

## **From research and demonstration to the first commercialization plant: Abengoa Bioenergy's experience in 2nd generation bioethanol**

The technology of enzymatic hydrolysis is one of the basic lines on which Abengoa Bioenergía is focusing its technological development efforts in order to diversify the raw materials that biofuels and bioproducts can be produced with. The main objective sought is to be able to produce bioethanol from lignocellulosic raw material, essentially straw from different cereals and herbaceous crops.

As a result of the effort made, we have developed our own second-generation alcohol producing technology which has been tested first on a pilot scale in York (Nebraska, US) and then demonstrated in our BCyL plant (Salamanca, Spain). BCyL demonstration plant has operated over 4,000 hours continuously, achieving conversion yields above those of the design and showing its flexibility for using different biomasses.

Now the company is currently developing the Hugoton project (Kansas, US), supported by the US DoE, where a first commercial plant is going to be built to produce 100 million liters per year of bioethanol from corn sugar and switchgrass.

Regarding the enzyme technology, Abengoa Bioenergía has a license for the use and modification of an organism that produces the enzymes necessary for the conversion of cellulose in sugars and which, therefore, control a critical and necessary step in enzymatic hydrolysis technology. The R&D work focusses in the adaptation of the organism to the production of the optimum enzymatic cocktail and the necessary fermentation process in order to be able to obtain it industrially. The pilot facilities of York and BCyL demonstration plant are critical for the development of the enzymes and allow Abengoa Bioenergía to have a test base unique on a global level.

Abengoa Bioenergía has a unique platform to produce sugar in its current facilities and in the second-generation facilities it is promoting. Bioproduct production both via fermentation and catalysis is one of the objectives of this development program that will enable obtaining much greater added value from our plants and having products that should, in the coming years, replace a large part of the oil derivatives in a sustainable manner.

Finally, on July 2011 the RED Bioenergy Sustainability Assurance Standard (RBSA) developed by Abengoa was approved by the European Commission. The RBSA Standard demonstrates the compliance of any raw material or production process with the requirements of the Directive, from agricultural production through to sales of biofuels, including the industrial transformation processes. Furthermore, this system incorporates innovative technology developed by Abengoa, principally for calculating greenhouse gas emissions and developing sustainability maps, to enable an effective and comprehensive implementation of these new sustainability requirements in its supply chains. The biofuels developed by Abengoa can be sold with this "sustainable" certification across the whole of the EU, which will uniquely identify this guarantee in every EU country.