

Success Stories of Advanced Biofuels for Transport

SUNLIQUID LIGNOCELLULOSIC ETHANOL PLANT IN ROMANIA

Year of plant start-up:	2020
Location:	Podari, Dolj County (near Craiova), Romania
Technology:	Conversion of agricultural residues to cellulosic ethanol via enzymatic hydrolysis and fermentation
Plant capacity:	50 kt/a of cellulosic ethanol
Operational experience achieved:	Not yet in operation
Total Capital Expenditure:	Over 100 M Euros
Principle feedstocks:	Domestically available agricultural residues like wheat and other cereal straw
Feedstock Capacity:	Approx. 250,000 metric tons per year
Products/markets:	Cellulosic ethanol as transport fuel
Technology Readiness Level (TRL):	TRL 8 – sunliquid technology has been proven in pre-commercial plant in Straubing, Germany for over 6 years in operational environment

DESCRIPTION

After 6 years of operating Clariant's pre-commercial sunliquid® plant in Straubing, Germany and thorough process demonstration, in December 2017 Clariant announced the approval by the Board of Directors to invest in a new full-scale commercial plant for the production of cellulosic ethanol from agricultural residues using its sunliquid® technology in Romania.

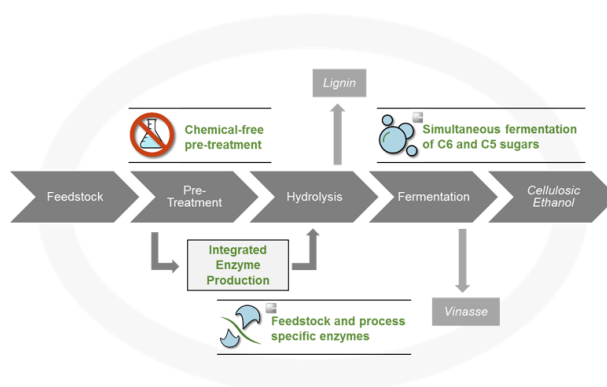
The new plant, with an annual production capacity of 50,000 tons, will be built in the southwestern part of Romania in the region of Craiova. The facility will be a flagship site, confirming competitiveness and sustainability of the sunliquid® technology at commercial scale thus supporting Clariant's sunliquid® licensing business strategy.

At full capacity, the new plant will process approximately 250,000 tons of wheat straw and other cereal straw annually, which will be sourced from local farmers. Co-products from the process will be used for the generation of renewable energy with the goal of making the plant independent from fossil energy sources. Therefore, the resulting cellulosic ethanol is an almost carbon neutral advanced biofuel.

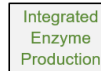
Construction of the plant will provide a whole range of benefits for the surrounding region of Craiova. It will allow local farmers to industrially market straw for the first time, which was previously practically unutilized agricultural residue.

During the construction phase of the new plant, several hundred construction workers will be employed from locally based companies wherever possible. After completion, the plant is expected to provide around 300 permanent jobs in supporting industries serving the site, and in the transportation and storage of the feedstock. The plant itself will employ a workforce of between 100 and 120. Clariant plans to recruit its workforce locally and provide training both in its own laboratories in Planegg near Munich and at the pre-commercial sunliquid® plant in Straubing, Bavaria.

FULLY INTEGRATED SUNLIQUID® PROCESS



The **chemical-free** mechanical and thermal **pre-treatment** enables an optimal hydrolysis. Purification steps are unnecessary and makes for a safer and more environmentally friendly process.



Through the **process integrated enzyme production** costs can be reduced to a minimum. Enzymes are produced exactly when and where needed, there are no costs for logistics or formulation and no dependence on external suppliers.



Clariant can quickly adapt **enzymes** to new **feedstock and process conditions**. This achieves a most efficient hydrolysis with maximum yields and makes the process flexible for different boundary conditions.



The **organism** used for fermentation is **highly optimized** and able to **simultaneously** ferment both **C5 & C6 sugars in a one-pot reaction**. Thus the ethanol yield increases by 50% compared to only C6 fermentation.

The SUNLIQUID process

FLAGSHIP INVESTMENT sunliquid® ethanol plant in Romania



Groundbreaking for sunliquid® Ethanol Plant

12 September 2018

Clariant is investing more than 100 million EUR in its first sunliquid® plant

The new facility will have an annual production capacity of 50,000 tons of ethanol, first batches of product are expected to be delivered in 2020.

At full capacity, the new plant will process around 250,000 tons of wheat and other cereal straw annually. The resulting cellulosic ethanol is a practically carbon-neutral advanced biofuel.



Reduced CO₂ emission
Reduction by 95%



Energy self-sufficient
All energy from the combustion of waste flow as lignin



Process integrated enzyme production
Significantly reduced costs

The plant in Romania in a nutshell

Stakeholders involved:	Clariant, EC FP7, BBI JU, farmers, local service providers
Financing Support:	EC FP7, BBI JU
Contribution to Sustainable Development Goals:	Sunliquid cellulosic ethanol GHG savings potential of 95% compared to fossil fuels, sustainable and domestic source of renewable energy in Romania, example of circular economy
Contribution to GHG emission reduction in transports:	Sunliquid cellulosic ethanol GHG savings potential of up to 95% compared to fossil fuels
Employment:	100-120 direct jobs associated to operation of plant 300 indirect jobs for supporting businesses like agriculture and logistics sector 800 jobs during construction phase
Replicability and scale-up potential:	Based on cellulosic feedstock availability in the EU
Success factors:	Feedstock availability, legislative support, proven technology, favourable infrastructure
Constraints:	Uncertainty in legislation and government support
Info provided by:	Paolo Corvo, Head of Sales & Marketing Biofuels & Derivatives, Clariant
More information:	www.sunliquid.com https://www.sunliquid-project-fp7.eu https://www.biofuelsdigest.com/bdigest/2018/09/16/looking-deeper-into-clariant-cellulosic-technology-part-1-of-2-a-visit-to-straubing-germany-and-an-integrated-pilot-plant/



The ART Fuels Forum brings together 100 experts and leaders representing the alternative transportation fuels Industry to facilitate discussions, elaborate common positions on policy issues and identify market penetration opportunities and barriers for these fuels. The Forum is established and financed by the European Commission under the project name “Support for alternative and renewable liquid and gaseous fuels forum (policy and market issues)”.

www.artfuelsforum.eu