

Success Stories of Advanced Biofuels for Transport

CELLULOSIC ETHANOL COMMERCIAL PLANT IN CRESCENTINO (ITALY) BY VERSALIS

Year of plant start-up:	2013
Location:	Crescentino, VC, Italy
Technology:	Enzymatic hydrolysis of cellulosic biomass and fermentation to produce cellulosic ethanol.
Plant capacity:	Confidential
Operational experience achieved:	During the period of activity, the plant has produced around 20,000 tons of fuel-grade cellulosic ethanol
Total Capital Expenditure:	240 Mill EUR as reported by previous owner
Principle feedstocks:	Feedstock that have been used are: Arundo Donax, wheat straw, rice straw, hardwood
Feedstock Capacity:	The supply chain is directly managed by the Plant Owner.
Products/markets:	The main product is cellulosic ethanol sold as transport fuel. The residual lignin is used as solid fuel into a power station to generate 13 MW of green electricity partially sold to the national grid.
Technology Readiness Level (TRL):	TRL 9 – actual system proven in operational environment

DESCRIPTION

The Crescentino plant, located in the province of Vercelli in Italy, was the first in the world to be designed and built to produce bio-ethanol from agricultural by-products, woody material or plants not suitable for food consumption. This is a major innovation which many companies in the energy industry have been trying to achieve for years.

This has been made possible thanks to PROESA®, the technology developed from 2006 by M&G Group and currently owned by Versalis, the chemical company of ENI. The project was also supported by the European Commission as part of its Seventh Framework Program.

It has been possible to produce bio-ethanol using maize, sugar cane and other vegetable substances. PROESA® technology (ethanol production from biomass) is capable of extracting bio-ethanol from cellulosic biomasses such as wood, energy crops or agricultural waste such as straw.

The Crescentino bio-refinery is located on a former industrial site in an important agricultural area, especially for rice, wheat and maize production. Furthermore, woody material and woody residues from other industries can be also easily procured locally in a 70 km radius from the plant.

This area was chosen because it is located in the center of an agricultural area, has its own internal rail link and is relatively close to the R&D Center in Rivalta Scrivia (Italy), where PROESA® technology was developed.

The site includes a boiler for electrical energy production from biomass and biomass derived material, a dedicated wastewater facility with full water recirculation, including the production of biogas from WWT anaerobic digestion. These features allow a further improvement of environmental footprint of the plant, making Crescentino a very efficient example of advanced biofuel production at scale. In addition, a part of the old foundry has been reused, following its conversion into a warehouse for the storage of the biomasses.

Crescentino project was started in 2010, construction work began in 2011 and the boiler started producing energy in the autumn of 2012. In January 2013 bio-ethanol production began and the plant reached continuous operational capacity in 2015. After some technical improvements, such as the introduction of a soaking section of the biomass before the pre-treatment, the operation was regular during the first half of 2017 at industrial rate. Following the acquisition in November 2018, Versalis is in the process of implementing an action plan that will lead to a full resumption of operations with implementation of some process improvements.

The expertise developed at Crescentino will enable similar plants to be built in the rest of the world.



Plant in Crescentino (Italy)

Stakeholders involved:

Relevant actors:

- Versalis – Technology owner/licensor, engineering and operator
- European commission 7th Framework Program

Financing Support:

Versalis acquired the plant as part of the M&G bio assets acquisition for an undisclosed amount

Contribution to Sustainable Development Goals:

SDG 2, 10, 12, 13, 7, 8, 9, 15

Contribution to GHG emission reduction in transports:

The PROESA® technology allows production of cellulosic ethanol from non –food feedstock with high GHG emission savings.

Employment:

The plant in Crescentino has created around 100 direct jobs and, additionally, a number of Indirect jobs in logistic and plant related services

Replicability and scale-up potential:

PROESA® technology has the potential to be adopted by multiple bio-refineries across the world. Crescentino plant can be either scaled up or scaled down depending on the logistic, geography, biomass availability.

Replication and scalability of the project at regional, national and international level is very high.

Success factors:

Cellulosic biorefineries are typically large capex projects whereby large volumes of biomass are involved.

As a consequence, successful deployment of cellulosic biorefineries depends on several variables:

- Local feedstock availability (considering also existing competing uses)
- Access to supporting financial measures (at least for first and/or second of a kind investment)
- Long term regulatory framework-longer than 10yrs-, including binding targets to minimize off-take risk (either a specific mandate, a carbon target or fiscal support)

Constraints:

The lack of investors' confidence is the main obstacle to biofuel technologies. Major risks perceived by investors are:

- Off take risks, as bio-based products compete against cheap fossil-based products –today cheaper than ever due to low oil price;
- Financial risks, as biorefineries are high-capex investment, particularly in the case of so-called advanced/second generation bioproducts/biofuels, where the level of innovation, technological development, expertise involved is pretty high. Due to their inherent level of innovation, advanced biorefineries projects are not yet easily bankable today in the European context.
- Regulatory risks: without a long-term regulatory framework, including binding targets (i.e. blending mandate), it is unlikely that investors would invest large capital in the European market: indeed, on a global basis, other regions offer more suitable environment for biofuels investments, thanks to large feedstock availability, consolidated market, relatively low labour cost, etc.

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More information:

https://versalis.eni.com/irj/go/km/docs/versalis/Contenuti%20Versalis/IT/Documenti/Documentazione/Licensing/Biotech_0_Proesa.pdf

<https://www.eni.com/assets/documents/press-release/migrated/2020-en/02/PR-Versalis-Crescentino-8-febbraio-2020.pdf>



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