CarE-Service

Circular Economy oriented services for re-use and remanufacturing of hybrid and electric vehicles components through smart and movable modules

I2MB 2019
INNOVATION & MANUFACTURING
BROKERAGE EVENT
Palace of Congresses and Exhibitions of Galicia
Santiago de Compostela (Spain)
6th – 7th November

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Institute of Intelligent Industrial Technologies and Systems for Advanced Manufacturing

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Project figures

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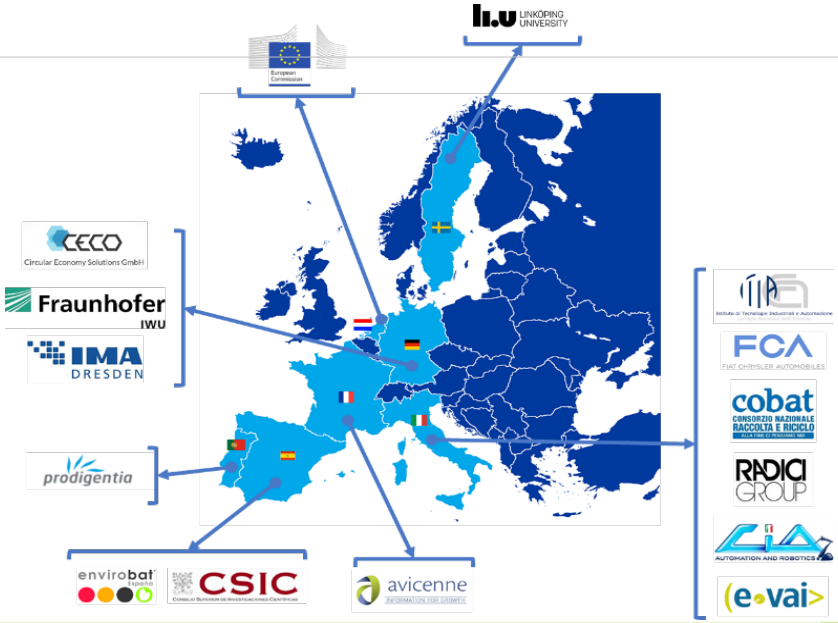


- 15 Partners
- 7 Countries
- Costs: 7,7 mln€
- EU Funding: 6,2 mln€
- From June 2018 to May 2021 (3 years)
- Coordinator: Giacomo Copani (CNR-STIIMA)

The paradigm shift in automotive industry

Automotive industry

one of the most relevant manufacturing industries in Europe

- **Jobplaces** and welfare *(12 million jobplaces, 780 billion turnover, 140 billion value added)*
- Citizens' **quality of life**
- **Environmental sustainability**
- Sustains **other supply chains** *(materials, electronics, machine tools, automation, …)*
- **Triggers innovation** in other sectors

Paradigm shift

Traditional fuel cars → Electric & Hybrid Electric Vehicles (**E&HEVs**)

By 2040 the 35% of the newly sold vehicles will be electric

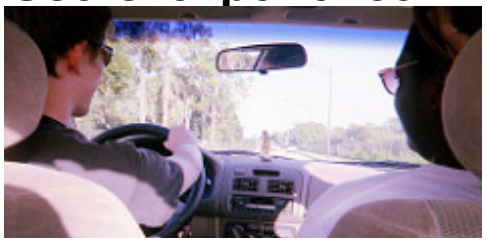
Current and future challenges

High Total Cost of Ownership of E&HEVs

€

- High initial cost of E&HEVs due to battery and other high added-value materials and components
- Battery life
- Maintenance cost

Users' experience



- Vehicle performance and autonomy
- Maintenance need
- Recharging stations
- ….

End-Of-Life

EU is not currently prepared to efficiently manage the EOL of E&HEVs:

- No consolidated processes and technologies for E&HEVs EOL
- No value chains for E&HEVs EOL

CarE-Service

Circluar Economy of E&HEVs: technological barriers

New high added-value parts and components in E&HEVs

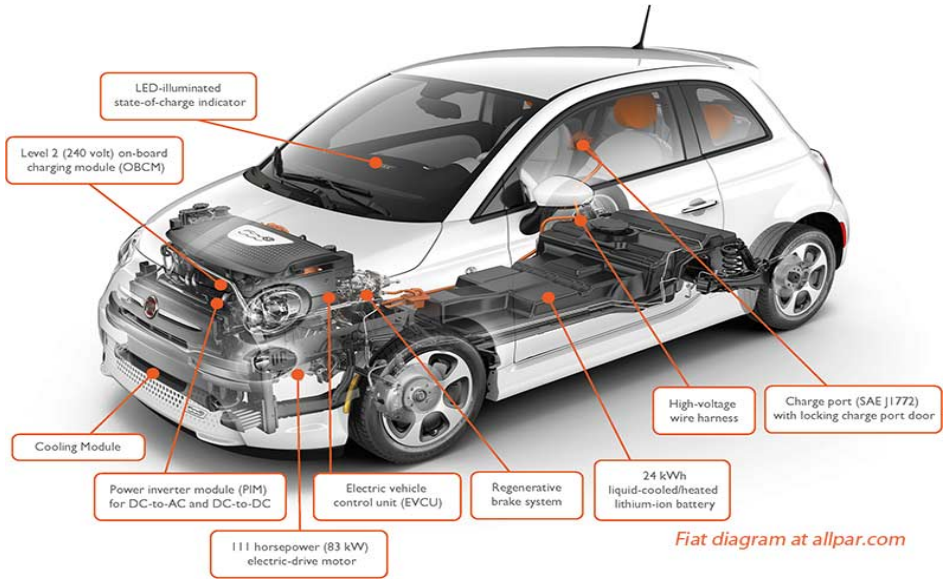
Battery system

Techno polymers

Composites

Electronics

…



What to do with them at the EOL?

How to safely disassemble and treat for re-use?

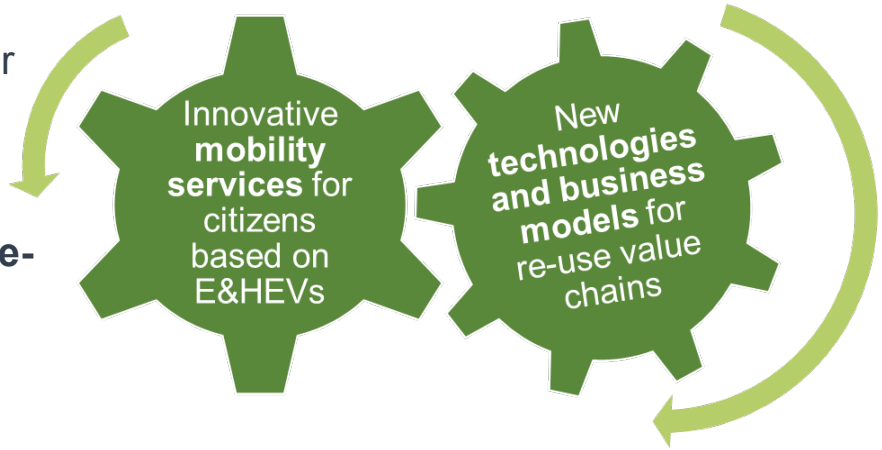
- **Lack of consolidated processes and technologies**
- **Components are not designed to be re-used**

Circluar Economy of E&HEVs: business and systemic barriers

- Lack of consolidated re-use chains
- Unclear sustainability of re-use business models
- Limited number of post-use cars in this ramp-up phase
- Unexplored re-use market
- Risk of market un-acceptance
- Regulation does not support re-use

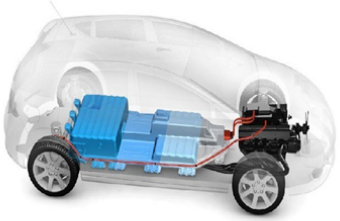
Project goals

- **Redesign E&HEVs** for circular economy
- Develop EU leadership in **advanced technologies for re-use** of E&HEVs
- **Reduce TCO** of E&HEVs
- Create **new value chains** and businesses in EU around Circular Economy of E&HEVs



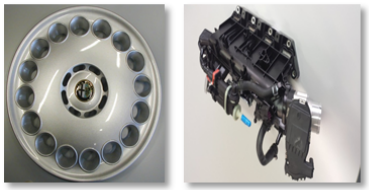
Industrial and social impact

Batteries

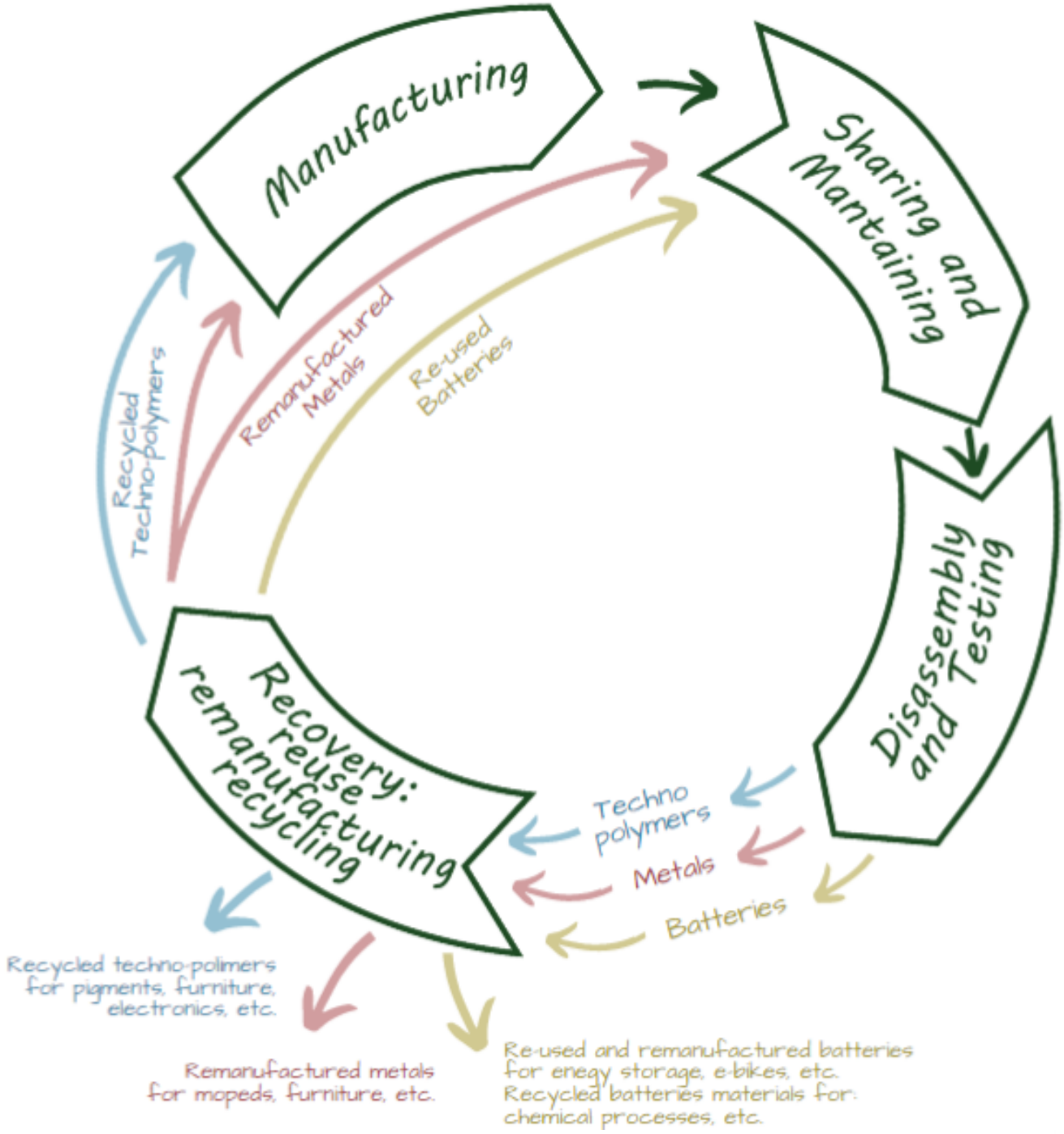


Metals

Techno-polymers



Concept


Manufacturing
Sharing and Mantaining
Disassembly and Testing
Recovery: reuse remanufacturing recycling
Recycled Techno-polymers
Remanufactured Metals
Re-used Batteries
Techno polymers
Metals
Batteries
Recycled techno-polimers for pigments, furniture, electronics, etc.
Remanufactured metals for mopeds, furniture, etc.
Re-used and remanufactured batteries for enegy storage, e-bikes, etc.
Recycled batteries materials for chemical processes, etc.

New mobility products-services

- **Non-ownership**:
  - car sharing, renting, leasing
- **Performance-oriented**:
  - Responsibility of the service provider for vehicle availability and performance
  - Quality reward criteria for customers returning vehicles
- **Exploiting benefits of circular economy**:
  - Reduced cost of spares
  - Reduced cost of vehicles built with re-usable parts
  - Continuous functional and aesthetic upgrade of parts through remanufacturing/refurbishing at low cost
- **High market segmentation**

Benefits for customers:

- higher affordability
- better assistance
- Increased overall transportation performance
- improved user experience

Smart Mobile Modules

Mobile units bringing advanced technology for on-site disassembly and testing/certification where is the demand

Disassembly Module

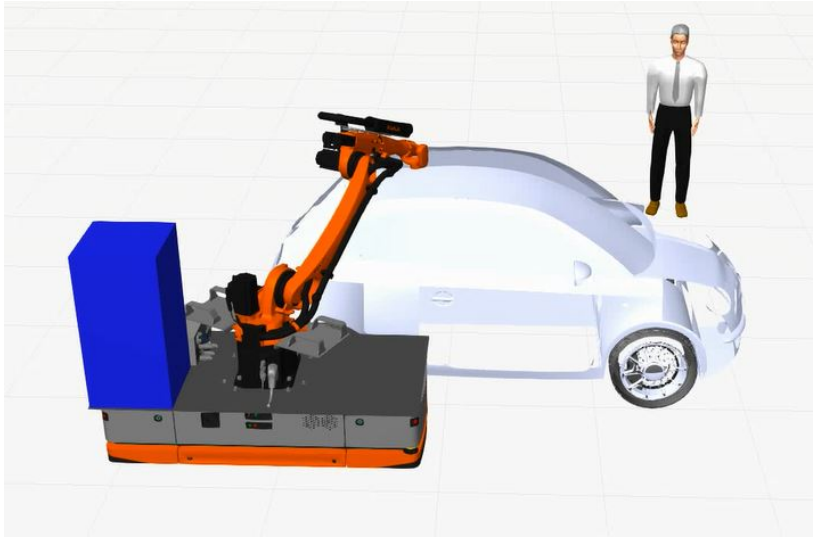
- DSS suggesting which components to disassemble based on car sensors data, manufacturer product data and market
- Disassembly guidelines
- Robotics cooperative disassembly
- Mechatronics tools

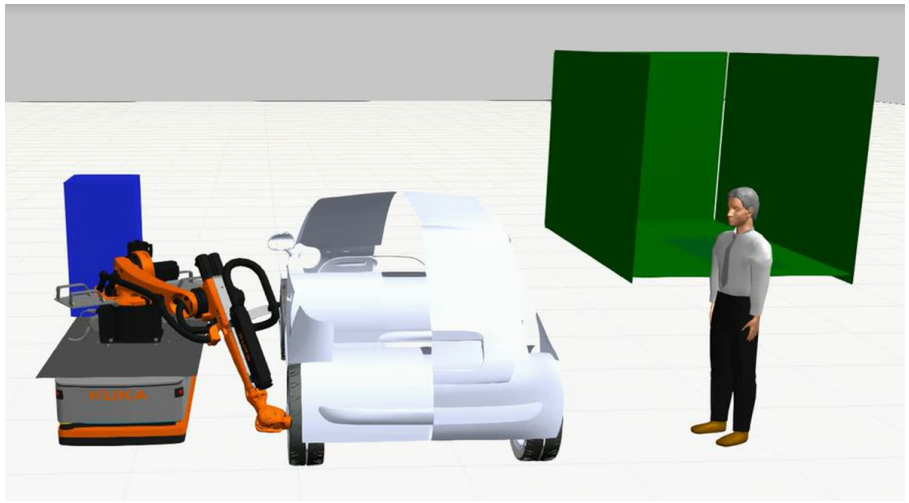
Testing Module

Functional, geometric, mechanical and electric testing methods and technologies for:

- Certification of re-usable parts
- Testing of components and parts for remanufacturing
- estimation of the type and content of high value-added materials for recycling

Smart Mobile Module for testing and qualification





AGV with top mounted robot used for disassembly components from the car.

The AGV can give more flexibility adapting the position depending on the car model or part to disassembly.

Re-use technologies for Li-Ion batteries

Dismantling technology for disassembly of battery cells

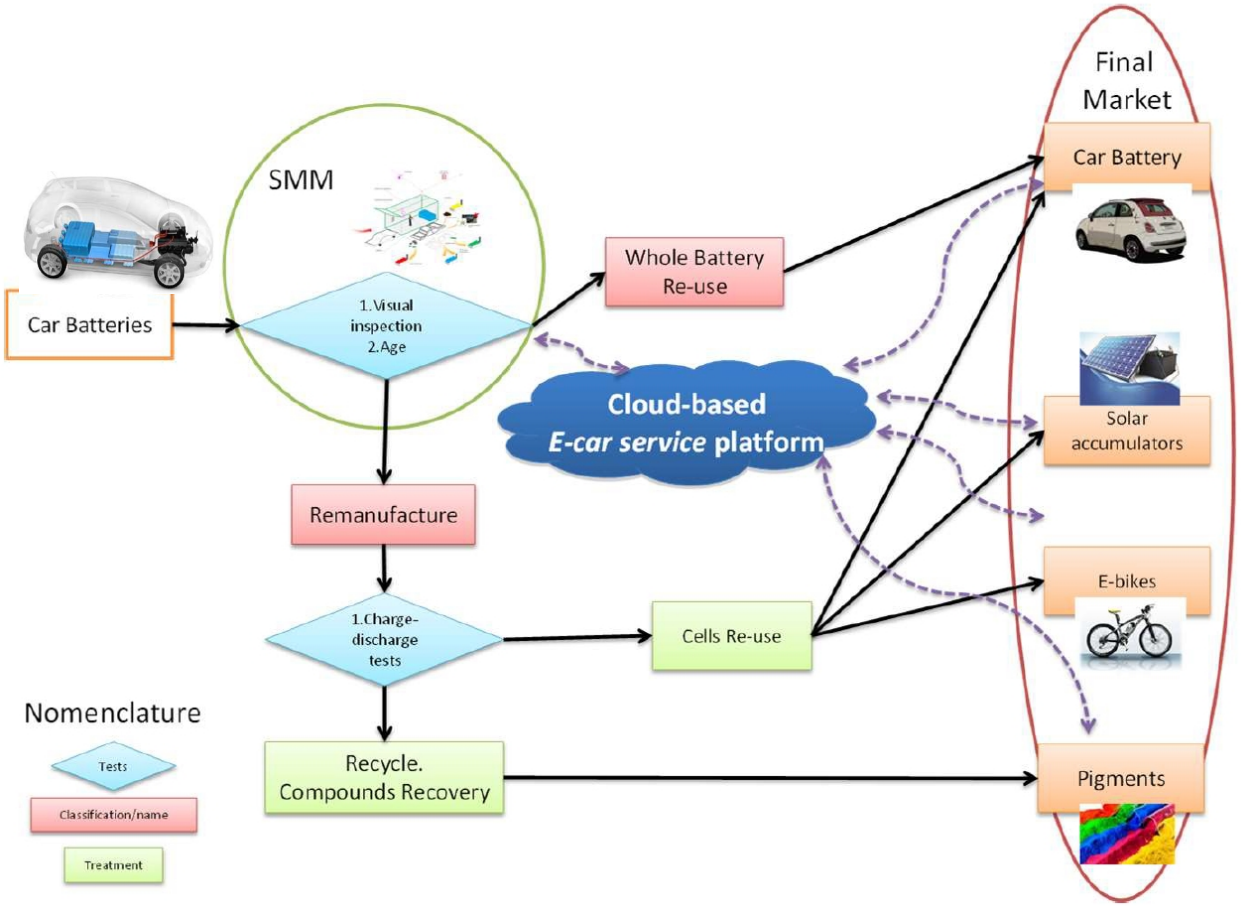
Human-robot cooperation to separate plastic, wires, electronic controllers and cell batteries

Testing technology and algorithms to predict residual life

Charge/discharge cell behaviour test, protocols and software for assessing battery SoH

Compounds recovery technology

Hydrometallurgy to sustainably recover Li, Co, Mn, Al, etc.



Re-use in other applications

Solar panels, e-bikes, pigments, etc.

Re-use technologies for metal parts

New flexible joining technologies

Disassemble and re-assemble modules of structural metal parts as spares or restyled models elements

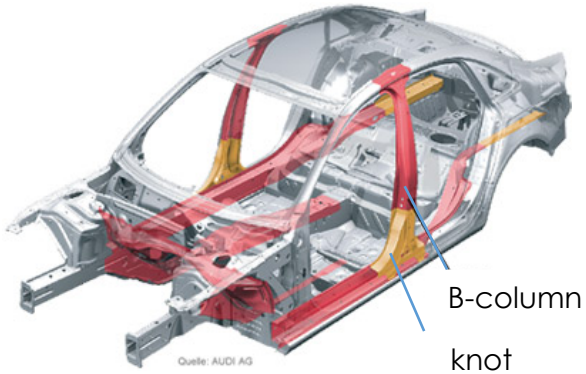
Cold reforming of external non-structural elements

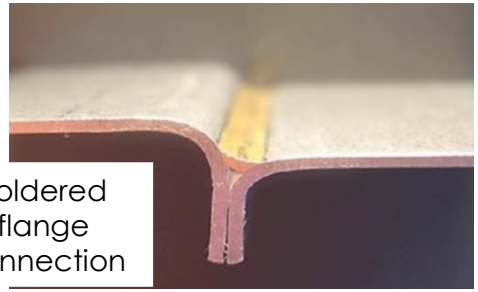
Obtain new parts to use as spares or to upgrade vehicles aesthetics at sustainable conditions

Re-use technologies for metal parts

Soldering and de-soldering process for car body structures

For example:
B–column fixed in a knot with the sidesillbar





Re-manufacturing: From a roof of car make 4 brake disc covers

Re-use technologies for techno-polymers

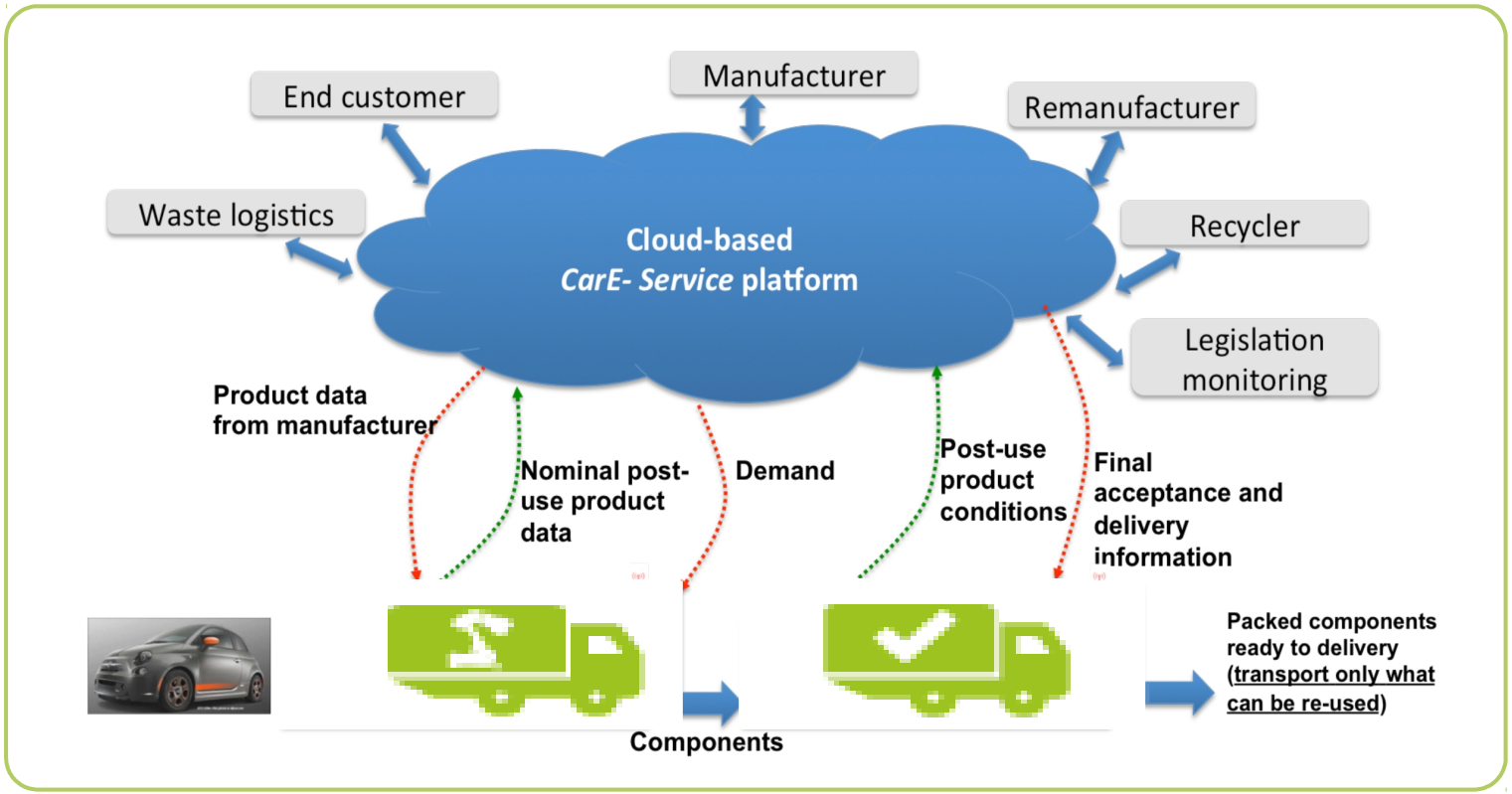



New recycling process for techno-polymers

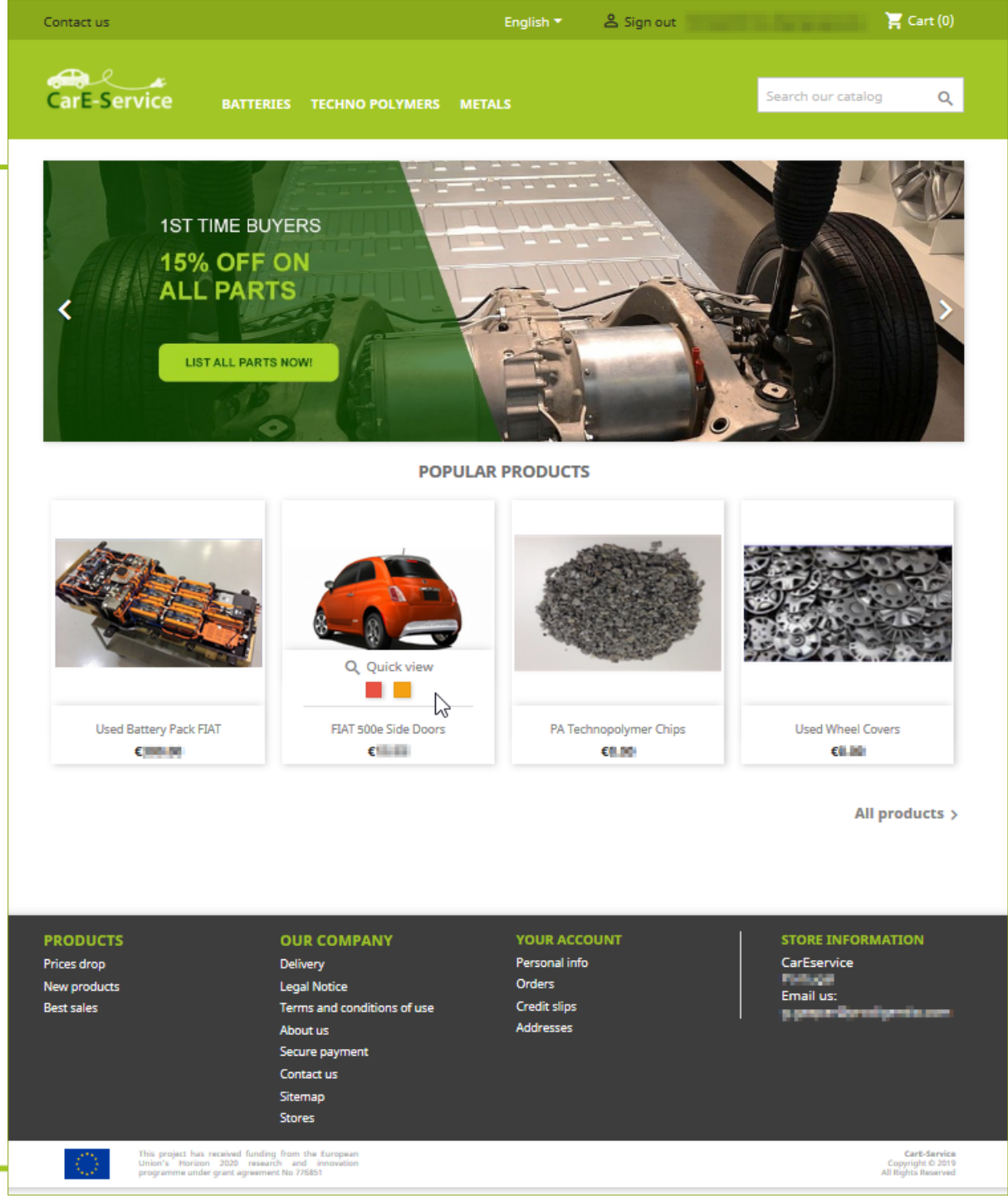
- Separation of metal sub-parts
- Grinding of new formulation compounds
- Extrusion for transformation of new parts (for automotive and other sectors such as furniture, design, etc.)
- Testing of materials properties

CarE-Service ICT Platform

ICT Platform connecting demand and supply of re-usable parts and allowing the coordination and optimization of the re-use value chain



CarE-Service ICT Platform



CarE-Service Stakeholders

Car Sharing/leasing/renting services and OEM	Europcar Autovermietung GmbH.
Companies	Solar Engineering and Applications 2005 Zaragoza, SL (solar panels); Bultaco Motors SL (electric motorbikes), Thermal recycling composites s.l. (recycling of Evs composites); Ferro Spain, S.A. (coatings); eBIKE75 S.L. (electric bikes); Elettronica Santerno (Inverters design and marketing)
Dismantlers	Centro Rottami srl
Scientific and business professionals	International Synergies Limited; Institute of Automobile Research (INSIA- UPM).
Authorities at Regional, Metropolitan and National level	Region Lombardy; Saxony (region) State Ministry; Province Östergötland; Region Castilla – La Mancha Ministry of Environment; Santander Region Council; Metropolitan City of Milan; The Institute for Diversification and Saving of Energy (IDAE) agency of of the Spain Ministry of Industry, Energy and Tourism; Region of Azuqueca de Henares.
Clusters	Lombardy Intelligent Factory Cluster, Automotive Cluster of Ostdeutschland; Saxony Automotive Supplier Network (AMZ)

Join our project !

Demonstration

- **Technical solutions** in 3 re-use value chains
- **Re-use applications**
- **Mobility services** (multiple locations, customers involvement)
- Overall **business sustainability**
- **Social impact**

Exploitation

- **Open industrial training workshops**
- **Exploitation meetings**
- First **market replicators**
- **Regional Authorities** involved
- **White paper for regulation**
- **Community of customers**

Stakeholders' Group
Consumers' Committee
Social Community

Join our "Stakeholders' Group" and "Consumers' Committee"

www.careserviceproject.eu

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