







# Demonstration of an integrated innovative biorefinery for the transformation of Municipal Solid Waste (MSW) into new BioBased products

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#### **PERSEO Bioethanol®: Urban Biorefinery. The company**

IMEAL

# INDUSTRIAS MECÁNICAS ALCUDIA S.A.

Metal mechanical company founded in 1979.
Located in L'Alcúdia (Valencia – Spain)
High technological capacity. Experience in petrochemical and refinery sectors.
25.000 m2 of facilities. 180 employees.





About 100 Mt of municipal biowaste is generated every year in Europe.

Only about a third (30 Mt) of this was separately collected and composted and/or digested (European Compost Network (ECN))

New Waste legislation (22 may 2018)

Mandatory separate collection of bio-Waste: 31/12/2023
Maximum 10% landfill of MSW 2035.

COM (2015) 614 Circular economy. From residue to resource.

# **BIOREFINERY FROM ORGANIC URBAN WASTE** bioethanol and Profitable.

BIO ENERGY

The Process is Real, Feasible, Replicable

**Proven Pre-industrial process.**  $\checkmark$ 

Pilot plant 25 t/d from 2007.

**Biotechnological process:** Transform the organic fraction of municipal waste into advanced bioethanol, bioproducts and bioenergy.







#### Demo Project Budget: 15 M€ Duration: 4 years project (6/2017 – 5/2021)





andfill

Composting

Anaerobic Digestion

# The URB OFIN objective

NEW MODEL OF OFMSW TREATMENT Biorefinery Multiple bioproducts Higher value



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OFMSW

VALUE







## **Project Challenges**

- To tackle the issues inherent to MSW treatment, such as variability in composition (seasonality and geographic location) and presence of inhibitors to downstream biotechnological processes.
- ✓ To validate the whole value chain at demonstration scale (TRL 5-7).
- To demonstrate at Demo-scale the economic and environmental benefits of the Urbiofin treatment and conversion technologies of the OFMSW into final or intermediate products.
- ✓ To validate safety, quality and purity of the products in order to meet commercial and/or regulatory requirements.
- ✓ To assess the environmental and socio-economic performance of the whole value chain using a Life Cycle Assessment (LCA)





#### Bio-based Industries Consortium



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#### Module I. Conversion of OFMSW to bioethanol and bioethylene













1st Generation

Wheat

Sugar bee Sugar-can

Sorahum

Corn stove

Wheat stray

Vood chir

vitchorase



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### **Market of bioproducts**

## **Bioethanol**:

- ✓ Biofuel: 90% of total biofuels. Market Forescast in Europe: 13 billon € in 2030
- Chemical Building block: Bioethanol is considered as one of the "top" 10" potential biobased raw materials for the chemical industry. (US Energy Department)

#### **Bioethylene:**

✓ Global bioethylene market size was over USD 160 billion in 2015 and is foreseen to exceed USD 235 billion valuation by 2024









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#### Module II. Conversion of OFMSW to VFAs for production of PHA.











# Market of bioproducts

## **Bioplastics:**

- ✓ Biodegradable bioplastics market is expected to double between 2014 and 2019.
- ✓ In the case of PHA market it is expected a growth from 32 to 104 Mton, mainly related to flexible or rigid packaging and agriculture purposes.









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# Module III. Biogas bioconversion to biomethane and added value products



#### CIAM Innovation Center



AD  $2 = 40 \text{ m}^3$ 



#### **Bioproducts:**

















Universidad deValladolid

### **Market of bioproducts**

#### > Biofertilizers

✓ Global bio-based fertilizers market is expected to reach USD 1.9 Billion by 2020 at a CAGR of 14.0% from 2015 to 2020



\*Others include zinc, boron, and sulfur-solubilizing biofertilizers E – Estimated; P - Projected Source: Expert Interviews and MarketsandMarkets Analysis

#### Advantages of bio based fertilisers vs conventional (mineral) fertilisers

- ✓ It is a recovered / renewable origin bioproduct
- ✓ It improves soil quality/health and not only crop productivity
- $\checkmark\,$  It contains higher components and nutrients concentration
- $\checkmark~$  It offers easy manipulation and application in field
- $\checkmark\,$  Slow release of nutrients and improved crop yield
- $\checkmark$  It reduces the environmental footprint of crop production









The achievements

Process definition and improvements

Pilot plants start the DEMO activitiy.

#### ✓ Final products requirements



2020-2021





2019-2020









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