



MAGALOG

LNG a clean fuel for ships

A new era of
green shipping



**The introduction of liquid natural gas (LNG)
as ship's fuel**

MAGALOG - Marine Fuel Gas Logistics

Welcome to the no.1 issue of the MAGALOG newsletters.

MAGALOG heralds a new era of environmentally conscious shipping

The needs to counteract increasing air pollution by shipping in harbours and en route as well as drastically rising oil prices have lead to thinking about alternatives to conventional fuels like heavy fuel and marine diesel. One of such alternatives is LNG or liquid natural gas. Norway is one of the countries which produces and exports natural gas and also LNG. In recent years, in Norway; several ships powered by LNG have successfully been put in service. It appeared logical, to widen the geographical range of LNG into one of the worlds most sensitive sea areas, the Baltic Sea, and the technical scope from offshore supply vessels and coastal ferries to "normal" Ro-Pax and Ro-Ro vessels.

Based on these consideration the project MAGALOG had been initiated by the Norwegian gas and LNG supplier GASNOR AS and the German IEE energy management agency Baltic Energy Forum e.V. under the STEER part and the logistics for renewable and alternative fuels string of the IEE (Intelligent Energy Europe programme). An appropriate application, filed in 2006, towards the Intelligent Energy Executive Agency of the European Commission was successful. Also the contract negotiations with the IEEA came to a successful end so that the project had its official start on 1st December 2007.

The project took up its work with the first partner meeting on 15th and the first international conference on 16th January 2007, both in Bergen, Norway. Especially the first MAGALOG conference reached great interest among regional authorities, port cities, ship owners, shipyards, motor manufacturers, classification societies, LNG and gas companies, technical equipment providers and interests from other industries like operators of gas powered lorries and buses.

MAGALOG aims at reducing ship borne emissions and providing fuel alternatives and security likewise. It is based on the objective to power ships with LNG (liquid natural gas) instead of heavy fuel or marine diesel.

With a view to reducing the greenhouse gas emission load as well as exhaust gases LNG provides a valuable ecologic alternative. Moreover it may provide fuel security and flexibility at prices lower than marine diesel. Long time delivery contracts do grant an extra bonus to fuel management.

LNG powered marine vessels

In recent years two offshore supply vessels as well as five coastal ferries and one coastal LNG-tanker powered by LNG have been launched and put in service in Norway. Moreover one Norwegian ship owner intends to build a Ro-Ro vessel sailing the Baltic Sea.

Examples of LNG-powered vessels



2 offshore vessels of the "Viking Energy" type



2 offshore vessels of the "Viking Avant" type



5 coastal ferries of the "Bergensfjord" type



Vision of a LNG powered Ro-Ro-vessel

Photos by courtesy of
Eidesvik AS, Bømlo, Norway,
Fjord1 Nordvestlandske, Florø, Norway
Marintek AS, Trondheim, Norway.

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Supply Chain for LNG-fuel in the Baltic Sea

A new fuel requires new logistical supply structures. Therefore, MAGALOG has the objective of establishing a supply chain of middle sized LNG-Terminals strategically located in certain Baltic Sea ports.



The first middle sized LNG terminal dedicated to serving shipping is being planned for the MAGALOG partner city Lübeck, Germany. A decision to build an LNG terminal in Lübeck and/or its daughter city Travemünde will be based on the results of a feasibility study to be ready by mid 2008. Furthermore pre-investment studies will be made for Swinoujscie, Poland, and three other Baltic Sea port cities.



LNG-Terminal construction site (<http://www.chart-ferox.com/>)

Moreover a demand study will be made analyzing which ships could be candidates for operation with LNG. Primarily these will be vessels in short sea shipping service such as ferries, Ro-Ro vessels and other ships in coastal services.

LNG the preferred fuel in 5-10 years time

We believe that in 5-10 years time the majority of ships contracted for short sea trades will use LNG as a fuel.

Vision of a Norwegian ship-owner at the MAGALOG conference in Bergen, Norway, on 17th January 2007

... in response to increasing demand from customers, authorities and the public:

- SECA (Sulphur Emission Control Area) in the Baltic Sea (2006) and the North Sea (2007) permit a maximum content of 1.5% sulphur in ships'fuels. Other areas, such as the Mediterranean, are set to follow.
- Norway charges a NOX levy of 15Kr/kg. The levy is scheduled to increase.
- Swedish ports such as Stockholm and Gothenburg charge harbour dues by environmental performance.
- Emission cleaning technologies need to meet future environmental demand.
- Shipping and aviation will have to contribute to slowing the pace of climate change beyond 2012



Advantages of LNG-fuel:

- 100% less particulate matter emissions
- 100% less sulphur oxide emissions
- 80% less nitrogen oxide emissions
- 25% less greenhouse gas emissions
- no particle filters
- no scrubbers
- no selective catalytic reaction
- no pre-heating
- no-separation

Why LNG as a fuel for ships?

Internal combustion engines have been operated on gas right from their early beginnings. Even today such engines still need carburettors or injectors to gasify fuel.

Cars can also be powered by Auto Gas or by Compressed Natural Gas (CNG). LPG consists of Propane and/or Butane, and CNG of Methane. Both gases are known as a „green fuels” because they reduce the CO₂ emission load by 20-25%. Both gases are stored at high pressure to reduce transport and storage volumes.

Natural gas can also be reduced in volume by a factor of about 600 by cooling it down to -163 °C at atmospheric pressure. It is then named LNG or Liquefied Natural Gas. LNG is not inflammable when in a liquid state. The liquefaction process removes impurities such as water, dust and heavy hydrocarbons that may increase the environmental load. LNG is therefore much cleaner than normal natural gas.

The shipping industry has known LNG for decades as a bulk commodity transported by large LNG-tankers around the world. Until recently, only a few LNG-tankers used to burn boil-off gas for fuel and combustion purposes.

For some years now a number of forward looking companies in Norway have been paving the way by pioneering the use of LNG as a fuel for ships have been engaged in regular coastal or short sea shipping services. Engine manufacturers are prepared for the challenge of LNG fuelled engines. LNG engines and dual fuel engines are on the market.



LNG-Tanks (<http://www.gasnor.no/>)

LNG is being transported in large quantities from Norway to the USA, from Algeria to Spain, France and Italy and from the Gulf Emirates to Japan.

Expected Results

At the core of the project are analyses of the northern European shipping industry, especially short sea shipping, which will lead to the identification of candidates for the use of LNG-fuel. The analyses will draw on the need for replacement which will, with a view to present and future requirements of reducing SO_x, NO_x; CO₂ and particulate matter, be accomplished with environmentally friendly technologies and/or alternative fuels.

Furthermore, shipping trade routes with a potential for LNG as fuel and the corresponding fuel volume and environmental effects will be identified. This goes along with a comparison of the competitive strength of LNG to traditional fossil fuels, bio diesel and ethanol.

These more general strategic analyses will be accompanied by studies about the feasibility of LNG supply chains in the Baltic Sea, i.e. candidate harbours and the need for small and middle sized LNG tankers as well as appropriate logistics infrastructure. Primarily it is thought to have the west Norwegian region of Hordaland as a starting point of LNG logistics. Swinoujscie may also serve as a starting point because here a large LNG import terminal will be built in the coming years.

At the end of the project but nevertheless most importantly the project will prepare for full scale pioneer projects in selected ports, the first of which will be Lübeck and Swinoujscie, for the supply of the shipping world with LNG-fuel. This requires intensive analyses of locations, size of the terminals, bunker requirements, environmental considerations, safety and security regulations, contacts with authorities and stakeholders.

Together with this a full scale pioneer project for the supply of the City of Lübeck with LNG as a back-up will be undertaken.

All project measures will be accompanied by intensive publicity measures such as two international conferences, one in Bergen, Norway, and one in Lübeck, Germany, flyers, newsletters, internet site (<http://www.eu-magalog.eu>) and representation at various external conferences, workshops and exhibitions. Of course, the project will also be made public in various professional magazines and in local, regional and national newspapers.



GASNOR AS, Bergen, Norway
<http://www.gasnor.no>

GASNOR is the coordinator or lead partner in this project. This partner is setting paces in the field of Small Scale LNG. Gasnor has its own LNG-Resources on the island near the Norwegian town Haugesund in western Norway. The core business of Gasnor is sales and distribution of natural gas to local consumers like industrial enterprises and hotels and hospitals. Moreover Gasnor delivers natural gas in the form of CNG to cars and buses and in the form of LNG to shipping. Gasnor renders to its clients technical support, counselling, guidance and training.

baltic energy forum



Baltic Energy Forum e.V., Lübeck, Germany
<http://www.baltec.de>

Baltic Energy Forum is one of the initiators of MAGALOG and its assistant coordinator. Baltic Energy Forum e.V. is energy management agency within the European programme „Intelligent Energy Europe” in the legal form of a non-governmental and charity organization since 2003. Together with it’s national and international partners, i.e. regional and local authorities, universities, enterprises and NGOs Baltic Energy Forum executes projects for reducing greenhouse gases and other emissions. A particular focus of Baltic Energy Forum lies on shipping, ports, maritime regions, offshore, fisheries and protection of the maritime environment. Baltic Energy Forum is one of the leading European organizations in the field of energy management and alternative energy solutions for shipping and harbours. Together with Stadtwerke Lübeck GmbH Baltic Energy Forum e.V. is signatory to the “Memorandum of Understanding on sustainable on Sustainable Port and Maritime Policy for the Baltic Sea Region.”

MARINTEK

MARINTEK AS, Trondheim, Norway
<http://www.marintek.sintef.no>

MARINTEK is one of the largest maritime scientific organizations in Europe. MARINTEK has special experience in the development of LNG system for maritime vessels. In MAGALOG MARINTEK provides the scientific view on maritime logistics in general and maritime small scale LNG propulsion systems in particular. MARINTEK is part of the SINTEF group, the largest independent scientific organization in Scandinavia. SINTEF supports about Norwegian and foreign enterprises in research and development.



Hordaland Oil & Gas, Bergen, Norway
<http://www.holga.no>

Hordaland Oil & Gas (HOG) is the leading representation of oil and gas interests in the County of Hordaland, the westernmost Region of Norway. Members of the organization are the County of Hordaland, communities and enterprises of the oil and gas sector. The members are committed to the development of oil and gas resources and to protection of the environment likewise.



The Municipality of Swinoujście, Poland
<http://www.swinoujście.pl>

The Municipality of Swinoujście, Poland, is partner in the project and candidate for one of the shipping related pilot LNG terminals. It is of particular advantage of Swinoujście that this town will be seat of a large scale LNG terminal in the future. Swinoujście is well known seaside resort and the largest Polish ferry harbour likewise. Ship borne air emissions are threatening the touristic industry. Therefore it is a particular asset for Swinoujście to be pacemaker in combating air pollution.



Stadtwerke Lübeck GmbH, Lübeck, Germany
<http://www.sw-luebeck.de>

Stadtwerke Lübeck GmbH (SWL) is the public utilities company of the Hanseatic City of Lübeck. It provides electricity, gas, district heat, water, telecommunication and public transport services to the city of Lübeck and its population. As transport provider Stadtwerke Lübeck operates river ferries in the part city of Travemünde, Germany’s largest harbour at the Baltic Sea. Moreover Stadtwerke Lübeck represents the City of Lübeck in Environmental Commission of the Union of the Baltic Cities, a pan-Baltic organization which represents more than 100 cities in the Baltic Sea Region. This partner has great interest in providing LNG supply to shipping, in utilizing LNG as a back-up for its natural gas grid and operating its own ferries and buses with LNG or CLNG as an environmentally friendly fuel. Stadtwerke Lübeck GmbH is one of the most important drivers in sustainable development. It had been lead partner in the predecessor project “New Hansa of sustainable ports and cities” which aimed i.a. at developing a shore side electricity system for commercial shipping as a means of reducing ship borne air pollution in port cities.