

# Logistics of fuel from ethanol producer to forecourt in Sweden and the Netherlands

October 2007, BioFuel Region, Stockholm and Rotterdam  
BEST Deliverable No 4.8

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**Language:** English

**Project no: TREN/05/FP6EN/S07.53807/019854**

**Project acronym: BEST**

**Project title: BioEthanol for Sustainable Transport**

**Instrument: Integrated Project**

**Thematic Priority: 6.1 Alternative Motor Fuels: BioFuel Cities**

**Report title:**

## **Logistics of fuel from ethanol producer to forecourt in Sweden and the Netherlands**

Deliverable no: 4.8

Version: 1

Lead Participant for the deliverable: BioFuel Region, Stockholm, Rotterdam

Date of delivering to EC, contractual: June 2007

Date of delivering to EC, actual: October 2007

Period covered:

Revision

Approved by

- Site coordinator BioFuel Region
- Site coordinator Stockholm
- Site coordinator Rotterdam
- Wp leader
- Evaluation manager
- Coordinator
- Steering Group
- European Commission

Dissemination level:

- PU – Public
- PP – Restricted to other programme participants (including Commission Services)
- RE – Restricted to a group specified by the consortium (including Commission Services)
- CO – Confidential, only for members of the consortium (including Commission Services)

Start date of project: 01/01/2006

Duration: 48 months

Project coordinator name: Gustaf Landahl

Project coordinator organisation name: City of Stockholm, Environment and Health Administration



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# Introduction

This report describes the logistics of fuel from ethanol producer to forecourt in the countries of Sweden and the Netherlands. The report is divided into two parts – where part A describes the logistics and distribution in Sweden and part B describes the logistics and distribution in the Netherlands.

The descriptions are in some parts less detailed due to the fact of business confidentiality which makes it difficult to have a higher level of description in this report.

In both part A and B are some of the difficulties and problems with the use of ethanol due to i.e. EU custom regulations, high prices as a result of high logistic costs and high taxes described.

# Part A – Logistics of fuel from ethanol producer to forecourt in Sweden

## Different types of ethanol fuels available in Sweden

### E5

In the late 1990's the Swedish fuel company OKQ8 started sales of gasoline with ten per cent ethanol content. When Sweden became a member of the European Union in the year 2000 regulations were changed and the ethanol content dropped to today's five per cent. Due to the fact that the adding of up to ten per cent of ethanol doesn't affect the engine performance efforts are now being made to change the regulation.

### E85 – Etamax B

E85 is a fuel that consists of 86 weight per cent ethanol, 11,6 weight per cent gasoline and the remaining percentages being two types of denaturants and colouring. It is a fuel intended for flexifuel vehicles that can alternate between E85 and ordinary lead-free gasoline or any blends of these without any adjustments to the engine. The use of E85 in the flexifuel engine reduces the emissions of fossil carbon dioxide by about 80 per cent.

In Sweden there are two qualities of E85 which are season based and regulated in the Swedish standard SS 15 54 80:2006. In the summer quality the vapour pressure is 35-70 kPa while it in the winter quality is 50-95 kPa. The ethanol content in the summer quality must be at a minimum of 75% and in the winter quality at a minimum of 70%. The volume content of gasoline in E85 may in the summer quality differ between 14-25% and in the winter quality between 14-30%.

### E95 – Etamax D

Etamax D is an ethanol fuel for heavy vehicles and can be used in modified diesel engines. The fuel consists of 92 weight per cent ethanol, remaining percentages being an ignition improver, denaturants and colouring. There are currently in Sweden approximately 600 ethanol buses in operation.

## Preparation of fuels

The mixing of the different types of bioethanol fuels are performed at designated sites. These sites are preferable located close to existing infrastructure like harbour, rail road and roads. This will facilitate the transport of rawmaterial and fuels to and from the mixing site.

At the mixing site there are storage tanks for the components in the fuels, the size of these tanks depend on the volumes of fuels produced at each specific site.

From the storage tanks there are pipe connections to the different means of transport so that raw material and fuel can be pumped to and from the storage tanks. The tanks are placed within an embankment which will collect leakages from the tanks. This embankment must be able to collect the total volume of the largest tank + 10% of the volume of all tanks placed within the embankment. There are also spill collection system and rain



protection needed at the mixing site, and a control system that will control the levels in the tanks, pumps and other equipment associated with the mixing site.

## Transport of fuel

From the mixing site the fuels are either transported by boat, train or truck. For the product E5, dehydrated ethanol is transported to the oil companies own fuel preparation sites (Sekab the main importer of ethanol in Sweden does not mix gasoline and ethanol for the E5 fuel). E85 however is produced at the mixing sites and transported either directly to the filling stations by truck or to fuel depots using all three modes of transport. The Etamax D is today mainly distributed directly to the public transport companies by truck and used in buses.



## Filling stations

### Storing and handling E85

One of the major benefits with ethanol as a fuel is that it is a liquid soluble in gasoline. It can be distributed and implemented in today's infrastructure without any major modifications. E85 has however different corrosive properties from gasoline, which means that some materials are unsuitable for use when storing and handling ethanol blends. Some materials that should not be used with E85 are zinc, brass, lead and aluminium. E85 and gasoline react differently with some plastic and rubber materials. It is therefore important to choose a material that is compatible with ethanol for use in pumps, pipes and tanks. Examples of materials that are suitable for use with E85 are stainless steel, galvanised steel and bronze.

### Ethanol pumps

The ethanol blend E85 is sold in two different kinds of pumps; either a pump that is used only for E85 (a static pump) or a flexifuel pump. An important benefit of the flexifuel pump is that it can offer different blends of ethanol and gasoline, which encourages a flexible fuel development. For example, in the future, both E85 and E100 could be sold from the same pump. The consumer would choose the desired blend with a simple push of a button. The flexifuel pump is connected to two different underground tanks – one with gasoline and one with ethanol. Additional investment costs for a flexifuel pump compared to a static E85 pump are not more than €2,000.



*The flexifuel pump*

## Legislation

In October 2007 there are 1000 filling stations offering E85 as a fuel in Sweden. By 2010, according to Swedish law, at least one renewable fuel should be available at filling stations distributing more than 1000 m<sup>3</sup>:

- *From 1 April 2006 to 28 February 2007, if the point of sales volume in excess of 3000 m<sup>3</sup> gasoline or diesel in 2004.*
- *From 1 March 2007 to 29 February 2008, if the point of sales volume in excess of 2500 m<sup>3</sup> gasoline or diesel in 2005.*
- *From 1 March 2008 to 28 February 2009, if the point of sales volume in excess of 2000 m<sup>3</sup> gasoline or diesel in 2006.*
- *From 1 March 2009 to 31 December 2009, if the point of sales volume in excess of 1000 m<sup>3</sup> gasoline or diesel in 2007.*
- *From 1 January 2010 and every subsequent year, if the point of sale had sales volume in excess of 1000 m<sup>3</sup> gasoline or diesel in two years previous to the year in question.*

## Difficulties due to EU custom regulations

The bioethanol fuel market needs a biofuel at a cost which is competitive with gasoline and diesel. Raw material for Etamax D (E95) is hydrous ethanol unlike the anhydrous ethanol for Etamax B (E85) for FlexiFuel Vehicles (FFV). Hydrous ethanol is offered on the technical ethanol market within the EU. Both the biological ethanol fuel market and the technical bioethanol market within EU has been examined and so far, no European ethanol producer or supplier has been able to offer a competitive EU produced ethanol that will meet the equivalent ethanol cost for E95 and E85.

Brazil produces large quantities of ethanol from sugar canes. Ethanol from sugar canes is more efficient in reducing fossil CO<sub>2</sub> than grain ethanol. The ethanol is however, considered to be an agricultural product and duty is therefore to be paid on it as ethanol under Taric number 2207 10 00 10, with a tariff rate of €19.2/hl. This high tariff rate leads to a raw product cost that exceeds the selling price of the end products. It is impossible to offer a competitive E95/E85. Ethanol as a fuel ought to be treated in respect of customs like other fuels within the transport sector.

The Swedish Customs has classified the bioethanol fuels E95 and E85 according to CN code 3824 90 97. The tariff rate for the bio fuels are 6.5% of the customs value, which makes it possible to offer a competitive E95/E85. With an authorisation for Processing under Customs Control (PCC), it would be possible to use Brazilian bioethanol for the production of E95 and E85 and these products are viewed as transportation sector fuels in the same manner as gasoline and diesel, with low customs duties. The import of the ethanol is, with a PCC permit, according to the tariff rate of the processed products. An authorisation for PCC must be granted within the EU commission, according to agricultural regulations. If a PCC is not granted, it is not possible to provide the bioethanol fuel market with a competitive E95 and E85 and it will have extensive consequences for the continued development of the innovative biofuel market within the transport sector.

# **Part B – Logistics of fuel from ethanol producer to forecourt in the Netherlands**

## **Introduction**

Nedalco at Bergen op Zoom is producing ethanol which is being dehydrated, blended and stored at Nedalco's partner in a joint-venture Bruggeman Alcohol in Heilbronn, Germany. From Germany small amounts of bio-ethanol is transported to the Netherlands.

In Rotterdam there is one pump holder, Argos Oil, offering E5 and E85. There are 4 more pump holders in other regions of the Netherlands offering E85. At this moment there are over 500 FFV's running in the region and over 300 FFV's will be delivered in 2008.

The price of E85 is not competitive to regular gasoline due to high logistic costs and high tax.

Rotterdam is investigating and setting up projects in order to lower the price of E85.

This report describes the distribution and logistics of bio-ethanol in the Netherlands, a description of blending sites in Rotterdam and a description of problems faced by Rotterdam in introducing bio-ethanol as a fuel in The Netherlands.

## **Different types of ethanol fuels available in The Netherlands**

In the region of Rotterdam E85 and E5 is available at one pump holder, Argos Oil. According to the European legislation all fuels have to contain 5,75% bio component in 2010. Since Argos Oil is a progressive company they offer E5 already. Argos oil is also the only pump holder in the region of Rotterdam that offers E85.

## **Production**

The ethanol is produced at Nedalco in Bergen op Zoom. They produce ethanol for several market segments: the beverage market, the industrial market and the transport segment. In 2006 about 20% of the production volume in Bergen op Zoom (15 million liters) was produced for end use as bio-ethanol (for the transport segment).

In general it can be said that 95% of production process of bio-ethanol is similar to all other ethanol grades. The production of bio-ethanol differs in 2 ways compared to industrial or beverage ethanol; With bioethanol less recycling in the columns is needed to purify the alcohol into pure ethanol and Bio-ethanol needs to be dehydrated (for 96% into 100% ethanol by removing the last 4% of water)

Since Nedalco at Bergen op Zoom has no dehydration and blending capacities, this is done by Nedalco's partner Bruggeman Alcohol in Heilbronn (Germany). At this location, the bio-ethanol dehydrated and blended with regular gasoline into E85. E5 is blended at the territory of the pumpholder, Argos Oil. At Bruggeman Alcohol in Heilbronn the bio-ethanol is also stored.

## **Transport**

Bio-ethanol for the use of E5 and E85 is transported by trucks from Germany to the Dutch filling stations. Due to small quantities of bio-ethanol used in the Netherlands only 1/3 of a truck is being used per delivery.

## Filling stations

There are five E85 filling stations in the Netherlands. One filling station is situated in the region of Rotterdam (Argos Oil). The other four filling stations are outside the region of Rotterdam: Beesd, Leeuwarden, Rijswijk and Wormer.

Rotterdam has now interested more companies in setting up E85 pumps in the Rotterdam region. It concerns car dealers and oil companies like Total and Tamoil. Of course Argos Oil is also still planning to set up more E85 pumps

## Problems

The problems Rotterdam and its region is facing at this moment regarding to E85 is the high price of the fuel E85 in comparison to regular fuel (€1,91 vs €1,55 per liter ). The cause if this high price is on the one hand the high excise on the fuel and on the other hand the high logistic costs of the fuel since it has to be transported from Germany in low amounts.

## Price

Rotterdam together with Nedalco and several other parties have started a lobby traject to get tax incentive from the government. At this moment there is no view whether and if so when a positive decision will be taken. Even if a positive decision will be taken, the possible tax incentive will not come into force before the year 2009. Despite of the high price of E85 the number of vehicles in Rotterdam and its region is growing. This growth is causing also the growth of sold bio-ethanol. However, the amount of sold E85 is not growing as spectacular as the number of vehicles, caused by the high E85 price. Nevertheless, in the past year almost 21.000 liters were sold, which is almost 3 times the amount of the first half year and 4 times the amount of 2006.

However Rotterdam has succeeded to get a compensation fund from its regional authorities to compensate the incremental costs of E85 of the consumers in Rotterdam and its region. In the second half of 2007, the organizational and juridical feasibility of this policy is investigated. So far, European regulations regarding forbidden state support are making it very complicated to arrange the right workable solution for getting this incentive into place. Due to that fact, it has not yet been implemented in 2007, but shifted towards the coming year 2008. Rotterdam and the regional authorities believe that this policy will certainly attract more entrepreneurs to offer E85.

Another policy Rotterdam is working on, is a generic subsidy arrangement for entrepreneurs who want to invest in filling stations for biofuels. This generic subsidy should cover a substantial, but legally permitted, part of the capital investment. Together with the compensation of the incremental costs, these actions should attract more pump holders to invest in E85 facilities. The subsidy arrangement will be part of the Rotterdam Climate Initiative (RCI) and will have to come into force in the first half of 2008.

## Logistics

The other cost increasing factor is the high logistics costs since E85 has to be transported from Germany in small quantities. Rotterdam is now investigating other dehydration and blending options in or near Rotterdam. Interesting companies in this matter are:

**Argos Oil** : has a E85 and E5 filling station and plans to set up a blending site

The Argos Group is one of the larger, independent oil companies in The Netherlands. Our activities include trading, storage and sales of (bio) fuels and lubricants. By the strategic positioning of offices, storage and distribution facilities in the Port of Rotterdam, Argos is a centre player in the Dutch oil business (...) Argos Oil aims to be a flexible supplier of the (changing) energy-needs and demands of her clientele, with emphasize on the environment (...)'.

([www.argos.nl](http://www.argos.nl))

**Vopak:** has blending facilities

‘With a history of almost four centuries, Vopak is the global marketleader for the independent storage and handling of liquid oil products, chemicals, vegetable oils and liquefied gases. Vopak has terminals in the world's most strategic ports, with specialised facilities: product tanks, jetties, truck loading stations, pipelines and access to road and rail networks. Products are stored for customers at these terminals for some time, often under very specific conditions, such as temperature, or they are blended to obtain the desired specification. Vopak's terminals play a key role in the transit: products are transported from the terminal to end users by vessel, tanktruck or pipeline’.

([www.vopak.nl](http://www.vopak.nl))

**Abengoa:** is setting up a bio-ethanol plant in Rotterdam. They have started with the construction of bio-ethanol plant with a capacity of 480,000 barrels. The location lies central in the Europoort area, northern of the distribution centre of Storochem and western of the chemical factory of Caldic. Abengoa are Europa's largest bioethanol producer with three factories with together wide 500 millions litre production capacity.

([http://www.portofrotterdam.com/en/news/pressreleases/2007/17102007\\_02.jsp](http://www.portofrotterdam.com/en/news/pressreleases/2007/17102007_02.jsp))

‘Abengoa Bioenergy is the European leader in the production of bioethanol for use as a biofuel, and currently operates with three plants in Spain, Ecocarburantes Españoles, in Cartagena (Murcia), Bioetanol Galicia in Teixeiro (La Coruña), and Biocarburantes Castilla y León (Babilafuente), which have a total installed capacity of 150, 176, and 200 million liters annually, respectively. It has also begun the construction of its fourth plant in Europe, through Abengoa Bioenergy France, in the Petro-Chemical Complex in Lacq, Pyrénées Atlantiques (France)’.

([www.abengoabioenergy.com](http://www.abengoabioenergy.com))

**BER:** bio-ethanol producer

‘BER BV will produce 110,000 tons per year of bio-ethanol from approximately 350,000 tons of wheat. Bio-ethanol is used in ETBE and in blends with gasoline, in certain cases up to 85% (E85) (...) The bio-ethanol production process of BER starts with a state-of-the-art bio-ethanol production facility, in which starch is converted into alcohol. The alcohol is separated from the other liquid components in a distillation step. In the distillation tower and after rectification 99.9% bio-ethanol remains for sale. Over 100.000 tons of a pure flow of carbon dioxide exits this unit which can easily be sold. The BER-concept is a concept in which new technologies are combined and connected with this bio-ethanol plant (see diagram)...’

([www.ber-rotterdam.com](http://www.ber-rotterdam.com))

At this moment Rotterdam is investigating the possible roles of these (and other) companies in putting up an alternative supply and logistic chain for bio-ethanol and its effect on the pricing of E85. At the end of the first quarter of 2008 there will be more insight in a possible alternative supply chain.

## **More information**

Storing and Dispensing E85 and E95 – experiences from Sweden and the US.

Safety aspects with E85 as a fuel for vehicles. BEST Deliverable No 4.2.B