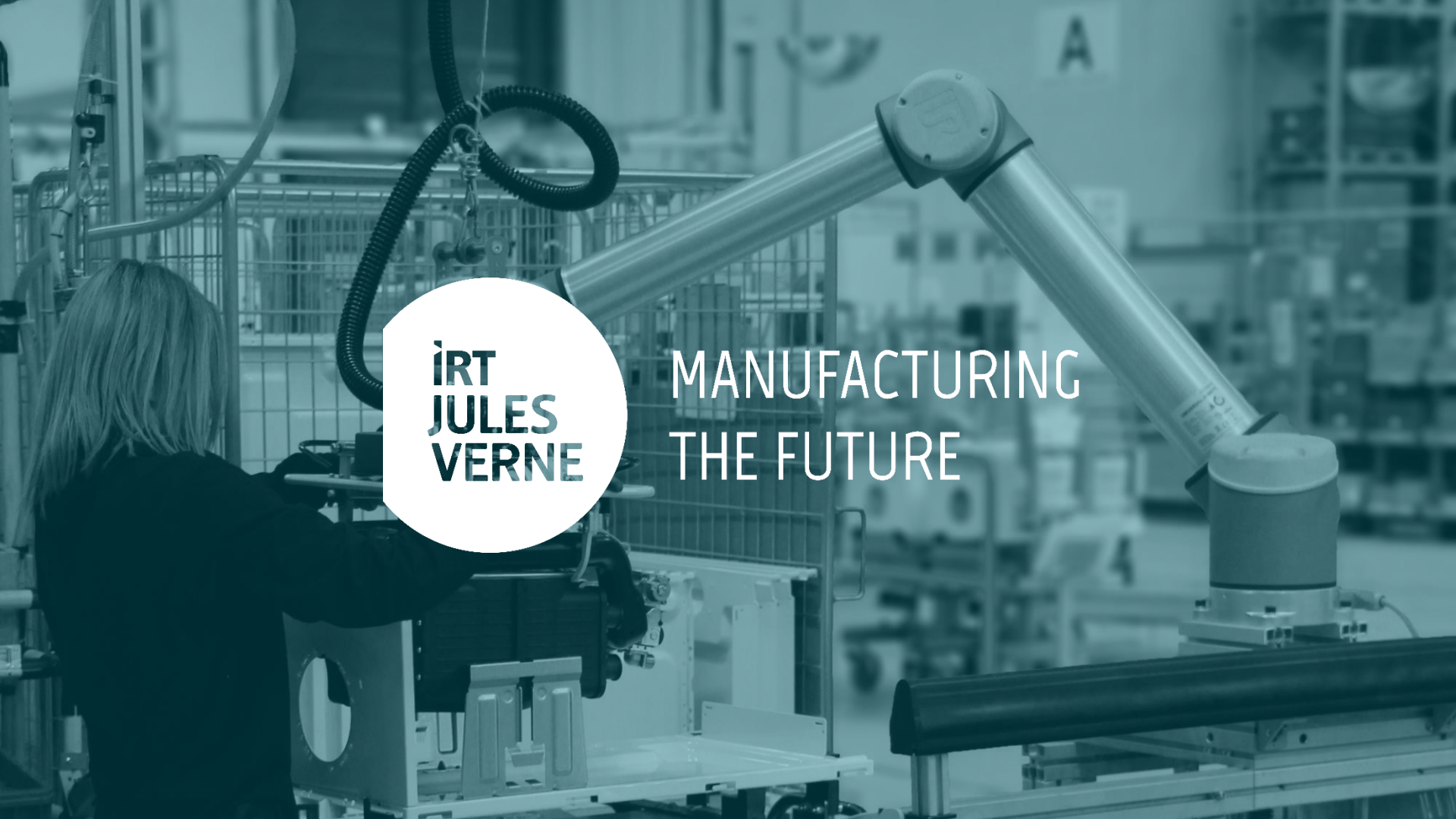

IRT
JULES
VERNE
MANUFACTURING
THE FUTURE

JULES VERNE INSTITUTE OVERVIEW

OVERVIEW OF IRT JULES VERNE'S OFFER

3 KINDS OF TECHNOLOGICAL RESEARCH

- R&T collaborative project
- R&T European project
- R&T Contract research

2 KINDS OF TECHNOLOGY TRANSFER

- Sale of patents and licences
- Pre-industrialisation project

JULES VERNE INSTITUTE, MEMBER OF NANTES UNIVERSITÉ

- New public higher education and research institution

Nantes Université

UNIVERSITÉ DE NANTES

CENTRALE NANTES

ensa nantes

Beaux-Arts Nantes Saint-Nazaire

Instituts thématiques Inserm
Institut national de la santé et de la recherche médicale

CENTRE HOSPITALIER UNIVERSITAIRE DE NANTES

IRT JULES VERNE

MISSION

8 Technological Research Institutes — IRT & ITE — 7 Energy Transition Institutes

FRENCH INSTITUTES OF TECHNOLOGY

Focus on Manufacturing

OUR VOCATION
To reinforce the competitiveness of the French industry

OUR MISSION
To accelerate innovation and promote technology transfer to the factories

OUR CORE BUSINESS
Collaborative research

FRANCE 2030

163M€ from the Programme of Investments for the Future

FIT : KEY FIGURES

- **15** institutes for sovereign, sustainable and resilient innovations
- Over **643** industrial partners, including **454** technological SMEs and **255** academic partners
- **72** European projects
- **199** patents
- **972** publications
- **124** technological platforms

FIT : A KEY INTERLOCUTOR

OF THE STATE AND MINISTRIES

Support for R&D and innovation policies

Present in 20 out of 28 "PIA 4" acceleration strategies (12.5M€):

- Decarbonated hydrogen
- Decarbonation of industry
- Digitalization and decarbonisation of mobility
- Robotics and human/machine interface
- Advanced technologies for energy systems
- Bio-sourced products
- Recyclability, recycling and reincorporation
- Electric vehicle battery
- National IA Strategy
- Biotherapy and bioproduction
- Cloud and making the digital world more environmentally friendly
- Sustainable city and innovative building

...

FOR THE INDUSTRIAL SECTORS: SECTOR STRATEGIC COMMITTEE (CSF)

Support for R&D and innovation sectors

Present in 10 out of 18 comittees:

- Aeronautics
- Automotive industry
- Chemistry and materials
- Sea Industries
- Electronics
- Digital infrastructure
- Mining and metallurgy
- Health
- Security
- New energy systems

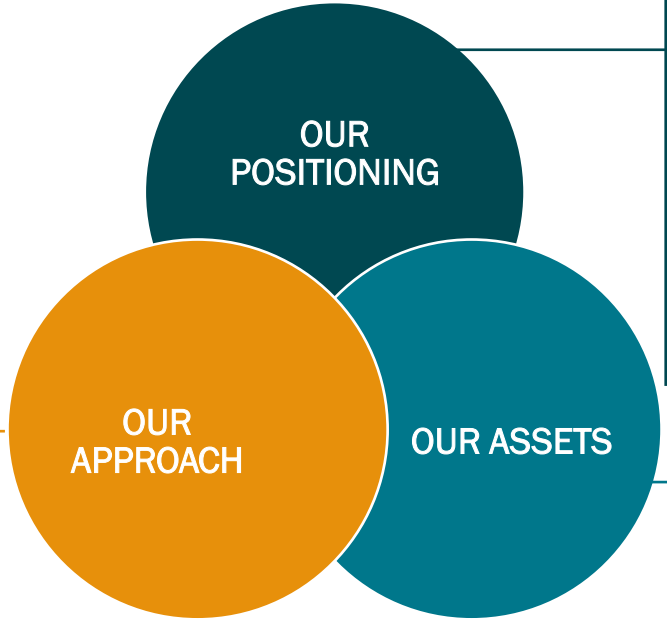
A SUSTAINABLE MANUFACTURING

EMC2's **Manifesto for a sustainable industry**

A VISION OF MANUFACTURING AT THE SERVICE OF A SUSTAINABLE INDUSTRY

- **Sober and environmentally friendly** manufacturing
- Manufacturing that puts **people** at the heart of its concerns
- **Efficient, flexible and intelligent** manufacturing
- **Collaborative manufacturing**, within the company and between companies
- Manufacturing that takes into account the stakes **of sovereignty**

STRATEGIC POSITIONING ON MANUFACTURING



- SOLUTIONS ORIENTED
- SYNERGY BETWEEN MANUFACTURERS AND INTEGRATORS
- CROSS-FERTILISATION BETWEEN SECTORS

3 STRATEGIC DOMAINS

- INTEGRATED PRODUCT/PROCESS DESIGN
- INNOVATIVE PROCESSES
- SMART FLEXIBLE SYSTEMS

4 KEY SECTORS

- INDUSTRIAL COMPETENCES
- INDUSTRIAL SCALE PLATFORMS
- AGILITY
- FINANCIAL LEVERS

R&D THEMATICS

FORMING AND PREFORMING PROCESSES	• Composites preforming & forming technologies • Metal forming
ASSEMBLY	• Multimaterial joining technologies • Structure and systems assembly
ADDITIVE MANUFACTURING PROCESSES	• High deposition rate metal additive manufacturing • High performance composites additive manufacturing
MOBILITY IN INDUSTRIAL ENVIRONMENT	• Smart and autonomous mobility of manufacturing tools and systems in industrial environments or structures
MANUFACTURING FLEXIBILITY	• Flexible and intelligent process automation • Quick reconfigurability of manufacturing systems

NATIONAL INTER-IRT PROGRAMS

FRENCH INSTITUTES OF TECHNOLOGY

Thermoplastics

	Materials	Semi-product	Processes	Assembly
St-Exupéry	x	x		
Jules Verne		x	x	x
M2P	x			

Additive Manufacturing

	Design	Raw material	Materials	Processes	Post-treatment
St-Exupéry			x		
Jules Verne				x	
M2P		x			x
SystemX	x				

TECHNOLOGY TRANSFER PROCESS

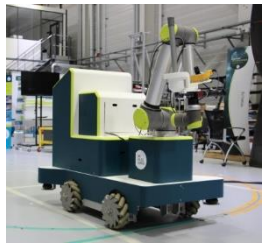
INDUSTRIAL NEEDS

INDUSTRIAL RESEARCH PROJECT
- Involvement of integrators
- Integration of use cases in the project
- Techno economic assessment

TRANSFER TO THE FACTORY

TECHNOLOGY MATURATION

SERVICES PRODUCTS



Exploitt Method inspired ©

MAJOR INDUSTRIAL MEMBERS

PARTNERSHIPS

COMPANIES

AIRBUS · DAHER · LATÉCOÈRE · LIEBHERR · aperam · RAFAUT Group · SAFRAN · STELIA · ARKEMA · FLYING WHALES · Constellium · HUTCHINSON · DUQUEINE GROUP · TESTIA · ARESIA

FORVIA faurecia · PSA GROUPE · RENAULT · GLASS FOR FUTURE Nippon Electric Glass

NAVAL GROUP · CHANTIERS DE L'ATLANTIQUE · BUREAU VERITAS · PREDICT by SNEF

GE Renewable Energy · EDF · ENGIE · LM WIND POWER a GE Renewable Energy business · OWENS CORNING · SUEZ

SHAPERS · DECATHLON · EUROPE TECHNOLOGIES · fives · MERSEN · PRODWAYS

UNIVERSITIES & RESEARCH CENTRES

canoe · ceatech · cetim · cnrs · CENTRALE NANTES · ARTS ET MÉTIERS ParisTech · icam · IMT Atlantique Bretagne-Pays de la Loire École Mines-Télécom · Inria · SAINT EXUPÉRY · IREPA LASER INSTITUT CARNOT MICA · Université Gustave Eiffel · Nantes Université · IRT M2P

SMALL & MEDIUM ENTERPRISES

ACB An Aries Alliance Company · ALBATROS · AXIOME ROBOTIC SOLUTIONS · SENSE in ENHANCE YOUR MATERIALS · CHOLETAISE MOULES OUTILLAGES · COFD · COUSIN · DELTA NEO · cero · LOIRETECH · LANCELIN · PINETTE PEI ENGINEERING & MACHINERY · TERAKALIS · EMC2 · PCMI AUTOMATISATION & COMPOSITE · Sicomin

SMEs AT THE HEART OF IRT JULES VERNE

A strong and historic bond with

The European manufacturing technology competitiveness cluster

EMC2

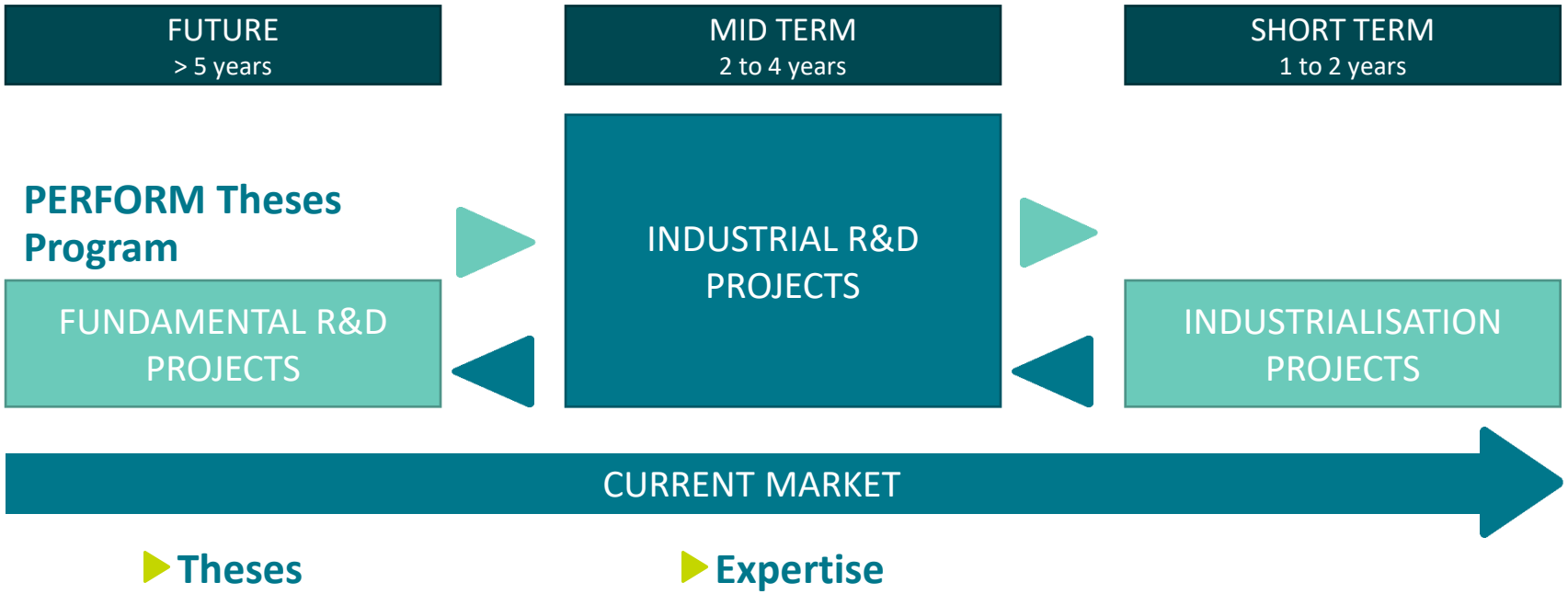
- **R&D intensive SMEs**

ALBATROS GIE

- **First innovative SMEs**

Accès PME

THE PLACE OF ACADEMIC PARTNERS AT IRT JULES VERNE



KEY FIGURES (SINCE 2012)

PROJECT PORTFOLIO

112 R&D projects

249 M€

CONTRACT RESEARCH

150 Contract researches

5 M€

60 Customers

EUROPEAN ACTIVITIES

19 EU projects

7,9 M€

STRONGER TOGETHER

131 Employees

43 Industrial members

25 SME members

16 Academic members

REVENUES AND ASSETS

25 M€ Annual revenue

19 M€ Equipment investment

77 Patents

JULES VERNE INSTITUTE EXECUTIVE BOARD

8 INDUSTRIAL PARTNERS

AIRBUS, NAVAL GROUP, FORVIA faurecia, ALBATROS, DAHER, CHANTIERS DE L'ATLANTIQUE, GE, EMC2

4 ACADEMIC PARTNERS

cnrs, Nantes Université, CENTRALE NANTES, cetim

1 REPRESENTATIVE OF JV RESEARCHERS

IRT JULES VERNE

François PAYNOT
President, IRT Jules Verne
CEO, Airbus Nantes

NAUTILUS

The new Jules Verne Institute, building a place for collaborative innovation dedicated to manufacturing

Located 1 Mail des 20 000 Lieues
44340 Bouguenais, France

AT THE HEART OF A MAJOR INNOVATIVE CAMPUS

In 2030 >> 15000 Employments /

1500 Researchers / 3000 Students

SOME OF OUR R&D PROJECTS

WELDED ASSEMBLY SOLUTION FOR FLAT PANEL

ASPEN PROJECT

OBJECTIVES

- To develop or to adapt the two components necessary for the automation of the realization of a single weld cord on large parts of large dimension.

INDUSTRIAL IMPACTS

- Controlling the weight of the cobot
- Reduction of production cycles
- Reduction of the arduousness of welding operations

PARTNERS

IRT Jules Verne, Les Chantiers de l'Atlantique, CETIM, CNRS (LS2N), Europe Technologies, Naval Group

ASPEN PROJECT

ZERO WASTE BLADE RESEARCH PROJECT

ZEBRA PROJECT

OBJECTIVES

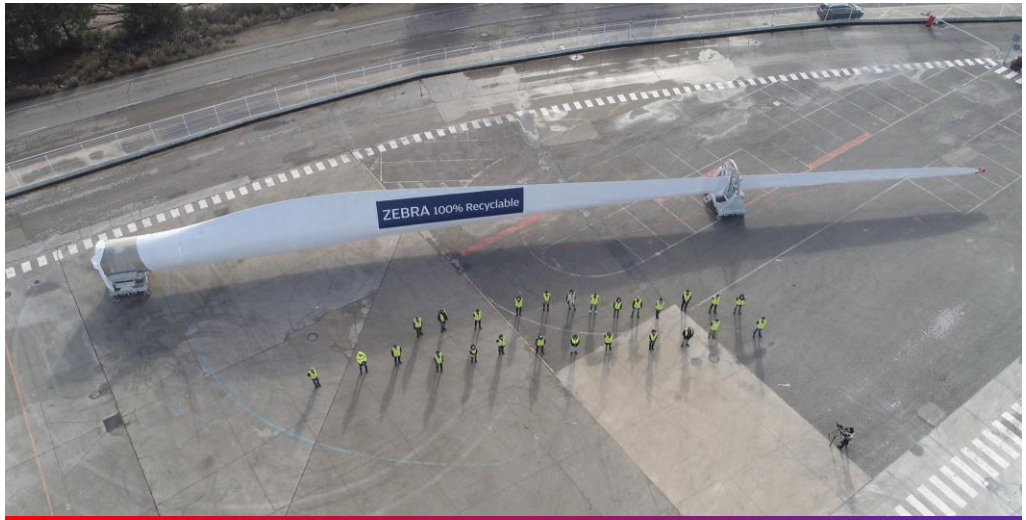
- To demonstrate the technical-economic and environmental feasibility of thermoplastic wind turbine blades, in an eco-design approach to facilitate recycling

INDUSTRIAL IMPACTS

- Reduction of energy consumption
- Reduction of production waste

PARTNERS

IRT Jules Verne, Arkema, CANOE, Engie, LM Wind Power, Owens Corning, SUEZ.



ZEBRA PROJECT

FROM THE IMPREGNATED FIBER TO THE STRUCTURE

FIBIAS / FIBIAS ++ PROJECT

OBJECTIVES

- To develop technologies for the implementation of thermoplastic composites for large series automotive applications. These technologies must allow the switch from dry reinforcing fiber to the shaped structure, net shape and ready to be integrated into a vehicle.

INDUSTRIAL IMPACTS

- 25% reduction in the cost of TP composite parts.
- Development of organosheets, GMT, sandwiches from recycled materials.
- Reducing the CO2 footprint.

PARTNERS

IRT Jules Verne, Faurecia (FORVIA), Choletaise Moules Outillages (CMO), IMT Nord-Europe, PSA Automobiles.

FIBIAS PROJECT

HANDLING & POSITIONING OF HEAVY PARTS FOR ASSEMBLY

HAPPY / HAPPY 2 PROJECT

OBJECTIVES

- To develop and evaluate a concept of aerostructure assembly line which is flexible regarding product variant and production rate evolution.
- The system consists in positioners mounted on Automated Guided Vehicles and controlled by a closed loop system based on local measurements provided by external sensors.

INDUSTRIAL IMPACTS

- Flexibility to product variant and production rates
- Non-recurring cost reduction
- Enhanced reconfigurability of the workshop

PARTNERS

IRT Jules Verne, Airbus, Airbus Atlantic, Acsystème, CNRS (LS2N), IMT Atlantique, INRIA, Naval Group.

HAPPY PROJECT

STUDY OF THE COMPRESSION/STAMPING PROCESS – OVERCOMING AND ITS SIMULATION

COSMOS PROJECT

► OBJECTIVES

- To develop die-casting process for high performance materials (C/PEKK)
- To develop a tool concept compatible with the material, processes and type of parts
- To develop a simulation tool to support process developments

► INDUSTRIAL IMPACTS

- Reduce production costs by integrating features
- Improved product performance (interface quality)
- Development of the French thermoplastic industry (GIFAS TP)

► PARTNERS

IRT Jules Verne, Arkema, Arrk Shapers, CEA, Cogit Composites, Daher, Hutchinson, Latécoère, Liebherr, Porcher, Clayens NP Group

COSMOS PROJECT

FLEXIBLE AND AUTOMATED CND PLATFORM FOR MANUFACTURING PROCESSES

FANTOM PROJECT

OBJECTIVES

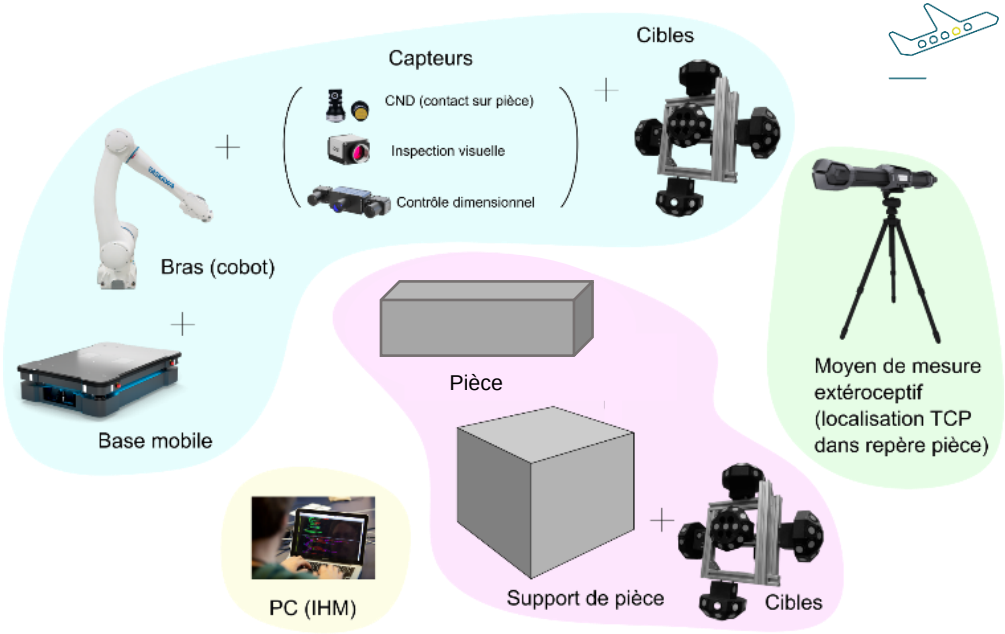
- To overcome the lack of flexibility of the usual means of control by developing a robotic control system for structures of large dimensions or complex geometry

INDUSTRIAL IMPACTS

- Automated CND (Material Health, Visual Inspection, Geometric Inspection) controls in an agile and mobile way
- Analysis facilitated by combining data from different types of controls and reliable diagnosis

PARTNERS

- IRT Jules Verne, Airbus, Axiome, CEA TECH, Daher Aerospace, Diota, Testia



FANTOM PROJECT

STATIC WELDING OF THERMOPLASTIC COMPOSITES FOR AERONAUTICS

SPECTRA PROJECT

OBJECTIVES

- To meet the assembly needs of high-performance thermoplastic composites, by increasing the maturity of the conduction static welding process.

INDUSTRIAL IMPACTS

- Development of numerical modelling tools for the assembly process
- Development of powerful, compact and innovative tools
- Development of calibration solutions for welded assembly sets and functionalization of frames

PARTNERS

Airbus, Arkema, Cero, Hutchinson, IRT Jules Verne, Pinette Emidecau Industries, Safran, Stelia Aerospace

SPECTRA PROJECT

ISOLATION SOLUTIONS FOR ON-BOARD LIQUID HYDROGEN STORAGE

NOMADE PROJECT

OBJECTIVES

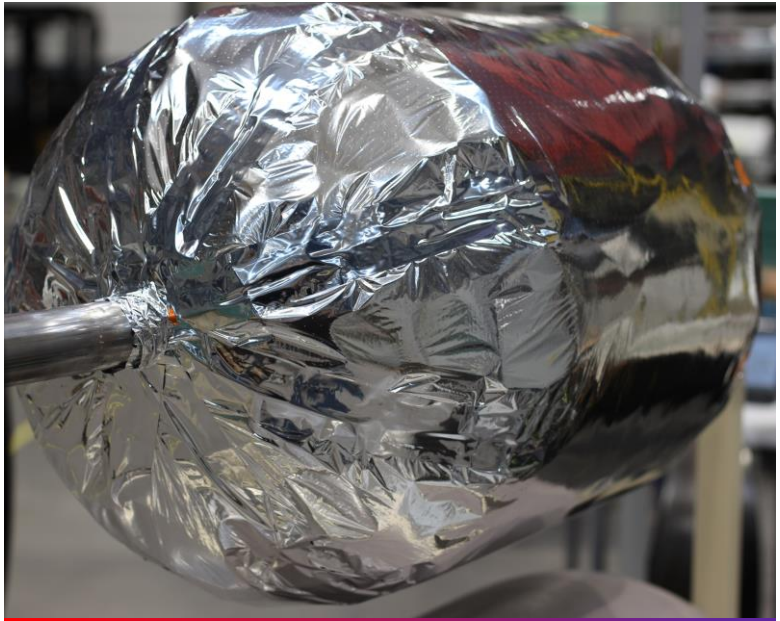
- Develop insulation solutions and associated processes to optimize and guarantee the thermal and gravimetric performance of liquid hydrogen tanks while considering the industrial and economic feasibility of the solutions chosen.

IMPACTS

- Meeting the challenge of clean mobility for tomorrow's heavy transport
- Proposal of a manufacturing range consistent with industrial production cycles

PARTNERS

IRT JULES VERNE, AIRBUS, APERAM, ARESIA, DAHER, FAURECIA (a FORVIA Group company), FIVES, FLYING WHALES, NAVAL GROUP, CEA, ECOLE CENTRALE NANTES (LHEEA) and IRT SAINT EXUPERY



NOMADE PROJECT

Monitoring of Composites by infusion for naval activity

MONOCLE PROJECT

OBJECTIVES

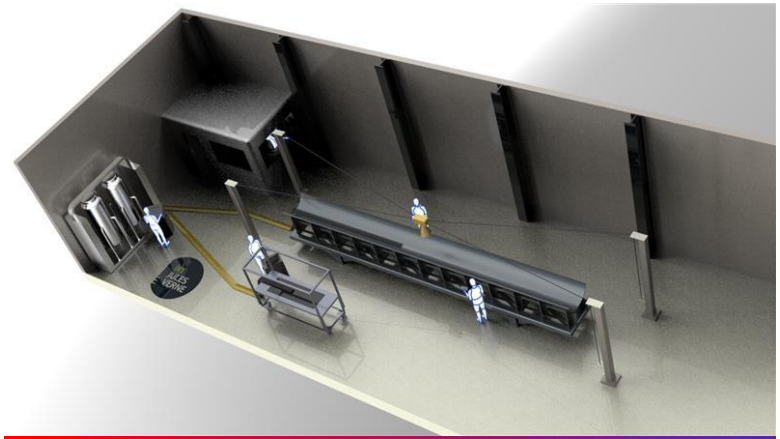
- Establish a methodology for a first-time compliant, single or quasi-single thick, large-dimension composite part infusion process.
- Detect anomalies in real time.
- Develop a decision support tool for the pilot operator of the infusion process.
- Transfer results to Naval Group workshop

IMPACTS

- Reduction of production costs.
- Reduction of the environmental footprint.

PARTNERS

IRT JULES VERNE, Naval Group, Bureau Veritas Marine & Offshore, PCMI, PREDICT Groupe SNEF, SICOMIN.



MONOCLE PROJECT

IRT JULES VERNE

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