

A close-up photograph of a metal joint, showing two pieces of metal joined together with a visible weld or seam. The lighting highlights the texture and contours of the metal.

MULTIMATERIALS JOINING

Development and industrialization of joining processes and components for multi-material assemblies

Societal and environmental issues are driving the use of more efficient materials of different types that need to be assembled, hence the need to develop special assembly processes (mechanical or hybrid with welding/bonding).

IRT M2P aims to innovate in the field of joining processes, developing new hybrid systems to push back the industrial limits of new materials use. Assemblies mechanical behavior study and the development of dimensioning models allow to predict the feasibility of joints, their service life and to define the optimum process window.



EXPERTISE & SERVICES

Innovative processes development and associated joining components

Feasibility of multi-material configurations and process windows definition

Process monitoring, data acquisition and analysis

Multi-physics processes simulation: use and development of models, definition of material behaviour constitutive laws

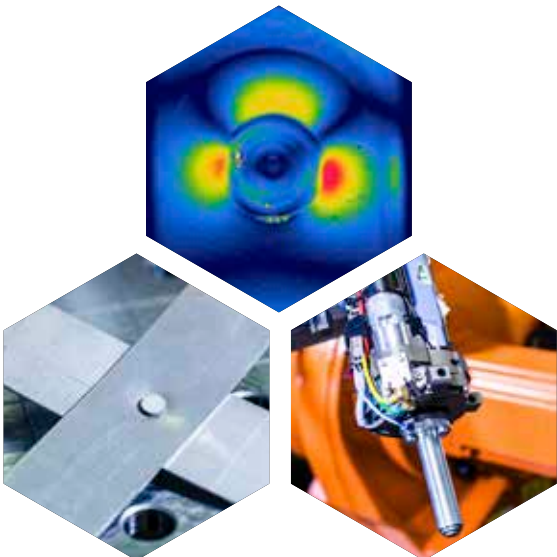
Characterization of assemblies mechanical behavior

Single-point and structure scale behaviour modelization

Development of equivalent models applicable in design offices

Hybrid processes (bonding and welding)

Development and understanding of new assembly processes through investment in specific platforms (joining or characterization equipment)



TECHNOLOGY

High speed nailing

- Without pre-hole
- Joining time: 1s
- Only one side access



Flow drill screwing

- Possible without pre-hole
- Joining time: 1,5 - 3s
- Only one side access
- Removable component (repairable and recyclable)



Clinching

- Stamping connection between a punch and a die
- Joining time: 1s
- Two sides access
- No additional component (lightweighting)
- Watertight (sheet integrity)



Self-piercing riveting

- Rivet penetration by punching of the top sheet
- Joining time: 1s
- Watertight (bottom sheet integrity)
- Two sides access



Self-piercing riveting (solid)

- Solid rivet penetration by punching of the top sheet
- Joining time: 1s
- Two sides access



Materials functionalization

- Resistance welded multi-material assembly enabled by the use of inserts
- Local treatments to fit material characteristics to assembly processes

Fasteners

Available toolbox for prototyping some materials, mass treatment and surface treatment of components

Robotization

Industrial representative conditions and processes modeling by taking into account the mistakes brought by the high cadency and the low stiffness of the robotic arms.

Working at different levels of maturity (single-point on specimen, multi-point, mini-structures, etc.).

Analysis & Characterization

In support of developments: metallography, quasi-static tests, fatigue, crack propagation monitoring by infrared thermography

Further information on our activities www.irt-m2p.fr

EQUIPMENT @M2P

TWO PLATFORMS:

Fixed frame / 6 axis robot and associated tools

NAILING SYSTEM

- Automated pneumatic setting tool with feeding station and process monitoring

SCREWING SYSTEM

- Max. spindle rate 8000 rpm at 15 Nm
- Max. vertical force of 3,6 kN

CLINCHING TONG

- Electrical cylinder 80 kN
- C-frame size 200 mm

RIVETING TONG

- Self piercing rivets
- Solid punch rivets
- Pneumohydraulic cylinder 80 kN
- C-frame size 250 mm

CHARACTERIZATION

- Quasi static testing machine 100 kN
- Fatigue testing machine 100 kN
- Numerical Microscopic analysis
- Hardness testing
- NOXCAM640 calibrated infrared camera

APPLICATIONS

- > Lightweight assemblies for automotive body-in-white
- > Aluminum on high strength steel
- > Hybrid mechanical + welding process development
- > Local softening of high strength steel before assembly
- > Development of an innovative screw
- > Investigations for the aeronautic and other industries

RELATED ACTIVITIES

COMPOSITE MATERIALS

Development of joining components to enable the use of composites in multi-material structures.



HEAT & THERMOCHEMICAL TREATMENT

Performances improvement by optimization of surface and inner properties of fasteners.



About IRT M2P

The Institute of Research and Technology for Materials, Metallurgy & Processes (IRT M2P) is your partner for developing innovative products and processes to accelerate your company's growth.

We bring our expertise, a wide array of state-of-the-art semi-industrial technological platforms and a network of academic labs to the R&D projects we carry out with our more than 120 industrial partners.

Working together

- Multi-partner research projects with private/public co-funding
- Private research studies, tailor-made services
- Small series & prototype production
- Training

Contact us to discover our 9 areas of technological expertise:

- > Advanced Foundry
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- > Surface Treatment & Coatings
- > Mechanical Surface Treatment
- > Heat & Thermochemical Treatment
- > Composite Materials
- > Multimaterials Joining
- > Analysis & Characterization



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