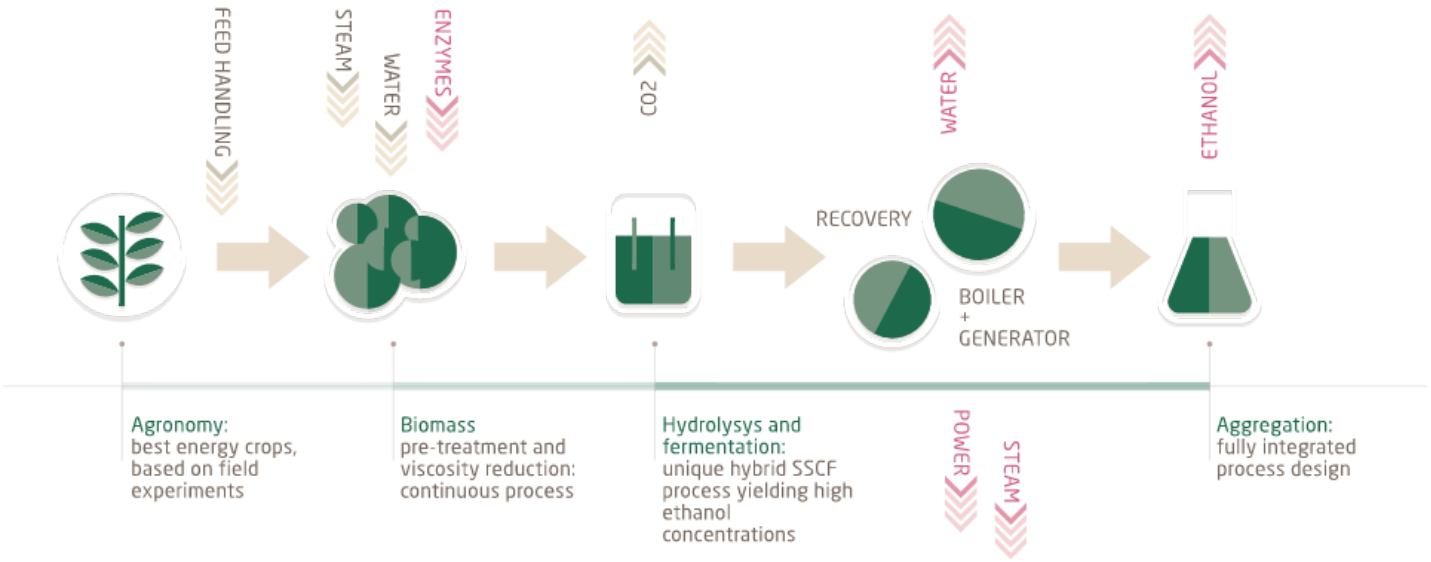
BETARENEWABLES








## What is Proesa™?

**Proesa**™ belongs to the so-called "second-generation" technologies which allow the use of the sugars present in lignocellulosic biomass to obtain fuel and other chemicals with lower greenhouse gas emissions and at competitive costs compared to fossil fuels (oil, natural gas).

It is the result of an investment of over 150 million Euro, started by Biochemtex in 2006.
The **Proesa**™ technology was designed to use non-food biomass, like rice straw and sugarcane bagasse. Thanks to the efficiency of the **Proesa**™ process, non food sugars can be obtained at competitive costs and without incentives, thus enabling a widely spread use of bio-products from renewable sources.

Extensive agronomic studies have been conducted for the development of this technology, accompanied by a logistics modelling.
Before being applied for the first time in Crescentino, **Proesa**™ was tested at length in the Rivalta Scrivia (Alessandria) pilot plant, which boasts a capacity of 1t/day of biomass treated.

The technology is protected by 14 patent families, 4 of which are public.

## The advantages of Proesa™

- The cost of the product is competitive compared to oil (70 dollars / barrel)
- The industrial plants can be adapted to local conditions.
- The balance between the CO2 produced in the industrial cycle and that absorbed by the biomass feedstock is approximately neutral, with reference to Directive 2009/28/EC.
- The separated lignin is used to obtain energy.
- During the processing, biogas is generated as another energy source.
- No land is subtracted to food crops and this does not affect their price to the consumer.
- Dependence on fossil fuels is reduced as well as the impact on greenhouse gas emissions.

Alcohol, such as ethanol, is obtained from the fermentation of sugars and starches with the use of yeasts. This is the normal first-generation process, based on edible feedstock such as corn, sugar cane and the like. These agricultural raw materials have relatively short molecules and are likely to be "digested" by enzymes.

But non food sugars – contained in agricultural waste or in non-food crops/biomass – are made up of long molecules of polysaccharides, that yeasts cannot easily attack. And this is not all. Cellulose and hemicellulose are entrapped in a matrix of lignin, which prevents the access of enzymes. Therefore, the problems to be solved are two: separate lignin from cellulose and hemicellulose and then break down the molecules that constitute them (polysaccharides) into simple sugars.

At laboratory level, some companies were able to obtain bioethanol through the use of non-food biomass but were faced with very high costs for the transfer of these processes onto an industrial scale.
Thanks to **Proesa**™ costs are very competitive.

The process is based on a first phase in which the biomass is subjected to high temperatures and pressures. This process allows to separate the cellulose and hemicellulose from the lignin. Subsequently, the polysaccharides are treated with enzymes that release the simple sugars, then fermented by yeast into ethanol.
The lignin, together with the biogas derived from the processes, is recovered to be used in the boiler that generates power and heat.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## Contacts

Strada Ribrocca, 11
15057, Tortona (AL), Italy
Tel: +39-0131-810-1