The World's First Eco-Ambulance

Stockholms läns landsting

Stockholm County Council

The world's first eco-ambulance:

As safe for the patient as a regular ambulance – but far kinder to the environment

Why a green ambulance?

Stockholm County Council's (SLL) green ambulance is part of an endeavour to reduce the environmental impact of its ambulance operations. The green ambulance runs on biogas – and the amount of environmentally hazardous substances has been reduced wherever technically and economically feasible. Patients requiring rapid transport to hospital won't notice any difference, but the environment will benefit over time.

The green ambulance will help Stockholm County Council achieve its environmental objectives:

- *To increase the proportion of renewable vehicle fuels* by using fossil-free fuels for passenger and freight transport by land and sea.
- *To reduce the use of chemicals and chemical products* that may have serious effects on health and/or the environment.

Read more about SLL's environmental programme on page 16.

The world's first eco-ambulance is the result of a partnership between Stockholm County Council and Ambulanssjukvården i Storstockholm AB, AISAB, a company wholly-owned by the Council. Together we are striving to reduce the environmental impact of ambulance operations.

Obstacles are for overcoming

Ambulances are subject to a wide range of different rules, standards and other requirements, and this makes it impossible to procure just any biogas or ethanol-powered vehicle and convert it into an ambulance. The fact that they are also ordered in small numbers means there are no great incentives to develop alternatives to existing vehicle models on the market which can be converted into ambulances. Therefore it has been difficult to find a model that can be powered by renewable fuels.

Another obstacle is that biogas vehicles require more and heavier fuel tanks. This makes the vehicles heavy, which is far from ideal from an environmental perspective: the lighter the vehicle, the less fuel it requires. Another reason for keeping the weight down is that if the vehicle exceeds 3.5 tonnes, AISAB's ambulance drivers need to upgrade to heavy vehicle driving licences.

The challenge was therefore to find a light enough biogas-powered model. Read on to find out how we managed to overcome all the obstacles.

From idea to finished ambulance

2005. Stockholm County Council develops a vision for a green ambulance.

2006. A pilot study is carried out to examine various technical solutions and to estimate the extra costs a more eco-friendly alternative could entail. Work on requirement specification for future procurement.

2007. A request for tender is sent out, but no tenders are received.

2008. A dialogue is initiated with several ambulance builders to discuss the possibility of developing an ambulance powered by renewable fuel. Euro-Lans AB, which has a general agreement with AISAB, shows interest in the project.

2008. Mercedes-Benz Sweden launches a gas-powered delivery van – MB Sprinter 316 NGT – a model that can be developed into an ambulance. Development work is carried out in partnership with ambulance builder Euro-Lans AB.

May 2009. The eco-ambulance is launched and comes into service at AISAB's ambulance station in Ekerö, outside Stockholm.

- **Phthalate-free wall covering and cupboard fittings. Some phthalates can impair fertility and cause foetal damage.**

Client and supplier – finding new paths together

Collaboration between the ordering client and the supplier was an important success factor in the project. Stockholm County Council not only set new, tougher requirements when it came to environmental adaptation, it also worked alongside the supplier – ambulance builder Euro-Lans – to find new solutions to meet those requirements. By starting to use renewable fuels and new components and materials, the burden on the environment could be reduced.

In tandem with the development process, an internal project was initiated at Euro-Lans to produce fittings and furnishings with a lower impact on the environment. The aim was to create a better work environment for production personnel, a better work environment inside the ambulance, to increase the degree of recycling and reduce the external impact on the environment.

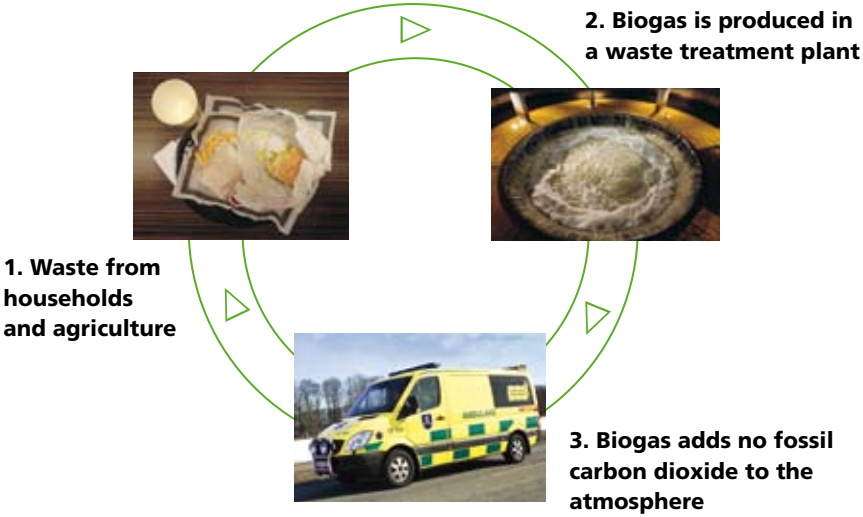
One positive effect of the project is that Euro-Lans now considers the environment to a far larger extent when choosing suppliers and technical solutions. They supply more eco-friendly emergency vehicles generally. For instance all their vehicles – ambulances as well as fire engines and police cars – use only halogen-free cabling. Read more at *www.eurolans.se*

To sum up, high customer requirements encourage suppliers to find new solutions. The collaboration between producer and user can lead development towards a better environment, in all respects. What's needed is plenty of perseverance.

Why run the ambulance on biogas?

Fuel gas is the collective name for biogas and natural gas used as vehicle propellants. Biogas and natural gas are essentially identical (methane). The difference lies in how they are produced. Natural gas is a fossil fuel, but with a lower environmental impact than petrol or diesel.

Biogas is renewable and is obtained by rotting organic matter such as waste sludge, food remains and cultivated crops. Compared with all other available fuels – both fossil and renewable – biogas has very low emissions from a life cycle perspective of substances that affect health and the environment, such as nitrogen oxides, hydrocarbons and particles. Biogas also has the lowest impact on the climate and does not add any fossil carbon dioxide to the atmosphere.



AISAB, Ambulanssjukvården i Storstockholm AB, is Stockholm's leading ambulance company and carries out almost half the county's assignments – that's over 56,000 assignments every year.

The green ambulance in figures, May 2009 to the end of February 2010

Assignments	**1,367**
Distance	**34,180 kilometres**
Petrol	**615 litres**
Biogas	**3,887 Nm^3 (equates to 4,276 litres of petrol)**

What do ambulance personnel think?

An initial assessment of the eco-ambulance among AISAB's ambulance personnel showed an overwhelmingly positive result. In addition to the lower environmental impact, the ambulance is perceived as being quieter, easier to manoeuvre and gives a gentler ride.

The main negative is the relatively short range of gas-driven vehicles, as well as the limited access to gas in the Stockholm area – which entails having to refuel more frequently and sometimes having to drive farther to refuel.

What does a green ambulance mean in reality?

The eco-ambulance is a Mercedes-Benz Sprinter 316 NGT. What makes this model unique is that it satisfies the requirements on weight, loading capacity and range, which has been a problem with previous gas-powered models. It has fuel tanks for both gas and petrol. The driver can switch between fuels at the touch of a button. The range is just under 300 km on gas and 800 km on petrol. During the ambulance's first year of service, around 87% of the fuel consumption has been gas. The target is 100%.

Extensive work has been carried out to review the components and materials in the conversion and fittings to find out what environmentally hazardous chemicals are used – and to what extent alternative materials with lower levels of unsuitable chemicals can be found. It was not only essential that the materials were sustainable from an environmental perspective, they must also fulfil requirements on function and work environment.

Read more about all the improvements in the green ambulance

Improvements to reduce environmental impact

Phthalate-free wall covering and cupboard fittings.

Adhesive free of solvents and isocyanates.

Halogen and PVC-free electricity cable.

Aerodynamic alarm/light system with LEDs uses 5-10% less fuel. LEDs, Light Emitting Diodes, have low energy consumption and a long life span.

Insulation without environmentally hazardous substances.

PVC-free floor mat.

Tyres without harmful HA oils.

Stud-free winter tyres.

Major environmental gain for a minor additional cost

All in all, the first eco-ambulance is just 14% more expensive to buy than a standard ambulance of the same make. The additional costs are incurred in part from running on biogas, from alternative fitting and furnishing materials, and from the aerodynamic alarm/light system. Just over half of these costs are due to the fact that this was the first eco-ambulance to be developed. Even during construction of the next green ambulance the total additional cost is expected to be halved – to around 6%.

Moreover, there will be a considerable saving from running the vehicle on biogas compared with petrol. The fuel cost for biogas is roughly on a par with diesel.

The next step – an even greener ambulance!

Stockholm County Council is continuing to analyse the chemical content of the basic vehicle, partly in collaboration with Mercedes-Benz. It is hoped that solutions can be found to further develop the vehicle from an environmental perspective. By:

- analysing alternative components and materials for the medical equipment
- analysing alternative materials for chair cushions and stuffing
- identifying other parts in the ambulance which are of interest to study with regard to environmental impact
- mapping possible logistical improvements
- reducing fuel consumption by decreasing the weight – through smaller/lighter equipment and consumption materials

In future procurements of ambulance vehicles (via general agreements) and ambulance services, Stockholm County Council will draw on the experiences gained in this first project – and set similar requirements. The first green ambulance is not the last!

- **Halogen and PVC-free electricity cable. Halogens break down ozone.**
- **Insulation without environmentally hazardous substances. Only natural materials in the insulation.**

- **PVC-free floor mat. The production of PVC includes the use of many substances that are hazardous to health and the environment – such as halogens, mercury, dioxins and phthalates.**
- **Adhesive free of solvents and isocyanates. These substances are primarily a work environment problem, as they can cause asthma.**

- **Tyres without harmful HA oils. HA oils get into lakes and oceans via surface water. The oils are toxic to aquatic organisms.**
- **Stud-free tyres. Studded tyres contribute to high particle levels in the air during the winter.**

Stockholm County Council's environmental work

Environment Step 5 (Miljö Steg 5) is Stockholm County Council's (SLL) environmental programme for the years 2007 to 2011, with tangible environmental goals and goal achievement reported annually. The County Council's long-term environmental work helps secure cleaner air and water for the county's residents.

SLL provides health and medical services, dental care and public transport in such a way that benefits the residents' health and living environment. The Council contributes to the ecologically sustainable development of the Stockholm region, and the protection of its rich environment.

The Council's environmental policy

SLL's operations shall be run in such a way that they have only a modest impact on the environment and ill-health is prevented. To achieve this the Council shall:

- Foster ecological sustainability through far-sighted regional planning, resource management, transition to renewable resources and lower emissions of pollutants.
- Consider the environment in every action and decision.
- Procure, purchase and order goods and services that have the lowest possible effect on the environment.
- Fulfil legal and official requirements and strive to continuously improve the operations' environmental results.
- Notify and influence employees, the public and organisations with the aim of spreading awareness and improving the County Council's environmental results.

The environmental flower symbolises the five environmental areas Stockholm County Council is working on.

Environmental goals in each area of Environment Step 5/Miljö Steg 5

Transport

- By 2011, at least half of the County Council's passenger and goods transport will be performed with renewable fuels.
- By 2011, emissions of particles and nitrogen dioxides from public transport will be significantly reduced and systematic noise reduction work will be conducted.

Energy

- By 2011, total energy consumption will not have increased compared with 2000.
- By 2011, all electricity and cooling will be from environmentally friendly sources.
- By 2011, at least 75% of heating will be from renewable sources that generate low emissions.

Pharmaceuticals

- By 2011, levels of the most environmentally damaging pharmaceuticals in emissions from purification plants or in surface water will be lower than in 2005.
- By 2011, emissions of nitrous oxide (laughing gas) will be reduced by 75%, compared with 2002.

Chemicals

- In 2007, the County Council identified and quantified chemicals and chemical products used in the operations which may have serious effects on health and/or the environment.
- By 2011, 25% of the chemicals and chemical products that are listed on the County Council's phase-out list will be phased out.

Products

- By 2011, conservation of resources and eco-cycle adaptation will be prioritised in purchasing and procurement.
- By 2011, purchasing of goods and consumable items containing chemicals on the County Council's phase-out list will cease.
- By 2011, 25% of the County Council's meals will be based on organically produced products.
- By 2011, the use of building materials containing substances on Locum's elimination list will cease.

Facts about Stockholm County Council

Stockholm County Council (SLL) has overall responsibility for health and medical services including dental care, public transport and regional planning in the county. Operations are carried out by SLL itself or by private suppliers/contractors.

SLL has over a thousand suppliers and made procurements worth SEK 24 billion in 2008. The County Council's operations are primarily financed through taxation.

With a turnover of SEK 70 billion and around 43,000 employees, the County Council is one of the biggest employers in Stockholm County. 96% of SLL's personnel work in care. Half of all public transport in Sweden takes place in Stockholm County.

The ambulance service – How it works

SLL has agreements with three suppliers for ambulance services in the county. There are 45 emergency ambulances in the county, 35 of which are in service round the clock, 365 days a year. There are also 10 transport ambulances which mainly operate during the day. In addition, there are two emergency vehicles and an air ambulance which are on call 24 hours a day, 365 days a year. In the summer there is another air ambulance in service.

SOS Alarm is responsible for Sweden's 112 emergency call service, and is commissioned to prioritise and direct ambulances and other medical units in the county. Nurses receive medical calls and prioritise each ambulance job by establishing the medical needs of the patient being transported, selecting a suitable ambulance and assessing whether an emergency vehicle or an air ambulance is required.

Glossary

Dioxins. Chlorinated environmental pollutants formed during the combustion of organic matter, along with materials containing chlorine – such as PVC. Dioxins have been found in large parts of the environment, in fish and mammals, and in human breast milk.

Halogens. Toxic elements – such as fluorine, chlorine, bromine and iodine – which break down ozone.

HA oils. Highly aromatic oils which contain several chemical substances and hydrocarbons that are carcinogenic and often difficult to break down in the environment.

Hydrocarbons. Compounds of various organic substances which are often classified as toxic and carcinogenic. Polycyclic aromatic hydrocarbons (PAHs) are formed when carbon or hydrocarbons, such as various oils, are heated without enough oxygen to enable complete combustion into carbon dioxide.

Isocyanates. Chemical compounds used in the production of polyurethane, which is found in plastic and as a binding agent in glue, paint and varnish. Isocyanates can cause asthma.

Methane. A greenhouse gas formed during the breakdown of organic matter, partly via digestion in animals. Contributes to the greenhouse effect.

Nitric oxide. Toxic gas formed during combustion in air. The nitrogen contributes to acidification and eutrophication of land, lakes and oceans, for example.

Nm^3. Normal cubic metre, used to measure the volume of gas in a fuel tank, for example. A normal cubic metre is the amount of gas that takes up one cubic metre of volume at a pressure of 1 bar (normal pressure at sea level). In a vehicle's fuel tank, the gas is compressed to 200 bar. 1 Nm^3 of biogas is equivalent to 1.1 litres of petrol.

Phthalates. The collective name of a group of chemical substances based on phthalic acid. Phthalates are used as plasticizers in PVC, for example, and can impair fertility and cause foetal damage.

PVC. Poly Vinyl Chloride (PVC) belongs to the group thermoplastics. PVC is used in many building materials – such as flooring and wall coverings, electricity cables and foil on boards for cupboard fittings.

Production: *Stockholm Södra Glory Reklambyrå AB*
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FSC

MILJÖMÄRKT

Flying start for green ambulance

The world's first eco-ambulance is the result of a partnership between Stockholm County Council and Ambulanssjukvården i Storstockholm AB (AISAB), a company wholly-owned by the Council. Together we are striving to reduce the environmental impact of ambulance operations.

The green ambulance runs on biogas and the amount of environmentally hazardous substances has been reduced where technically and economically feasible. The floor mats are PVC-free, the wall coverings and cupboard fittings do not contain phthalates, the electricity cables are halogen and PVC-free, and the insulation contains no environmentally hazardous substances. The project began in 2005, and in May 2009 the world's first eco-ambulance came into service in Ekerö, outside Stockholm.

Read more about our work
Stockholm County Council: *www.sll.se*
AISAB: *www.aisab.nu*

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A collaboration within Stockholm County Council

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