



High quality methylal
from non-recyclable
plastic waste by an
improved Catalytic
Hydro-Gasification
Plasma (CHG) process

LAYMAN REPORT/March 2021



*The LIFE ECOMETHYLAL project has received funding from the
LIFE Programme of the European Union.*



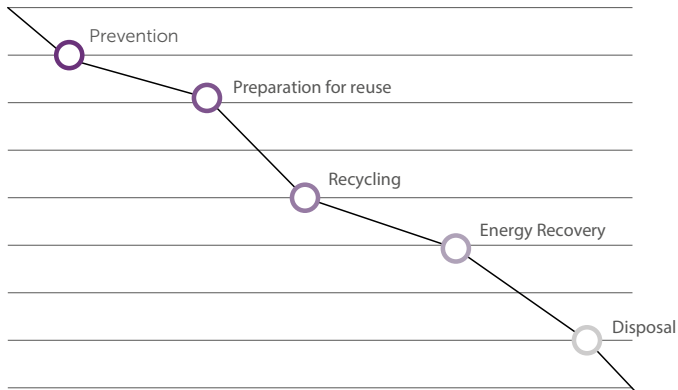
INTRODUCTION

THE PROBLEM

The use of plastic materials is extended to almost all sectors (e.g., packaging, automotive, electrical and electronic or building and construction, among other). Plastic products, at the end of their useful life, become waste.

In 2018, 29.1 million tonnes of plastic waste were collected in the EU in order to be treated. Plastic waste is managed; currently 75.1% are valued to obtain new recycled materials (32.5% recycled) or energy (42.6%), the remaining 24.9% is sent to landfill.

According to the waste hierarchy, recycling is preferred to energy recovery and both are above disposal.



The trend in the last years shows a significant decreased in landfilled plastics but is necessary further action to reach a zero plastics waste to landfills in Europe.

Energy recovery is an option for **non-recyclable waste** compared to landfill disposal, which is inefficient in terms of resources utilization, environmentally, economically, and socially. But it is interesting to improve the energy option, prioritizing recycling and **to limit landfilling to non-recyclable and non-recoverable waste**.

THE PROJECT SOLUTION

LIFE ECOMETHYLAL project will strengthen a hypothetical legislation and give a solution through recycling of waste streams.

It will implement a highly profitable technology called Catalytic Hydro-Gasification with Plasma (CHP), to produce methylal using the current non-recyclable plastic waste (NRPW) from the sectors: automotive, electric-electronic, textile and packaging, according the waste hierarchy established by the EU policies. This should dramatically reduce the amount of landfilled NRPW and will involve production and marketing of a new eco-product made from recycled material.



The
**LIFE ECOMETHYLAL
Project** demonstrates
how waste can be
recycled, not to
recovery energy, but
to produce methylal
(dimethoxymethane), a
chemical substance of
interest to industry in its
numerous applications.



PROJECT OBJECTIVES

- Reduce the NRPW address to landfill and a new eco-product commercialized (by material recycling) which is a more sustainable alternative compared to the current one from fossil sources.
- It contributes to the shift towards a resource-efficient, circular economy and specifically, to the plastic waste recovery.
- Implement a mature and patented solution for homogeneous biomass.
- These plants can be installed inside/closed to the plastic treatment plants/recyclers companies to treat the non-mechanically recyclable fraction.
- The LIFE ECOMETHYLAL replicability to all EU will contribute to reduce the landfill waste.

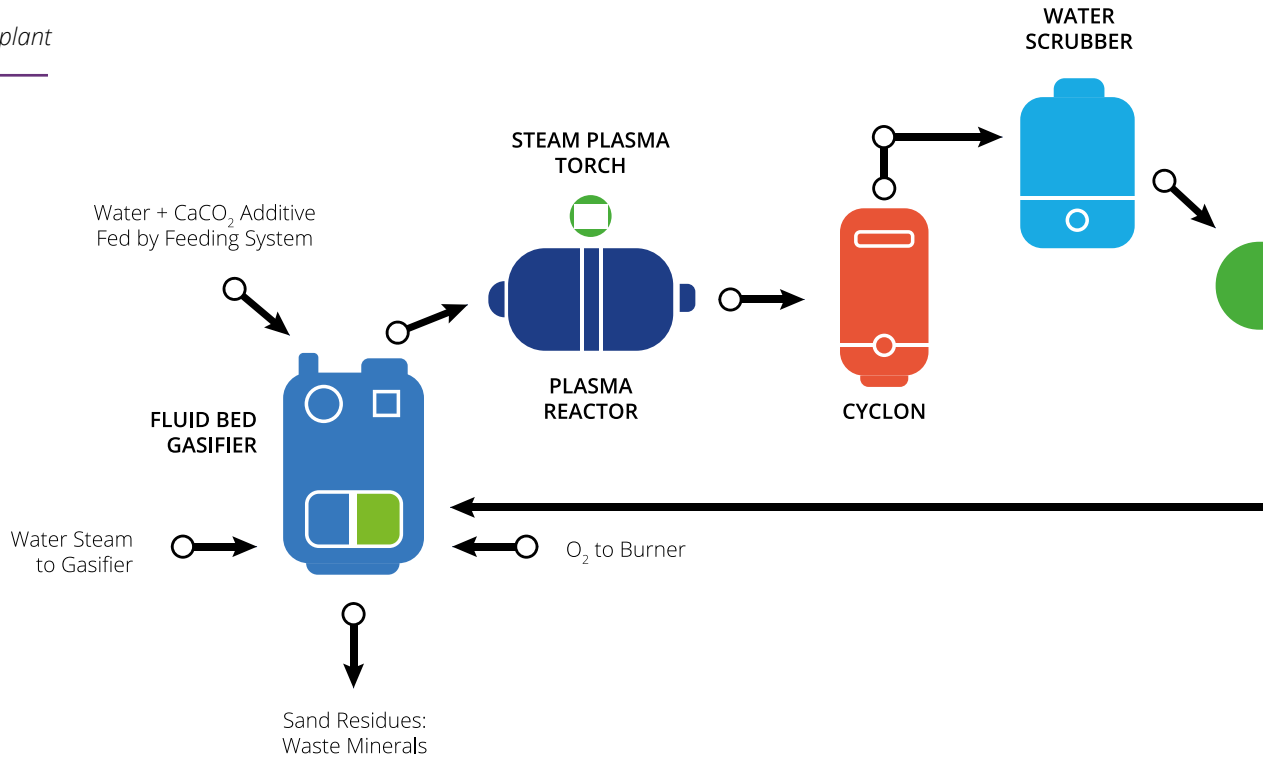
PROJECT IMPLEMENTATION

The LIFE ECOMETHYLAL Project, which will end this month, received funding from the LIFE Programme of the European Union.

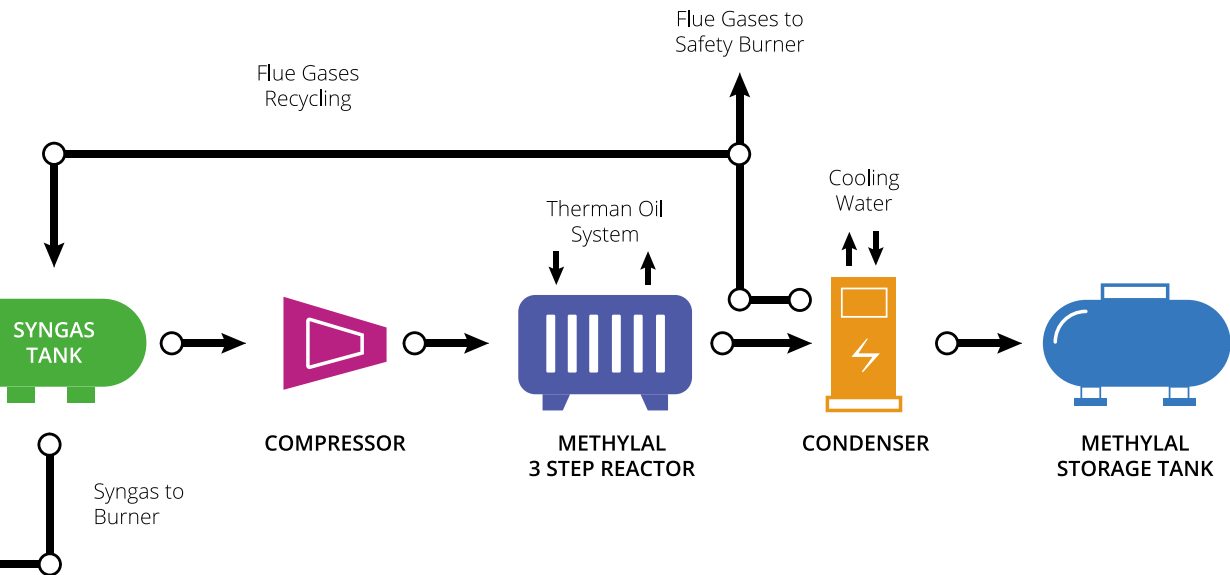
[LIFE15 ENV/ES/000208].

The highlight of the project was demonstrating that waste initially considered non-recyclable for mechanical recycling can actually be recycled through chemical recycling to obtain products of interest to industry, and that the process can therefore be introduced in production cycles. This result led to the construction of a modular pilot plant consisting of two main units: a gasification unit and a synthesis unit.

Flow diagram of the plant



Gasification Unit

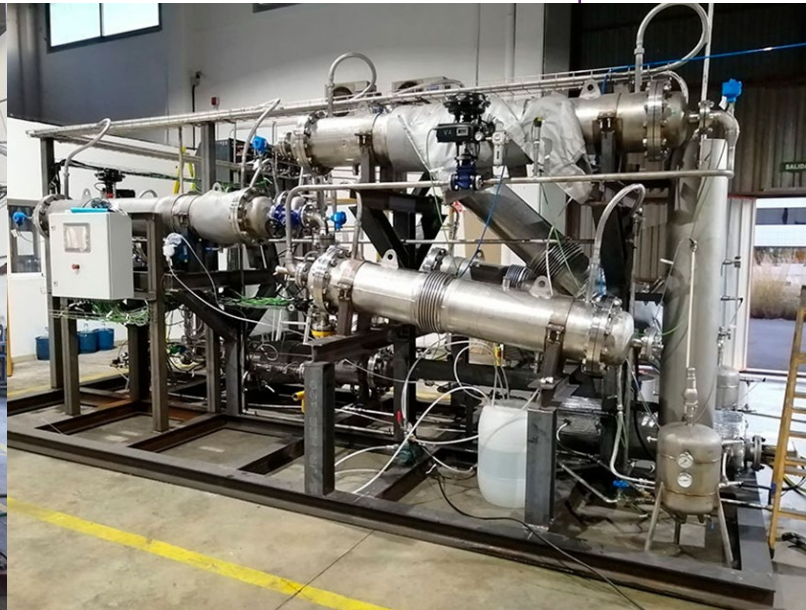


Methylal Production Unit

Gasification unit

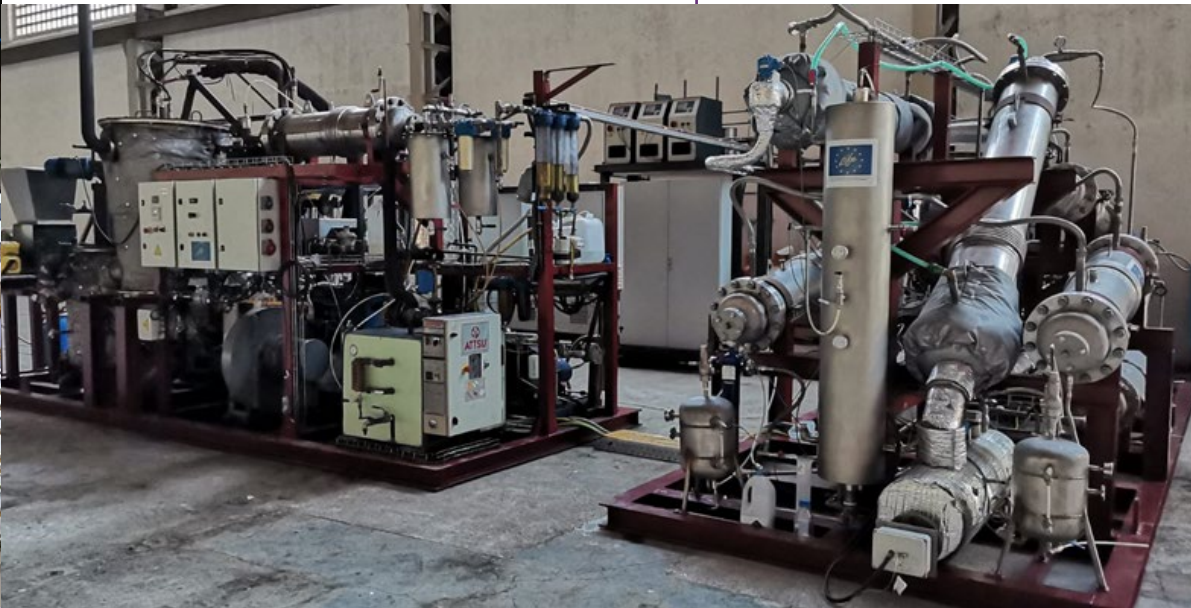


Synthesis unit



Mi-Plast Plant

Produced
Methylal



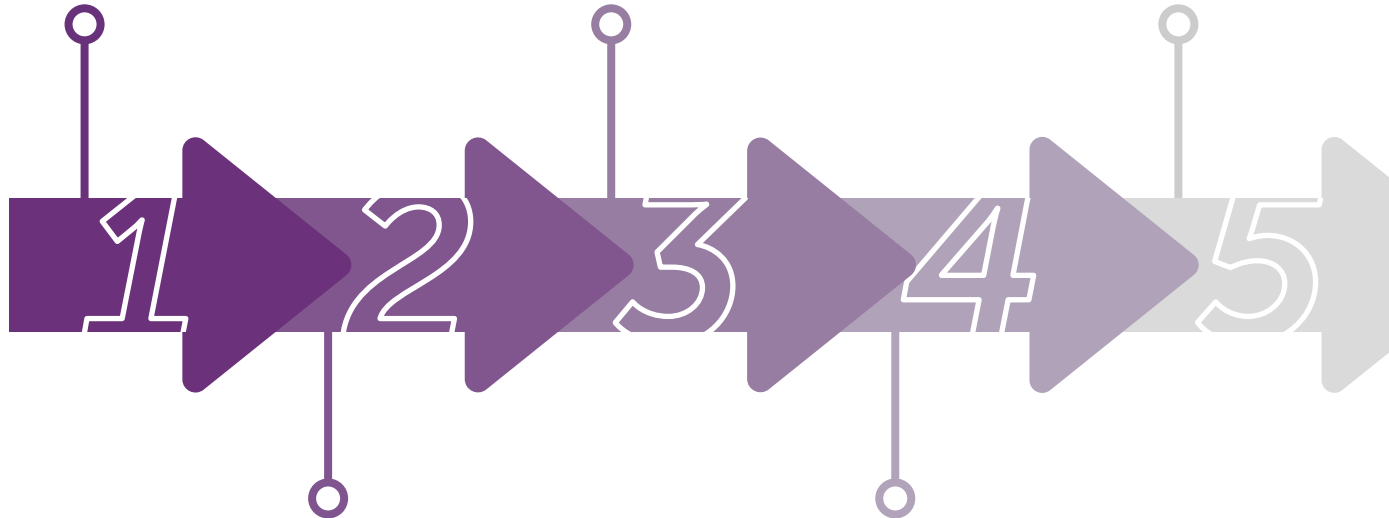
The pilot plant was presented at a workshop at **ACTECO** (Spain) in September 2020 and at **MI PLAST** (Croatia) in November 2020.

ACTIVITIES AND MAIN OUTCOMES

Review of environmental problems, standards & legislation in EU on treatment of NRPW and methylal production

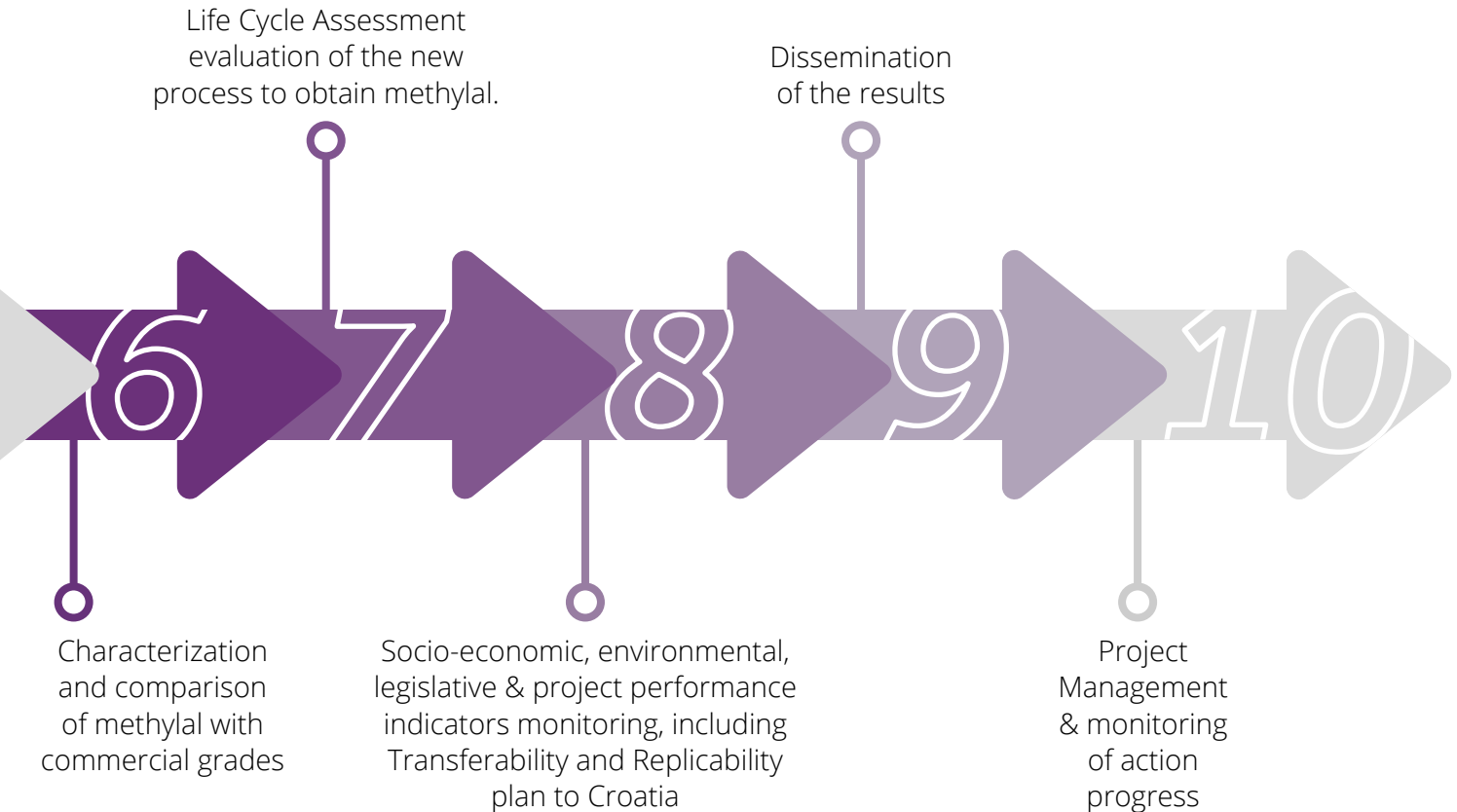
Pilot plant construction

Pilot implementation and practical optimization



Re-definition of demonstrative project plan

Treatment and conditioning of NRPW & setting-up



RESULTS

Obtained in the pilot plant:

- Development a pilot plant with a compact and modular configuration which requires small space and low investment. It runs continuously, reducing energy consumption.
- Ecomethylal plant is able to manage heterogeneous plastic waste resulting in low humidity and some pollutants. It can be installed inside a closed plastic treatment plant / recyclers companies to treat the non-mechanically recyclable fraction.
- 3,6 tonnes of waste treated in the project.

- 36% efficiency of process (kg methylal/kg plastic waste) which could be increased to 50% by improving temperature and pressure control at the industrial plant.
- The product obtained methylal is a substance highly valued in the chemical industry as raw material, being used as additive for resins, coatings, paints and glue. It has a relevant market (estimated 5.200 M€/a).
- >80% purity of methylal.
- The LIFE ECOMETHYLAL replicability to all EU will contribute to reduce the landfill waste in line with European priorities.

RESULTS

Expected results in the transfer to future industrial plant:

- Plant emissions comply with the limits of current European environmental regulations.
- By collecting and optimizing residual heat flows from the gasification unit and the exothermic reactions of the gas to liquid reactors and the oxidation reactor in the synthesis unit, a 70% reduction of electrical power in the synthesis unit can be expected in the industrial plant compared to the pilot plant.

- The compact size of the technology allows it to be implemented at the waste manager's facilities, optimising existing resources and avoiding the transport of waste.
- The modular nature of the technology, with an annual treatment capacity of a maximum of 8,000 Tn/year of plastic waste, allows the rapid implementation with the possibility to expand the plant if necessary, to adapt to the treatment capacity of potential clients.

CONCLUSIONS

The results of the project demonstrate that the combination of gasification and synthesis is viable for recycling plastic waste from many sources and with complex compositions. In addition to these processes, products of high interest for industry can be obtained, such as methanol and methylal. These processes are expected to be implemented by industry to help meet European Union recycling targets for plastic waste and thus comply with the waste hierarchy.

- Direct decrease of the waste that are currently going to landfill.
- Production of added value Methylal.
- Creating awareness of the existence of this waste and the possibility of its good management.

LIFE ECOMETHYLAL PROJECT

Reference: LIFE15 ENV/ES/000208

Total Budget: 2,039,142 €

EU contribution: 1,007,464 €

Duration: 55 Months

(01/09/2016 to 31/03/2021)

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