ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Good practices for University - Business Collaboration

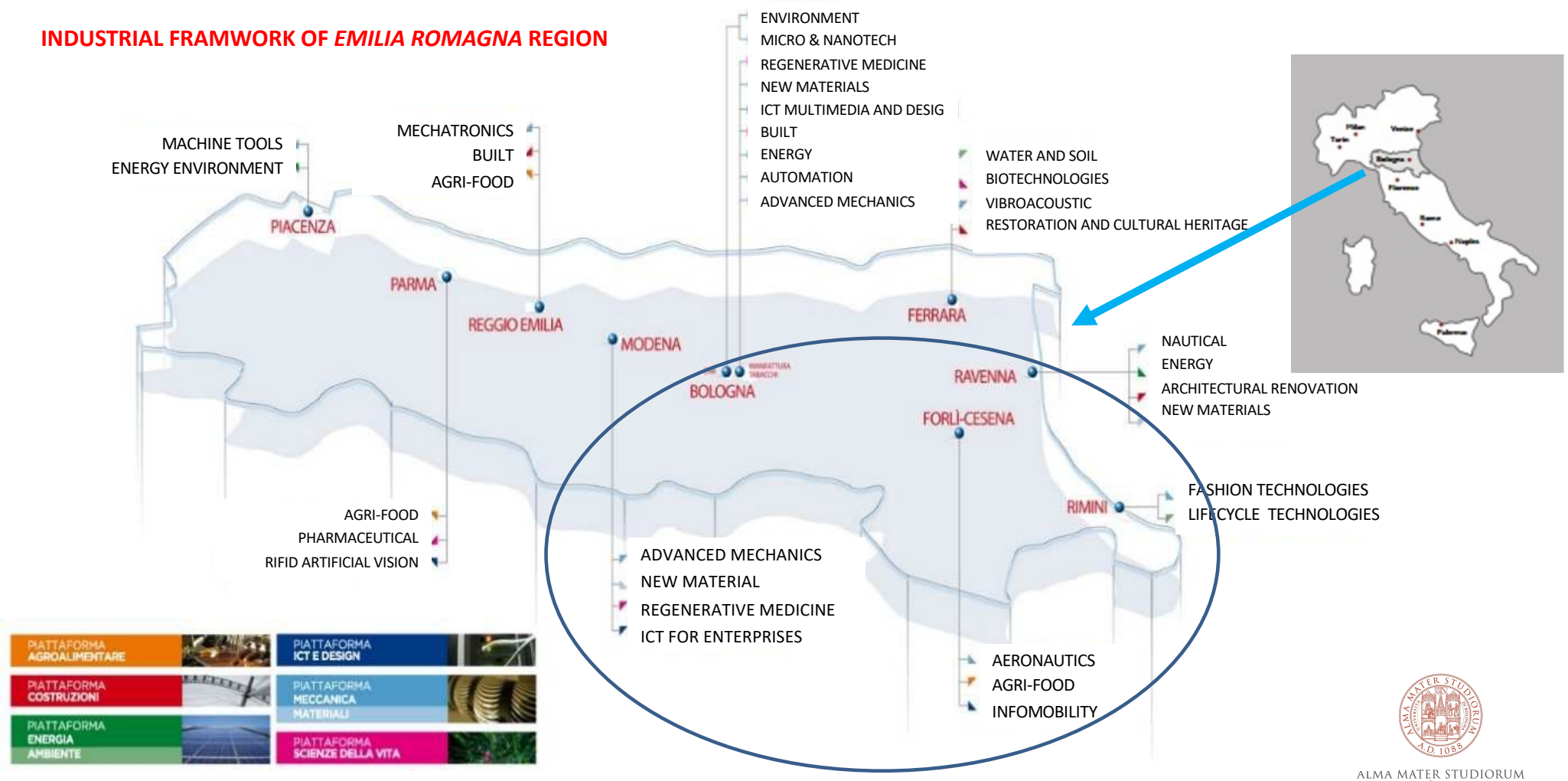
The Interdepartmental Centres for Industrial Research at the University of Bologna

Dario Croccolo

Head of Interdepartmental Centre for Industrial Research in Advanced Mechanical Engineering Applications and Materials Technology

Interdepartmental Centres at University of Bologna

INDUSTRIAL FRAMWORK OF *EMILIA ROMAGNA* REGION



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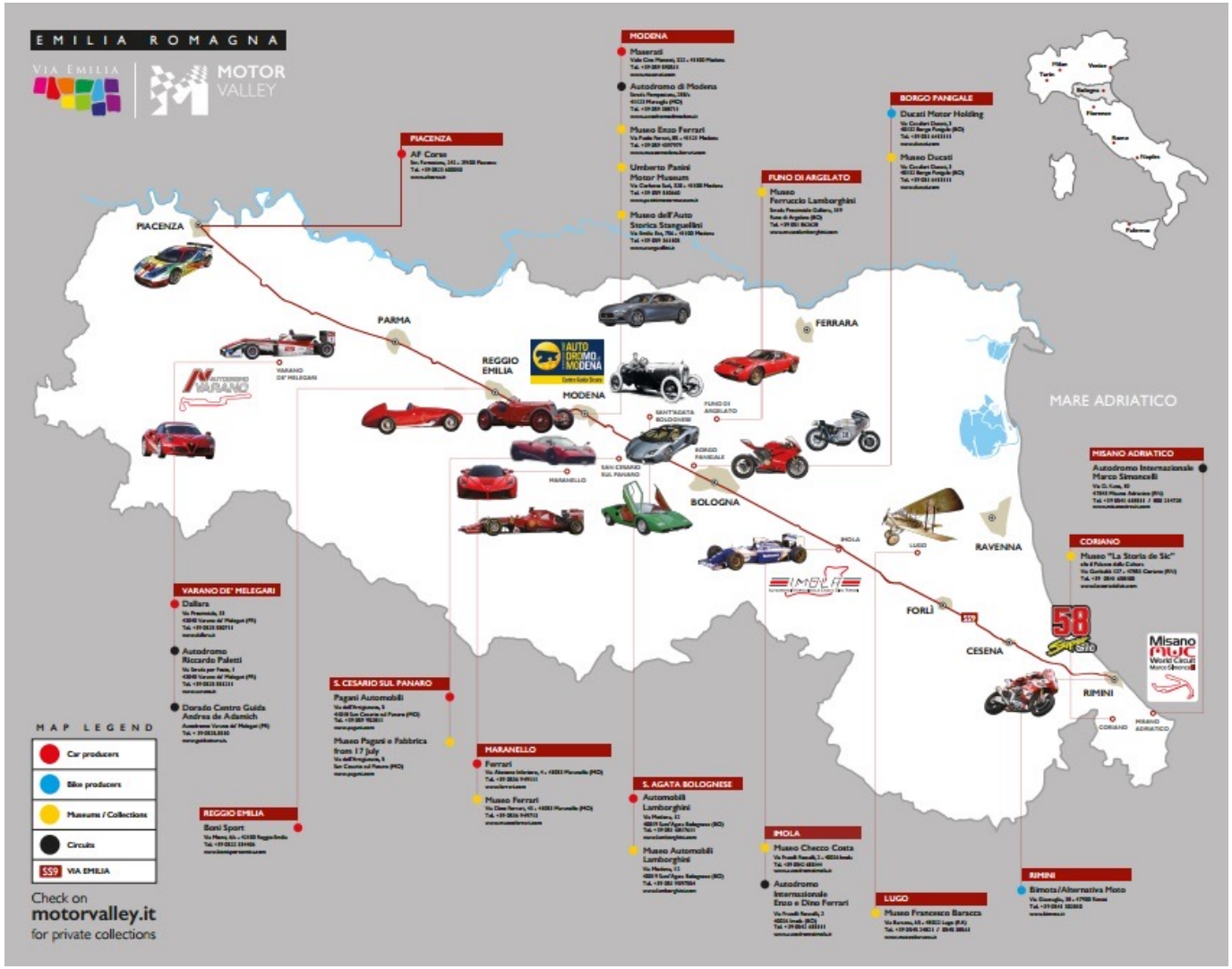
Interdepartmental Centres at University of Bologna



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Interdepartmental Centres at University of Bologna

MISSION

- Cooperate with the regional industrial system, mainly SMEs, through joint R&D projects, commissioned research and research assistance

- Share infrastructures through the establishment of Joint Labs

- Promote the enhancement of research results, through *licensing, spin off*, *creation of new companies*.

Interdepartmental Centres at University of Bologna

ADDED VALUES

- Multidisciplinary and cooperation among 24 Departments involved
- Represent UNIBO in the "RER Technopolis System" and in the new regional Clust-ERs
- Preferential access to R&D funding PR FESR RER (Regional)
- Preeminent role in RER programming and enhancing the competitiveness of the territory
- Partnership with companies and potential greater competitiveness of UNIBO on national and international funds

Interdepartmental Centres at University of Bologna

CIRI	Acronym	Head
Aerospace	AERO	Paolo Tortora
Agri-Food	AGRO	Francesco Capozzi
Buildings & Construction	EC	Marco Savoia
Renewable Resources, Environment, Sea and Energy	FRAME	Francesco Melino
Information and Communications Technologies	ICT	Luca Foschini
Advanced Mechanical Engineering Applications and Materials Technology	MAM	Dario Croccolo
Health Sciences & Technologies	SDV	Monica Forni

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Interdepartmental Centres at University of Bologna

CIRI	Researchers
AERO	51
AGRO	121
EC	113
FRAME	138
ICT	100
MAM	160
SDV	113
total	**796**

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CIRI AERO

MISSION

Promote the development of **knowledge, expertise, and research**

for companies and research institutions, both private and public,

operating in the sectors of aeronautics and space

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CIRI AEROSPACE

ALMA MATER STUDIORUM UNIVERSITÀ DI BOLOGNA

CIRI AERO

MISSION

Develop **research projects** through interdisciplinary **Operating Units**:

OU 1 - Aeronautics, Aerodynamics and Propulsion

OU 2 - Space Science and Technology

All activities are carried out for increasing research projects directly funded by companies or supported by public funds

Let's focus on industrial research !

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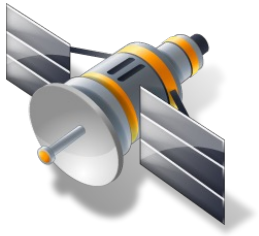
OPERATIVE UNITS



OU 1 **Aeronautics, Aerodynamics and Propulsion**

- Development of new materials
- Technological processes and manufacturing techniques for the aeronautical industry and high technology enterprises
- Modelling and development of innovative components and systems for the aeronautics industry
- Experimental and numerical study of the aerodynamic characteristics of industrial devices and propulsion systems
- Experimental and numerical study of the characteristics of turbulent streams
- Development of new ground, aeronautical and space propulsion systems and components
- New design and prototyping paradigms, for the aeronautics and high-tech industry

key words

Aerodynamics and Fluid dynamics, Plasmas, Thermo-fluid dynamics, Aerodynamic Plasma Control Propulsion, Virtual Reality and Simulation, Lightweight Structures and Composite Materials, Flight Mechanics

OU 2 **Space Science and Technology**

- Space exploration science, technologies, techniques and systems
- Planetary exploration missions design, implementation and data analysis
- Microsatellite and space microsystems design, implementation and In-Orbit-Validation (IOV)
- Space experiments design and implementation, with a focus on experiments on the Int'l Space Station (ISS)
- Ground control centers for in-orbit control of space mission, radio tracking from ground and precise orbit determination
- Development of advanced numerical techniques to analyze large amount of data (Big Data) from past, current and future space missions

key words

Astrophysics and Cosmology, Astrobiology Earth Observation, Microsatellites and Space Systems, Satellite Ground Station, Radio Science and Planetary Exploration

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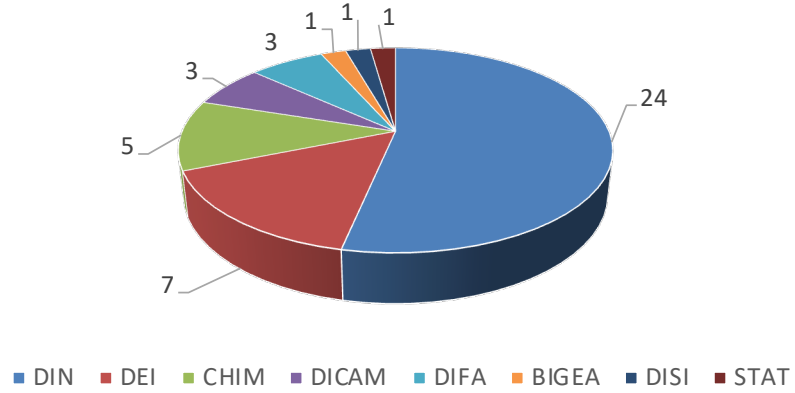
WHO and WHERE

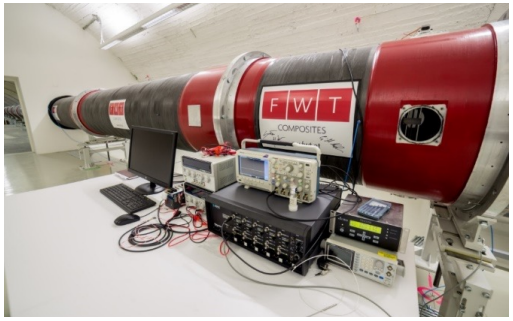
Researchers and Departments



Locations and Equipment

Tunnels "Ex Caproni" in Predappio – Laboratory CICLoPE

Technopole in Forlì – Laboratory of Aerospace Technologies



COMPETITIVENESS

Role of the Italian **AVIATION** industry:

- fixed wing aircrafts
- helicopters and tilt rotors
- remotely piloted or autonomous aircraft
- Air Traffic Management(ATM) and systems (eg. radar systems)
- aircraft engines with related sub-systems
- avionic systems and equipment
- surveillance systems, defence electronics and secure communications

Focus of the national **SPACE** activities:

- production of high-tech space launchers mainly used for access to low orbits
- production of satellites equipped with optical and radar systems for Earth observation and environmental analyses
- participation in international scientific programs of space missions and observation of the Universe

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HIGHLIGHTS

– **Project ALMASat → ALMASpace → SITAEL**
  - R&D Academic project (ALMASat-1)
  - Start-up of the spin-off ALMASpace
  - Spin-off assignment and merger with SITAEL S.p.A. (main private capital Italian space agency)

– **Project Helicopter CURTI S.p.A. → Spin-off ZEPHYR**
  - Steady skills on drones in the Flight Mechanics laboratory
  - Agreement for «dronizing» of the Zefhir helicopter by CURTI S.p.A.
  - Start-up of the spin-off ZEPHYR S.r.l.

– **Project EU-HIT (CICLoPE tunnel)**
  - Laboratory for experimental researches on wall turbulence – a unique in the world lab
  - FP7 EU-HIT project for the creation of an infrastructural EU network
  - «CERN style» model: international working groups stay at CICLoPE for a certain period of time (2-3 weeks), paying for its use then publishing the results jointly to the UNIBO researchers involved

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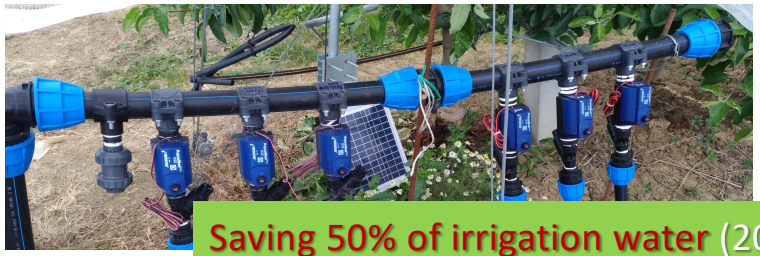
CIRI AGRO

PRIMARY PRODUCTION



Saving 50% of irrigation water (2020 data): 1640 cubic m/year/ ha in standard apple orchard; 850 cubic m in the specialized parcel.

S3O SMART SPECIALIZED SUSTAINABLE ORCHARD

Development of solar roofs that can be integrated with anti-hail nets

Self-driving electric rover for orchard work

Drones and sensors powered for data collection

Management of the orchard microenvironment

S3 SMART SPECIALISATION STRATEGY Emilia-Romagna

POR FESR EMILIA-ROMAGNA 2014/2020

UNIONE EUROPEA Fondo europeo di sviluppo regionale

RegioneEmilia-Romagna

R2B RESEARCH TO BUSINESS

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PRIMARY PRODUCTION

Food strategies for improving the sustainability of production and the quality of poultry meat

Replacement of soy protein with more sustainable sources (e.g. insect meal, microalgae, cell culture, by-products)

Differentiation of the final product (e.g. reduction of antibiotic use, enrichment in essential nutrients for humans - PUFA, Se, Zn)

Improvement of the technological characteristics of meat (e.g. increase in the antioxidant content of meat)

- Project EU **NextGenProteins** «Bioconversion of Underutilized Resources into Next Generation Proteins for Food and Feed»
  https://nextgenproteins.eu
  NEXTGEN PROTEINS
- Project EU **INTAQT** «INnovative Tools for Assessment and Authentication of chicken meat, beef and dairy products' QualiTies»

Improvement of the shelf-life of products for the reduction of losses and waste

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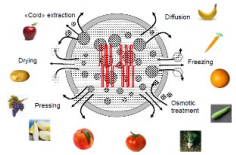
INDUSTRIAL TRANSFORMATION

Emerging non-thermal technologies: process optimization

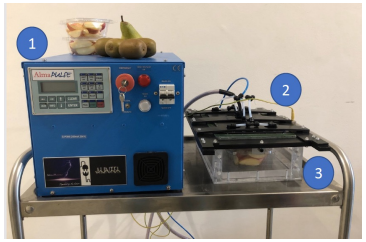
High level of innovation

High homogenization pressures for the production of functional apple-based SNACKs (Gea Niro Soavi)

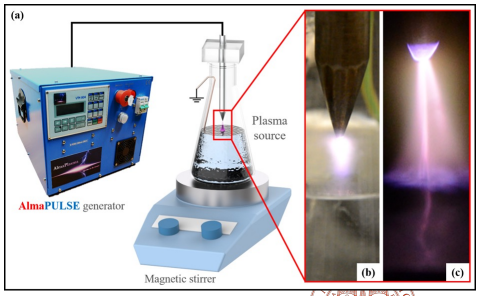
Technological tests applied for the treatment of food with **high intensity ultrasound (US)**

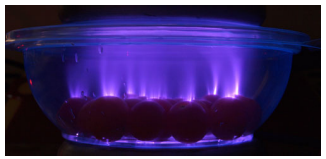


Technological tests applied for the treatment of foods with **pulsed electric fields (PEF)**



Technological tests applied for the stabilization of food and packaging with **cold plasma gas and plasma-activated water**





CIRI AGROALIMENTARE

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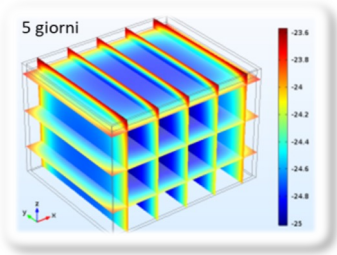
INDUSTRIAL TRANSFORMATION

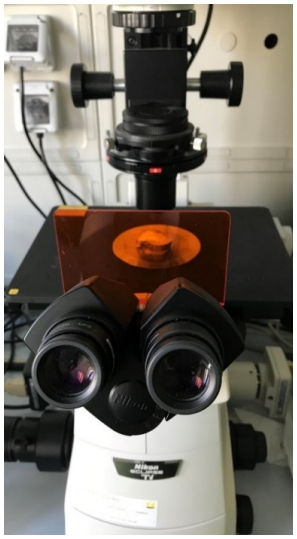
COACh

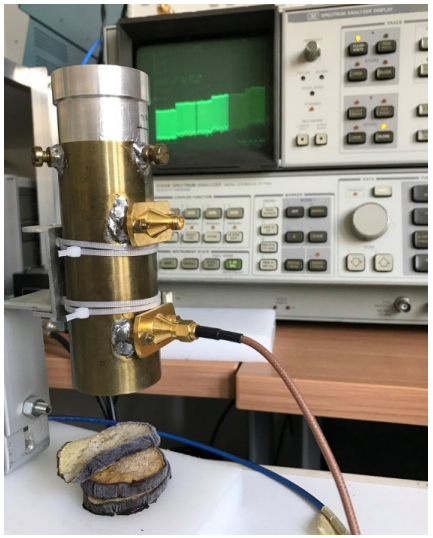
"Cold management in Agro-food Chains: solutions for process digitalization"

Prototype of an integrated system for the optimized management of the cold chain in a process of transformation of vegetable products and its validation in an industrial environment

- Numerical models to evaluate the incidence of cell temperature fluctuation on the product;
- Determination of the different product states as the temperature varies







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INDUSTRIAL TRANSFORMATION

Valorization of fish products and by-products

Fishing wastes

- ✓ **8%** of global fisheries are discarded at sea (FAO, 2016) **(10 million tons/year)**
- ❖ **Objective:** To sensitize processing companies and consumers to the reduction of waste, through the valorization of species not appreciated by the Italian market and the promotion of little-known products

PRIZEFISH

Piloting of eco-innovative fishery supply-chains to market added-value Adriatic fish products

Interreg Italy - Croatia PRIZEFISH — EUROPEAN UNION

Evaluation of the quality of mantis shrimp flesh in the freezing regime

✓Valorization of Squilla mantis
CRUSTACEAN
Specie: *Squilla mantis ;* Family: Squillidae

NEWTECH AQUA

Tools and Strategies for a Sustainable, Resilient and Innovative European Aquaculture

✓Valorization of neglected species
(amberjack and meagre)
Through the formulation of innovative products

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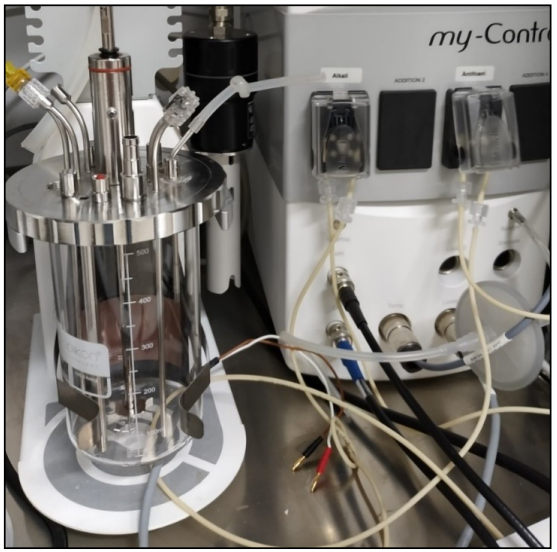
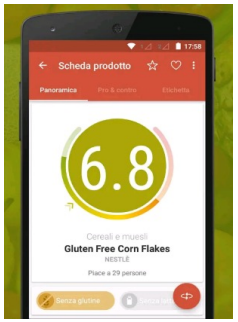
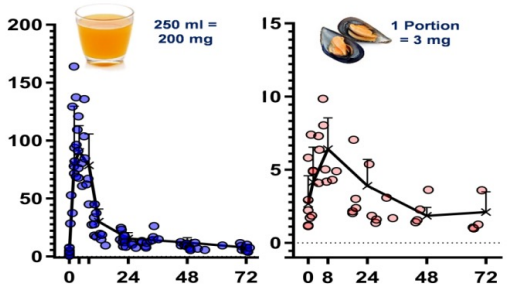
FOOD & HEALTH

Valorization of biodiversity in functional food products







Portable devices for self-assessment of healthiness and nutritional value.
Selection of biomarkers to verify the intake of particular foods.
Devices for in vitro evaluation of the bioavailability of nutrients

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CIRI BC

Organization and Staff

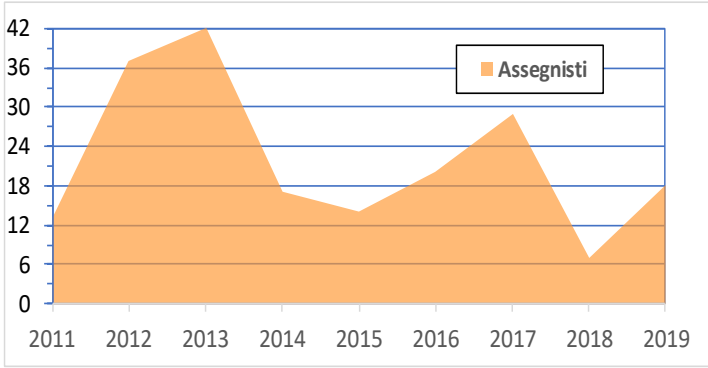
3 UNITS

- Fluid dynamics applied to civil infrastructures, energy and environment
- Safety, sustainability and energy in buildings, civil constructions and environment
- New technologies applied to restoration, recovering and requalification of existing buildings (Ravenna)

Staff : (2022)

Research staff	**103**
Research fellowship	25
Consultants.	4
Technical staff	2

Research fellowship: 197 (11-19)
105 (14-19)



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Location

Collocazione interna a UNIBO a BO e RA

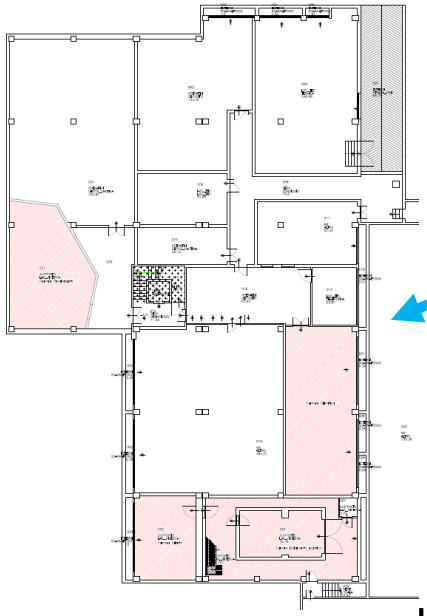
Spaces:

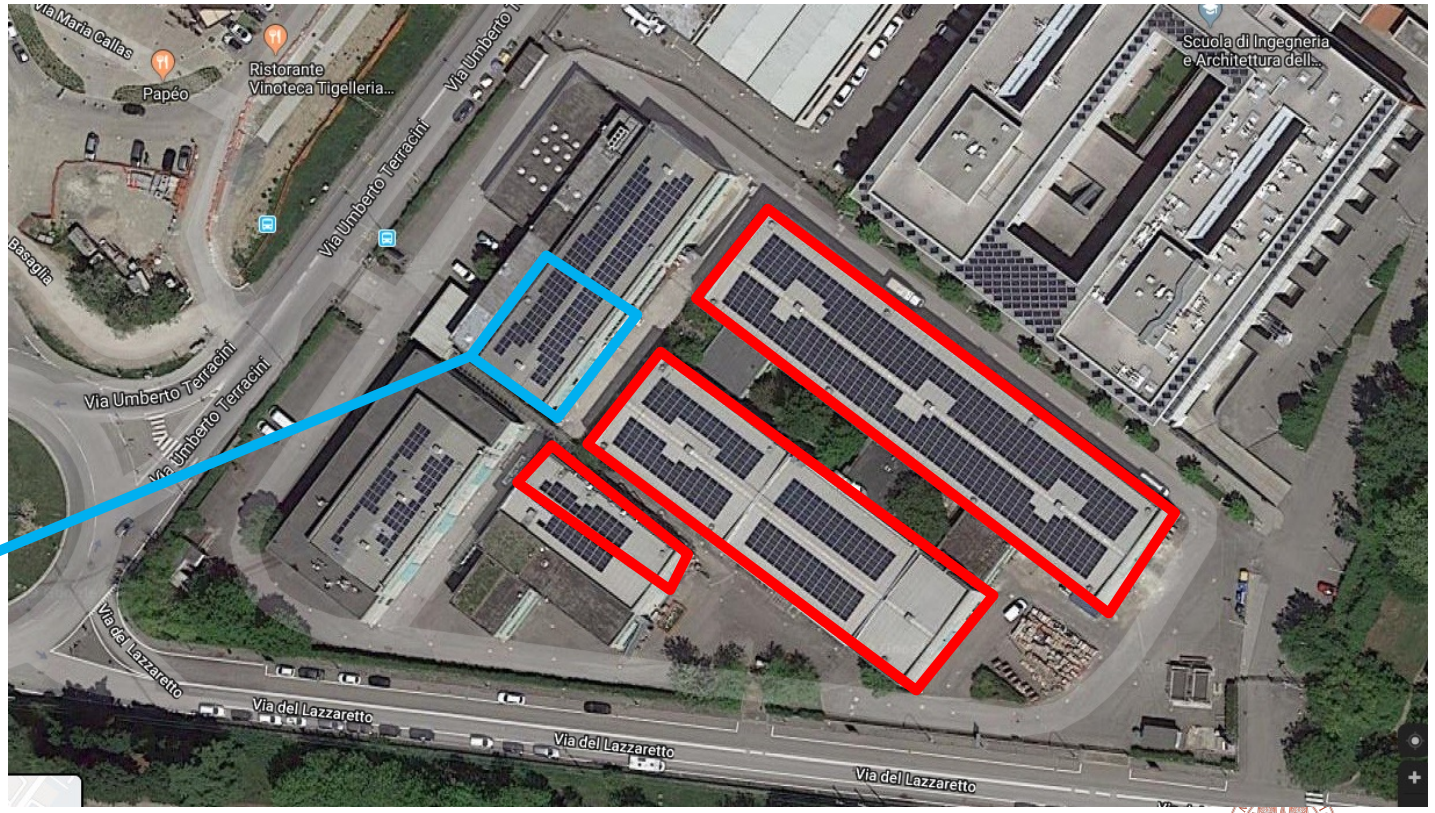
DICAM → 4850 m^2

DIN → 420 m^2

DBC →105 m^2

DA → 25 m^2





Integrated management of safety

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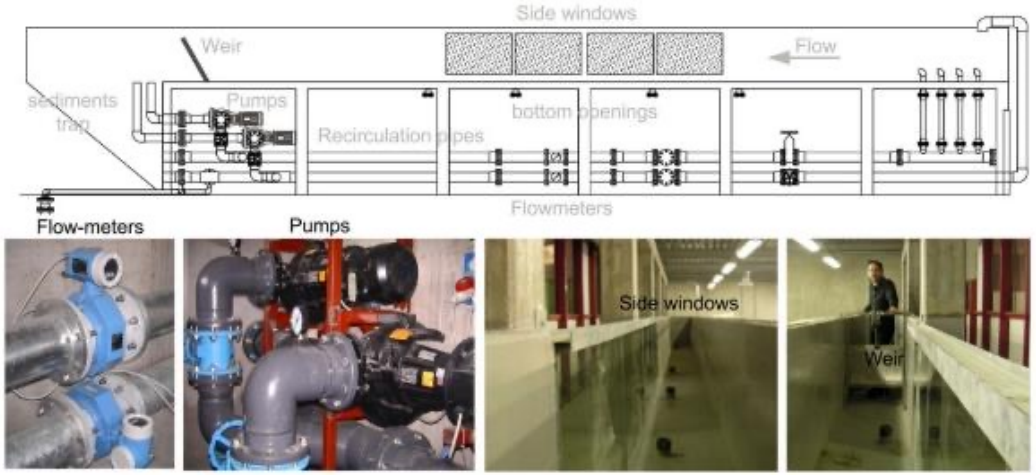
Facilities



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Facilities

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Funds from industrial research

3,8 M€

Grants from competitive research projects (Italian, EU, etc…)

- also with Companies -

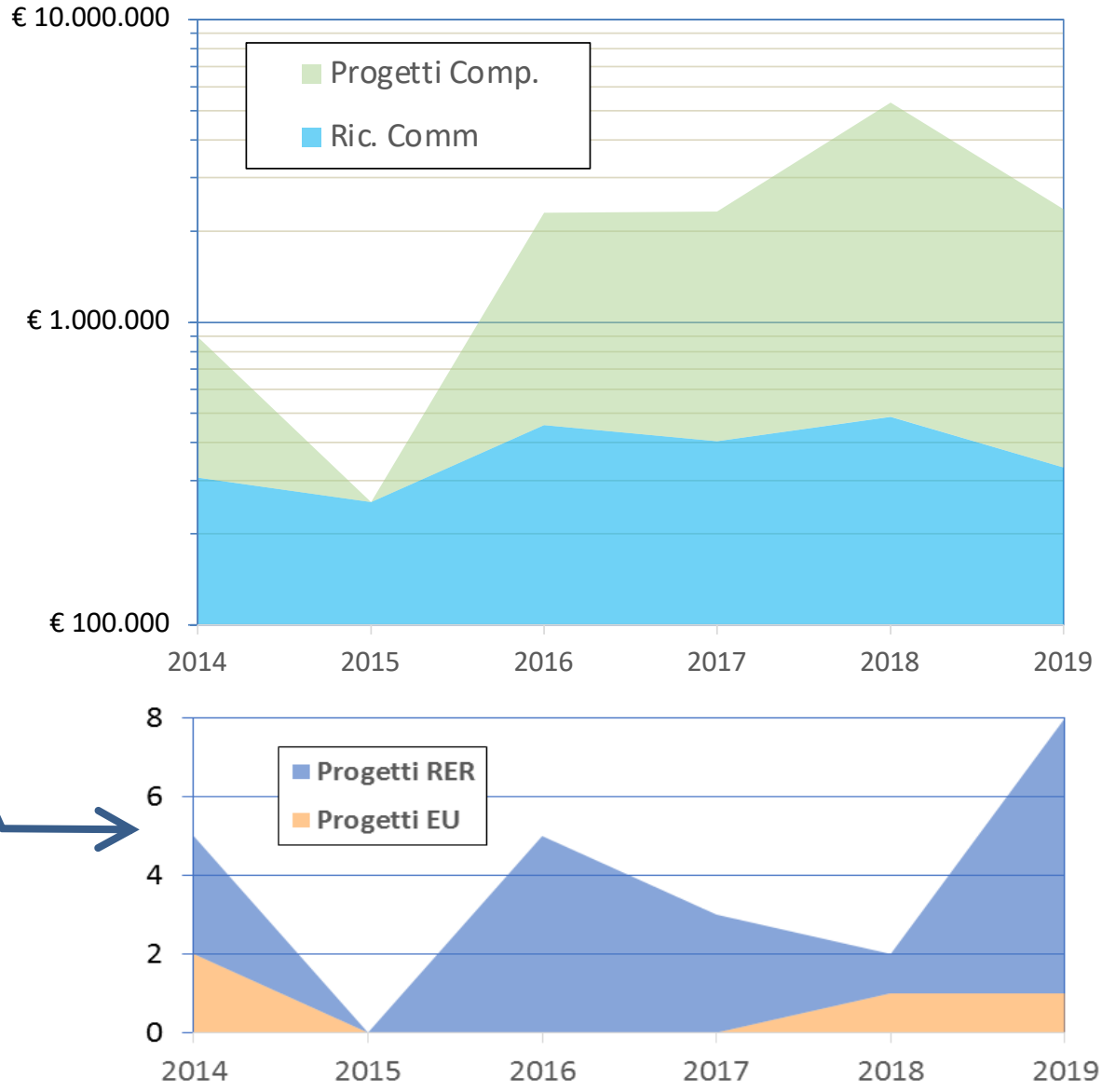
13,1 M€

Original grant 2011 (RER):

9,1 M€

Total competitive grants:

22,2 M€



CIRI BC

Success stories

Rothoblaas

- Multi-year collaboration
- Development of bolted connections for wood structures
- Improvement of acustic performances of woodden products

Kerakoll

- Multi-year collaboration
- Development of composite systems for structural strengthening
- Components validation
- Structural testing

- Creation of 2 Joint Research Labs:
  - CMF Greentech
  - ALIVA facade

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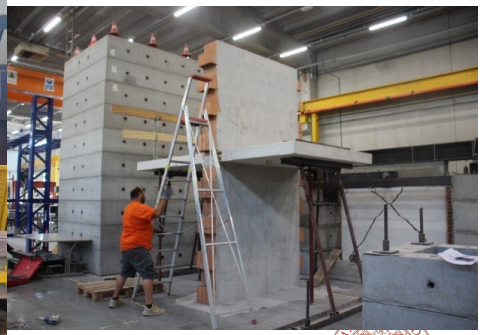
Success stories

FASSA SRL

- Multi-year collaboration
- Development of innovative buildings strengthening materials (FRP, FRCM, CRM);
- Validation of building systems resistant to seismic stresses in plane and out of plane;

TERZER SRL

- Multi-year collaboration
- Structural optimization of thermal insulation systems applied on rc slabs;
- Validation of thermal insulation system applied on rc slabs of existing buildings;
- Analysis of seismic/cyclic behaviour of thermal insulation system applied on rc slabs.



…and many others

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CIRI FRAME

Mission

The mission of CIRI FRAME is to **promote**, **coordinate** and **carry out**

industrial research

promotion of research results

technology transfer

in the field of:

- **renewable sources**, raw materials and energy;
- study and protection of the **environment**;
- the study and use of the **sea** and coasts;
- sustainability in the production and rational use of **energy**;

CIRI FRAME

Organization

About 130 RESEARCHERS from

15 Departmens

organized into 3 Operational Units

CIRI FRAME

Research Infrastructures

Ravenna technopole

Marina di Ravenna Research Center

Rimini technopole

Joint Laboratories at the Departments of:

- Chemistry;
- Industrial Engineering;
- Electric, Electronic and Information Engineering;
- Industrial Chemistry;
- Civil, Chemical, Environmental And Materials Eng.
- Biological, Geological and Environmental Sciences;

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Operational Units

Renewable Sources and Sustainability (Scientific manager: Prof. Daniele Fabbri)

- Biorefinery;
- Ecodesign, Ecoefficiency and Industrial Ecology;
- Life cycle of products and sustainable waste management, circular economy;
- Recovery of contaminated sites;
- Green Chemistry & Green Catalysis;

Marine Resources and Blue Growth (Scientific manager: Prof. Fausto Tinti)

- Study of the marine environment and the sustainable use of its resources;
- Technologies for the protection of the sea and coasts and for the mitigation of anthropogenic impacts and climate change;
- Technologies related to fishing, aquaculture and the preservation of the fish heritage;
- Oceanographic systems;
- Offshore platforms;
- Shipping systems; Cultural and environmental heritage of the sea;Marine tourism;

Technologies for Energy and the Environment (Scientific manager: Prof. Alessandro Tugnoli)

- Development and use of dedicated energy crops and residual biomass in agriculture;
- Biofuels, hydrogen, synthesis gas, net-zero-CO2 fuels;
- Low temperature fuel cells;
- Smart Grids;
- Energy Efficiency;

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Recent Collaborations with Companies

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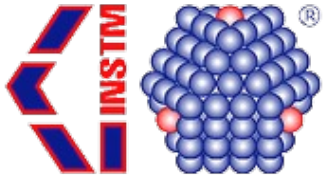
Recent Collaborations with Institutions

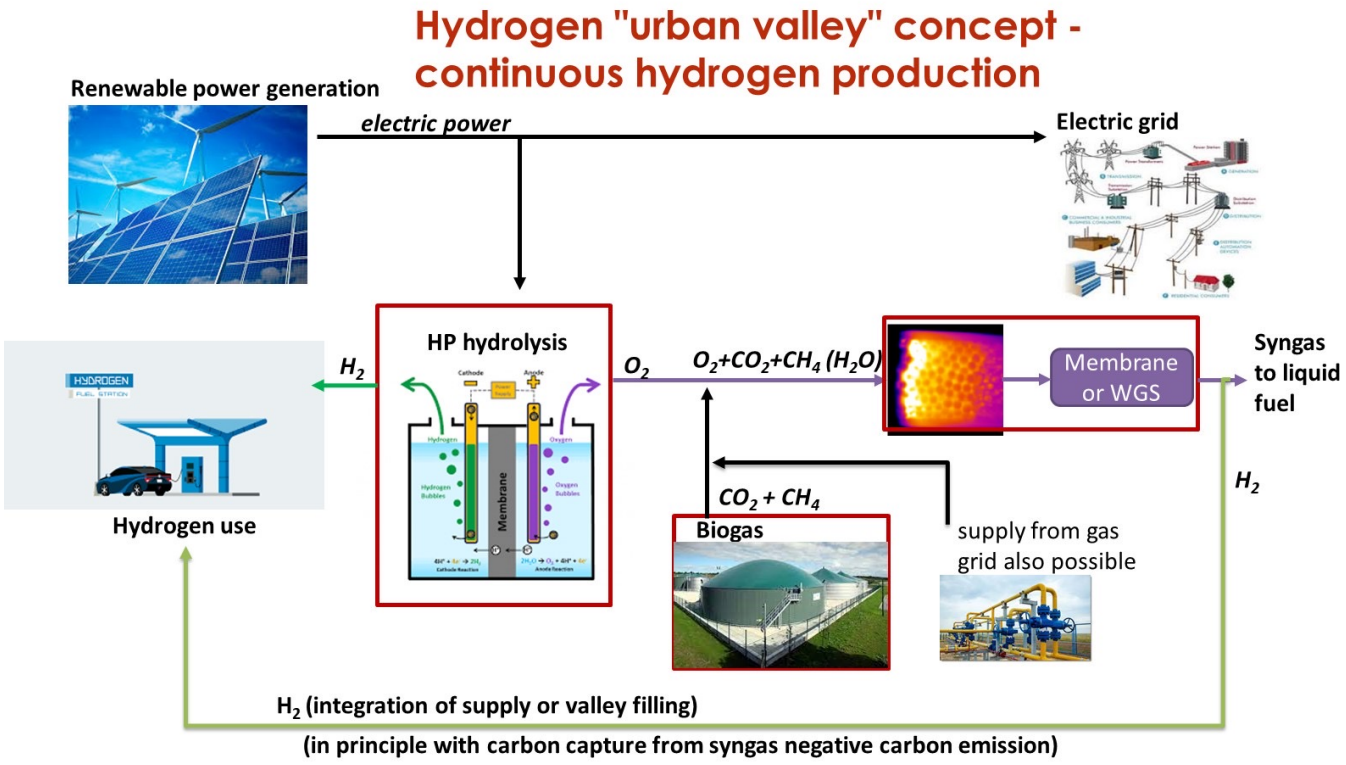


CIRI FRAME

An example of success (1)

HC-hub-ER - Hydrogen and Carbon use through Energy from Renewables

Joint LAB Eni – CIRI-FRAME, Università di Bologna



Main GOAL of the LAB

- ✓ Support and enhancement of industrial projects in the field of the production of green hydrogen and CO2 use;
- ✓ Collaboration between public and private sectors for the development of technologies related to the production of green hydrogen and the use of CO2;
- ✓ Applied research scouting for the development of prototypes and pilot plants;

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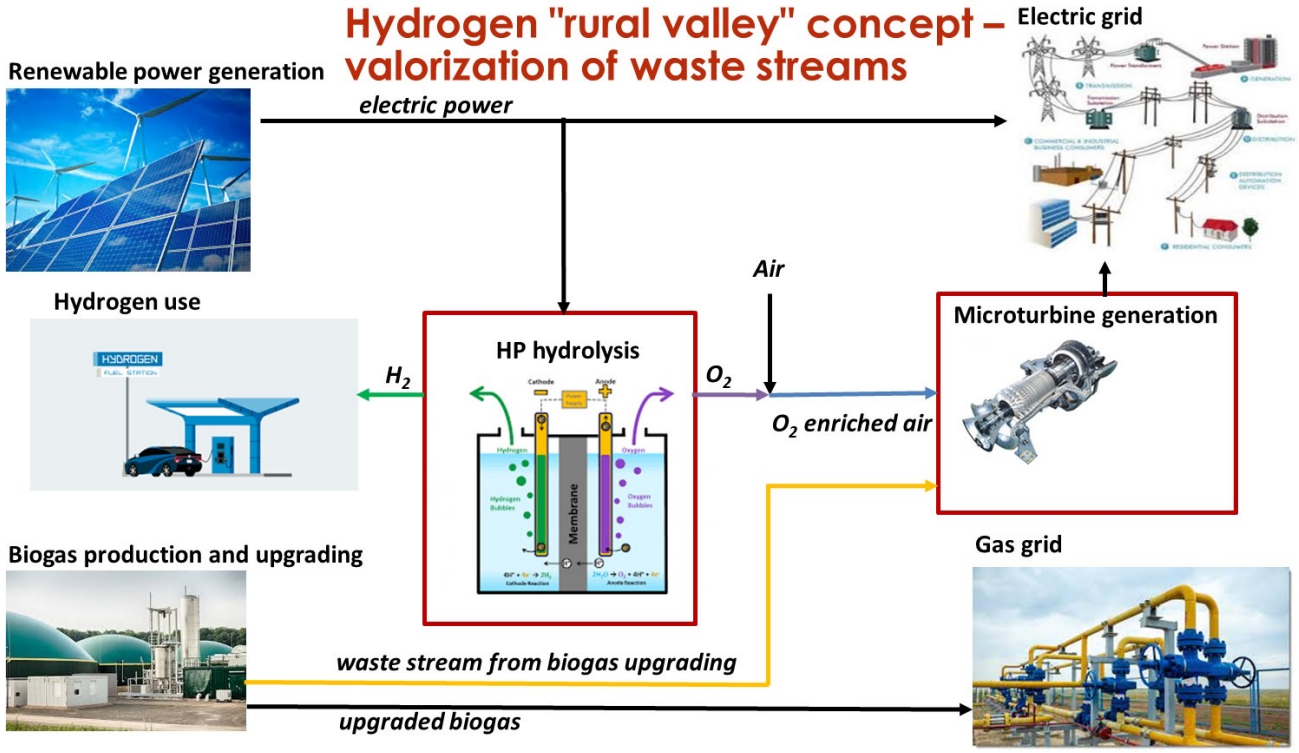
CIRI FRAME

An example of success (1)

HC-hub-ER - Hydrogen and Carbon use through Energy from Renewables

Joint LAB Eni – CIRI-FRAME, Università di Bologna



Projects in progress:

- ✓ Sustainable and Safe Production of H2
- ✓ Use of CO2 in synergy with the transformation of hydrogen
- ✓ Technologies with potentially negative CO2 emissions - CO2 mineralization in waste
- ✓ Development of membrane and hybrid systems for CO2 separation

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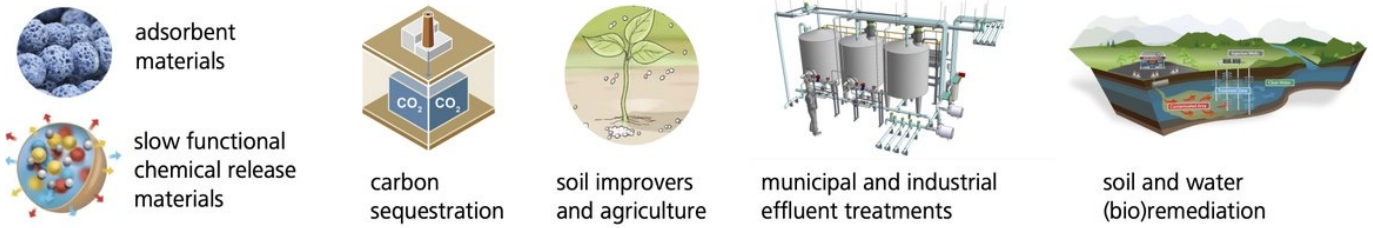
CIRI FRAME

An example of success (2)

FIP-WE@UNIBO - Fraunhofer Innovation Platform on Waste Valorisation and Future Energy Supply

Joint LAB Fraunhofer Gesellshaft – CIRI-FRAME, Università di Bologna



Second Generation Carbons

Materials from residues: development of functional and low cost carbon-based materials from biogenic residues, waste and recycled fossil material for industrial scale applications.

Hyperthermophilic Composting and Biochar-Biomass Co-Composting

- ✓ nutrients recover and agronomic improvement of soil
- ✓ waste reduction
- ✓ reduced costs through compost self-production
- ✓ economic opportunities through Carbon credits

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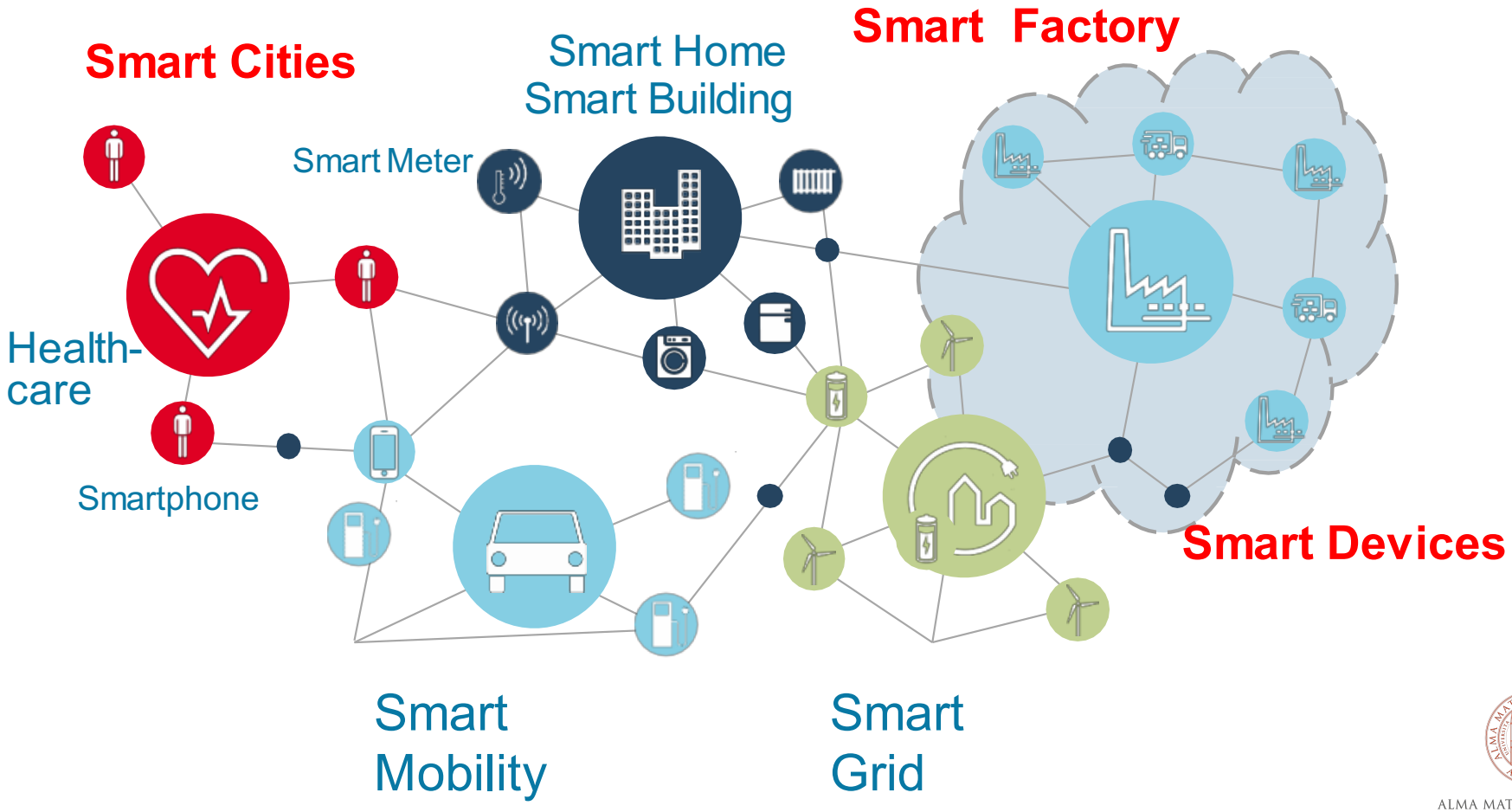
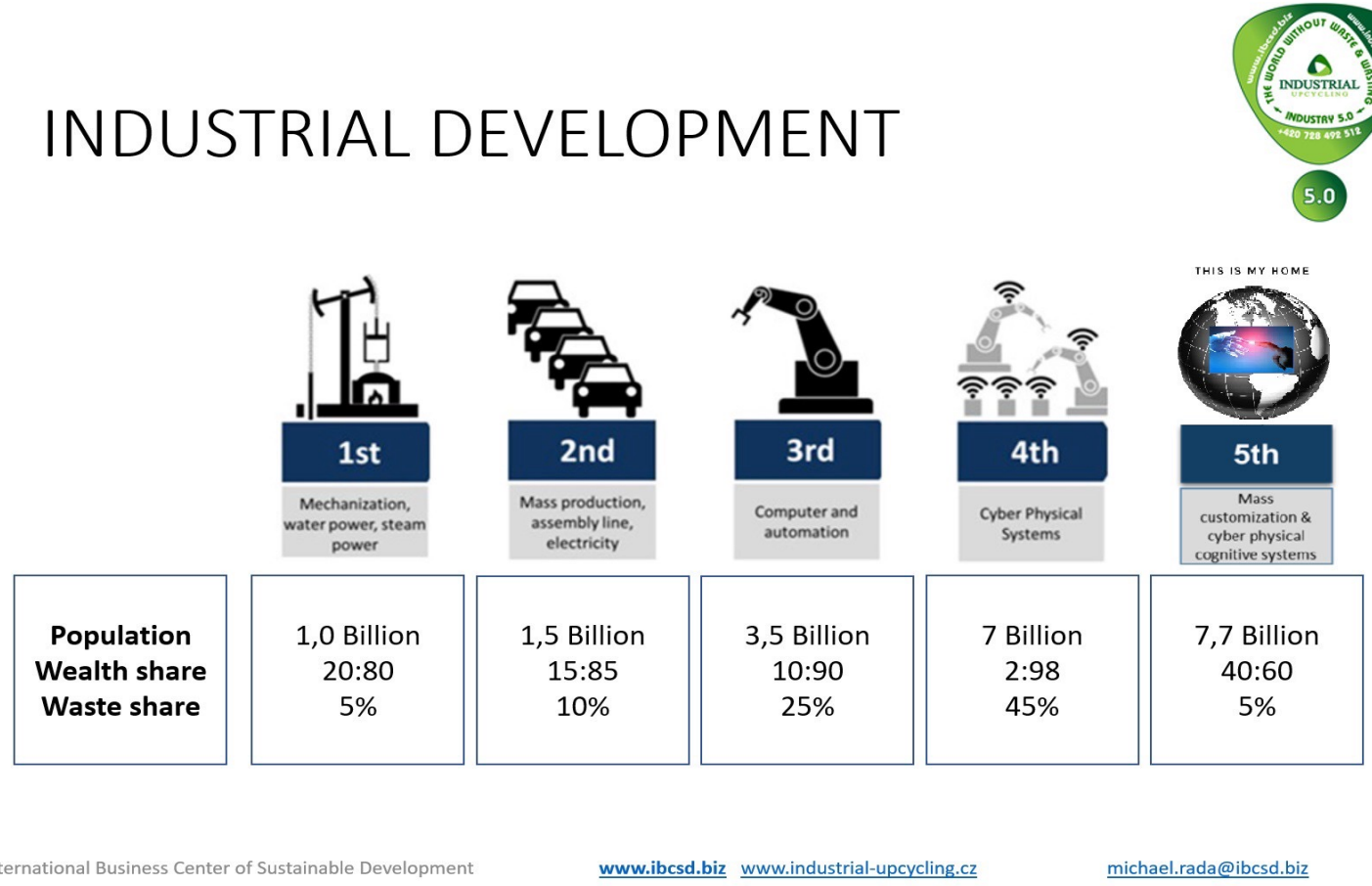
CIRI ICT

Digital transformation: smart everything vision



CIRI ICT

In Europe, new challenges: Industry 4.0, Industry 5.0 & Society 5.0



- **Sustainable**, **human-centric** and **resilient** The worker is not to be considered as a 'cost', but rather as an 'investment' position for the company → **centrality of human capital**
- Skills, up-skilling and re-skilling → **continuing education**

 Fonte EU: https://ec.europa.eu/info/publications/industry-50_en

CIRI ICT

Digital transformation: people at the center...

thanks to technology

- Big Data Analytics, Machine learning
- Cloud e edge computing
- Augmented e Virtual Reality
- Data Warehouse, Big Data e DBMS NoSQL
- Business Process Reengineering e Digital transformation
- Predictive maintenance

Fonte EU: https://ec.europa.eu/info/publications/industry-50_en

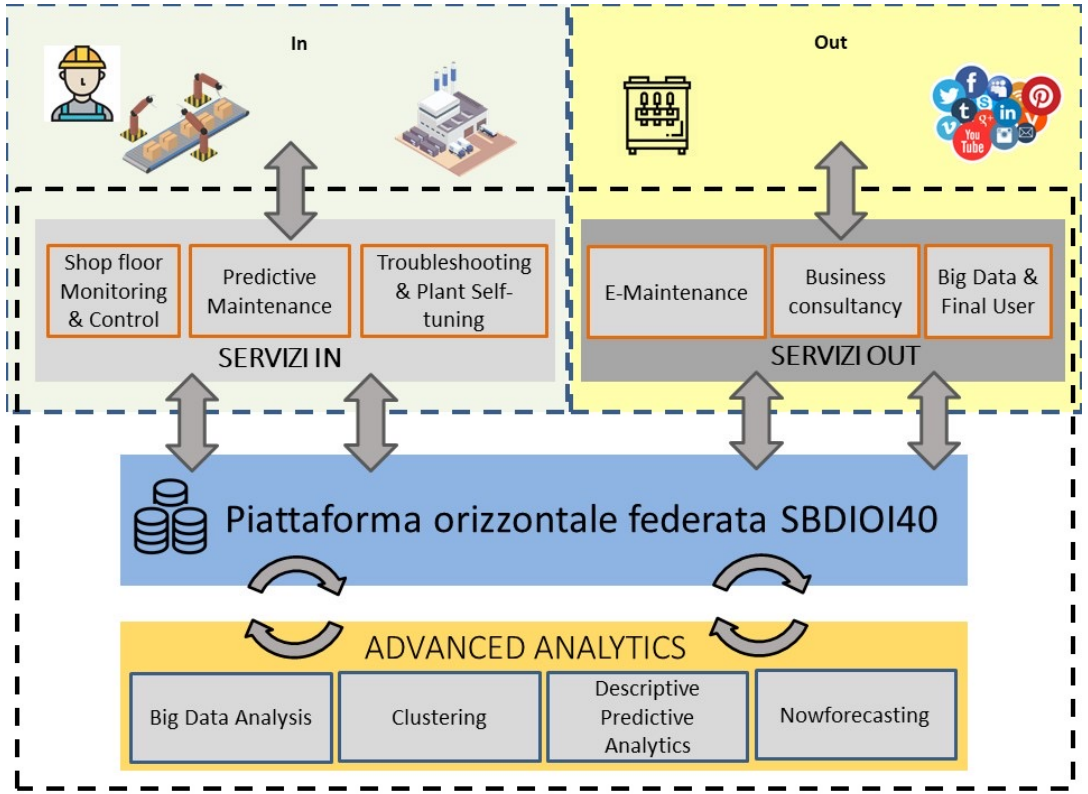
CIRI ICT

Success story (1)

SBDIO I4.0
Big Data
for Industry

SBDIOI40: Services Big Data In e Out for Industry 4.0

Assist and support local companies in the **transition from product economy to service economy**



POR FESR EMILIA-ROMAGNA 2014/2020
FSC Fondo per lo Sviluppo e la Coesione
UNIONE EUROPEA Fondo europeo di sviluppo regionale
RegioneEmilia-Romagna
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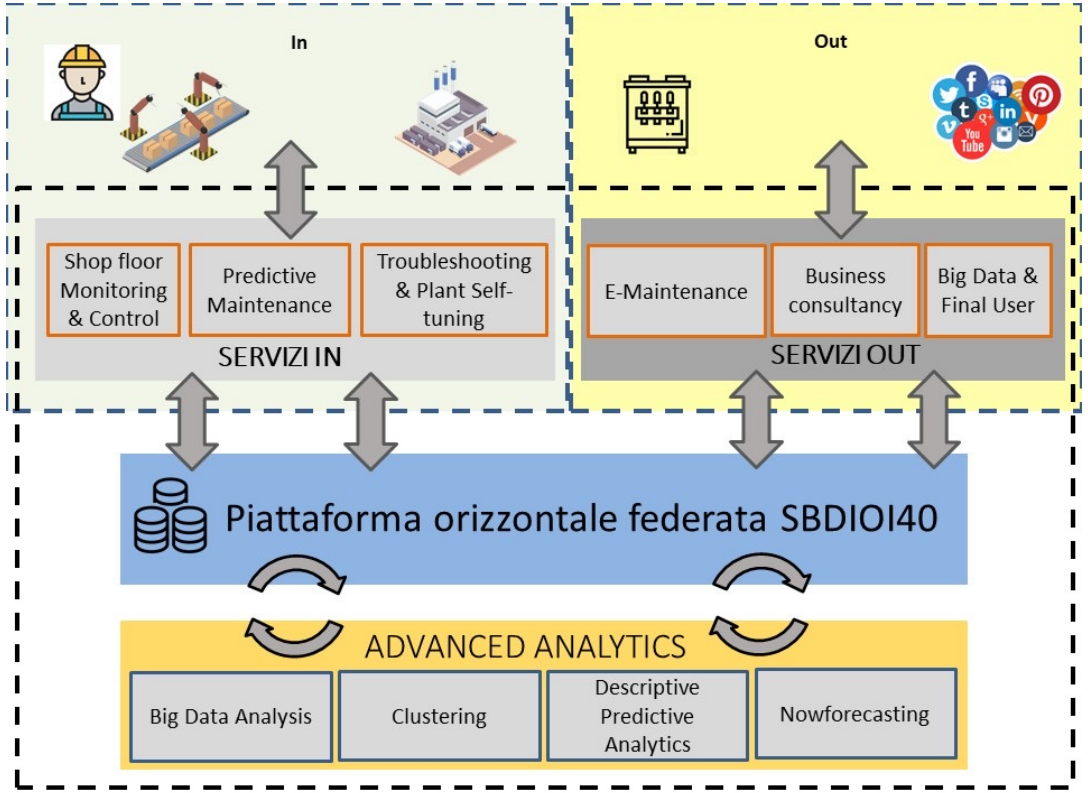
CIRI ICT

SBDIOI40: Goals

- Build a **federated cloud platform**
- Integrate **Artificial Intelligence** and **Machine Learning** capabilities
- Facilitate the transition to **big data-enabled management of the shop floor**
- Creating **Out Services**: remote monitoring, after sales, …
- SBDIOI40 **Federated Demonstration Lab**

SBDIO I4.0
Big Data
for Industry



Participating companies

Manufacturing: Sacmi | Carpigiani | GEA

IT: Imola Informatica | Italiana SW | Injenia | CINECA

Laboratories and Innovation Centres

CIRI-ICT AIRI T3Lab
CIRI-MAM MechLav

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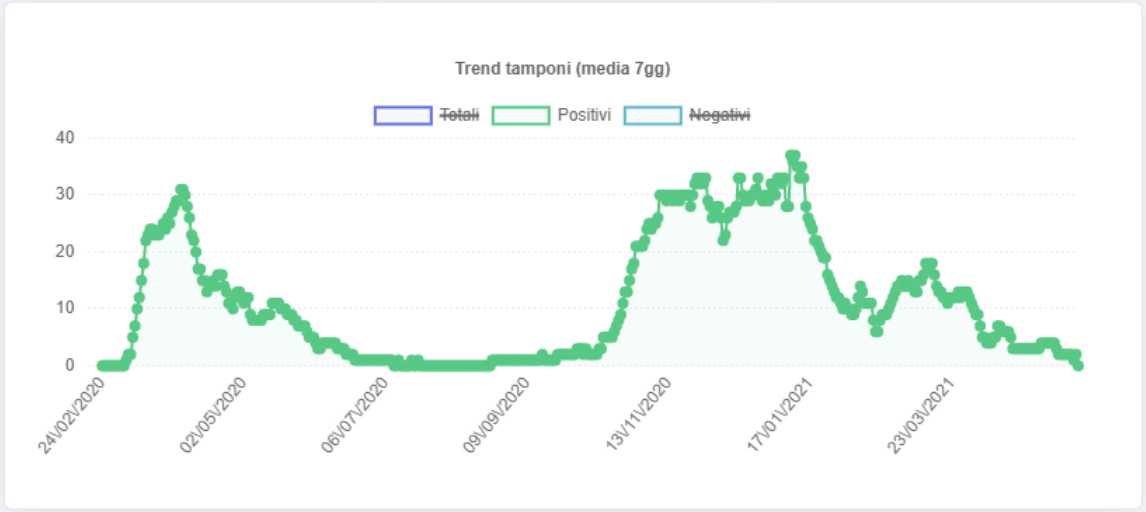
Success story (2)

SWAPS: Support for Automatic Workflow of Health Personnel Management

SWAPS

- Collaboration with the Operative Unit of Occupational Medicine of Prof. Francesco Saverio Violante for the management of COVID+ cases



SWAPS offers **different views**: Big Data make it easy to read reality and current trends

For example, this chart shows the infection trend of COVID+ healthcare workers

0	-13%	-30%	-78%
Errors in Agenda	Time needed to manage a Symptomatic Operator	Time to manage a COVID-19 Confirmed Case Contact Operator	Time to retrieve anamnestic information

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FSC Fondo per lo Sviluppo e la Coesione
UNIONE EUROPEA Fondo europeo di sviluppo regionale
RegioneEmilia-Romagna
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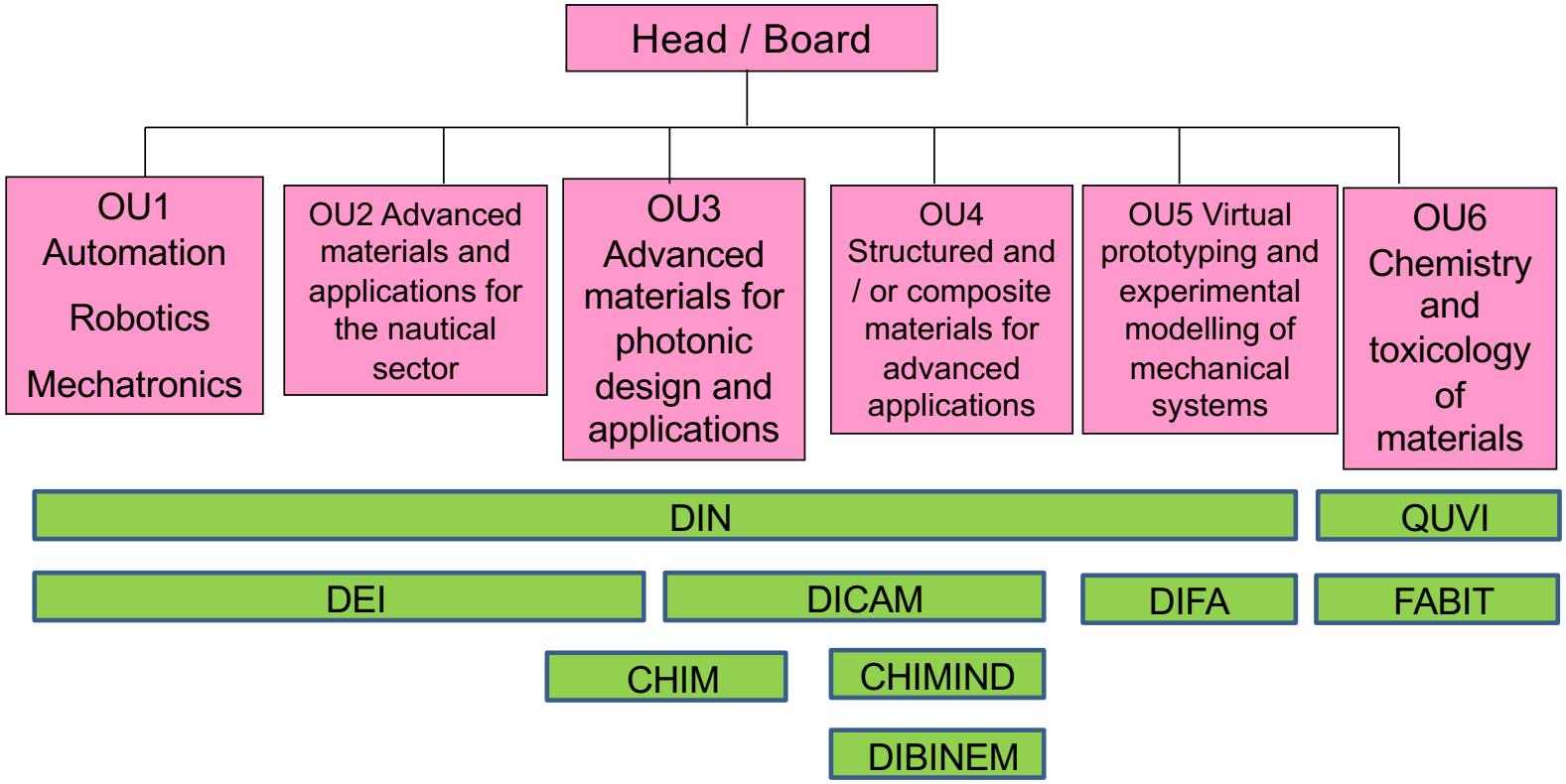
CIRI ICT

- Since its creation, CIRI-ICT researchers have been engaged in research projects
  - In the context of international, national and regional competitive calls
    - average funding 2011-18: 500 KEuro/year
    - funding 2019-20: 650KEuro, 2021: 740KEuro
  - In agreement with local companies
    - average funding 2011-21: 250 KEuro/year
  - In addition to the permanent staff, the research projects also employed about 200 of young temporary researchers

CIRI MAM

CENTRO INTERDIPARTIMENTALE MAM DI RICERCA INDUSTRIALE
Advanced Mechanical Engineering Applications and Materials Technology



- 60 Full time researchers
- 140 Academics from 12 Departments
- 400 Research contracts in 5 years
- 20 M€ net income

- European Projects
- International partnerships
- 2 High-Tech Start-up companies
- 2 Laboratories inside private companies

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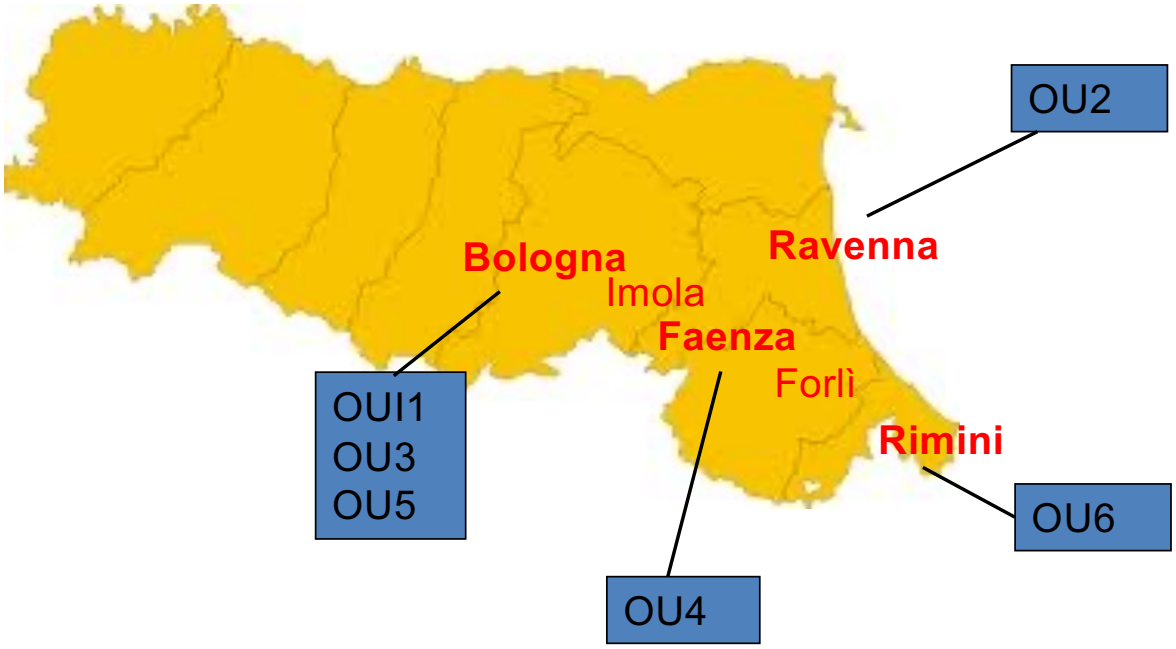
Advanced Mechanical Engineering Applications and Materials Technology

CIRI MAM IN EMILIA ROMAGNA



Ravenna technopole

Rimini technopole

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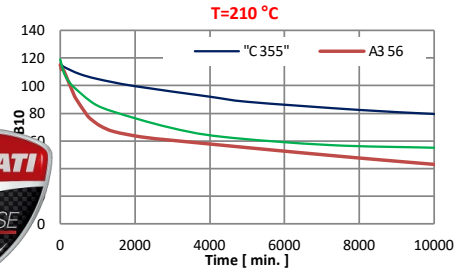
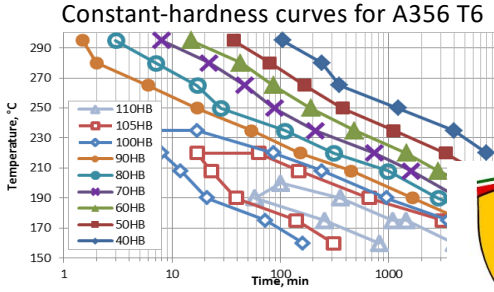
CIRI MAM
Advanced Materials

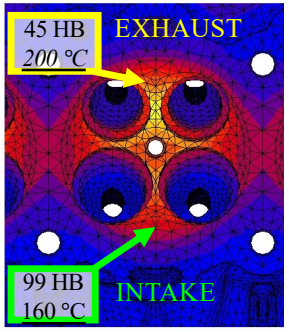
CENTRO INTERDIPARTIMENTALE MAM DI RICERCA INDUSTRIALE
Advanced Mechanical Engineering Applications and Materials Technology

- Aluminium alloys for high temperature applications reinforced with nanodispersoids

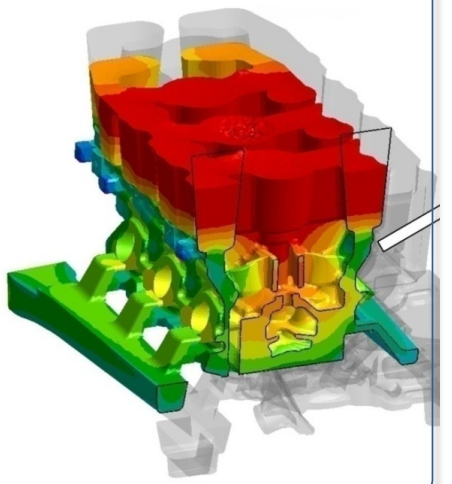


- Foundry and heat treatment optimization of cast aluminium alloys





- Hybrid
- Graphene – Al alloy castings for high conductivity applications (FP7 NMP Project)



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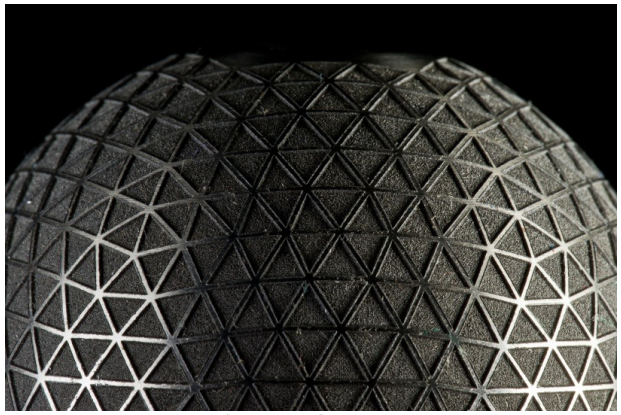
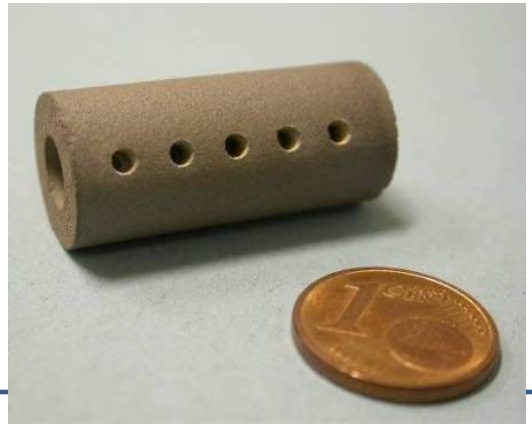
Advanced Manufacturing

Laser Manufacturing

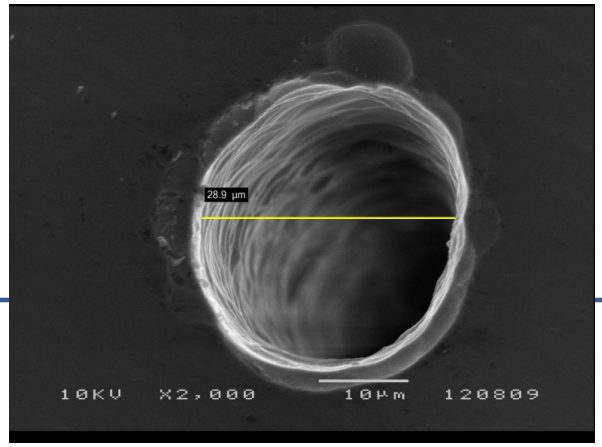
• A wide number of Laser processing technologies are developed in the high power, micro and nano size



Fine surface Sculpturing



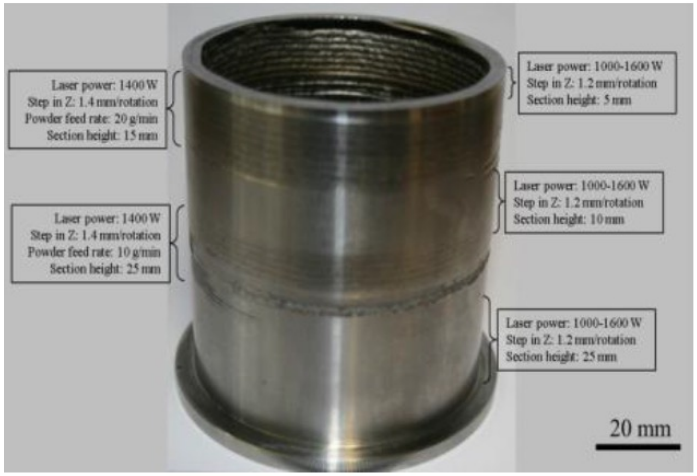
Micromachining

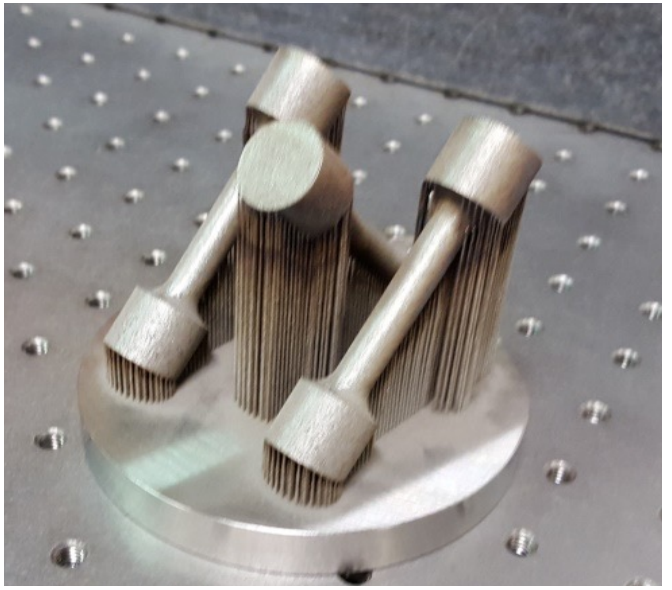


Waveguides on glasses

Additive Manufacturing

- **MATERIALS**: Metals, Alloys, MMC, Polymers, Composites
- **TECHNOLOGIES**: SLM, Cladding, FDM, SLA, Hybrid
- Development of process parameters for new materials and compositions
- Development of cladding technology for variable chemical composition within a component
- Manufacturing of hybrid components Metal-CFRP (Europe Vanguard Network)





47

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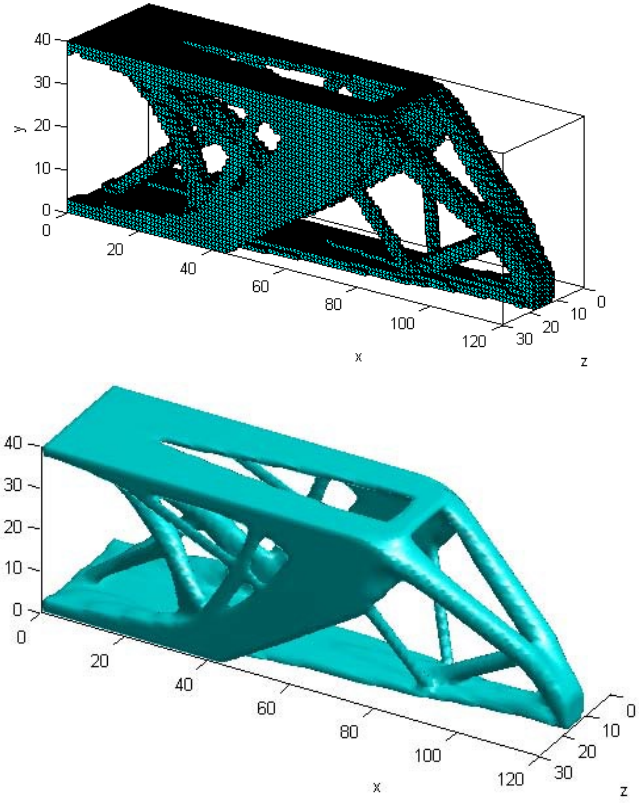
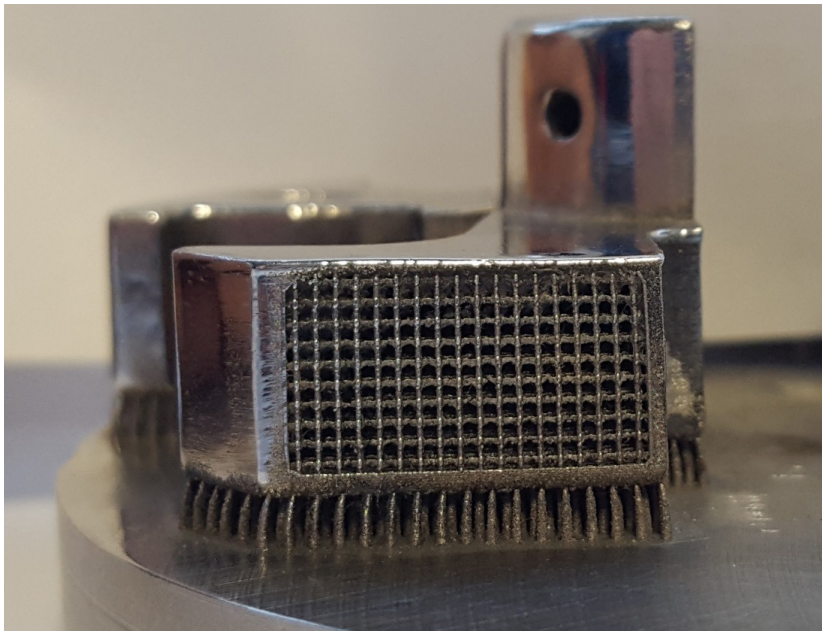
MECCANICA AVANZATA E MATERIALI

ADDITIVE MANUFACTURING



Development of ultra-light components

- by topology optimization
- by cellular structures



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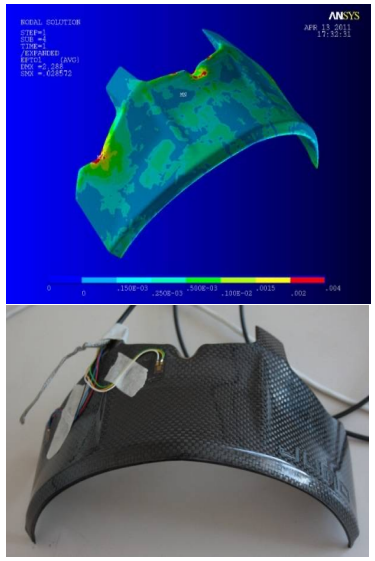
MECCANICA AVANZATA E MATERIALI

Composites ADVANCED MANUFACTURING

- Lightweight component design and production procedures
- Crashworthiness and Impact Evaluation
- Adhesive joints
- Sandwich Structures: design, optimization, fabrication
- Hybrid Components (Ti-CFRP)
- High damping materials
- Embedding sensors and Bragg fibers for strain and damage evaluation
- Hydroelastic Slamming simulation

Carbon Fiber Spring for high cycles fatigue applications



Hybrid Component

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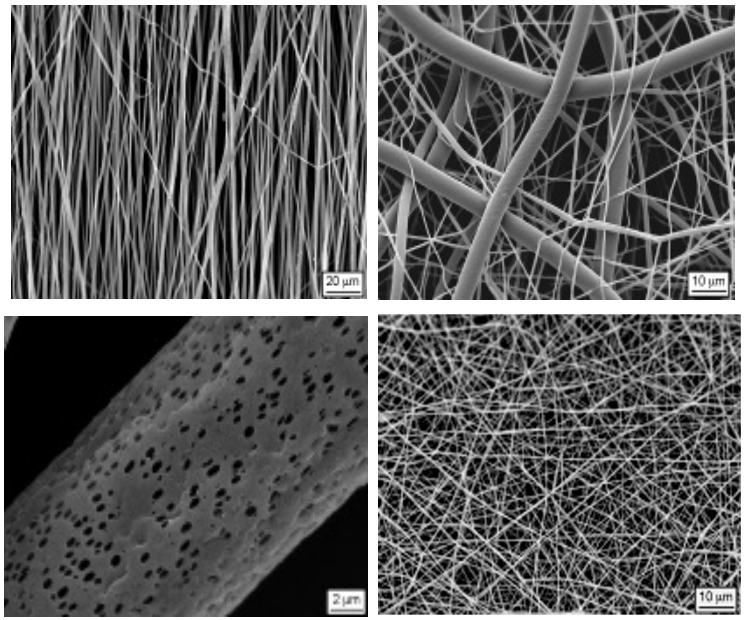
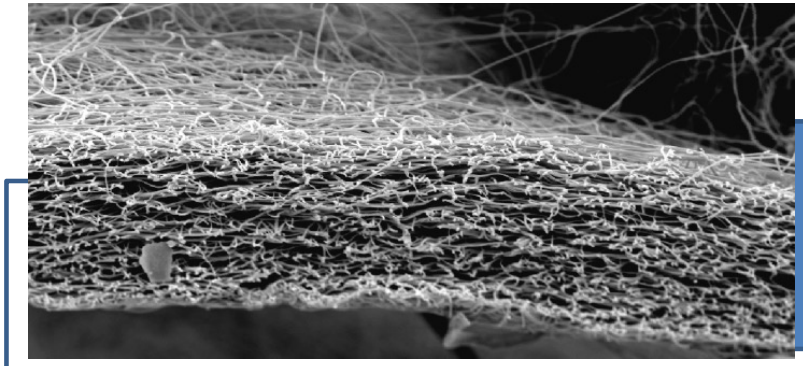
Advanced Mechanical Engineering Applications and Materials Technology

Electrospinning

Advanced Manufacturing

- Development of Nano-structured Fibers
- Development of Applications
  - ✓ Scaffolds
  - ✓ High conductive materials
  - ✓ Energy storage
  - ✓ Aromas deposition
  - ✓ Air and water filtration
- Machine Design and Prototype construction
- Vascolarized and self-healing structures





Nanofibers of different shapes and materials are developed for different applications

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Advanced Manufacturing

Energy storage

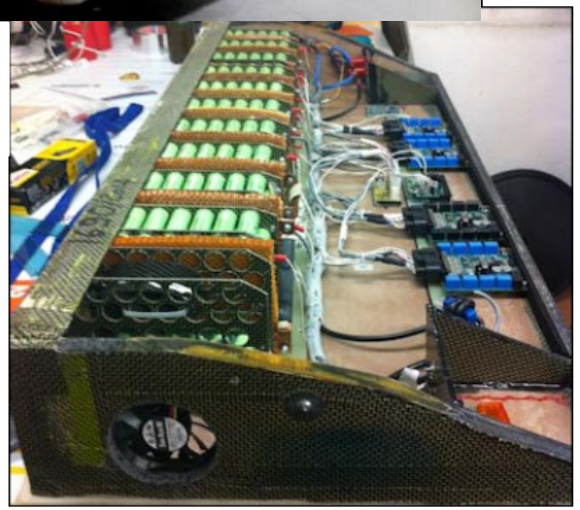
ONDA SOLARE PROJECT

The 100% electrical solar car

made in Italy

Partners:

- University of Bologna (Mechanical and Electrical Department)
- GrafiteCompositi S.r.l. (Italy)
- TBE electronic and automation



51

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FEM modeling

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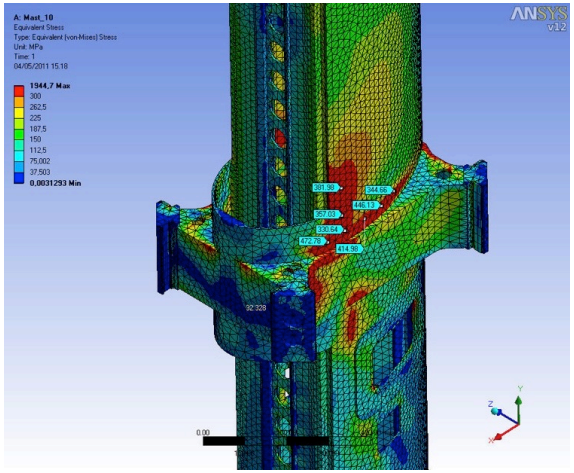
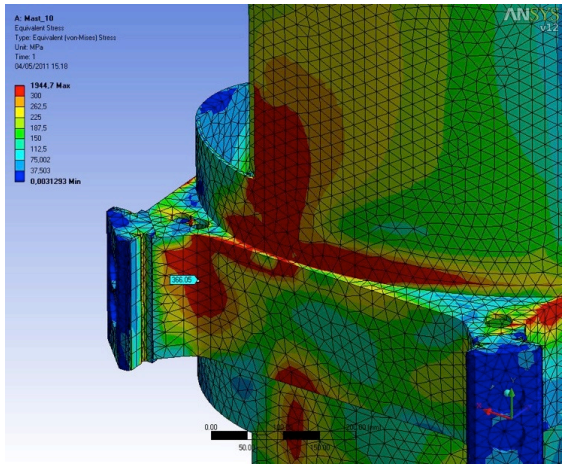
CALZONI





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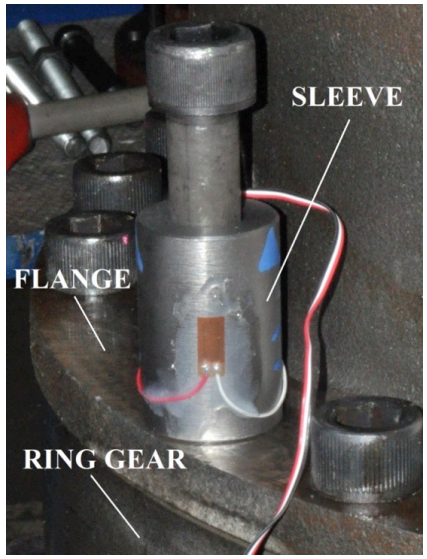
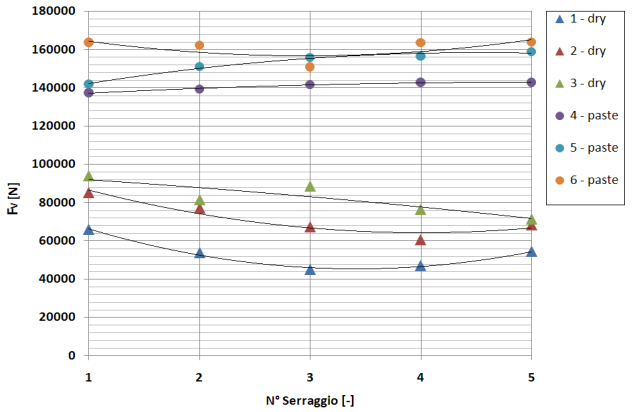
Bonfiglioli





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CIRI MAM

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Advanced Mechanical Engineering Applications and Materials Technology

Packaging Laboratory «Lab4Pack»

- Lab4Pack is alaboratory aimed at packaging processes development, established within a private company

- important Instruments(1M€)
- 4 full time researchers

\+ Microscopy
\+ Reology and forming processes
\+ Permeation – Shelf life
\+ Biology assessment

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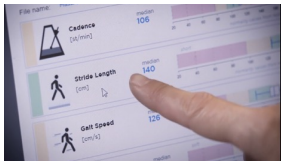
CIRI SDV

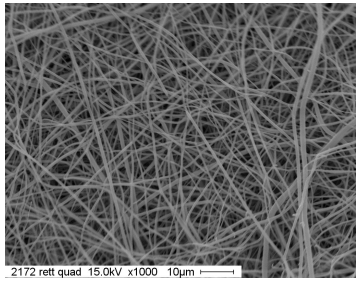
Industry & Context

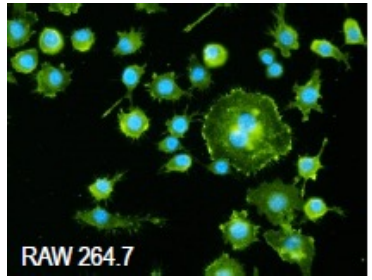
Research & Development Center

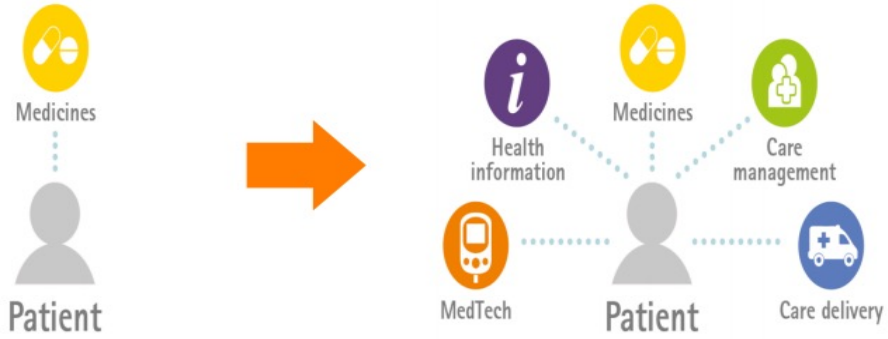
In Health Science and Tecnology wellness industry sector

Medical Devices	Translational Medicine
Diagnostics, Nanomedicine and Genomics	Technologies for health promotion and prevention









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CIRI ICT

Funding & Organization

Contracts Research from Industry
2011 – 2020: **2,165,000 €**

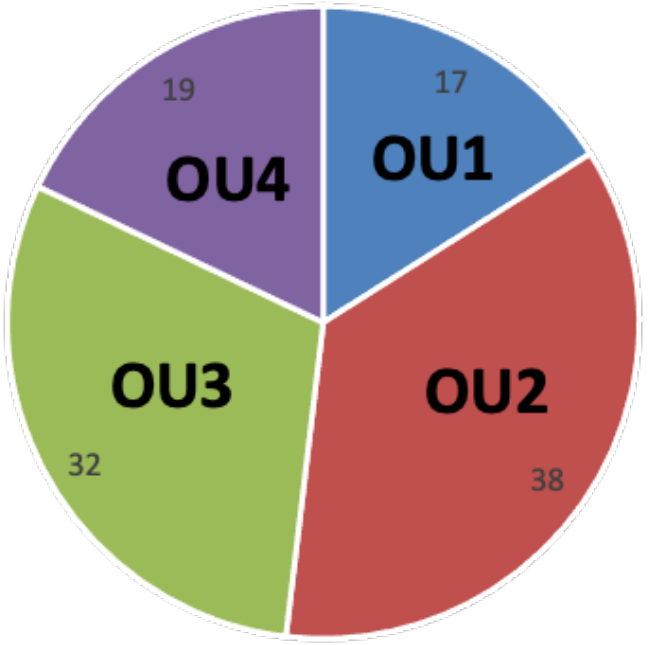
Projects from Competitive Calls
2011 – 2020: **4,400,000 €**

Operative Units: 4

Affiliated Departments: 10

Researchers: 10

Industrial research labs: 13



Non-Tenure Track Researchers
From 2011 - To 2021: 151

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CIRI SDV

CIRI SDV locations

Operative locations: **4** (Bologna, Ozzano, Cesena, Ravenna)
Laboratories: **13 plus the Joint Research Lab with the IRET** Foundation

Bologna

Emilia-Romagna

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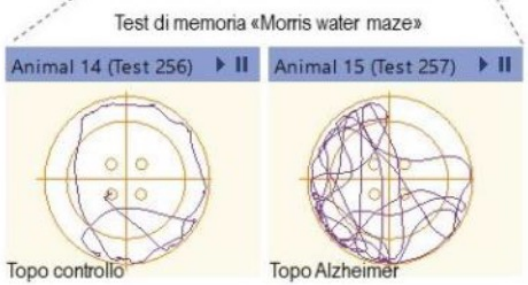
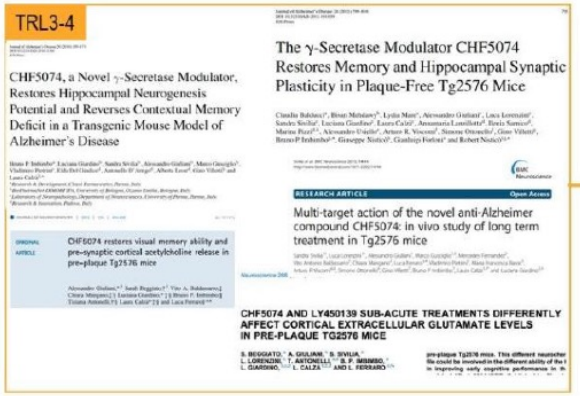
CIRI SDV

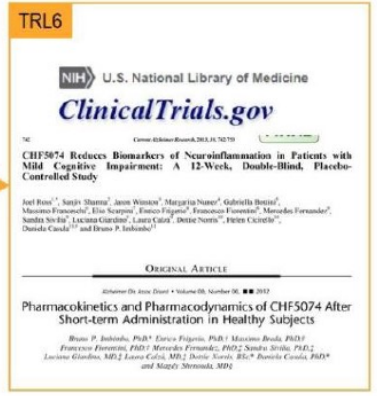
Successful results

CHF5074: a novel anti-Alzheimer modulator able to restore neurogenesis potential

(Cerespir US startup for molecule development PHASE 3)







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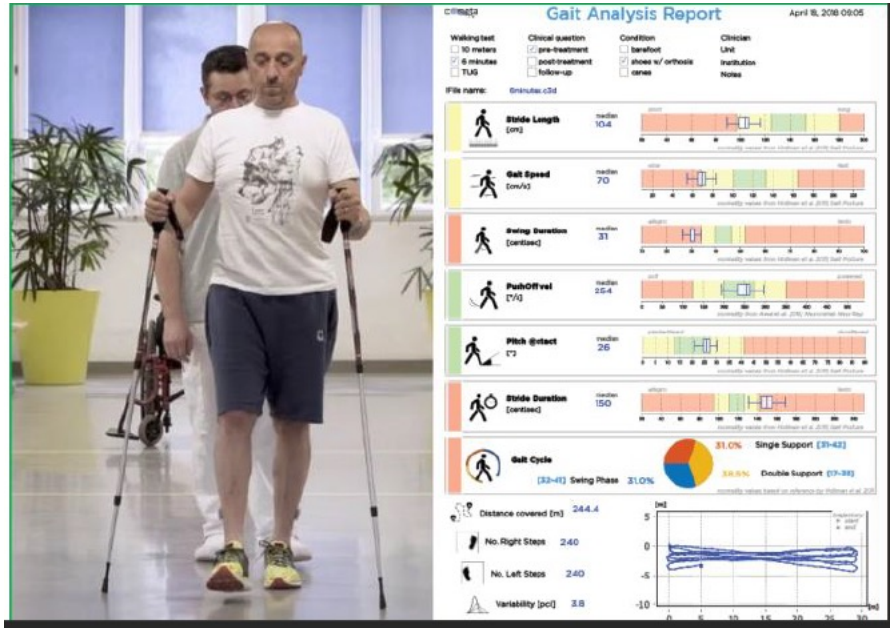
CIRI SDV

Successful examples

Step-by-Step: an integrated approach to the patient with acute neurological lesions

- prototypes of functionalized materials implantable for the controlled release of two drugs
- development and validation of a system capable of providing an evaluation of the evidence-based rehabilitation pathway

Innovative approach:
multitherapy
'Multiple drugs-multiple targets-one disease'



CIRI SDV

Successful examples

MySign

Technologies for remote monitoring applied to different settings and physiological systems, including but not limited to cardiovascular and respiratory systems through multiparameter wearable devices.

A new device is under development and currently is at TRL6.

CIRI SDV

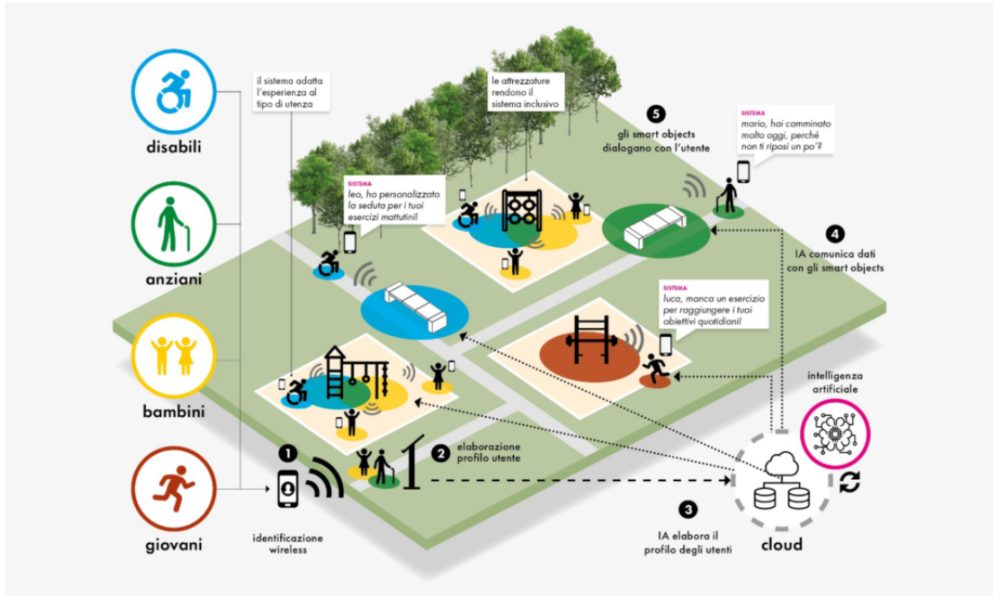
Successful examples

Home & Environment:

habitat

Pleinair

Parchi Liberi E Inclusivi in Network
per Attività Intergenerazionale Ricreativa e fisica



Patents from 2018 to present: # 14

EXAMPLES

1. Electrospun fibers for a local release of an anti-inflammatory and a promyelinating drug
Number: PCT/IT2018/000084 Deposited: 16/06/2018

2. Hierarchical multiscale electrospun scaffold for the regeneration and/or replacement of tendinous/ligamentous tissue and a method for its production
Number: PCT/IB2018/054153 Deposited: 08/06/2018

3. Apparatus, sensor and process for determining at least one parameter of blood circulating in an extracorporeal blood circuit
Number: EP18162977.5 Deposited: 20/03/2018

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CIRI SDV

30+ large companies and SMEs

Company portfolios

Spin-off

mHT
mHealth Technologies
http://mhealthtechnologies.it/

CELL dynamics
Simplify your choices.
http://celldynamics.strikingly.com/

TransMedResearch
http://transmed-research.com

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