Creating New Business from Waste-Based Advanced Ethanol

NEW BUSINESS | SUSTAINABLE | RESPONSIBLE

Executive Summary

The world needs sustainable solutions to replace fossil fuels. Producing high quality advanced biofuels from waste is the fastest and most economical way to fulfil this demand.

Waste-based biofuels production is a new business with multiple stakeholders from feedstock suppliers to product and co-products off-takers – we are talking about a new ecosystem. The St1 Biofuels' Etanolix® plant refines biodegradable food industry waste and process residues into advanced ethanol that has premium value in many countries, e.g. the EU states and the US.

There are several attractive reasons to join the waste-to-ethanol business: It is a possibility to extend one's offering or to gain a better strategic position in the market. If a company already has access to suitable feedstock, ethanol production is a way to add value to existing resources. Another motivation especially for parties in the fuel industry who have biocomponent blending obligations or produces biofuels, is to have their own secured sustainable advanced ethanol production. From a government's point of view, waste-based ethanol production is a way to increase local energy independence and employment.

St1 Biofuels is a pioneer in waste-based advanced ethanol production with several plants in operation. The company provides a full solution for building new business in waste-to-ethanol production by offering services covering the whole business developing process - from the feasibility study to plant operation support and life cycle services – together with turnkey plant delivery projects.

St1 BIOFUELS PROVIDES A TURNKEY SOLUTION FOR BUILDING NEW BUSINESS IN ETHANOL PRODUCTION

Introduction

The challenge: the growing global demand for sustainable biofuels

The awareness of decreasing oil resources combined with the growing concern about global warming have increased political attention towards alternative energy sources, fuels in particular. More and more public attention has been paid to the effects of greenhouse gas emissions, and more sustainable energy solutions have raised consumer interest. The European Union's directive for the promotion of the use of energy from renewable sources ((2009/28/EC), below *EU Renewables Directive*) requires that ten percent of the energy demand in transportation in the EU is replaced with renewable energy. Similar kinds of requirements have also been issued for transportation fuels elsewhere, e.g. the Renewable Fuel Standard (RFS) in the United States. The EU has also agreed in the 2030 Climate and energy policy framework that at least 27% of the energy consumed in the EU should be renewable energy by 2030. This target is obligatory at EU level. Such regulations, as well as the growing environmental awareness of consumers, have created opportunities for new businesses to answer to the global energy and waste challenges in new profitable ways. One such opportunity is the production of advanced ethanol from waste and process residues for the needs of transportation. The term advanced ethanol is used to describe non-food or second generation ethanol.

The solution – Etanolix® plant

There is a need for alternative sources of energy, as well as for more sustainable ways of managing waste. Hence, it is a logical choice to tackle the renewability challenge by recycling waste as a resource for energy production. This is also incentivized in some EU countries through legislation, as the renewables obligation can be fulfilled with only half of the amount of biofuels, if they are refined from waste or residuals. Such biofuels are regarded as double counted in the EU Renewables Directive.

The St1 Biofuels Etanolix® plant is based on capitalizing locally generated waste and process residues by producing ethanol, which also minimizes transportation costs and emissions. The end product, fuel grade advanced ethanol, is ready for use in high-blend ethanol fuels or as the bio-component in low blends. The Etanolix® process also generates stillage that can be used as high-protein animal feed or as a feedstock for biogas plants for the production of renewable electricity and heat.

Unique process for utilizing waste

The energy efficient Etanolix® plants refine waste and residues containing starch and sugar, such as dough, sugars, and juices, into renewable ethanol. The plant's reception process allows the use of both packed and unpacked material as feedstock. The Etanolix® plant can be set up as a stand-alone unit or integrated into a production facility that generates suitable waste for ethanol production, thus minimizing both costs and emissions arising from logistics and transportation. The Etanolix® plant is available starting from a yearly production capacity of five million litres of fuel grade ethanol. The size brings down the investment need and shows the uniqueness of the Etanolix® plant: traditional ethanol production necessitates significantly higher investments.

Ethanol Production from Waste – A New Business Opportunity

Waste-to-ethanol production opens new business opportunities for the different actors in the waste-to-fuel value network, be it in feedstock supply, waste management and logistics, or fuel distribution. Existing resources and capabilities should be considered closely when formulating a business model for the production of advanced ethanol.

Producing double counted advanced ethanol

Ethanol as a fuel. Ethanol is globally the most widely used and well-known biofuel. It has great benefits that differentiate it from other renewable options for transportation fuels. Firstly, it is a liquid fuel that can replace gasoline directly in existing usage, ensuring speed to market. Thus, there is no need for incremental investments into the distribution network. Secondly, the performance qualities of waste based ethanol are superior compared to most alternative biofuels, and it generates over 90 % less CO_2 emissions than conventional fossil fuels. Therefore it has the possibility to vastly reduce GHG emissions in a relatively fast way. Furthermore, as climate change pushes the demand for more sustainable energy solutions, advanced ethanol is both ecologically and economically feasible.

THE PERFORMANCE QUALITIES OF RENEWABLE ETHANOL ARE SUPERIOR COMPARED TO MOST ALTERNATIVE BIOFUELS

A fuel that meets the criteria. Recent incentives and obligations in the EU and US legislation have aimed at promoting the use of renewable resources in energy production. The EU Renewables Directive (2009/28/EC) aims at answering to 10 % of the EU's energy demand in transportation with renewable energy by 2020. The directive transforms energy demand on the national level as well: each member state has national targets to which adhere. Furthermore, fuel distributors have national requirements for biocomponent blending.

In order to promote the use and innovation of more sustainable biofuel products, the EU Renewables Directive introduced the concept of double counting, which raises the value of biofuel products that are refined from waste or residues, i.e. advanced biofuels. According to the directive, advanced biofuels that fulfill the criteria will count double towards the renewability targets.

Biofuels are expected to meet set lifecycle emission reduction targets in order to be eligible in the renewables obligations. From 2013 the reduction target has been 35 %, but the percentage will rise stepwise during the next three years. In 2017, biofuel production should lower the amount of CO_2 emissions by 50 %, and by 2018 the reduction must be 60 %. Furthermore, in the United States the RFS requires an emission reduction of 50 % for a fuel in order to be considered an advanced biofuel.

Figure 1 illustrates how the Etanolix® plant surpasses the 2018 value by 30 % units already today. Two important factors contribute to this result. Firstly, the Etanolix® plant uses waste and residues as feedstock, which in turn does not generate any additional CO_2 emissions caused by e.g. the cultivation of the feedstock. Secondly, the process energy needed for the plant operations can be produced from renewable sources, which has an immense effect on the production's total emissions. In terms of the emission reduction targets, the Etanolix® plant is thus a safe investment for years to come.

THE ETANOLIX® PLANT IS A SAFE INVESTMENT FOR YEARS TO COME

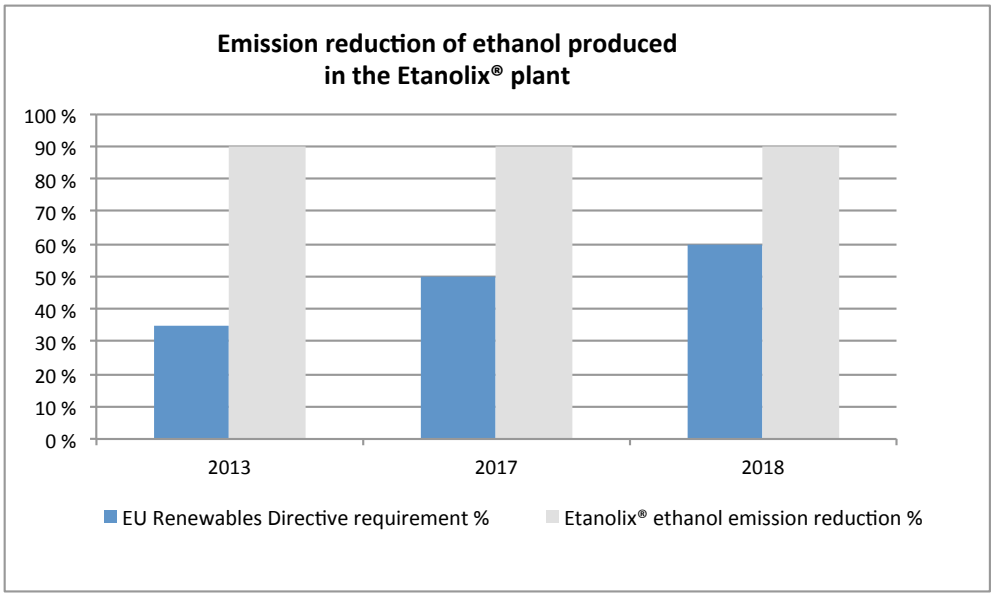


Figure 1 – *Etanolix® plant emission reduction and EU Renewables Directive (2009/28/EC) yearly requirements*

Building the value network for a business model

Starting from your business. A waste-based ethanol business is based on a value network that comprises of e.g. feedstock providers, transportation partners, energy producers, farmers and fuel distributors. **Figure 2** presents a simplistic illustration of the network. The multifaceted nature of the value network allows approaching the ethanol business from various starting points, with unique resources and needs. The Etanolix® plant is an equal business opportunity for waste management and transportation companies, existing ethanol producers, oil distributors, and other players in the energy industry. Evaluating the potential ethanol producer's current resources and capabilities plays a key role in formulating a profitable business model. For instance, there may already be a suitable waste feedstock supplier or possible end-user in place, in which cases ethanol production is a viable extension to existing operations.

Securing Feedstock. The feedstock for an Etanolix® plant consists of biodegradable waste and process residues that are rich in starch and sugar. Suitable feedstock is generated in a variety of business areas, such as in the bakery and food industry, in grocery stores and by food distributors, as well as in wineries and breweries. For such actors, the production model offers a responsible waste management solution. The feedstock provider is given flexibility in his waste management logistics as the Etanolix® plant is able to process both packaged and unpackaged materials. Furthermore, new prospective feedstock sources with existing infrastructure and processes for the collection of waste arise continuously outside the said industries. This extends the possibilities for feasible plant location choices.

Another viable option is to integrate the Etanolix® plant directly to a suitable production facility, such as a brewery. In this case, liquid feedstock can be transported between the facilities through pipelines, which in turn eliminates the costs and CO_2 emissions caused by transportation. Integration is a valid option even in the case of the production plant's feedstock output not being sufficient to support profitable ethanol production on its own. In such circumstances, it is possible to support the feedstock flow from secondary sources. All in all, it is common practice to utilize a variety of feedstock providers and types.

THE PRODUCTION MODEL OFFERS A RESPONSIBLE WASTE MANAGEMENT SOLUTION

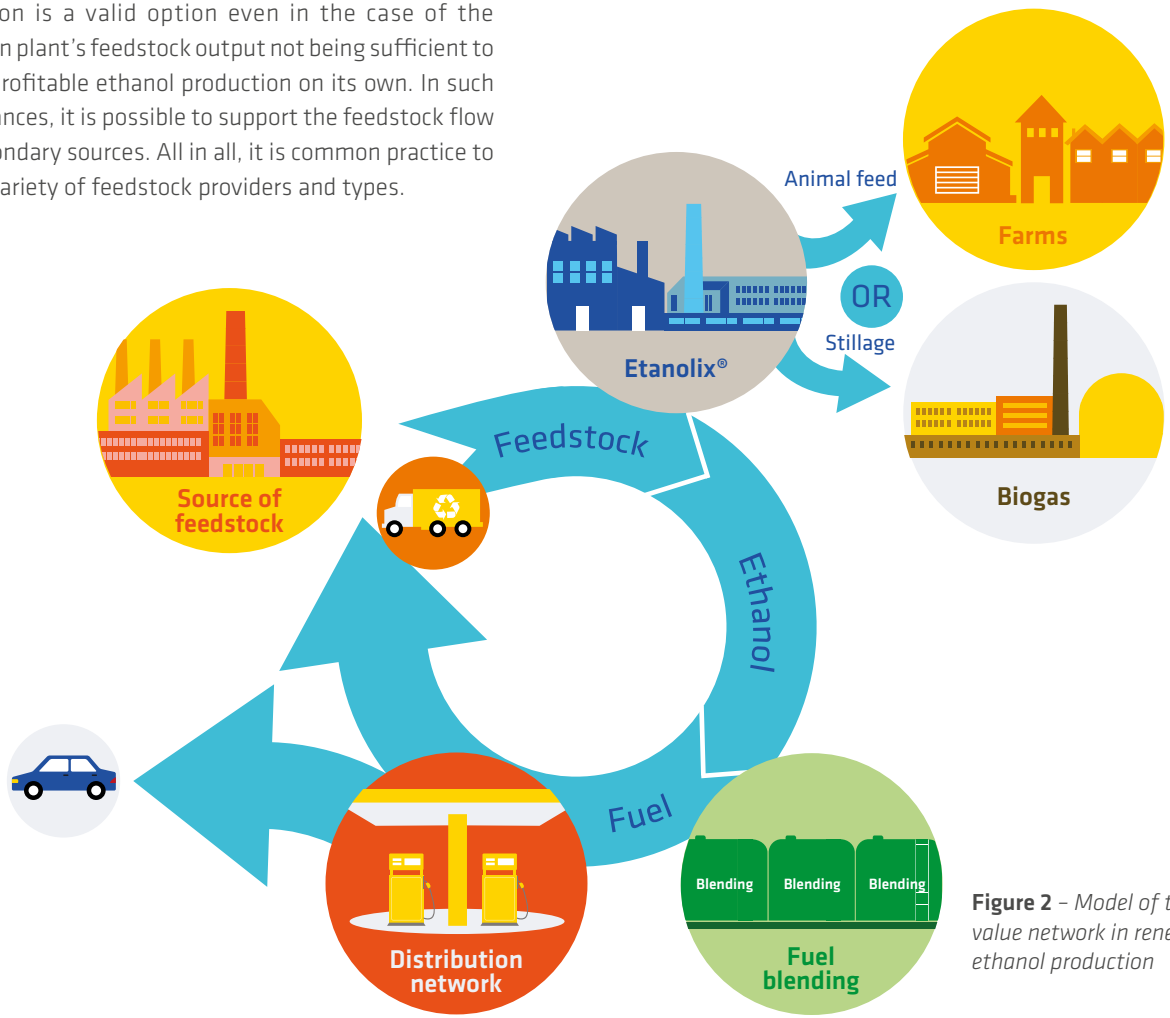


Figure 2 – *Model of the value network in renewable ethanol production*

Figure 3 presents how feedstock intake can be organized in the exemplar cases of the baking and brewing industry. There are a number of ways to collect bakery feedstock, e.g. dough and process residues for the ethanol plant.

In **example 1**, bakery waste is transported directly from individual bakeries to the ethanol plant as a part of the regular waste management activity. This option is particularly viable in the case of larger bakeries in relatively close locations.

In **example 2**, the feedstock is collected from supermarkets and various bakeries into a logistics hub during the return journeys in the ingredient and product delivery process. From the logistics hub the feedstock is then transported to the production facility, thus allowing larger deliveries.

Example 3 presents a "Waste bread collection loop" solution, in which a transportation route is established between various supermarkets, stores and smaller bakeries, totaling to a relevantly sized feedstock delivery. E.g. waste management companies or other transportation partners can take care of running the route.

Example 4, on the other hand, illustrates a product return system, where bakeries collect waste bread from stores when delivering fresh products. The feedstock is then transported to the production facility from the bakery, once again allowing larger deliveries.

Finally, **example 5** illustrates an integrated solution where the Etanolix® plant is situated next to the feedstock supplying facility, e.g. brewery. The feedstock is transferred to the ethanol plant through a pipeline, which eliminates the transportation costs and emissions. This is a viable option especially for liquid waste streams, such as brewery and winery waste.

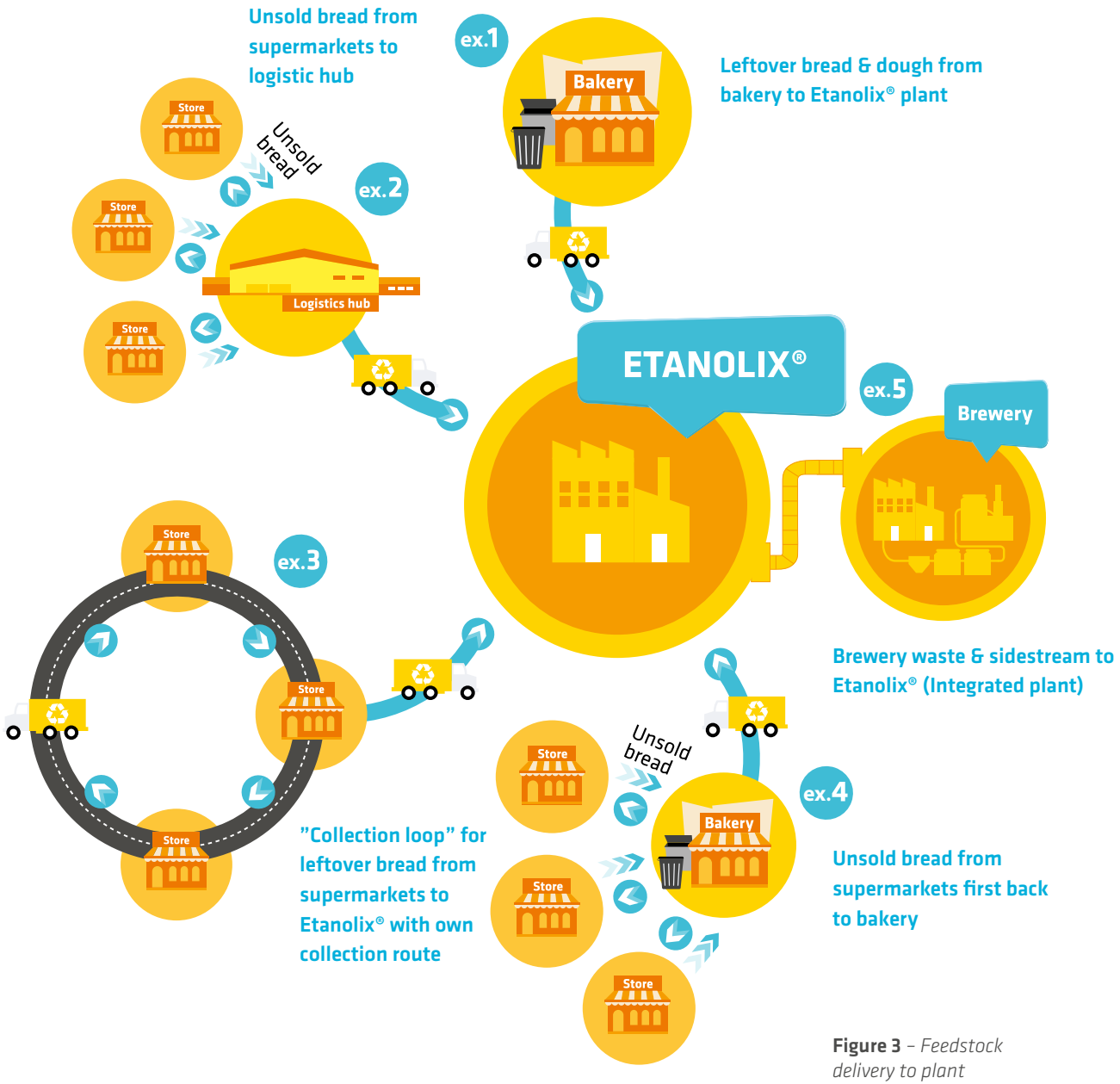


Figure 3 – *Feedstock delivery to plant*

Case EU Transport

"It is important to reduce greenhouse gas emissions and risks related to fossil fuel dependency in the transport sector. The European Council therefore invites the Commission to further examine instruments and measures for a comprehensive and technology neutral approach for the promotion of emissions reduction and energy efficiency in transport, for electric transportation and for renewable energy sources in transport also after 2020." (23/10/2014 – SN 79/14, point 2.13)

The European Council of October 2014 addressed in its conclusions the need for Greenhouse gas (GHG) emissions reductions in the transport sector as one of the key areas for the post-2020 period. European Commission in its own impact assessment (22/01/2014 - SWD(2014) 16) related to the 2030 policy framework, calculated that transport should contribute GHG emissions reductions up to 20% by 2030 to reach the overall goal of 40 % reductions.

Transport is one of the key climate and energy policy sectors as currently transport is responsible for 26 % of the total GHG emissions in the union. Reduction of transport emissions is essential and requires a holistic approach to vehicles, fuels and supply infrastructure. Increasing efficiency measures, increasing the share of renewable energy and widening feedstock sources to wastes and residues, should all be part of the policy mix. To secure the needed GHG reduction actions, industry needs a strong and holistic policy framework with regulatory instruments, which address efficiency while allowing different alternatives in different countries. When designing the long term policy framework, it is vital to fully utilize the readily available short and medium term GHG reduction opportunities, such as advanced Biofuels, produced from waste and residues.

"A Council on Clean Transportation (ICCT) report titled "Wasted" discusses the benefits of investing in the production of biofuels from waste. In addition to the many environmental benefits, the report anticipates that moving to such a waste-based biofuel policy would result in significant job creation, with many of these jobs being in rural Europe." (www.biofuelsreform.org)

Read the "Wasted" report: www.theicct.org/wasted-europes-untapped-resource-report

The closed loop model

In a closed loop system, waste is reused in-house as much as possible. In the full story, a company refines its own biodegradable waste into advanced ethanol in the Etanolix® plant and uses the end product as a fuel for the company's own transportation fleet. Excess production can also be distributed to consumers in various blending options. The loop is closed, when the company's employees drive home with cars running on their own waste based ethanol fuel.

RE85 – Our own advanced biofuel

- The RE85 is an advanced biofuel containing 80–85 % waste-based renewable ethanol produced in our own Etanolix® plants.
- RE85 reduces road traffic's lifetime emissions by up to 80 %.
- It meets the requirements imposed on biofuels by the EU Renewables Directive for years to come.

Capitalizing by-products

The ethanol distillation process generates liquid high-protein stillage that can be used as animal feed in piggeries with liquid feeding systems or as feedstock for the biogas plants. When the stillage is used as animal feed, the feedstock must not contain animal-based residues. The location of the ethanol plant also affects the choice between the two alternatives of using the stillage, as transportation costs and production synergies play a vital role in maximizing the benefits of the value network.

Producing animal feed close to the farms can significantly cut transportation costs and decrease the total CO2 emissions of the plant operations. Domestic production of animal feed also replaces imported soy and grain, diminishing the effects of volatile world market prices and facilitating full capitalization of the stillage. As the Etanolix® process uses only starch and sugar, the by-products are high in protein (25-30 %) and fat (15-20 %), which increases the quality and value of the animal feed.

In biogas plants, the stillage can be used to produce renewable electricity and heat that are subject to feed-in tariffs. The high fat and protein values of the stillage make it a great raw material for biogas production. When the Etanolix® plant is situated close to biogas production, the renewable heat and electricity can be utilized in the ethanol plant, pushing further the achieved emission reductions. Energy companies with existing biogas production can also employ the Etanolix® plant as a pretreatment facility for the current production. **Figure 4** presents the biogas potential and energy equivalent of the stillage that is gathered in the yearly production of 5 million liters of ethanol based on bakery waste.

TRANSPORTATION COSTS AND PRODUCTION SYNERGIES PLAY A VITAL ROLE IN MAXIMIZING THE BENEFITS OF THE VALUE NETWORK

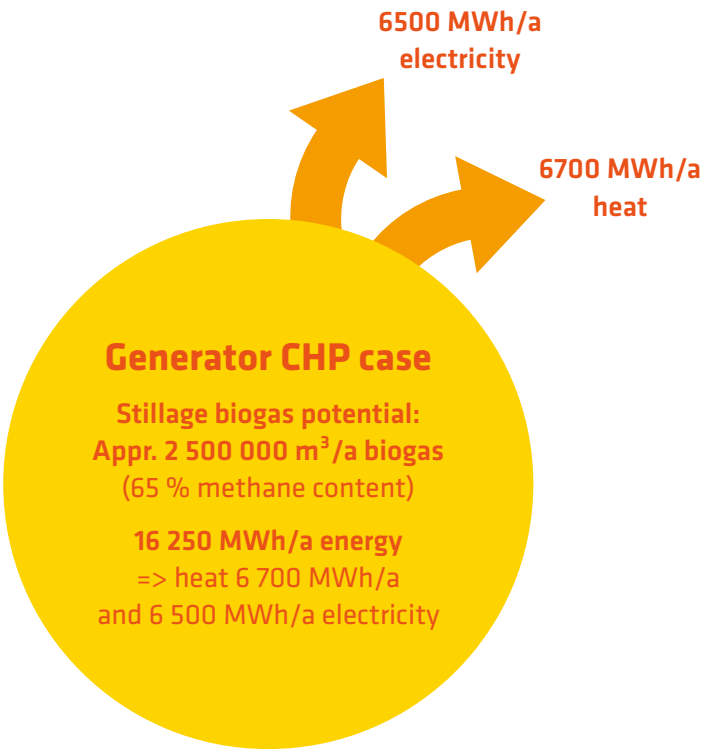
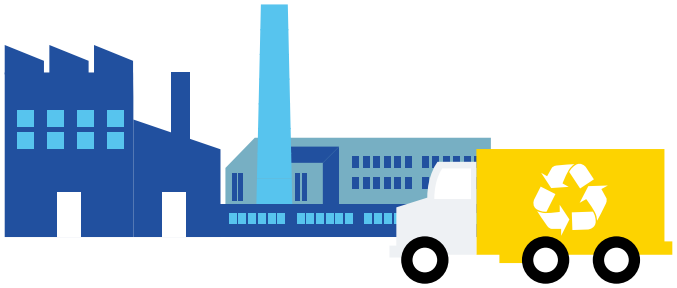


Figure 4 – *Stillage biogas potential*

Business cases

There are different business drivers for different actors. In the fuel industry, renewable ethanol production is a way to respond to tightening regulations and renewability obligations. It enables waste transportation and energy companies to extend their range of products and services. This enables them to gain a better position in the market and differentiate themselves from the competition. For existing ethanol producers, advanced ethanol is a premium product that allows higher margins and profitability.



Ethanol producers

From an ethanol producers perspective, the main advantage of the Etanolix® plant and waste-based ethanol production is the double counted status given to advanced ethanol, for example in the EU Renewables Directive (2009/28/EC) and in the US Renewable Fuel Standard (RFS). This allows the premium pricing of the end product. In addition to being directly applicable to existing distribution infrastructure, this makes the fuel grade advanced ethanol an easily marketable product to existing customers.

Waste management companies

A key benefit for waste management companies is that they already have access to suitable feedstock. There are a few megatrends that further enhance this: as urbanization continues to increase, there are growing amounts of waste in smaller areas. This poses new challenges for sustainable waste management, but also cuts down transportation costs in waste collection. More opportunities arise also from the trend of privatizing municipal services. Hence, investing into an Etanolix® plant and creating a business out of ethanol production allows maximizing the use of this resource at hand.

Another important driver stems from regulations: The EU Landfill Directive (1993/31/EC) requires the reduction of landfilled biodegradable waste to 35 % of 1995 values. Recycling the waste into ethanol not only helps in cutting down greenhouse gas emissions but provides a feasible business opportunity as well. Furthermore, many states offer viable taxing incentives for the production of renewable energy.

Fuel refiners, procurers and distributors

For fuel refiners and distributors, ethanol production opens the possibility to respond to tightening biofuel distribution obligations. According to the EU Renewables Directive (2009/28/EC), waste-based renewable ethanol is counted double towards these obligations. Investing into own biofuel production guarantees the availability of sustainable biofuels, providing protection from market instabilities. For fuel distributors, it is also important that the fuel grade advanced ethanol does not require any modifications to the existing distribution infrastructure, hence minimizing the need for additional investments.

This is an opportunity especially for smaller fuel procurers and distributors, such as the North European Oil Trade (NEOT), a fuel procurement company jointly owned by SOK and St1 Nordic, which handle the fuel distribution. In addition to procuring renewable ethanol from St1 Biofuels, NEOT will commence its own production in Finland in 2016.

"Our own waste-based ethanol production strengthens our strategy in meeting the growing biofuel obligations. It is essential for us as a procurement company to assure the availability of competitive and sustainable biofuels", says Henrikki Talvitie, CEO, NEOT.

Ethanol Production Process and Operations

The Etanolix® unit is composed of a multi-phased process during which the feedstock is hydrolyzed and fermented into alcohol. The alcohol is then recovered and dehydrated to fuel grade.

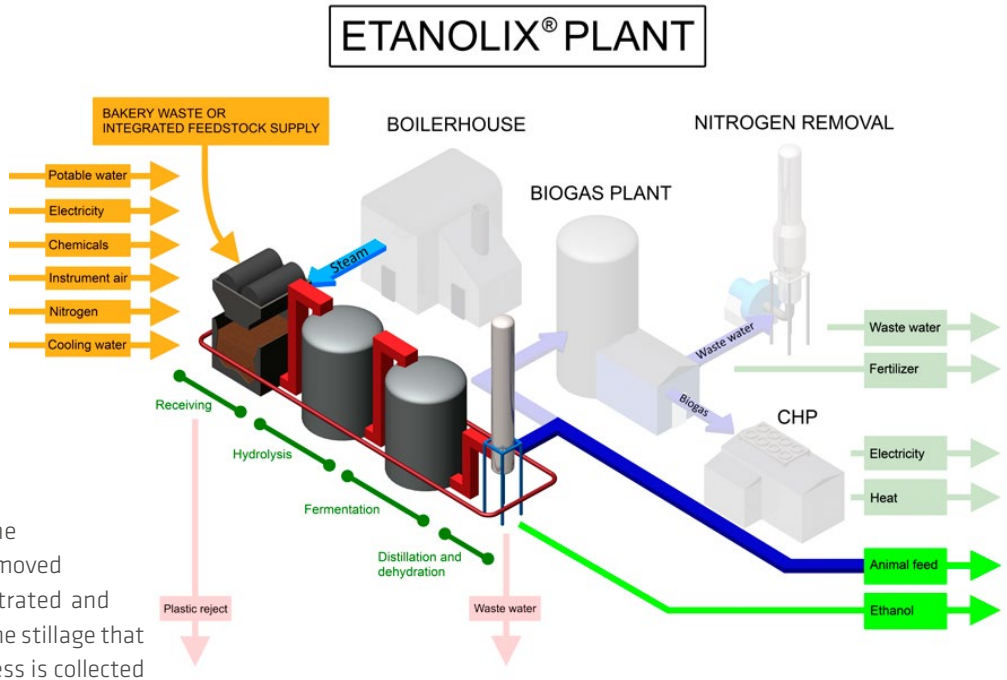


Figure 5 – *Etanolix® plant workflow*

Heat, electricity, and different chemicals are necessary in the process. All this contributes to the site requirements that are considered when deciding on the location of the plant. Plant construction and operation are also subject to basic environmental and industrial regulations. St1 Biofuels offers support with these permits and applications.

Production process

The Etanolix® plant production process results from years of experience in combining equipment, raw material, and processes for refining waste into a consistent ethanol product.

Figure 5 presents the material flow at the Etanolix® plant. The production process starts with receiving feedstock that has high carbohydrate concentrations, e.g. bakery waste. At this stage, the feedstock may still be in its paper or plastic packaging, which is removed during the reception process. In the hydrolysis stage, the feedstock is diluted with warm water in order to convert it into slurry. Before the fermentation process, the mash is cooled down, after which yeast slurry and enzymes are added. During the fermentation process, carbon dioxide is formed and collected and then cleaned to recover ethanol traces. In the distillation phase, the ethanol is removed from the fermentor beer, concentrated and then transferred to dehydration. The stillage that remains from the distillation process is collected for further use as animal feed or as feedstock for biogas plants. **Figure 6** illustrates the yearly material balance in the Etanolix® 5 million litre plant.

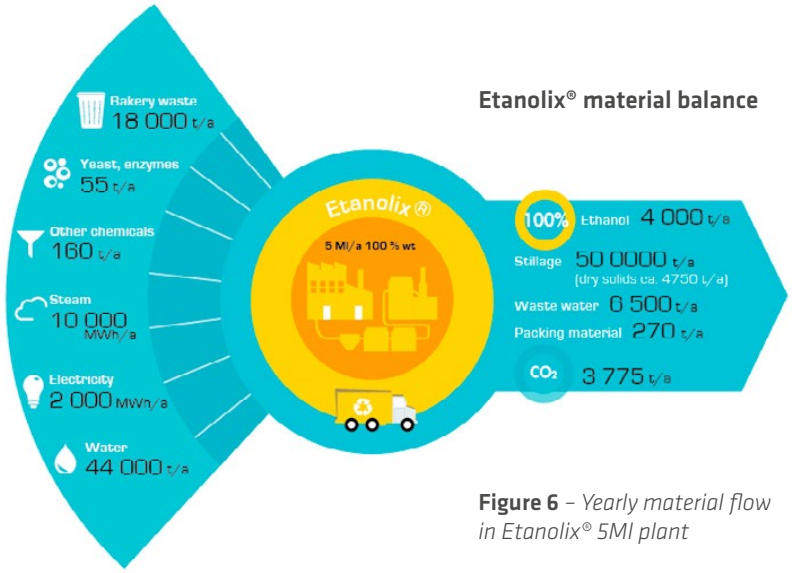


Figure 6 – *Yearly material flow in Etanolix® 5Ml plant*

Site requirements

The plant setup is relatively flexible as long as the required ground area and energy intake are considered. In terms of energy, the main focus lies in the supply of sufficient heat and electricity. As presented in **figure 5**, instrument air, cooling and potable water, and chemicals are also needed during the production process. Detailed utility specifications and plans are made in the feasibility study, led by St1 Biofuels. The average annual amount for electricity and water consumption is presented in **figure 6**. In terms of ground area specifications, a 5 million litre annual production site only needs approximately 60 m x 80 m of space, depending on the plant layout.

Integrating the plant into existing production facilities might offer considerable synergies. There might be integration of feedstock or utilities, such as cooling water from the mother plant, and in the most optimal and effective cases both aspects can be covered. Plant integration will then affect certain plant specifications, e.g. regarding container units. Such possibilities are considered in the feasibility study in the beginning of the project.

Permits and regulations

Like any other industrial operation, the Etanolix® plant construction and ethanol production is regulated in terms of environmental and safety issues. The typical permits and licences needed to build and operate an ethanol plant are listed in **table 1**. The full list of required permits is subject to change according to national legislation. St1 Biofuels offers consultation and support throughout the permission process.

The EU Renewables Directive requires that biofuels fulfil the sustainability criteria and companies producing biofuels need to have a sustainability scheme to calculate the life cycle emissions for the produced biofuels. In the scheme, all the emissions caused during the biofuel production are calculated and reported quarterly. For example due to its status as waste or residue the feedstock's emissions are zero.

St1 Biofuels has a sustainability scheme that has been accepted by the Finnish Energy Authority. St1 Biofuels provides extensive guidance and support when establishing the sustainability scheme and investigating new feedstock possibilities.

St1 BIOFUELS OFFERS SUPPORT AND CONSULTATION THROUGHOUT THE ETANOLIX® PROJECT

Permit	When needed (typically)	St1 contribution
EIA or other environmental permit	Before investment decision	Basic info of the process and project, emission estimations
Permit and/or agreement of utilities	Before investment decision or implementation design, depending on the company/financers policies	Consultation
Building permit	Before site works commence	Process related details, including 3D visualization drawings
Chemical permit for hazardous and/or flammable liquids	Typically before start-up	Chemical specifications and consumption figures
Alcohol license (licence to produce and store ethanol)	Before start-up	Consultation
Operation permit	Before start-up	Process related details and other info depending the scope of supply

Table 1 – *Typical permits and licenses for production*

Start a New Business with the Help of St1 Biofuels

St1 Biofuels is a pioneer in waste-based ethanol technology and production facilities. The company has built and developed an ethanol production fleet with several plants. Based on the experience and know-how from its operation, St1 Biofuels has designed repeatable plant solutions for waste-based ethanol production.

St1 Biofuels serves its customers from the early stages of business development to plant delivery, operational support and development tasks. The business development services consist of offering the company's expertise, experience, and continuous R&D to formulate and develop a feasible business model. St1 Biofuels' services cover the whole life cycle of a bioethanol plant, including laboratory tests, plant delivery services and production support services. The company can even offer an off-take agreement for the produced ethanol. The first step is to order the feasibility study that assesses the viability of the plant project.

Plant project

The plant project begins with the feasibility study, in which the different key factors in the business model's success are considered and evaluated. Such matters include e.g. feedstock availability, by-product usage, and preliminary site location. The aim is to find the best possible alternative for each individual customer. **Table 2** presents the full range of topics in the feasibility study. In total, the project comprises of five stages, with a go/no-go decision made after the first two stages. After the feasibility study, the project continues from pre-engineering, basic engineering and project implementation to plant operation. The competence and experience of St1 Biofuels covers all the steps in the project, and enables St1 Biofuels to offer support to the customer from the first idea to full operation.

Life-cycle services

St1 Biofuels' services continue after the plant handover: as listed in **table 2**, the customer is provided with e.g. 24/7 operational support, production reviews, preventive maintenance plans, as well as quality assurance and consultation for the animal feed production. Since St1 Biofuels operates a number of production plants in Finland, the company is able to offer insight for optimal production practices and innovation.

St1 Biofuels offers an off-take agreement for the produced ethanol from its customers. The Etanolix® plant produces world-class advanced ethanol that is appealing due to its competitive advantages. The distribution network in the Nordic countries has a bigger demand for ethanol than is produced with the current production fleet. In terms of logistics, distribution and commercialization there are already efficient models in use due to the existing production of St1 Biofuels in Finland.

Etanolix® plant from idea to operation

Decision gate: 1. Go/No-go | 2. Go/No-go | 3. Investment Decision | 4. Hand-over

FEASIBILITY STUDY 1 **PRE ENGINEERING** 2 **BASIC ENGINEERING** 3 **PROJECT IMPLEMENTATION** 4 **PLANT OPERATION**

FEASIBILITY STUDY

- Feedstock availability by client and applicability by St1
- Ethanol specification, and yield
- By-product (stillage) utilization
- Process and technology
- Plant description and site requirements
- Utilities
- Environmental impact
- Project implementation and scope of delivery
- Preliminary Capex/Opex estimation
- Site conditions and prospective location of the plant
- Laboratory analysis of prospective feedstock

PLANT DELIVERY PACKAGE

- Design of the plant
- Procurement of equipment
- Delivery of process modules
  - Feedstock receiving and handling
  - Hydrolysis
  - Fermentation
  - Distillation
  - Dehydration
  - CIP-system
  - Ethanol storage and loading
  - Chemical storage
  - Stillage storage and loading
  - Waste water pre-treatment
  - Cooling system package
  - Instrument air system
- Erection supervision
- Plant installation
- Operation manuals & training
- First fill of chemicals
- Commissioning and start-up
- Process control system

OPTONS (st1/Client)

- Stillage evaporation
- Control and social rooms
- Warehouse area
- Laboratory equipment
- Nitrogen system
- Weight bridge
- Waste water handling
- Boiler plant
- Biogas plant
- Gas engine
- Civil works

LIFE CYCLE SERVICES

- Feedstock contract model
- Supply of auxiliaries (yeast, enzymes, chemicals)
- Chemical and process safety consulting
- Production control system
- Operation support services
- Remote monitoring at Hamina, Finland
- Quality control and assurance services
- Maintenance system and management services
- Spare part management services
- Audits (quality, safety, operation)
- Upgrade, design and implementation planning
- Performance benchmarking
- Trouble shooting services

Table 2

This is St1 Biofuels

St1 Biofuels Oy was established in 2006 as a subsidiary of St1 Nordic Oy, with the goal of creating a sustainable ethanol production concept that could be widely utilized.

Operating now a number of ethanol plants, St1 Biofuels is a pioneer in waste-based ethanol production. The company delivers biofuel production technology and business services, as well as operates its own ethanol plants. The expertise of St1 Biofuels lies in biochemical processes, technology development, engineering, and project delivery. The core principle is to replace fossil fuels in a profitable and sustainable way.

St1 is a privately owned Nordic energy company with a turnover of 6.6 billion euros (2013). St1 strives to be the leading producer and seller of CO_2-aware energy.

The company's business ranges from a distribution network of over 1100 fuel stations in Finland, Sweden, and Norway, to fuel refinement and wholesale, as well as wind power.

Contact information

Patrick Pitkänen
Director, Head of Business Development
Tel. +358 (0)10 557 4734
patrick.pitkanen@st1.fi

Vesa Turpeinen
Sales Manager
Tel +358 (0)40 722 8074
vesa.turpeinen@st1.fi