WASTE2FUELS

## EDITORIAL

*by Waste2Fuels Project Coordinator, Ignacio Montero Castro*

Dear Reader,

As the project coordinator of Waste2Fuels, it is a honor for me to present the third edition of the project newsletter where you can read about the main project outcomes and developments achieved during the last months, a briefing of the main expected impacts of Waste2Fuels approach, as well as checking a briefing of the main expected impacts of Waste2Fuels approach.

During these months, the consortium has achieved all its expected goals, being able to make a step forward on **metabolically engineered microorganisms to convert agro-food waste biomass into butanol** and to start the **tests of the demonstration scale units for ABE fermentation and catalytic conversion of ethanol to butanol.**

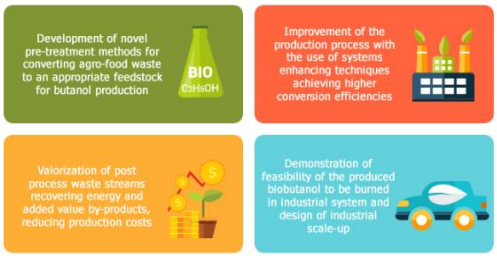
Furthermore, relevant advances on industrial scale-up milestones have been accomplished through the creation of detailed **process modelling for ABE production process** and the **evaluation of the viability of fuel blends on conventional engines.**

In the upcoming months, the consortium will focus on **validating the two demonstration scale units**, feeding the process finger print evaluation through LCA, LCC and s-LCA methodologies. Complementarily, further engine tests, as well as PAHs and UFPs concentrations and possible eco-toxicological impacts during bio-butanol combustions will be evaluated.

Through the deployment of these last actions, Waste2Fuels project will guarantee its impact on establishing **bio-butanol as a sustainable alternative fuel**, contributing to decentralization and security of EU energy production while valorizing unavoidable agro-food waste.

On behalf of the whole Waste2Fuels team, I hope you enjoy this third newsletter and I warmly welcome you to visit our website to have more information about us.

## What to expect in terms of impacts?




## A look back at the project's last 8-month period!

In the months leading up to today,

an **innovative continuous fermentation system** has been developed and optimized at lab scale, aimed at optimizing both the butanol productivity and the feedstock conversion.

**Adsorption technique** has been investigated for the recovery and separation of bio-butanol from the fermentation broth.

The **fermentation/recovery system**, after being optimally designed, has been created and mechanical tests of the whole system (pressure test) have been rolled out. The fermentation

Simple **physicochemical pretreatments**, such as autohydrolysis or surfactant-mediated hydrolysis, were developed to **transform agro-food wastes (apple pomace, potato peel and coffee silverskin) into sugar-rich hydrolysates.** Their fermentation provided butanol concentrations of 7-9 g/L without the need of detoxification steps.
Gas stripping recovery produced condensates with 120 g/L butanol in one step, reaching 300-360 g/L butanol in two consecutive steps.

**Models for pretreatment, hydrolysis, fermentation, and solvent recovery** steps, all based on experimental results, are implemented in Aspen Plus. Process simulation will be used to optimize the whole process chain of ABE production investigated in Waste2Fuels project.

Applying pervaporation (POMS membrane) the concentration of butanol (1% in fermentation broth) was increased to 21 wt% facilitating further solvent upgrading via distillation.

In parallel, **tests of performance have been carried out and emissions of a diesel engine and a domestic heating burner fuelled with butanol blends up to 20%.** The properties of the fuel blends were tested following standardised procedures. The results are very promising; they show that **bio-butanol blends can be used without problems up to 10 %**, but 20% could be the limit.

**Validation and demonstration of the two proposed catalytic routes to convert pure ethanol and ethanol-water mixtures into 1-butanol** have been run. For that reason, a demonstration unit has been constructed in which the most promising structured catalysts have been tested under dry and hydrothermal conditions, respectively.

Various data required for **estimation of catalysts stability and productivity** has been collected. In the last following step, the efficiency of **ethanol-to-butanol processes** will be evaluated and various issues regarding heat and waste utilization will be considered.

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