VärmlandsMetanol AB

founded 2001

**The biomethanol plant as pictured,
strategically located in the forest rich county of Värmland**

Methanol from wood - an excellent CO_2 neutral motor fuel!

An urgent, climate neutral and profitable industrial project

VärmlandsMetanol AB intends to build and operate the **world´s first commercial biomass-to-methanol plant** in Hagfors, Sweden. VärmlandsMetanol will gasify forest biomass residues and convert the syngas into fuel grade methanol - a motor fuel with excellent fuel properties, which can be mixed with gasoline and used in all gasoline engines.

Uhde, a ThyssenKrupp company, has been selected as a technology and turnkey contractor for the entire plant. Annual production **130 000 m³** fuel grade methanol.

Forest residue - a climate neutral ”Swedish oil-well” that won’t run dry.

www.varmlandsmetanol.se
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VärmlandsMetanol AB is a public company - shareholders are registred by Euroclear.

Questions and answers

What is Methanol?

- The simplest form of alcohols, wood alcohol, (CH_3OH)
- A high octane (105 octane) motor fuel with excellent fuel properties
- Ranks as one of the top 4 globally used chemicals
- In so far mainly produced through chemical processing of natural gas
- Is produced through gasification of coal at approximately 100 plants globally (including China)
- Can also be produced through gasification of wood (cellulosic biomass)
- Was used by the German army to keep their vehicles running during the second world war
- Was used in Sweden during the 1940s as admixture in gasoline
- Introduced as a motor fuel by the Swedish company Nynäs in the 1980s as M15 (produced from natural gas)

Why bioMethanol from forest?

- The technology of using wood is avaliable
- The plant will gasify wood and convert it to methanol through a well proven, commercially available and cost-efficient process, used since decades by the petro-chemical industry to produce methanol from coal
- A sustainable, domestic and climate neutral energy source
- The energy efficiency when gasifying biomass is more than twice that of any other method for the production of liquid biofuels
- bioMethanol reduces greenhouse gas emissions with 90% compared to gasoline (agro-based ethanol only reduces greenhouse gas emissions, depending on production methods, with 15-40%)
- bioMethanol used as low admixture (up to 25%) requires no adaptation of gasoline engines or infra-structure, moreover flexi-fuel cars (E85) run equally well on M85. In addition, bioMethanol is an excellent fuel for the cars of tomorrow, which will have electric engines powered by direct methanol fuel cells (DMFC)

Is Methanol dangerous?

- No, only if you drink it. (gasoline, diesel etc is also unhealthy to drink)
- No, contrary to gasoline and diesel it is not mutagenic or carcinogenic and degrades rapidly in soil, water, etc.
- Burning methanol is extinguished with ordinary water

Impact of EU´s climate goals?

- Directive 2209/28/EG stipulates that 10% of all motor fuels in the EU shall be renewable by 2020
- The EU Directive is an important market driver as it – based on default values for greenhouse gas savings – defines the phasing out of 1st generation agro-based ethanol (2016-2020) and prescribes the use of 2nd generation biofuels such as bioMethanol
- The Swedish Parliament adopted the EU Directive 1st of December 2010. In order to meet the 10% target by 2020, approximately 500 000 m^3 gasoline and 500 000 m^3 diesel must be replaced by biofuels every year

Do we have the feedstock?

- Yes, in Sweden we have about 23 million hectares of forestland. Annual increment has exceeded gross felling with 20-30% since the 1920s. Currently the annual increment, not harvested, is 30 million forest cubic meter (m3f)
- Moreover, the plant in Hagfors, located in the middle of forest rich land, will use low cost forest residues as feedstock, i.e. not be competing with saw mills and pulp industry regarding the supply of feedstock
- Supply of forest residue has been secured through agreements with leading producers of forest feedstock

What about ethanol?

- The energy efficiency for biomass-to-methanol con-version through gasification is ca 70% as opposed to 20-25% for wheat, other crops or wood-to-ethanol through fermentation
- Weak profitability, land use efficiency is poor and greenhouse gas savings are limited
- Arable land is limited (in Sweden and globally) which only allows for a marginal production of agro-based-ethanol
- Unethical to use agro-crops for producing ethanol in an increasingly starving world, with an alarming demographic development which subsequently will push food prices

What capacity will the plant have?

- Input 1 100 tonnes of forest residue/day (35 trucks/day)
- Output ca 400 000 litres of methanol/day (12 trucks/day)

What has been done?

- An industrial site (20 ha) has been acquired for the construction of the plant
- An office building in Uddeholm has been acquired
- Two conceptual studies have been concluded and an advanced conceptual design and feasibility study has been carried out by Uhde, proving the technical and economic viability of the project
- VM has selected Uhde as EPC contractor
- A detailed development plan for the site has been approved by the Municipality of Hagfors in January 2010
- An Environmental Impact Assessment (EIA) and a Risk Assessment has been completed as required by the Municipal Planning and Building Act and the Swedish Environmental Act
- Supply of feedstock/forest residue has been secured

What is happening now?

- The legal procedure for obtaining the industrial environmental permit was initiated 5 March 2010 and the Environmental Court is expected to issue the permit towards the end of 2011 or early 2012

Questions and answers

- A Pre-Basic Engineering Package (pre-BEP) has been delivered by Uhde (in September 2011), which will be succeeded by detailed engineering, procurement and construction
- License agreements with different technology providers has been negotiated and finalized in September 2011
- Off-take agreements with an oil company and two chemical companies are currently being negotiated and are expected to be concluded in the coming months

When will the plant be ready?

- Start of construction at the site 2012
- Start of production 2014/2015

How will the project be financed?

- The required capital - SEK 3,5 billion - will be raised through private placements and bank loans 50/50

Is it profitable?

- Yes!
- The bioMethanol will be sold as a low-blend admixture in 95-octane gasoline. Biofuels are and will be exempt from energy and CO_2 tax, which allows for a great profit margin compared to gasoline
- The low production cost shows that bioMethanol also can compete with gasoline on its own merits
- The rising demand for oil will increase and ensure future profits

Preem about Methanol:

"Another alternative motor fuel is methanol, which commonly is referred to as wood alcohol. Just as ethanol it is excellent to use as a low admixture in ordinary petrol. Another advantage is that it is cheap to produce from wood biomass. It is difficult to find disadvantages with using methanol. There is a surplus of biomass feedstock and the infrastructure – the gas stations – already exist".

Source: Swedish oil company Preem, the Energy Challenge 2010

History

VärmlandsMetanol AB was founded in 2001 by Dr Björn O. Gillberg and the Miljöcentrum Foundation. The initial purpose was to build and operate a pilot plant (20 MWth) producing methanol, district heating and electricity from forest biomass using gasification technology. The objective was to demonstrate the great potential of gasification technology and to create a research and development centre for large-scale bioMethanol production.

As the result of research and two pre-feasibility studies the company mission changed in 2006 to building a full-scale commercial plant of 111 MWth that would have a production capacity of 130 000 m^3/year fuel grade methanol.

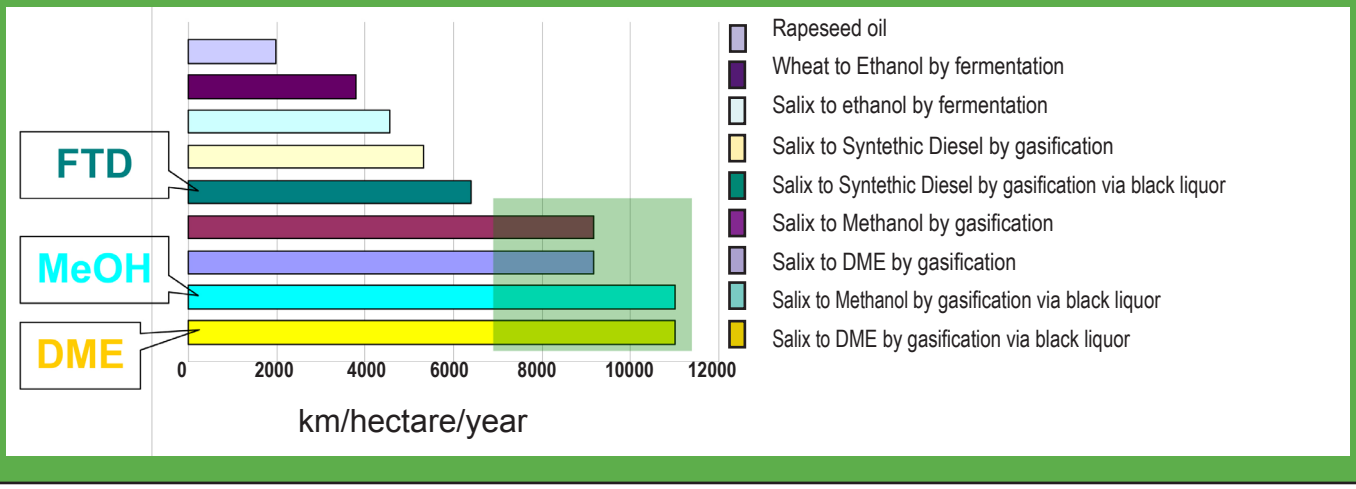
In 2007 VärmlandsMetanol AB became a public company. It is today owned by the Miljöcentrum Foundation, the Municipality of Hagfors, the Swedish Federation of Farmers, TRB (an umbrella organization for the 12 largest haulage contractors in Sweden), 950 private persons and 30 small companies.

Uhde, a ThyssenKrupp company and a world leading engineering contractor, has been selected as technology supplier and engineering partner for the project - an Engineering, Procurement and Construction (EPC) contract will be applied with a cost, time, quality and performance guarantee. Uhde's list of references includes over 100 gasifiers worldwide based on different gasification technologies covering a variety of feedstock.

The business plan is to produce and sell bioMethanol as low blend admixture in 95-octane unleaded petrol. Present-day gasoline engines and distribution systems can handle a mixture of this kind without modifications, or additional costs for distribution. A primary business objective is to develop a "turnkey" concept and build additional plants (for the production of bioMethanol or bioDiesel) in Sweden and also export the concept to other forest rich countries, such as the Baltic States.

As part of this strategy, VärmlandsMetanol recently concluded an agreement with E.ON Gasification Development AB, PEAB, SAKAB AB and the municipality of Kumla to complete a pre-feasibility concept study for a bio-refinery, output 250 MW bioMethane and bioMethanol as well as 50 MW district heating.

Distance per hectare and year (Heavy duty vehicle)



The graph shows that gasification of cellulosic biomass is the most energy efficient technology. VärmlandsMetanol AB will gasify forest residue but anticipate that Salix (willow tree) will be a common future feedstock.

Björn Gillberg and Lennart Björk:

"BioMethanol is a superior CO_2 neutral drop in motor fuel!"

- gasoline cars run excellent on low admixture blends (25%) without any modification
- ethanol cars run equally well on methanol
- methanol is an excellent fuel for electric cars of tomorrow, powered by fuelcells
- perfect raw material for any chemical industry to improve their carbon footprints
- bioMethanol is a highly profitable investment which does not compromise with the future of our children

VärmlandsMetanol Ltd - Board of directors

Chairman:
Lennart Björk, electrical engineer, board chairman of Gant and board member of Boomerang and New Moon.

Member and CEO:
Björn O Gillberg, Ph.D. and Ph.D. h.c., founder of Värmlands-Metanol, working board chairman of the Miljöcentrum Foundation and Miljöcentrum Ltd and former Environmental Controller to the Citytunnel project and the Öresund bridge in Sweden.

Other members:
Wollmar Hintze, M.Sc. and doctor of technology (Lund), former Environmental Director at the Citytunnel project in Malmö and adviser to TetraPak on environmental issues relating to process technology.

Sture Sonebrink, co-founder of VärmlandsMetanol, entrepreneur active in the forest industry.

Deputy member:
Minna Gillberg, Ph.D. (Lund och Oxford) strategic adviser (energy politics and business strategy for sustainable development) former adviser to former EU Environmental Commissioner Margot Wallström.

Auditor: *Stefan Lidén*, PwC.

BioMethanol right in time!

The time is more than ripe for bioMethanol. In a Swedish context a large-scale investment in gasification technology for the production of biofuels is a feasible, cost and energy efficient way to reach the EU 10% target for renewable motor fuels by 2020.

The choice of methanol produced through gasification of cellulosic biomass, as a substitute for gasoline, is from a process and technological perspective, self-evident. The energy efficiency is higher than for any other liquid biofuel. Sweden has a significant and increasing surplus of forest biomass. In addition, methanol used as a low admixture in gasoline does not require new infrastructure, which paves the way for a cost-efficient, immediate and major reduction of CO_2 emissions from the existing and future automobile fleet.

VärmlandsMetanol's industrial partner Uhde, Thyssen-Krupp, is one of the very few global actors, having the competence and the financial "muscles" needed to guarantee a successful implementation of the project.

Best regards
Björn O Gillberg, CEO