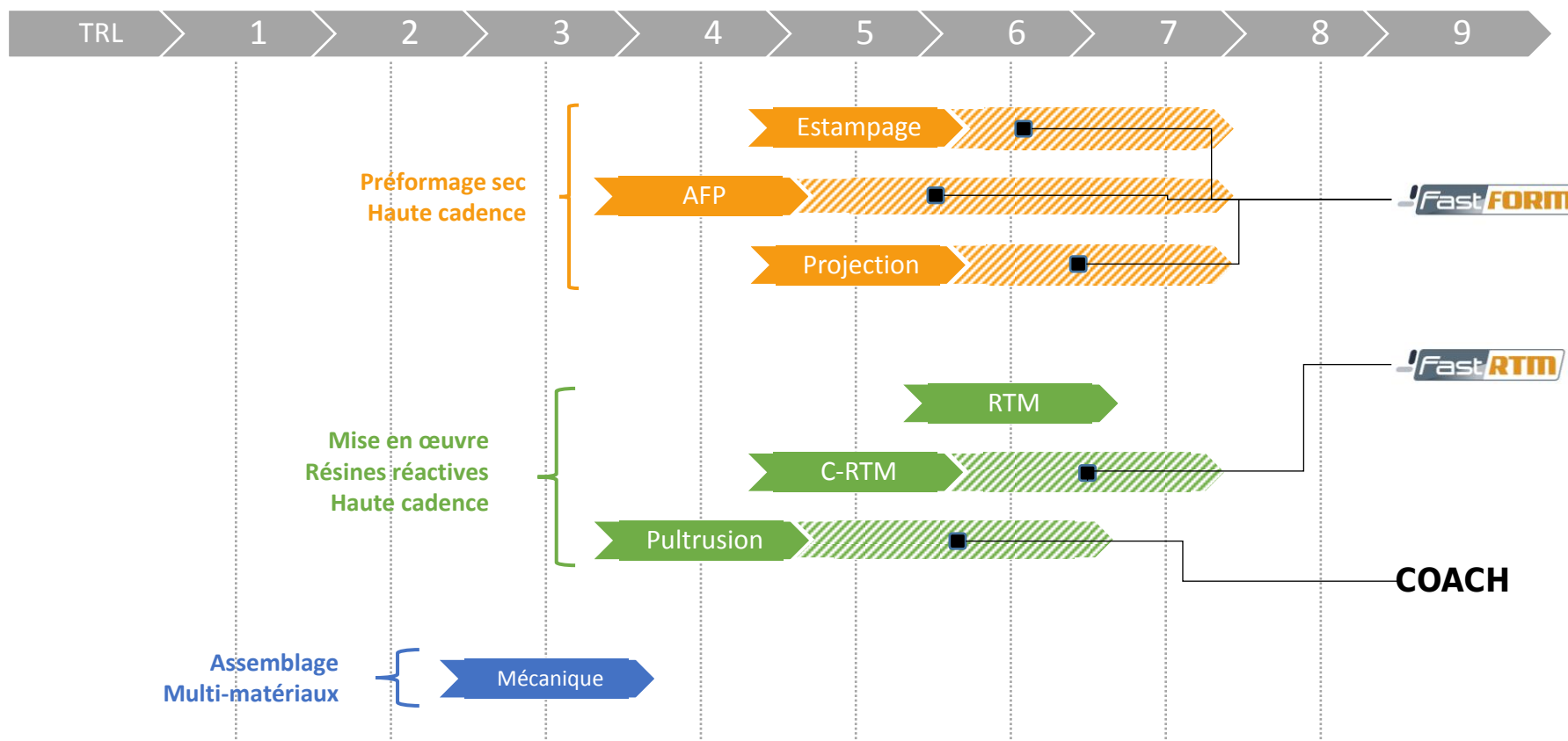


SFIP 2016



JEC 2017

Overview and key figures



Objectifs de maturité
des projets en cours

Roadmap macro

Process overview	Fast RTM
Fully automated RTM process	✓
High Pressure Injection	✓
Net-shape	✓
C-RTM	✓
Thermoset resins (TS)	✓
Thermoplastic resins (TP)	✓
Production rate	Up to 30 parts/h
Part dimensions	Up to 3m ²
On-line NDT	✓
Process parameters monitoring and recording	✓
Process simulation Numerical optimisation	✓

EQUIPMENTS

Eco Compact Sustainable Press (ECS Press)

- Press tonnage: 1500 Tons
- Opening and closing speed : 800 mm/s
- Platen size: 2 m x 1,5 m with parallelism control

RTM equipments and toolings

- Innovative modular toolings (net-shape, thermally optimised)
- Optimised temperature control system (current flow tube technology)
- TP and TS high pressure injection machines (30-250 cc/sec)

Automatisation

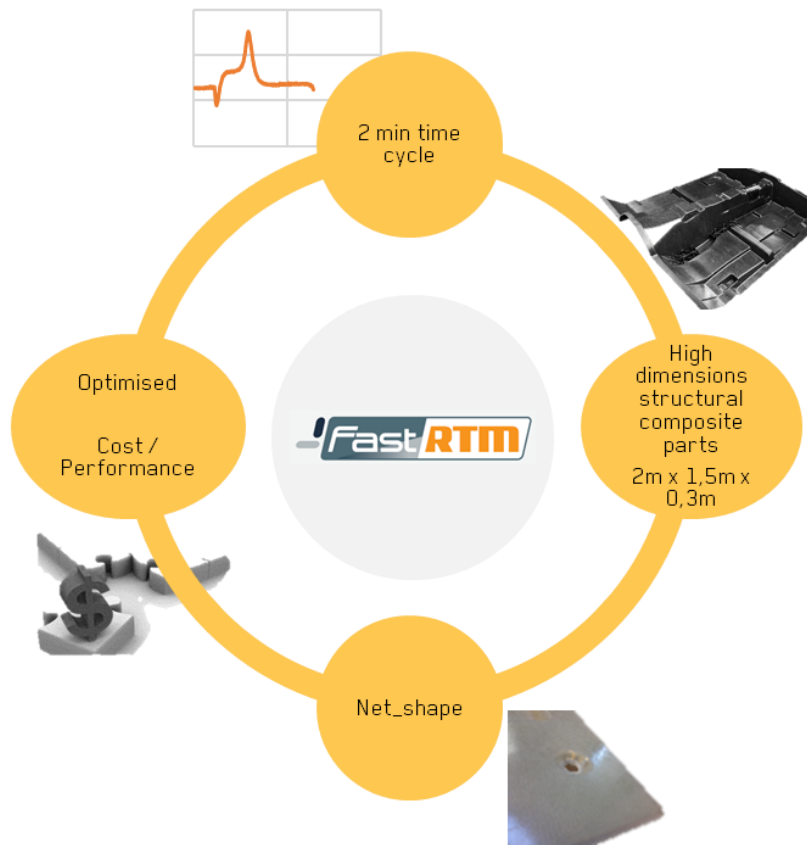
- Dedicated control room
- 6 axis robots (x2) - 700 kg capacity
- Modular prehensors (for preforms and composite parts)

Online monitoring, data saving and post-processing

- Online controls (preform and part)
- Centralised acquisition and archiving of process parameters
- Energy consumption measurement



Fast RTM line



EQUIPMENTS

Fast FORM - Preforming platform

- Cutting table (width 3m20)
- 300T press (plattens: 4m x 2,5m)
- Preheating system
- Coriolis AFP device
- Chopped fibre preforming device
- Automated environnement

- In development -
- Available in 2018 -



Fast FORM line

Process overview	Pultrusion
Continuous process	✓
High Pressure Injection	✓
Resin bath impregnation	✓
Thermoset resins (TS)	✓
Thermoplastic resins (TP)	✓
All reinforcements	✓
Production speed	Up to 5 m/min
Part dimensions	Up to 600 x 200 mm
Pre-heating reinforcements	✓
Post curing in line	✓
Process parameters monitoring and recording	✓

EQUIPMENTS

Pultrusion Line :

- Pulling Capacity: 6 Tons
- Pulling Speed : 25 to 5000 mm/min
- Profile Capacity : up to 600 mm X 200 mm
- Continuous control IR thermometers

Pre-heating and post cuisson devices:

- Cooling Table : 5000 mm X 500 mm
- Optionnal reinforcement preheating device (up to 400°C)
- Adjustable lenght post curing tunnel (up to 4m and 400°C)

Creel racks

- Carbon and glass fibres compatible
- Individually tension regulated yarn
- Enclosure with controlled hygrometry

Online monitoring, data saving and post-processing

- Online controls
- Centralised acquisition and archiving of process parameters
- Energy consumption measurement



Pultrusion line

Process overview	Thermo-stamping
Automated process	✓
High Pressure Stamping	✓
High Closure Speed Press	✓
« On-plattens » consolidation	✓
Stamping with toolings	✓
Up to 450°C	✓

EQUIPMENTS

Automated translation

- ≤ 5 sec from preheating to closed plattens/mold

Pre-heating IR oven:

- 450°C Max (60kW)
- Medium infrareds
- 16 independently regulated areas

Heating platten press:

- 180T (50 bars on 600 mm x 600 mm)
- Closing speed: 800 mm/s
- Plattens for consolidation (Ra 0,8) : 600 mm x 600 mm
- Up to 450°C (68kW) with $\pm 5^\circ\text{C}$
- Heating and cooling ramps: up to $10^\circ\text{C}/\text{min}$
- Plugable toolings



Thermo-stamping line

PLATFORM AVAILABILITY

- Multi-partner research projects with public co-funding
- Research studies/services
- Platform rental with technical support
- Training

TECHNICAL SERVICES

- Scale-up : Validate process/materials at an industrial scale
- Pre-industrialisation : Validate robustness and production rate of RTM/C-RTM processes in an industrial context
- Manufacturing cost reduction : Production cost reduction - Quantify economical advantages of RTM/C-RTM processes
- Materials development : Maturation and industrialisation of new materials (TP/TS resins or reinforcements)
- Process development : Optimisation of RTM/C-RTM processes and development of new processes
- Injection process optimisation : Development and/or optimisation of injection configuration (experimental and/or simulation)



CONTACTS

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Collaborate with IRT M2P



High pressure high speed nitrogen cutting system for composites

Cuting fiber glass and carbon fabric lay-up three dimensionnals at a speed more than 1m/s and 10mm precision.

- To run an high speed (2 pieces per minute) preforms line for rtm injection, we need an on line cutting tool wich respect this speed. These preforms have to be injected into a RTM mould and therefore have to respect some precise géométrical specifications and few pollutions.
- Among the technics used to cut fabrics of continuous fibers made from glass and/ or carbon in 3D, we identifie high pressure nitrogen cutting. This technic is precise, clean and can be very fast in comparison with conventional cutting methods. We test it at lab scale. We need to develop a high speed cuting prototype to evaluate her potential in an on line production of structural parts at high cadences.
- provide automotive structural parts
- CRITT Jet d'eau(Bar le Duc-France) - PEI
- Composites Parts manufacturers – cutting-fabric machine manufacturers.

On line non destructive control of structural composite parts

- We need to develop a high-speed line for testing composite parts to identify, without later control, defective pieces. We will adapt two existing laboratory technologies to a continuous production line: infrared thermography and « shearography ».
- Avoid ,for the line-out parts, systematic off line control as it is done for aeronautic parts. Only pieces detected as bad one will be analyse off line. We need to reach cadences of two parts per minute. We have to developp methods for defining good quality references and in parrallell to specifie the two on line apparatus. After building the prototypes we will test them on our automatic line.
- Reduce the cost of control in order to access the automotive market.
- No partners actually
- Measuring systems produceers – Measurers IR and « shearographie » specialist – Composite parts produceers.

Mechanical behavior simulation of SMC parts

- We want to create a simulation tool for estimation of the fibers orientations while forming SMC parts and to couple this tool with mechanical calculations .
- IRT M2P provide an high-speed stamping line for SMC parts to get a data base of parameters permitting the simulation of displacement of fibers in the molded resin.
- Permit a more accurate parts design and save weight and materials for equivalent properties.. .
- Remain competitive compared to others technologies (process) already simulated in the automobile market.
- Partners ESI group (not confirmed) Faurecia (not confirmed)
- Simulation software specialist, pieces manufacturers or users, logiciel editor.

High-speed injection mould RTM making

- Develop conductive and pressure resistant mould, to provide a fast thermal cycling system.
- Currently, ablating material from blocks of metal is the method used for producing RTM moulds. This technology (process) is slow, expensive and restricted to provide heat exchanging channels. While developing new techniques, we could introduce channels nearer from the moulding surface, to facilitate rapid exchanges and to reduce thermal inertia. Two techniques are identified : Stratoconception and Heat Deforming under vacuum from metal plates.
- Allow the use of high temperature thermoplastics into reactive RTM by using cycling temperatures moulds and/ or to reduce moulds manufacturing cost and energy consumption.
- To give access to the industry to high temperature thermoplastics in RTM composites.
- Identified potential partners: CIRTES – AUROCH
- Welding metal plates specialists - Moulds manufacturers – Thermal calculations specialists.