



New technologies and sustainability

By Maria Luiza Barbosa

The introduction of new technologies is a factor for progress in any economic sector, and this could be no different in the sugar-energy industry, which currently employs more than 840,000 people throughout the country, involves 70,000 suppliers and generates R\$ 45 billion in gross revenues per year. The increasing use of new technologies in the processes of planting, harvesting and producing ethanol and sugar, as well as the development of bioproducts that enhance productivity and reduce greenhouse gas emissions, promise major changes in the industry that will promote even more development that's achieved sustainably.

In the beginning of June, at the Ethanol Summit, two experts covered this theme – under my moderation – during the panel discussion “Focusing on Sustainability: New Technologies in the Biofuels Industry”.

Daniel Ibraim Pires Atala, a researcher at the Center for Sugarcane Technology, or CTC, addressed the extractive fermentation process and its contribution to the industry's overall sustainability.

This is a patented process, under development at the CTC in partnership with the University of Campinas (UNICAMP), in which ethanol is extracted as it is produced, eliminating its inhibiting effect on yeast during the fermentation process. The new approach operates with a reduction in the volume of vinnasse, allowing for more compact and economic installations, a reduction in cooling water consumption in the tanks and equipment costs.

The extraction process presented by the CTC researcher has significant economic and environmental advantages for the industry. It is equivalent to a traditional process with a 20°g/L ethanol content, allowing for a 75% reduction in the production of vinnasse, from an average of 12 down to 3 liters per liter of ethanol produced. The expected reduction in the fermentation tanks' cooling water is 20%, while the reduction in steam consumption for the distillation process is 75%. This process, still under development, will be incorporated into existing mills with minor changes to existing installations.

According to CTC's schedule, this model will be tested in a pilot mill to be set up in the second half of this year, with experiments beginning in 2010 and a demo plant to follow in 2011.

The presentation brought to the 2009 Ethanol Summit by José Luiz Olivério, of heavy equipment manufacturer Dedini S.A., showed the technological progress achieved in sugar and ethanol production mills, as well as new available and potentially available technologies for processing sugarcane. The objective was demonstrating the effects of these technologies in the reduction of greenhouse gas emissions.

In the current scenario, the world is emitting large volumes of greenhouse gases and causing global warming, mainly because of the consumption of fossil fuels.



Therefore, any solution that brings about the reduction of greenhouse gas emissions must be prioritized, for the sake of economic feasibility and social and environmental sustainability. Dedini has developed new technologies to mitigate these emissions.

New projects being designed by Dedini seek to emphasize the importance of sustainability by introducing bioproducts, which the company refers to as "The 6 bios' revolution" : biosugar, bioethanol, bioelectricity, biodiesel, biofertilizers and biowater, integrating them in a manner that leverages their social, environmental and economic feasibility.

This technological evolution is best presented through a lifecycle analysis of ethanol production, considering CO₂ emission equivalents in the various cycle phases: sugarcane production, sugarcane processing, ethanol distribution and use. The absorption, reduction or avoidance of emissions are also foreseen, allowing for the calculation of the entire balance of direct emissions in the production and use of ethanol made from sugarcane.

As a result, three development stages are presented, each referring to the introduction of a technological innovation that leads to an increase in productivity – more liters of ethanol from the same amount of sugarcane, the use of more efficient systems to generate electric power surpluses, the use of 50% of sugarcane straw as a source of energy, the use of biofertilizers, the replacement of mineral fossil-based fertilizers, the use of biodiesel (5% in trucks and 30% in tractors) replacing diesel. Using 100% of sugarcane straw as a source of energy and replacing 100% of the diesel used at the mill with biodiesel are also considered.

In each stage, the benefits produced with respect to the mitigation of greenhouse gas emissions are presented, along with the reduction in net emissions generated. Results are shown in a comparison with gasoline emissions, i.e., 2,280 kg of CO₂ /m³ of equivalent anhydrous ethanol.

The use of ethanol produced at the reference mill (traditional) reduces emissions by 2.02 kg of CO₂ /m³ of equivalent anhydrous ethanol, with the mitigation of 89% of direct emissions compared to those from gasoline (traditional mill).

After that, with the introduction of new technologies, the state-of-the-art USD (from Portuguese: Dedini Sustainable Mill), with available technologies already incorporated, the increase in productivity and the generation of electric power surpluses, from 9.2 MW to 50.7 MW; the introduction of biodiesel at the mill to replace 5% of the diesel consumed by trucks and 30% of the diesel consumed by tractors ; and with the introduction of Biofom – organic-mineral biofertilizer -, replacing most of the mineral fertilizers used, plus the optimized use of the water contained in sugarcane itself (biowater), one can avoid 2.56 kg of CO₂/m³ of equivalent anhydrous ethanol, in effect mitigating 112% of the emissions (state-of-the-art USD).

With the use of 50% of sugarcane straw as a source of energy, in the near future the USD will attain emission reductions of 3.02 kg of CO₂/m³ of equivalent anhydrous ethanol, with the mitigation of 132% of emissions (near future USD).



spreading the word about clean and renewable solutions from sugarcane



With the introduction of 100% of sugarcane straw as a source of energy and the replacement of 100% of the diesel used by biodiesel, potential emission reductions by USD's will rise to 5.0 kg de CO₂/m³ of equivalent anhydrous ethanol, mitigating 219% of emissions (potential USD).

A traditional mill (reference) avoids 2.02 kg of CO₂ equivalent/liter of equivalent anhydrous ethanol, or mitigates 89% of emissions generated by gasoline.

With the introduction of available new technologies at the USD, in the state-of-the-art alternative, one mitigates the emission of 2.56 kg of CO₂/ liter of equivalent anhydrous ethanol or 112% of emissions generated by gasoline.

In the potential USD alternative, using 100% of sugarcane straw as a source of energy and replacing 100% of diesel oil with biodiesel, plus the use of the 6 bios (biosugar, bioethanol, bioelectricity, biodiesel, biofertilizer and biowater), one avoids 5.00 kg of CO₂/ liter of equivalent anhydrous ethanol or 219% of emissions generated by gasoline.

The innovation and the development of new technologies are concrete efforts on the path to sustainability in the sugar-energy industry, with a strategic vision that anticipates demands and trends.

Companies in the industry value and recognize sustainability as a continuous improvement process in socio-environmental areas, without losing sight of the need to pursue positive financial results.

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