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# INSTITUT de SOUDURE Composite platform

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RESEARCH | TRAINING | INSPECTION | CERTIFICATION  
EXPERTISE | TESTING

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PROVIDING SOLUTIONS  
SINCE 1905

# Summary

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**01** Composite platform presentation

**02** Thermoset activities

**03** Thermoplastic activities

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# Composite Platform

The Composites platform of INSTITUT de SOUDURE is specialized in the processing and assembly of continuous fiber-reinforced composites.



Composite Platform (SAINT AVOLD 57)



**10**  
Employees



**2000m<sup>2</sup>**  
Of laboratory with the R&D center of SAINT-AVOLD (57) fully dedicated to composite materials



**5**  
activities

Composite platform



Thermosets

Thermoplastics

Equipment sales

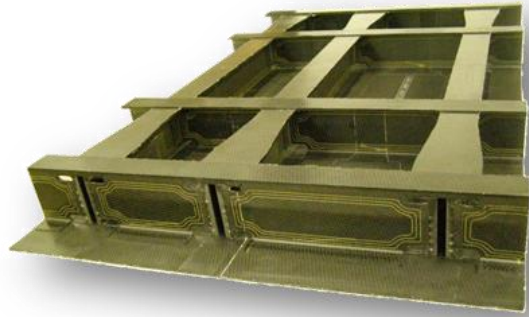
RTM and infusion processes

Audit and expertise

Formation

TP welding

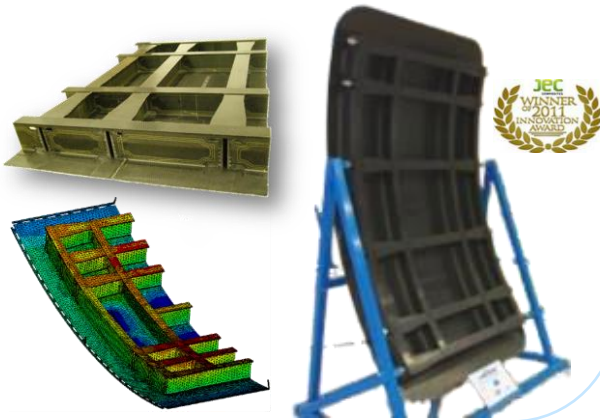
# Thermoset activities



# Thermoset activities

## RTM/INFUSION

- Simulation and study
- Prototyping
- Technology transfer



## AUDIT/EXPERTISE/ FORMATION

- Expertise in materials and identification of causes of failure
- On-site process audit / supervision
- Composites training, training courses on request



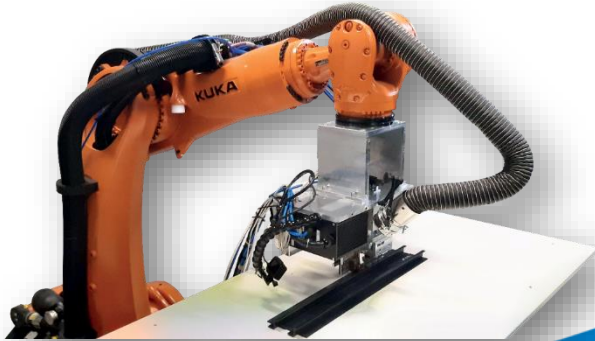
## Equipment sales

- Sale of a permeability bench
- Kx, Ky, Kz measurements



Specimen characterization: non-destructive testing (thermography, US, etc.), mechanical and physico-chemical characterization

# Thermoplastic activities



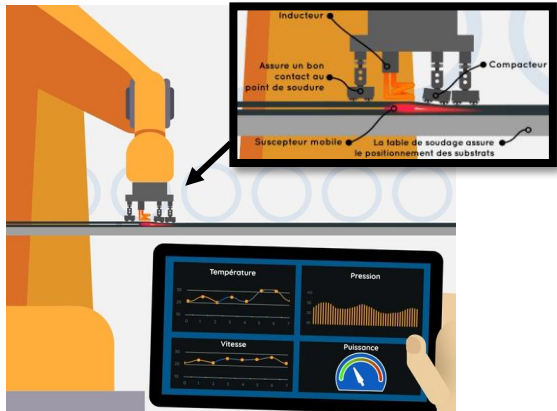


# 03 Thermoplastic activities

## Presentation of ISW technology



- Patented technology; developed jointly with ARKEMA
- **Innovative solution**, based on induction
- **Indirect induction heating**



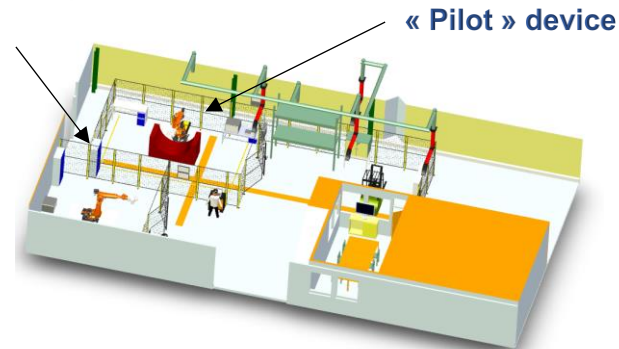
Principle

### ISW in few words :

- Interfaces heating by mobile susceptor.
- Dynamic/continuous welding process.
- Optimized/Functionalized interface layer possible (i.e. Resin ratio, melting Temp, Viscosity,...).
- Continuous process monitoring and control
- Welding of all thermoplastic materials (with or without reinforcement).
- Welding of Glass Fiber reinforced composite possible.
- Low input electrical power vs. Standard Induction Welding



« Laboratory » device



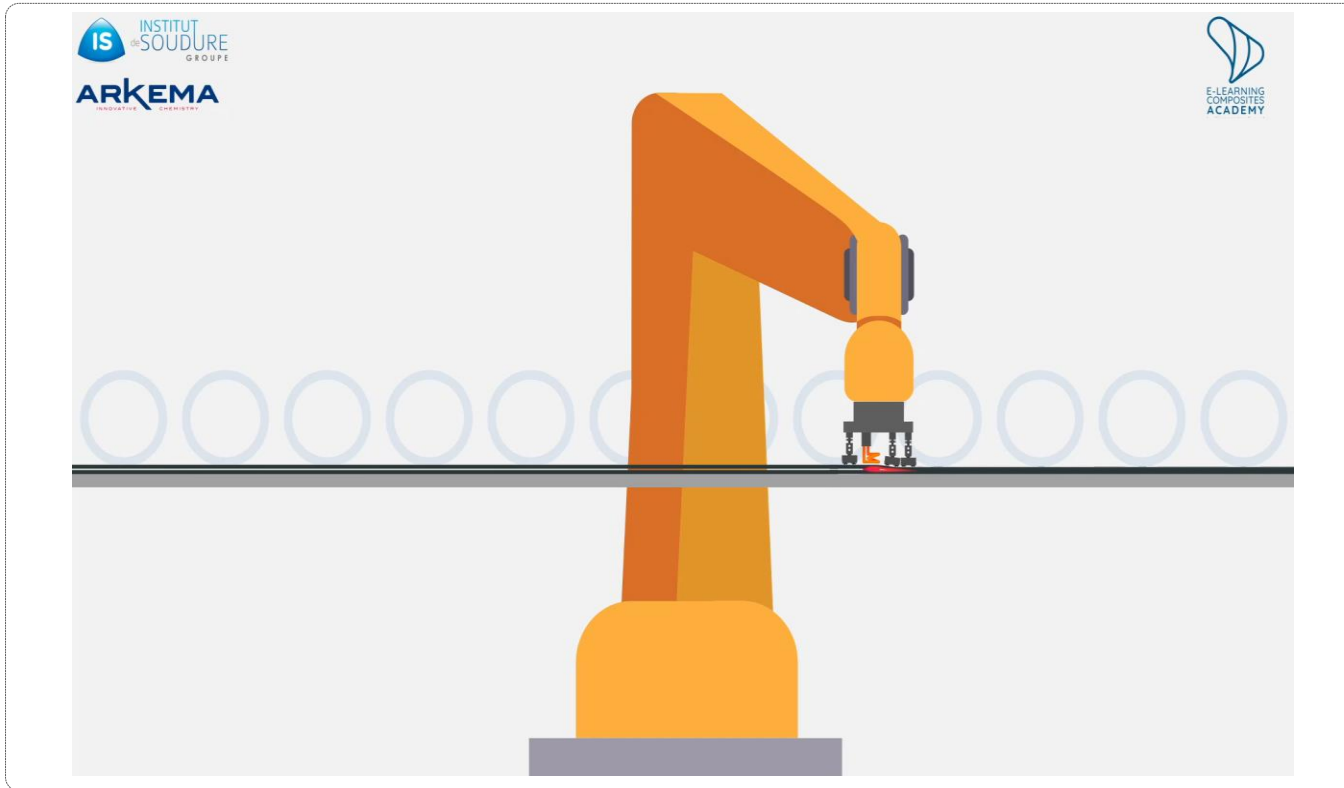
« Pilot » device



**1000m<sup>2</sup>**

Of laboratory dedicated to thermoplastic welding with two welding devices

# What is the ISW technology ?





## 03 Thermoplastic activities

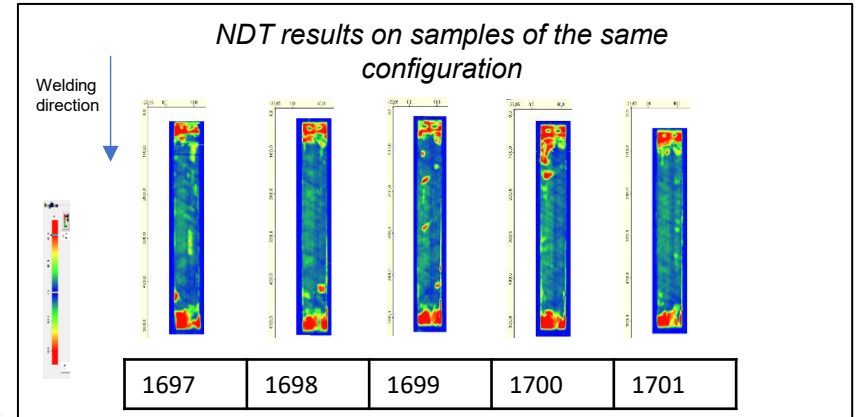
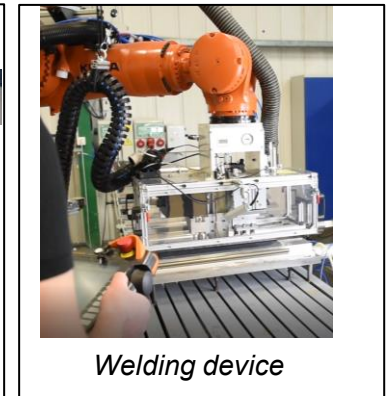
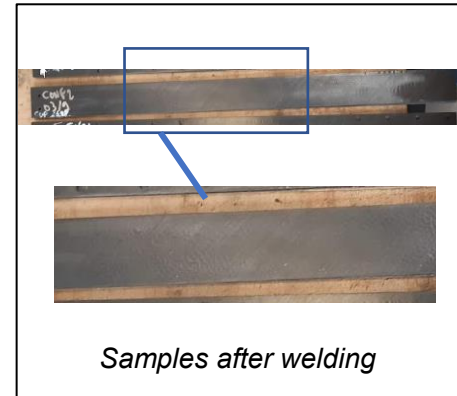
# Welding trials

### Analysis

- Visual inspection
- Non Destructive test (UT) after welding

### Results

- Welding of all the specimen width
- No degradation of the substracts
- Repetability
- NDT methodology to attest the welding quality





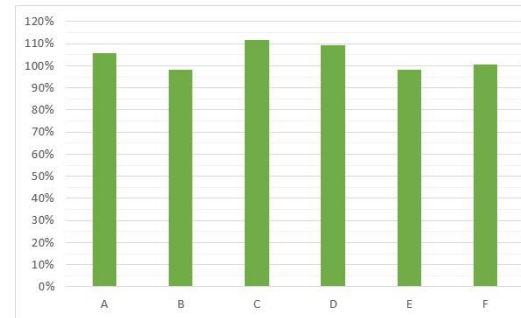
## 03 Thermoplastic activities

# Welding trials



## Welding trials and characterization

- **Analysis**
  - Mechanical characterization by SLS
  - Micrographic observations
- **Results**
  - Above 100% of the mechanical performances of the consolidated reference
  - Repetability



TARGET :  
85% of  
autoclave  
consolidated  
reference

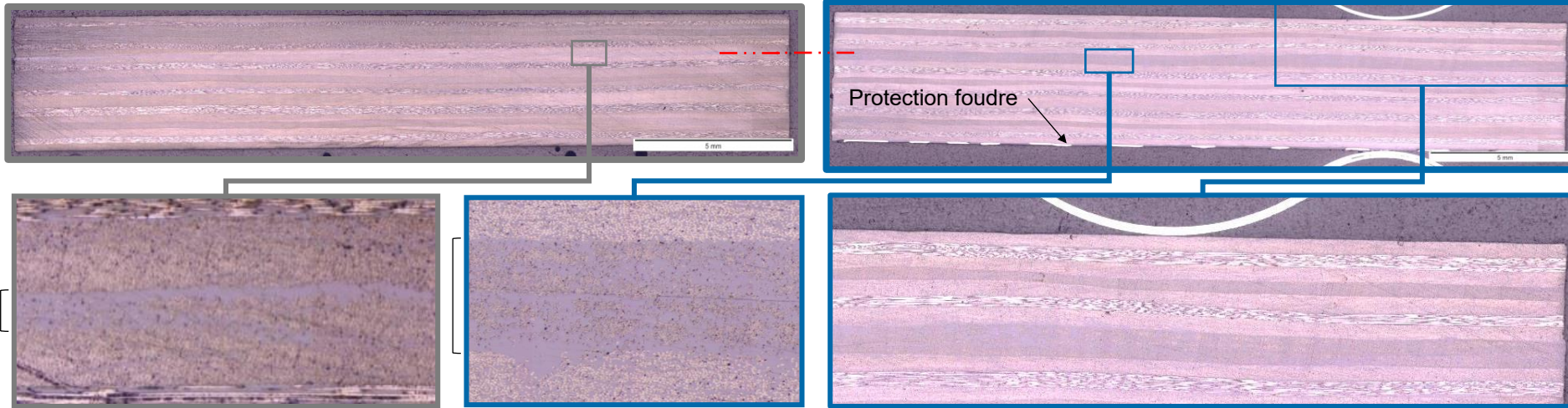
Mechanical results

Average value in SLS: 104%  
Standard deviation: 6%

# Welding trials: micrographic analyses

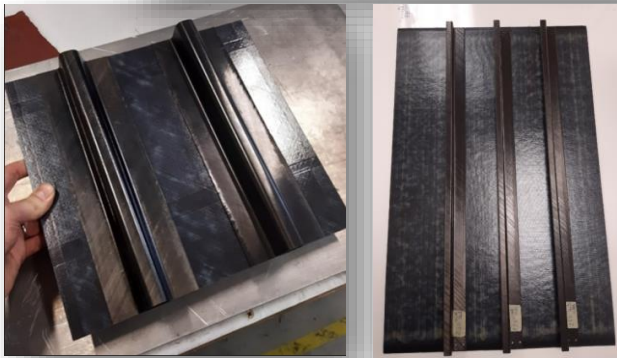
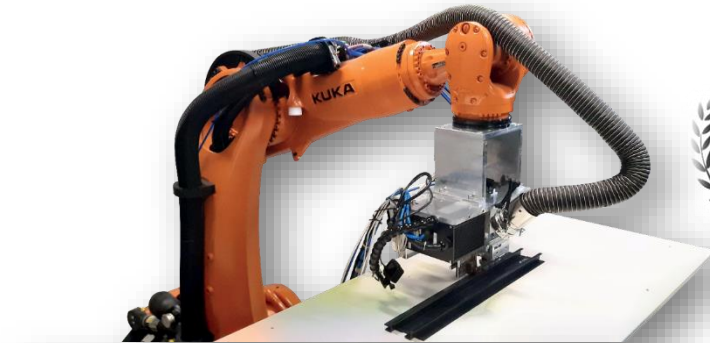
Interface type 2 - OF 260

Interface type 1 - OF 255



- No decompaction
- Good interface quality
- No degradation on the integrated LSP

# Toward Welding of Fuselage Panels: awards an demonstrators



**Demonstrators**  
JEC AWARD 2020

(STELIA AEROSPACE, ARKEMA, HEXCEL, LATECOERE)

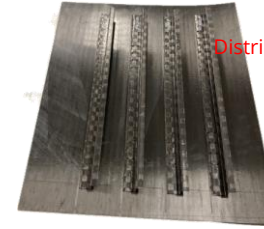


External face

**Welding of Z stiffeners on representative fuselage skin**  
Welding study + demonstrator  
(Airbus Atlantic)

# Toward Welding of Fuselage Panels: awards an demonstrators

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**Welding of Z stiffeners PA11-CF**  
(ARKEMA, HAICOPAS project)

## HAICoPAS Aerospace Demonstrator

made of HexPly® PEKK/AS7 and PEKK/IM7 thermoplastic materials, developed by:

• HAICoPAS consortium partners



• Supported by

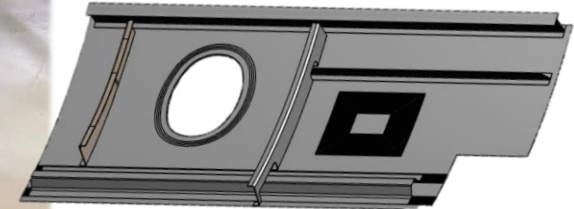
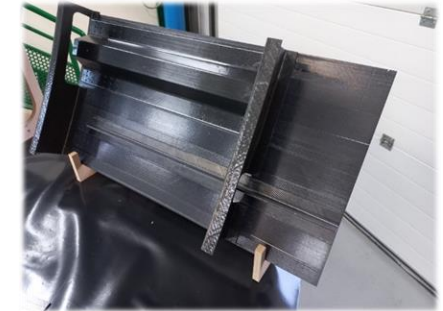
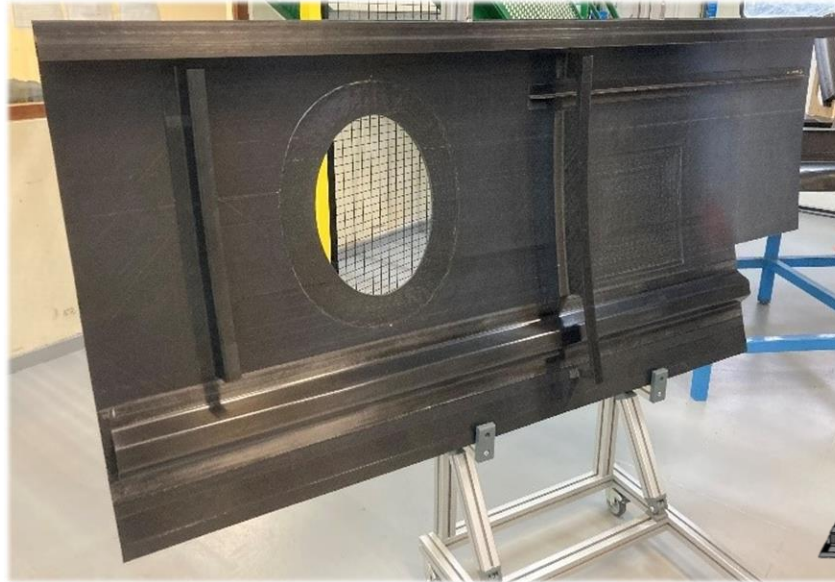


• And supported by the industrial advisory board



• Manufactured by

ATC by CCM Continuous Compression Molding process, for the omega stringer  
Hutchinson by Pullforming process, for I and T stiffeners  
Daher by press stamping process, for the Z frame  
Hexcel by OoA process, for the fuselage skin and the C frame  
Institut de Soudure and Arkema by ISW welding process for the omega to skin assembly



## Welding of $\Omega$ stiffeners (PEKK) on Aerospace demonstrator

(HEXCEL-ARKEMA, HAICOPAS project)

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