A Mutualised Research Centre for Advanced Manufacturing
Jules Verne Manufacturing Valley: French initiative for an open innovation ecosystem devoted to advanced manufacturing

- A technological cluster => 300 members
- A research center => 100 researchers
- Technological platforms => 60 000 m²
- A FabLab => 80 makers
A Technological Research Centre in the field of Manufacturing

<table>
<thead>
<tr>
<th>3 key programs</th>
<th>4 strategic sectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTEGRATED PRODUCT/PROCESS DESIGN</td>
<td>AERONAUTICS</td>
</tr>
<tr>
<td>Structure modelling and simulation – Design and control of structure in severe environment – Modelling and simulation of processes</td>
<td></td>
</tr>
<tr>
<td>INNOVATIVE PROCESSES</td>
<td>AUTOMOTIVE</td>
</tr>
<tr>
<td>Metallic and Composite production processes - Assembly processes - Functionalized tools - Process monitoring – Recycling</td>
<td></td>
</tr>
<tr>
<td>ADAPTIVE AND SMART MANUFACTURING SYSTEMS</td>
<td>SHIPBUILDING</td>
</tr>
<tr>
<td>Advanced robotics for industrial processes – Industrial service cobotics – Virtual and Augmented reality – Production management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ENERGY</td>
</tr>
</tbody>
</table>

4 technological platforms

- Composites
  - Composite parts/structures manufacturing
- Ocean
  - Metallic parts/structures manufacturing
- Acoustic
  - NDTs - Monitoring
- Smart Factory
  - Pilot production lines
Technological Research Centre in the field of Manufacturing

Driving some R&D projects through a PPP with Industrials Members and Academics

20 M€ operational budget
75+ engineers and researchers
Deep cooperation with leading French universities and research structures
# Technological road map

## 12 Emerging technologies

<table>
<thead>
<tr>
<th>Emerging Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional materials</td>
</tr>
<tr>
<td>Metal, alloys, and superalloys</td>
</tr>
<tr>
<td>Digital simulation of assembly processes</td>
</tr>
<tr>
<td>Failsafe engineering</td>
</tr>
<tr>
<td>Virtual reality for conception, production and training</td>
</tr>
<tr>
<td>Industrial robots</td>
</tr>
<tr>
<td>Self-adaptive systems in production</td>
</tr>
<tr>
<td>Diagnosis tools for predictive maintenance / telemaintenance / telesurveillance</td>
</tr>
<tr>
<td>Life cycle mastery</td>
</tr>
<tr>
<td>Energy consumption control</td>
</tr>
<tr>
<td>Industrialization of big structures (in particular through Factory of the Future)</td>
</tr>
<tr>
<td>Advanced technologies of production and industrialization for energy production, storage and recovery.</td>
</tr>
</tbody>
</table>
# Technological road map

## 12 Technologies of Excellence

<table>
<thead>
<tr>
<th>Technologies of excellence</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermoplastic composites</td>
<td></td>
</tr>
<tr>
<td>Direct production of metallic and polymer items</td>
<td></td>
</tr>
<tr>
<td>Digital simulation of production processes and life cycle stages</td>
<td></td>
</tr>
<tr>
<td>Advanced welding processes</td>
<td></td>
</tr>
<tr>
<td>Multi-material assembly processes</td>
<td></td>
</tr>
<tr>
<td>Processes for thermoset composites application</td>
<td></td>
</tr>
<tr>
<td>Processes for thermoplastic composites application</td>
<td></td>
</tr>
<tr>
<td>Nondestructive testing and structural health assessment</td>
<td></td>
</tr>
<tr>
<td>Fluid-structures interaction</td>
<td></td>
</tr>
<tr>
<td>Durability of materials and structures</td>
<td></td>
</tr>
<tr>
<td>Clean processes for surface preparation and finishing</td>
<td></td>
</tr>
<tr>
<td>Acoustics and vibrations</td>
<td></td>
</tr>
</tbody>
</table>
The Results: 44 R&D projects launched since mid-2012

- 44 projects
  - At least 2 industrials members

- 51 M€
  - Budget

- 8 M€
  - Mutualized Equipments

- 19% Shipbuilding /MRE
- 35% Aeronautics
- 20% Cross Sectors
- 26% Automotive
With dedicated mutualized facilities

ROBOFIN
Industrial demonstrator to develop robotic solutions for finishing operations (trimming, drilling and surface preparation) for composite and metal structures elements.

Robot Kuka KR 500 + rail 18 meters – in place June 2013

CELLULE HF
Production Cell for metal parts thermoforming. Titanium and Aluminium alloys.

Press superplastic forming (SPF) and hot forming (HF) - June 2014
SPF 1000 – FCC 500
Temperature 950 °C
Heating platens 2500 x 1500 mm

NATIONAL PILOTE COMPOSITE HIGH-CADENCE LINE
Pilote line for research on composite parts manufacturing and multi-materials ranging from fiber to finished product to achieve the targets: cost <-> weight <-> quality for automotive Industry

Modules IRT : fiber projection and Fluid RTM – end 2014
Partnership with CETIM
<table>
<thead>
<tr>
<th><strong>HYSMAR</strong></th>
<th>Hydrodynamics of large maritime Structures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td>To develop digital simulation capacities <strong>to design and to optimize the conception of offshore structures for Marine Renewable Energies</strong> (Windmills – floating or grounded – Tidal turbines, Wave turbines...)</td>
</tr>
<tr>
<td><strong>Industrial Partners</strong></td>
<td>IRT JV, ALSTOM, BUREAU VERITAS, DCNS, HYDROCEAN, STX</td>
</tr>
<tr>
<td><strong>Duration / Budget</strong></td>
<td>3 years / 1,436 M€</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>CHARMAN</strong></th>
<th>Autonomous multifunction robot for shipbuilding applications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td>Development of an <strong>autonomous</strong> multi-function <strong>trolley</strong> which would allow to free ship manufacturers from costly means of access for <strong>welding operations</strong>  → Demonstration on industrial prototype</td>
</tr>
<tr>
<td><strong>Industrial Partners</strong></td>
<td>IRT JV, STX, DCNS, SERVISOUD, BUREAU VERITAS</td>
</tr>
<tr>
<td><strong>Duration / Budget</strong></td>
<td>2 years / 728 K€</td>
</tr>
</tbody>
</table>
Résoudre la problématique liée à la nécessité d’installer un nombre croissant d’antennes de communication dans des environnements restreints sur des véhicules maritimes: encombrement, gênes physiques, maîtrise des diagrammes de rayonnement, compatibilité électromagnétique. Mise en œuvre de solutions innovantes au niveau des matériaux, des concepts et des outils de modélisation.
Ce projet de grands paquebots de destination vise principalement à réduire les émissions atmosphériques des nouveaux paquebots de grandes tailles de : moins 10% de CO2 ; et de moins de 97% de SOX. Par ailleurs, les innovations sur les procédés de conception et de réalisation (via la réalité virtuelle et la réalité augmentée) permettront d’accroître la compétitivité de la filière navale française.
Shipbuilding and MRE projects’ examples

HYPERWIND
SURVEILLANCE GLOBALE DU PARC ÉOLIEN

- Consiste à développer un système de surveillance globale pour turbines d’éoliennes Offshore et On Shore.

PROJET EN COURS
Début du projet
Financement État FUI 16 - (2013)
- 582 000 euros
Montant du projet
- 3,63 M d’euros
Consortium
- Netwind, Kéops automation, Airbus défense and space SAS, Armines (École des Mines), Météodyn, Université de Nantes
Territoires
- Pays de Loire - Ile de France
ORCA
DÉMONSTRATEUR D’HYDROLIENNE À ÉCHELLE 1 À PAIMPOL BRÉHAT

- Réalisation d’hydroliennes de grande puissance. A terme proposer des fermes hydroliennes d’une puissance supérieure à 100 MW.
Shipbuilding and MRE projects’ examples

PH4S

Solution de production d’électricité par combinaison d’énergies marines renouvelables : pilote hybride de production d’énergie à partir des quatre sources EMR : vent, houle, courant et soleil.

PROJET EN COURS

Date de labellisation
► Décembre 2013

Budget*
► 1 011 K d’euros

Consortium
► Geps techno, Mecasoud, STX France solutions, Icam, Ifremer

Territoires
► Saint Nazaire, Brest, Carquefou
Technocampus Ocean, a mutualized technological platform dedicated to Shipbuilding and MRE
16,000 m² - Opening July 2015
A Technological Road Map in accordance with global shipbuilding /MRE sector

3 key programs

INTEGRATED PRODUCT/PROCESS DESIGN
Numerical Basin **to reduce the cost** of Basin Trials and optimize Life Cycle Cost

INNOVATIVE PROCESSES
New Welding and Assembling Processes **to reduce weight**

ADAPTIVE AND SMART MANUFACTURING SYSTEMS
Robots, Cobots and Virtual reality **to prepare the Factory of the Future**

H2020 – Calls:
- ICT
- Mobility for Growth
- Factory of the Future
IRT Jules Verne, active on networking

- **Horizon 2020 through Waterborne Assets**
  - Member of WATERBORNE TP
  - Member of the PPP Vessel of the Future, involved in several technical arena which in perfect accordance with IRT Jules Verne Technological Road Map:
    - TA1: Energy Efficiency
    - TA2: Hull/Water interactions
    - TA4: Material Design and products
  - Member of Blue Growth WG to support the MRE thematics

- **Other actions towards Horizon 2020**
  - French National Contact Point in NCP1 Program
  - Member of EFFRA, EARPA, EU Robotics,
  - Several EU projects submit (NMP / ICT)
  - KIC
IRT Jules Verne, active on networking

- **Other International cooperation**
  - Collaboration agreement with the Fraunhofer Lightweight Construction Alliance (DE)
  - Ongoing partnerships with JAPAN - National Composite Center and CANADA – CRIAQ
  - MOU with Berkeley Energy and Climate Institute (BECI)

- **French National Committee for Marine & Shipbuilding Industry**
  - Member of GICAN,
  - And Participating to the elaboration of the R&D roadmap of the Sector
  - Member of Maritime Expertise Engineering and Testing
  - Involved in Government Plan for « Factory of the Future » including some specific working groups for « Shipyard of the Future » together with DCNS and STX

- **Other French National Sectors Committee**
  - Member of GIFAS (Aeronautics), PFA (Automotive)
Thank you

Laurent MANACH
Director
laurent.manach@pole-emc2.fr