

## The Food vs Fuel Dilemma

New bio-ethanol process using biowaste eases debate with System 800xA



Finnish company St1 Biofuels Oy becomes a pioneer in producing bio-ethanol from food waste. The company's new bio-ethanol plant in Finland is run by ABB's automation system and frequency converters.

The debate among environmentalists around the topic of biofuels has much to do with sugar cane and corn – the main sources of ethanol in the US – and how allocating optimum farmland to their harvesting for biofuel purposes diverts agricultural production away from food crops in a hungry world, or lead to the escalation of food prices, especially in developing countries.

But what if bio-ethanol is made without food crops?

What if residues of food production, which are classified as organic wastes, rejects or nonfood by-products, are instead used to produce bio-ethanol?

This breakthrough in producing the next-generation of biofuels is at hand, starting in Finland.

ABB's System 800xA is the automation system running the seven plants manufacturing bio-ethanol using food wastes.

## Finland's pursuit of responsible alternative energy production

In 2007, the European Commission proposed new and stricter standards for transport fuels, underpinning the region's commitment to combat climate change and pollution. One parameter of its fuel specifications is 10% maximum ethanol content in low blends. In Finland, petrol and diesel oil have to contain at least 2% biofuel from the beginning of 2008.

The European Union (EU) has targeted the market share of biofuels and other renewables against total gasoline and diesel sales to reach 10% in energy content by the end-2020. Finland's target is to double that to 20%. Current blending obligation for distributor is 6% renewables in energy content. In ethanol blends, this corresponds to approximately 10 % ethanol in gasoline.

### A double-edged petrol blend

Given these regulations, Finland explored energy activities to develop a range of technologies to produce biofuels.

St1 Biofuels Oy, started as a joint venture of St1 and Technical Research Centre of Finland (VTT), rolled out a Finnish-developed technology which converts a range of organic wastes and biomass materials into ethanol. Today, St1 Biofuels Oy is owned by St1 Group. Called RE85, this blended petrol fulfils the E85 fuel global specifications (gasoline that consists of 85% ethanol and 15% gasoline components).

And, as food waste is used as its raw material, the manufacturing process also provides a solution for waste management and disposal.

### Green credentials

The RE85 blend, produced using St1's Etanolix® production plant, has been shown to have one of the lowest carbon footprints of any biofuel production technology: as low as 0.01kg CO<sub>2</sub> per kilogram of oil equivalent (kgoe). This is much lower than the 3.8kg CO<sub>2</sub>/kgoe for fossil fuel diesels and 1.48kg CO<sub>2</sub> /kgoe for corn-based ethanol production.

The fuel can reduce carbon dioxide emissions by up to 80%. Used by flexible-fuel vehicles, in spite of higher consumption due to the approximately 30% lower energy content, the RE85 can also cheaper by mileage than regular 95 octane unleaded gasoline, says Patrick Pitkänen Mikko Ahokas, Head of Business Development at St1 Biofuels Oy.

### The Etanolix process and ABB's solution

Developed in VVT by Dr. Antti Pasanen, the Etanolix production process utilizes an advanced fermentation technology to break down non-edible by-products of pastry, candy and potato productions to create ethanol, carbon dioxide and a solid residue which can be used as animal feed or fertilizer. The ethanol is produced in two stages: fermentation of the raw material and the separation of nonfermentable solids from liquid.

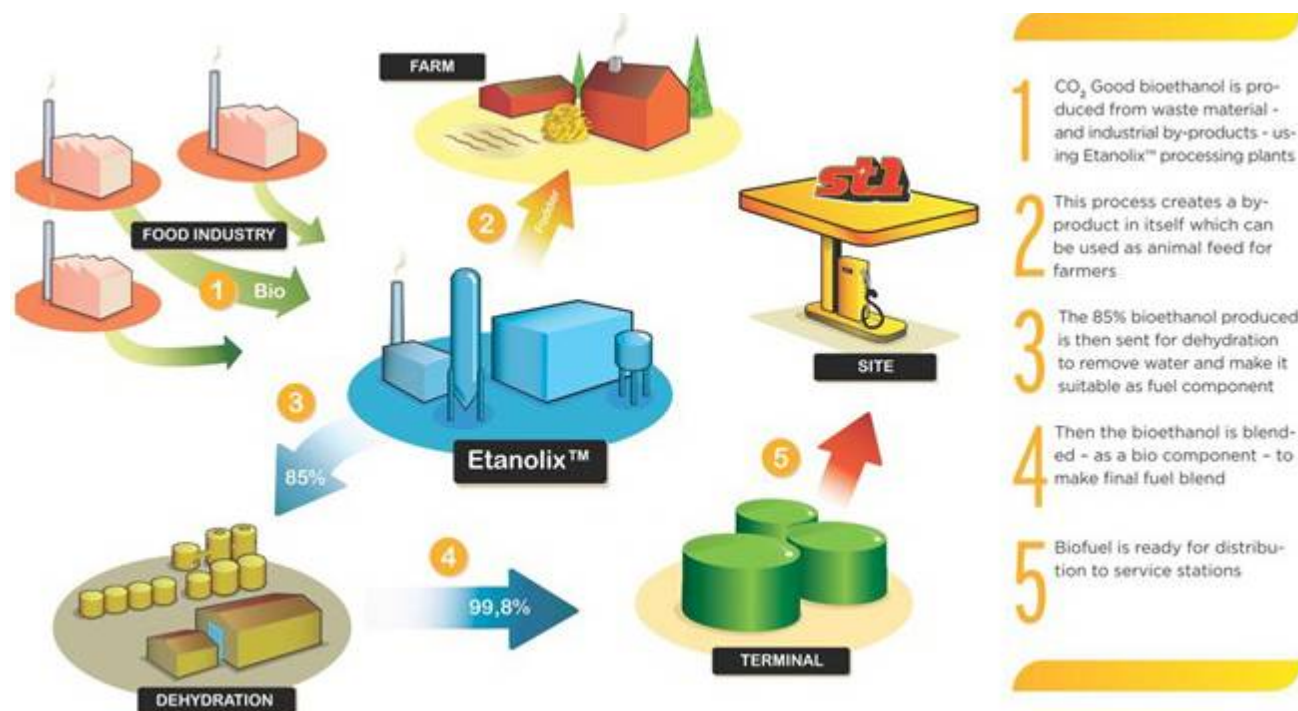
*We chose ABB as partner because it understands and anticipates the changing dynamics and demands of technology.*

Mr. Risto Savolainen  
St1 Biofuels Engineering Director

(From left) The stand-alone Lappeenranta plant uses bakery and sweet factory waste. The Närpiö plant is integrated into a potato flake factory. Both plants produce 1,5 million litres of bioethanol annually. ST1 has a distribution network in Finland, Sweden and Norway.



The Etanolix® technology performs these two processes simultaneously and in situ, or close to the sources of the raw material (i.e. biowaste or food waste). This means less operational energy consumption and less transportation or landfill costs incurred by biowaste producers.



The Etanolix ethanol distillation process, from fermentation to vaporization, is controlled and monitored by the System 800xA automation system developed by ABB.

With an annual production capacity of a million liters of ethanol, the stand-alone or integrated ethanol plant can be unmanned but operated remotely from St1's production headquarters in Hamina using the System 800xA.

In particular, ABB's automation system communicates with the ethanol plants via a private virtual network, collecting plant data with ABB's real-time database system for continual monitoring, reporting and analysis. It controls everything – from when valves open and close, to the activation of safety locks, alarms and automatic cleaning. The 800xA automation systems of seven (7) Etanolix production plants are connected and integrated by the 800xA automation system in the Hamina plant.

The ethanol from the plants is transported to St1's central dehydration plant where it is upgraded to over 99.8 % ethanol and blended with petrol components to produce RE85.

#### Scope of ABB supply

- IndustrialIT 800xA System
- PcDeviceLib
- Process Data Management
- Remote Service
- Drives

#### Why ABB

Given that Etanolix® is what is termed a "sunrise" technology, St1 was keen to source an application software with a high degree of reuseability and flexibility to meet the requirements of the process.

"The ethanol production process is implemented in a new way. We chose ABB as the partner because it understands and anticipates the changing dynamics and demands of technology," says St1 Biofuels Engineering Director Mr. Risto Savolainen

The transition to low-carbon transport fuels using biofuels is rife with challenges. However, advances in the ethanol conversion processes, such as Etanolix®, improves the sustainability of biofuels and points the way to responsible alternative energy production.

ABB keeps in step with these developments and is ready to scale the challenges.

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