



Cenaero



Brussels, June 1 2010

Infoday NMP and Factories of the Future

Dr. Bertrand Herry
Business & Project Management Group
Contact: bertrand.herry@cenaero.be

FP7 Project HYPLAS

Joining of hybrid structures by thermo-
mechanical actuation like FSP

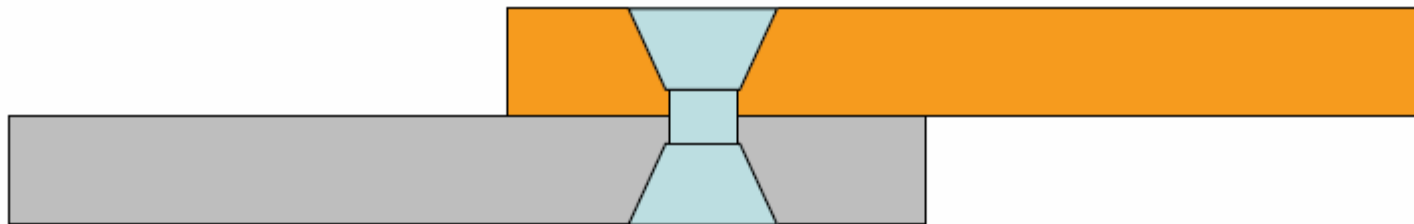
Dr. Laurent D'Alvise
Head of the Virtual Manufacturing Group
Cenaero

How to join metallic and organic components ?

Joining of hybrid structures consisting of metallic and organic components is more complex than joining similar structures. State of the art is the use of a third component like rivets or adhesives to create a connection. These components generate extra costs and require special treatments in the assembly processes. **Friction-Stir-Processing** shall be developed as an alternate joining technology showing durable joints, high robustness and low cost. The process shall be performed by standard robots or manually.

Based on EADS-IW (Germany) works

Overlap joint of dissimilar components by riveting



Pros:

- mechanical and robust method
- common technology

Cons:

- drilling of holes in fibre reinforced materials
- extra weight
- crack initiation
- non-continuous joint

Overlap joint of dissimilar components by adhesive bonding



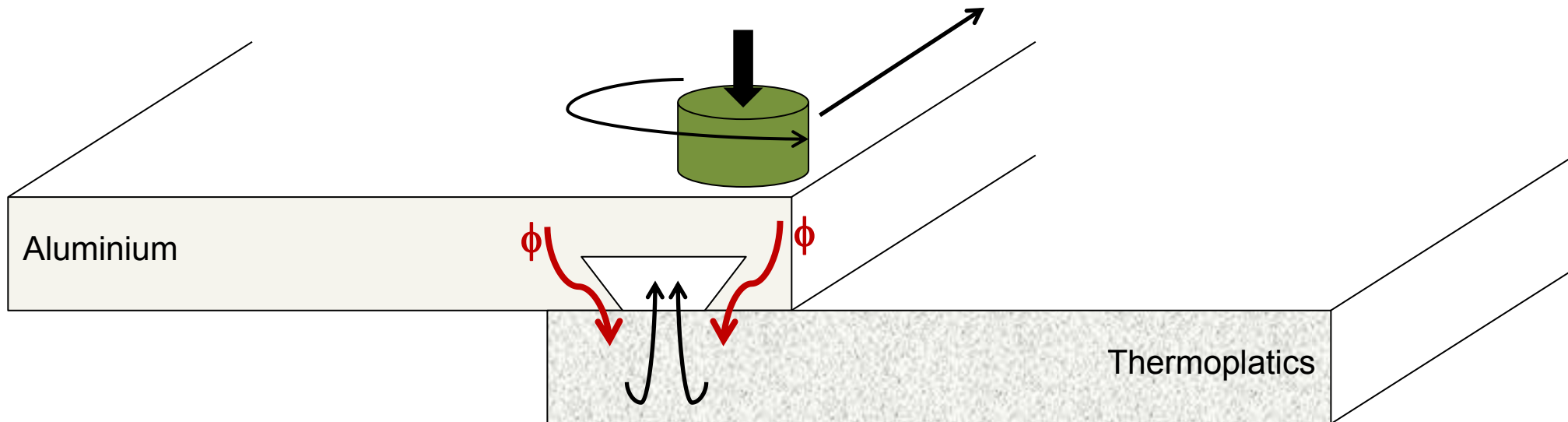
Pros:

- easy manufacturing
- continuous joint

Cons:

- accurate preparation of the surfaces
- strength of the adhesive joint can be far below the expected level
- overlapping area of the joint must be completely penetrated with adhesive
- missing areas lead to reduced strength and risk of corrosion

Overlap joint of dissimilar components by FSP



Principle:

- Friction Stir Processing (rotational speed, pressure, advancing speed)
- Frictional heat at the interface tooling/aluminium
- Thermoplastics melting
- Undercut (groove) fill-in
- Solidification (auto-rivet)

Overlap joint of dissimilar components by FSP

Variants:

- Undercut volume *in* or *out* of the aluminium workpiece
- **Continuous** or **Spot** Friction Stir Processing

Advantages:

- Mechanical bonding without any rivet
- Tight and durable dissimilar joints without using extra adhesives
- Reduce the overlapping length compared to adhesive bonded joints
- Avoid the surface preparation compared to adhesive bonded joints
- Avoid lack of penetrations/wetting caused by missing amounts of adhesives
- No emissions, no scrap and no fumes

- Specialized in providing state-of-the-art expertise in numerical simulations, mostly in manufacturing processes modelling
- Expertise in Friction Stir Welding modelling (coordinator of the FP6 DEEPWELD project)
- Specific team dedicated to Collaborative Project Management
- Sound knowledge in European funding project

- End-users (among SME) in all industrial sectors (aerospace, ground transport, naval transport, energy, medical care, ...)
- Universities / Research Centers with specific expertise in plastics knowledge
- Universities / Research Centers with specific expertise in metallic materials characterization
- Universities / Research Centers with specific expertise in industrial assembly and welding