COMPOSTAMP Project

Development of aeronautical thermoplastic composite parts by forming/overmolding

SEBASTIEN GUEROULT (IRT Jules Verne)
BERTRAND DUTHILLE (AIRBUS)
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COMPOSTAMP Project

INTRODUCTION : AIRBUS OVERVIEW
Introduction Fuselage clips concept
Fuselage clips manufacturing (AS IS)

Blank preparation

Forming

7 production steps
**COMPOSTAMP project**

- Develop and evaluate the stamping overmoulding industrial performances, with an application to fuselage clips
- Develop stamping – over moulding process full automated line
- Clip/cleat redesign with “One Shot” + “Net shape” functions integration
- Carbon/PEKK UD & Fabrics substrates / PEKK resin over moulded

**Industrial objectives:**
- Reduce lead time
- Reduce recurrent costs
- Increase rate
COMPOSTAMP : project

- Stamp forming and overmolding of composite parts – General presentation

Heat (IR oven)

Stamp forming

TP Injection

Transfer

Net-shape composite part

Laminates

Transfer
Overmolding technology – Automotive parts

- Stamp forming and overmolding of automotive composite part
Technical analysis

• What do we need to develop to make industrial overmolded parts fly?
  - Design to manufacture with overmolding process
  - Design specifics for hybrid parts mixing continuous fibres with short fibres

• Stamping and injection of high performance materials
  - Injection of PEKK or PAEK resins is not a baseline for manufacturers. Process window has to be determined, tooling has to be adapted

• Overmolded products characterization
  - Mechanical resistance, physico-chemical characterization, adhesion between injected part on substrate, conductivity

• Industrial assessment
  - Quality, repeatability, capability, cost assessment

COMPOSTAMP project purpose
COMPOSTAMP Project

Project overview
COMPOSTAMP project

3 years multi partnership project with aeronautics and automotive industries
2015 – 2018

Aeronautic industries
- AIRBUS
- DAHER

Automotive industries
- PSA
- faurecia
- RENAULT

Mold provider and plastics industries
- DEDIERNE MULTIPLASTURGY GROUP
- compose

Research and technical centers
- CEMCAT
- IRT JULES VERNE
- CETIM
• COMPOSTAMP project is divided between 4 work packages

WP 1
• Material selection + economical approach
  • UD Tape / Fabric laminate / Carbon short fiber
  • Economical indicators

WP 2
• Conception / Design
  • Mold Conception and manufacturing
  • Characterisation samples and clip design

WP 3
• Manufacturing
  • Manufacturing line development
  • Process Optimization (Design of experiments)

WP 4
• Characterization & Performances
  • Mechanical trials and Chemical trials
Conception and Design of characterization samples

- Design of characterization samples: result of a concession between characterization needs and process limitations

Mechanical test objectives: understanding of the impact of overmolding on composite parts made of continuous fibers
Conception and Design of characterization samples

- T stringers adhesion
  Objective = Adhesion between injected part and composite part / Break has to be in the injected part and not at the interface

- Bearing
  Objective = characterize the edge sealing and evaluate the knock down factor / Edge sealing has a mechanical contribution to the part sizing

- Single Lap Shear (SLS)
  Objective = Adhesion between injected part and composite laminate (peeling & shear strain) / Break takes part in the injected area
Composite parts manufacturing

- Manufacturing line development

- 150 t injection molding machine
- Transfer gripper
- IR Oven
- Mold
- 6 axis Robot
Composite parts manufacturing

- Mold reception and manufacturing ligne validation

![Composite parts manufacturing image](image1)

- First trial campaign results

![First trial campaign results image](image2)

**Objective: Preparation for the clip design and manufacturing**

Design specifics for hybrid parts mixing continuous fibres with short fibres using PEKK/Carbon materials

- Thickness of the laminate is not ok
  - resin flow

- Thermal homogeneity problems

- Mechanical results are promising
CLIP evolution and design

- Base line fuselage clip concept
  - 3 parts => 1 clip + 2 cleats
  - Trimming
  - Edge sealing

- First evolution: Study of injection design reaching the same stress requirements: CLIP
  - Injection cross junctions (mechanical properties)
  - Edge sealing with TP injection

  Cross jonction not possible due to technologies and mold limitation.

  -> Partial injection
CLIP evolution and design

- Second evolution: Study of injection design reaching the same stress requirements: CLEAT
  - Hollow cleat injection
  
  **Cleats injection not possible due to technologies and mold limitation.**
  -> Weld line

- Third evolution: taking into account mold and technologies limitations
  - Composites area simplification + drilling zone taken into account
  - Cleats injectable
  - Injection modelling improvement
  - Tooling injection optimization
CLIP evolution and design

• Base line: fuselage clip

• New design adapted to stamp forming and overmolding

1 CLIP + 2 CLEAT

Manufacturing of net-shape clip in the second part of 2017.
Conclusion and future works

- Material selection done
- Test plan available
- Mold for characterization sample
- First trials are encouraging. No showstopper with PEKK processing
- Next significant results expected are the characterization campaign and clip manufacturing
- Collaboration with automotive project is inspiring and fruitful
Thank you for your attention