CENER

CENTRO NACIONAL DE ENEGÍAS RENOVABLES
NATIONAL RENEWABLE ENERGY CENTER OF SPAIN

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CENER | NATIONAL RENEWABLE ENERGY CENTRE
ADItech

Lab Bench Pilot Demo Market

R&D

BIO2C – Biorefinery and Bioenergy Centre

Integrated trial and **demonstration platform** designed to develop:

- processes,
- equipment and specific components,
- new bioproducts and biofuels,
- bio-refinery concepts.

Process Development Units (PDUs) for **bioproducts** and **advanced biofuels** on a **pilot** scale level as an intermediate step towards the industrial **scale-up** of these technologies. **Services**, among others:

- Testing and Analysis
- Product and Process Development
- Tailor-made research Contracts
- Participation in R&D Funded projects (i.e H2020)
- External staff stages and training

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BIOCHEMICAL PROCESS UNIT

PILOT PLANT

Pretreatment

- **Continuous horizontal** reactor
- Feed flow: up to **5 kg/h**
- Pressure up to **14.5 bar**
- Temperature up to **200ºC**
- High **flexibility** in **feedstocks**

Enzymatic Hydrolysis

- **High solids** enzymatic hydrolysis **stirred tank reactor**
- **200l** capacity
- Temperature**: 20-80 ºC**
- **Atmospheric pressure**

Fermentation

- **Fully monitored bioreactors**
- **40l** and **100l** capacity
- Temperature: **23-85ºC**
- **Adjustable** agitation speed, air/gas ratios, pH, nutrients

BIOCHEMICAL PROCESS UNIT

INDUSTRIAL PLANT

Modular and **flexible** facility. Main equipments:

- **Biomass feeding** system
- High solid enzymatic **reactors** (**2 x 3 m³**)
- Solid- liquid **separation**,
- **Detoxification** and liquid fraction **conditioning**
- **Fermentation train** consisting of several monitorized bioreactors (**1, 3** and **6 m³**)

PRIVATE PROJECTS (EXTRACT)

Private Customer 2013 — UPSCALLING OF A FERMENTATION PROCESS (CONFIDENTIAL)

Detail of one of the fermenters in the Biochemical Process Unit

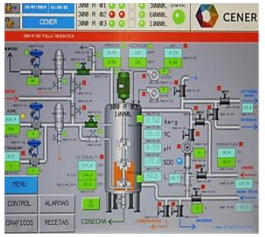
PROJECT SCOPE

Scaling up of **a fermentation process** of conversion of **wheat straw into industrial oils**, including: pretreatment, enzymatic hydrolysis, filtration, fermentation, centrifugation and drying.

CENER ROLE

- Project **coordination**: including equipment from vendors (plate filter, centrifuge, drier)
- **Plant operation**
- **3 test campaigns** (2 x 3000 litter enzymatic hydrolysis, 3000 litter fermentation)

Private Customer 2016-2018 — OPTIMIZATION AND UPSCALLING OF A FERMENTATION PROCESS (CONFIDENTIAL)



Screen control of the 1000 L bioreactor

PROJECT SCOPE

Optimization and scaling up of a **fermentation** process for **agrobiological product production**

CENER ROLE

- Product **chromatographic characterization protocol** development
- Fermentation test for production process **optimization and upscalling** up from flask to 1000 litters
- **Economic and sustainability** assessment

Private Customer 2017 — UPSCALLING OF A FERMENTATION PROCESS for PHB production

Detail of one of the fermenters in the Biochemical Process Unit

PROJECT SCOPE

Scaling up of a **fermentation process** of conversion **of cereal residue into Polyhydroxybutyrate** (PHB), including:

- enzymatic hydrolysis,
- decanter,
- fermentation and
- centrifugation

CENER ROLE

- **Project coordination**: including equipment from vendors (decanter, centrifuge)
- **Plant operation**
- 1st stage **upscalling to 100 L**
- 2nd stage **upscalling to 3000 L**

Private Customer 2017 — UPSCALLING OF A FERMENTATION PROCESS for 2,3 BD production

Detail of one of the fermenters in the Biochemical Process Unit

PROJECT SCOPE

Scaling up of a **fermentation process** of conversion **of organic fraction of municipal solid waste into into 2,3 BD including:**

- enzymatic hydrolysis,
- decanter,
- fermentation and
- centrifugation

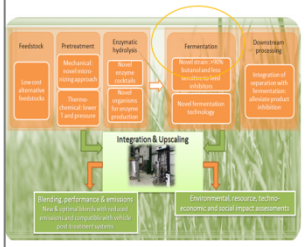
CENER ROLE

- **Project coordination**: including equipment from vendors (decanter, centrifuge)
- **Plant operation**
- 1st stage **upscalling to 100 L**
- 2nd stage **upscalling to 3000 L**

FUNDED PROJECTS (EXTRACT)

BUTANEXT — Next Generation Bio-butanol

2015-2018



PROJECT SCOPE

To overcome the technical and economic constraints to the **use of biobutanol as an advanced biofuel.**

To develop **highly efficient production processes** and convert **sustainable feedstocks** for the next generation of biobutanol.

CENER ROLE

Project **Technical Coordinator.**

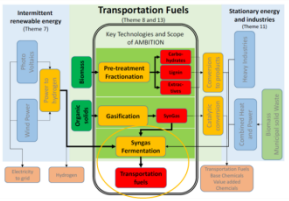
Integration and **scale-up at pilot scale of bio-butanol** production (100 L).

Fermentation batches have run successfully even more when the fermentation process is coupled with the pervaporation unit. To this end, the fermentor was **integrated with a pervaporation membrane module for this first time on pilot scale.**

http://butanext.eu/

AMBITION — Advanced biofuel production with energy system integration

2016-2019



PROJECT SCOPE

To develop a long-term joint **European Community Research & Innovation Agenda (ECRIA)** on the integration of biofuels production and surplus grid electricity valorisation.

To solve key bottlenecks in biomass conversion technologies. i.e. **efficiency, pre-treatment, gasification, gas cleaning** to valorize lignin-rich residue & **syngas fermentation** for the sustainable production of **biofuels & chemicals**

CENER ROLE

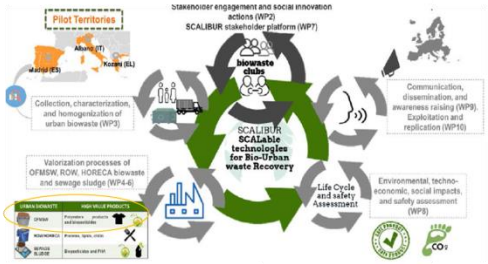
To lead the upscaling (40L), optimization and validation of 2 **syngas fermentation routes** for **1-butanol** and **butiric acid** production, using **self produced syngas** in a **2MWt** fluidized bed **gasifier .**

Sustainability Assessment

www.ambition-research.eu

SCALIBUR — Scalable Technologies for Urban Biowaste Recovery

2018-2022



PROJECT SCOPE

SCALIBUR aims at closing the gap between technological feasibility and **industrial applications** of **urban biowaste valorisation** by enhancing **strategic cooperation between sectors.**

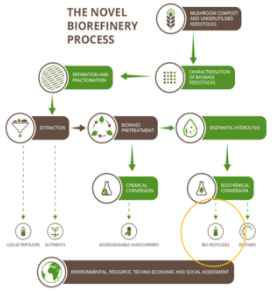
CENER ROLE

OFMSW valorization by enzimatic hydrolisis and fermentation in **BIO2C demostration plant (TRL7),** for a later production of bio-based **polyesters** and **biopesticides**

Sustainability assessment

BIO RESCUE — A novel biorefinery concept for mushroom compost

2016-2019



PROJECT SCOPE

To develop and demonstrate a new innovative **biorefinery concept** based on the **cascading use of spent mushroom substrate** (SMS) supplemented by wheat straw & other seasonal underutilised lignocellulosic feedstocks.

To avoid disposal and allow for the **production of some biodegradable bio-based** products and **bioactive compounds ,**

CENER ROLE

Project Coordinator

To lead the research line of SMS **conditioning** and two step **fractionation** process of the SMS into **three valuable fractions** (extract, high glucan solid and enriched lignin liquid),

Secondary conversion related to sugar **fermentation for biopesticides production**

Sustainability Assessment

Bio-based Industries Consortium

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THANK
YOU VERY
MUCH!