Jornada Técnica Internacional
Biorrefinería
de residuos
Paterna, 14 Junio 2018

Bioetileno, bioplásticos y biofertilizantes a partir de la fracción orgánica de residuos municipales

Caterina Coll, IMECAL
PERSEO Bioethanol®: Urban Biorefinery. The company

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.
244 Mt MSW generated in Europe (Eurostat – 2016)

Recycling 29%
Landfill 24%
Incineration 27%
Composting and Digestion 16%

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))
Municipal solid waste treatment in 2015
EU 28 + CH/N/ICE

Source: EUROSTAT 2017
Biowaste treatment is a big issue in Europe and Worldwide, demanding **Sustainable and competitive waste treatment process.**

New Waste legislation (22 may 2018)

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

Biotechnological process:
Transform the organic fraction of municipal waste into advanced bioethanol, bioproducts and bioenergy.
The Process is Real, Feasible, Replicable and Profitable.

Proven Pre-industrial process.
Pilot plant 25 t/d from 2007.

Technology:
- Simple biotechnological process.
- Compatible with the existing MSW treatment facilities.
- Better economical results than current MSWT
<table>
<thead>
<tr>
<th>Year</th>
<th>Project Description</th>
<th>Funding Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-2021</td>
<td>Demonstration of an integrated innovative biorefinery for the transformation of Municipal Solid Waste (MSW) into new BioBased products. (GA No. 745785)</td>
<td>Este proyecto ha recibido financiación del programa ERA-NET CO-FUND BESTF3 con cofinanciación de CDTI y MINECO en España y DECC en Reino Unido así como del Programa Marco de Investigación e Innovación, H2020, de la Unión Europea.</td>
</tr>
<tr>
<td>2017-2020</td>
<td>Chemical building blocks from versatile MSW biorefinery. (GA No. 745828)</td>
<td></td>
</tr>
<tr>
<td>2017-2020</td>
<td>Valorization of urban wastes to new generation of bioethanol (EXP-00098459 / SERA-20171009)</td>
<td></td>
</tr>
</tbody>
</table>
Demonstration of an integrated innovative biorefinery for the transformation of Municipal Solid Waste (MSW) into new BioBased products (GA 745785)

Project Budget: 15 M€ (Grant 10.9 M€). 4 years project (6/2017 – 5/2021)
The objective

Landfill
Composting
Anaerobic Digestion

NEW MODEL OF OFMSW TREATMENT

Biorefinery

OFMSW

URBIOFIN - Biorefinery

BIO-BLOCKS
- Bioethanol
- Volatile fatty acids
- Biogas

BIO-POLYMERS
- Polyhydroxyalkanoates
- Combined PHA’s

ADDITIVES
- Bioethyle
- Biochemical products

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 the large-scale, economically competitive deployment of 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 through a Life Cycle Assessment (LCA)
Module I.
Conversion of OFMSW to bioethanol and bioethylene

Bioproducts:
Market of bioproducts

**Bioethanol:**
- **Biofuel:** 90% of total biofuels. In Europe 13 billion € 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
Module II. Conversion of OFMSW to VFAs for production of PHA.
Market of bioproducts

- Bioplastics:
  - Biodegradable bioplastics market is expected to double in 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.
Module III. Biogas bioconversion to biomethane and added value products

**Bioprocesses:**
- Upgrading
- Microalgae
- Hydrolysis + concentration
- PHA production + Extraction

**Module 3 Applications Products**

**Bioproducts:**
- BioPlastics
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

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
- It contains higher components and nutrients concentration
- It offers easy manipulation and application in field
- Slow release of nutrients and improved crop yield
- It reduces the environmental footprint of crop production

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

- Feedstock requirements
- Process definition and improvements
- Final products requirements

Pilot plants start the DEMO activity.
Benefits of an urban biorefinery:

**Higher annual benefits**, when compared to current MSW technologies

**Waste is a resource**: Circular economy.

Improvment of the performance through the **use of by-products generated** in their own processes – **landfill diversion**

**Versatility** to treat different fractions of waste to obtain maximum added value and profitability

**Bioresources**

**Reduction of fossil resources** dependence in energy and products.

**Sustainability**

**Boost competitiveness**, foster sustainable economic growth and generate new jobs

Evolution towards the path of the bioeconomy defined by the EU.

**Waste is a resource**: Circular economy.
This project has received funding from the Bio-Based Industries Joint Undertaking under the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 745785.
Muchas gracias por su atención

Caterina Coll, IMECAL

caterina@imecal.com
+34699626947