Poster Sessions

Synthetic Natural Gas (SNG) production from woody biomass

Serge Biollaz , Paul Scherrer Institute, PSI

In this case study Synthetic natural gas (SNG) from woody biomass is the end product. Due to the fact of the excellent NG distribution infrastructure in Europe, SNG produce from biomass would most probably be in a gaseous form. Compressed natural gas (CNG) is a well known automotive fuel. From a Swiss-Austrian consortium a 1 MWSNG demonstration plant has been build up in Guessing, Austria for the complete value chain demonstration from woody biomass to SNG. Commercial plants are expected to be in the scale from 20 to 200 MWSNG.

In the initial conversion step i.e. in the biomass gasification process wood chips are converted into a syngas or more general into a product gas. The FICFB gasification process has operated in Güssing since 2002 for a combined heat and power (CHP) plant and in this time has reached more than 40'000 h of operation. The product gas is delivered at ambient pressure, has a high content of CH4, higher hydrocarbons and tars. This product gas is suitable for SNG production. The final conversion step consists of three individual steps, i.e. gas conditioning, SNG synthesis and gas upgrading. R&D work over the past 8 years was focused on gas conditioning and SNG synthesis. At the pilot scale it could be proven, that fluidized bed SNG synthesis is possible. Based on the data of this plant, the demonstration plant has been designed and operation conditions for the demonstration plant are selected. The whole process chain reaches high conversion efficiencies and has the potential for lower investment and lower operation costs than conventional SNG synthesis technology. Tests on a demonstration scale are in preparation in Guessing to confirm these findings and prepare commercialization of the technology.

Since 1992, Dr. Serge Biollaz has carried out research work in the field of thermo-chemical biomass conversion (combustion of non-woody biomass for head and power, gasification of biomass for heat and power, wood-to-methanol, wood-to-hydrogen). Since 2000 he has been head of thermal process engineering group at PSI and technical project leader for the R&D work at PSI for the process "wood-to-SNG". Focus in this project is on gasification, gas cleaning for SNG production as well as on synthesis of SNG from product gas and syngas.

IEA Bioenergy Task 39 - Mapping of second generation biofuels demonstration plants

Dina Bacovsky, Austrian Bioenergy Centre

Currently, large efforts are dedicated to the production of biofuels from lignocellulosic raw materials. While only few production facilities are operational yet, many projects are under construction or planned. But which are the companies involved, where are production facilities under construction, and which technologies will be applied? In order to answer these questions, IEA Bioenergy Task 39 has collected data on pilot and demonstration projects and displays the results in a web-based, interactive map.

IEA Bioenergy Task 39 'Commercializing 1st- and 2nd-Generation Liquid Biofuels from Biomass' is an international network dedicated to the development and deployment of biofuels for transportation fuel use. The Task is part of the International Energy Agency (IEA)'s Implementing Agreement on Bioenergy und currently comprises 15 countries. More information on the task is available at www.task39.org.

Task 39 has commissioned an overview on pilot and demonstration facilities for the production of biofuels from lignocellulosic raw materials. The task community has listed the projects in their countries, all companies listed were contacted and asked for more detailed information, such as type of product, type of conversion technology, production capacity, current status of the project, project owner and location.

All information was inserted into a database and is displayed in an interactive map. The map can be viewed at www.abc-energy.at/biotreibstoffe/demoplants. It allows the user to quickly obtain an overview on ongoing lignocellulosic biofuel projects, and to find detailed information on specific projects. The map will be updated regularly throughout 2009.

For more information please contact: dina.bacovsky@abc-energy.at

Dina Bacovsky is a senior biofuels researcher in the Austrian Bioenergy Centre. She holds a degree in process engineering from the Technical University Vienna. Her current tasks include process engineering for biodiesel production facilities, consultancy on innovative biofuels (new raw materials, new products), investigation on the state-of-the-art of 2nd generation biofuel technologies and implementation, and networking activities for the Austrian biofuels network and for IEA Bioenergy Task 39.

The Alfa-Bird Project

Olivier Salvi, EU-Vri, Project coordinator

ALFA-BIRD aims at developing the use of alternative fuels in aeronautics. In a context where the price of oil is increasing and with impact of fossil fuels on climate change, the sustainable growth of the civil aviation is conditioned by the respect of the environment.
In this context using biofuels and alternative fuels in aeronautics is a great challenge, since the operational constrains (e.g. flight in very cold conditions) are very strict, and due to the long lifetime of current civil aircraft (almost 50 years). To address this challenge, ALFA-BIRD gathers a multi-disciplinary consortium with key industrial partners from aeronautics (engine manufacturer, aircraft manufacturer) and fuel industy, and research organization covering a large spectrum of expertise in fields of biochemistry, combustion as well as industrial safety.Bringing together their knowledge, the consortium will develop the whole chain for clean alternative fuels for aviation. The most promising solutions will be examined during the project, from classical ones (plant oils, synthetic fuels) to the most innovative, such as new organic molecules. Based on a first selection of the most relevant alternative fuels, a detailed analysis of up to 5 new fuels will be performed with tests in realistic conditions.

Olivier Salvi, graduated in 1994 as Engineer in Environment and Industrial Risks (Ecole des Mines d'Alès). He has been working at INERIS, the French National Institute in charge of Industrial risk and environment protection since 1995. Between 1995 and 2001, he was in charge of research programmes in the field of Risk Assessment and Management, and between 2001 and 2007, he work as Scientific Manager and was in charge of the research programme portfolio in the Accidental Risks Division. In 2006, he took part with European partners in the founding of the European Virtual Institute for Integrated Risk Management (EU-VRi) and is acting as General Manager, seconded by INERIS. For the grouping, he supervises the coordination of several European collaborative projects, such as ALFA-BIRD (www.alfa-bird.eu-vri.eu), F-Seveso (www.f-seveso.eu-vri.eu)... Strongly involved in the international activities of INERIS, he became in 2007 the International Business Development Manager. In relation with this activity, he acts as General Secretary of the European Technology Platform in Industrial Safety (see www.industrialsafety-tp.org).

The GAYA project: Demonstration plants on gasification for Green Methane production

Véronique Mambré, GDF Suez

GDF SUEZ has launched a project called GAYA on the SNG, to support its commercial rising. GAYA aims to construct a collaborative, partnership and modular R&D platform with European influence. That platform would include pre-industrial plants on the whole chain, from biomass to SNG valorisation. A dedicated research program of 7 years with 11 partners has been built. This project has been submitted for funding to the French Environment Agency. The aim is to reach an available offer of bio-SNG from gasification, reliable, with high efficiency in 2015.

Biomethane : a promising technology to improve biomass valorisation

Biomass gasification is a promising way to produce renewable energy. It produces a biosyngas which can be turned into different kinds of energy : CHP (Combined Heat and Power), liquid biofuels or combined SNG and heat.

Combined SNG/heat production widens the biomass use. It is environment-friendly and efficient:

- high energetic and chemical yields: overall efficiency around 70% according to the first studies (10% yield better than the Fischer-Tropsch pathway);

- local heat valorisation and reasonable biomass supply: local biomass supply and use of the heat by the neighbouring industries or district heating;

- distribution and transport via the existing grid: no new infrastructure, no CO2 emissions;

- SNG has similar qualities to natural gas and is seen as a gaseous biofuel for CNG vehicles, to contribute to reduce GHG emissions;

- complementary to other biofuel purposes: limited size for SNG plants (30-50 MW) while huger sizes for BtL plants (100 MW).

Technical, economic and environmental issues to promote industrial development

Even if gasification has been used since the 80s for coal gasification, its adaptation to biomass needs to solve technical problems issues mostly linked to the presence of tars in the syngas. On top of those technical aspects, the development of that technology is also linked to economic and environmental issues.

Contact : veronique.mambre@gdfsuez.com

GoBiGas Project

Ingemar Gunnarsson, Göteborg Energie A/B

The purpose of the GoBiGas project is to build a large scale plant that converts low quality cellulosic materials to biofuel with a conversion rate of more than 60%.The plant will be built as a co-generation plant where most of the losses in the process are recovered, pushing the overall efficiency to around 90%. It will have a capacity of 20 MW biomethane production, which is enough to supply some 15 000 passenger cars with biofuel. It will be operational in 2011. In a second phase, completed by 2015, the plant will be expanded to 100 MW plant, capacity. The plant will have with a continuous operation of 8000 hours per year.

Biomethane is the 2nd generation biofuel that allows for the highest conversion factors in gasification processes, because it's the simplest hydrocarbon that exists. It also allows for very efficient transportation through the natural gas grid, because biomethane and natural gas is the same chemical substance, but with different origins. This is already being practiced in Sweden and other Member States.

The project will result in substantial reductions in CO_2 emissions, not only because of the small amounts of fossil fuels used in the WTW chain, resulting in CO_2 savings of at least 85% for every unit of fossil fuel displaced, but most importantly it will provide very high CO_2 savings per unit of land used for fuel production. Apart from the difference of yield in the different processes, the use of the waste heat in GoBiGas is an important element in the CO_2 balance.

Since 2006, Ingemar Gunnarsson has been project manager for the GoBiGas project. He holds a M.Sc. chemical engineering from Chalmers University Gothenburg, and has 30 years of professional experience from development, planning, and construction energy plants and distribution-systems mainly for utilisation of natural gas, biogas and biomass.

PERSEO - lignocellulosic ethanol from MSW

Araceli Zorrilla *on behalf of* Caterina Coll Lozano, IMECAL

The aim of the PERSEO project is to produce second generation bioethanol from organic urban waste fraction. In the last years it has used feedstock coming from the food market to produce biofuels, but recently the market prices have been increased, reducing the feasibility of the bioethanol projects.

The composition of organic fraction of Municipal Solid Waste is similar to lignocellulosic material. The cellulose and hemicellulose will be fermented obtaining bioethanol. In the process the lignin is separated and used by cogeneration to produce the power and heat necessary for the process.

IMECAL, in collaboration with CIEMAT and FORD SPAIN, have developed an experimental Pilot Plant, situated in L´Alcudia (Valencia), with process capacity of 4Tm/day, to convert organic urban waste fraction into second generation bioethanol and lignin.

Caterina Coll Lozano is responsible for the pilot plant PERSEO for second generation bioethanol production. She has over 11 years experience in process engineering and environment. She studied Chemical Industrial Technical Engineering at the University School of Industrial Engineering of the Polytechnic University of Valencia, and also spent time at the "School of Science" of the "Institute of Technology Sligo in Sligo (Ireland). She holds a Diploma of Advanced Studies (DEA) in the Department of Chemical and Nuclear Engineering from the Polytechnic University of Valencia. She then trained and worked in the Division of Biomass Renewable Energy at CIEMAT. She has experience in the management, coordination and implementation of projects. Over the past several years has participated in scientific and technical publications in various magazines, books and made contributions to conferences.

ATENEA - lignocellulosic ethanol from citrus waste

Manuel Irún *on behalf of* Rafael Castañeda Sánchez, IMECAL

Two million tones of citrus waste are produced in the Valencian Area every year. Additionally the citrus juice industry generates 600.000 Tm of orange peels. The Valencian authorities are investigating the use of this citrus waste to produce biofuels. The citric waste is mainly composed of peel, seeds and membranes that contain monosaccharides, polymeric cellulose, hemicellulose and pectin, that will be transformed into bioethanol through a fermentation process.

IMECAL, in collaboration with CIEMAT, FORD SPAIN and AVEN, have developed an industrial process to obtain bioethanol from this waste.

Rafael Castañeda Sánchez has a Doctorate in Science from the Universidad Politécnica de Valencia. He is responsible for PERSEO pilot plant R&D laboratories, and scientific cooperation. In 1999 he started working on research of novel bioinorganic coordination species for the Universidad de Valencia. In 2001 he joined the workgroup of Prof. Avelino Corma at the Instituto de Tecnología Química de Valencia (UPV-CSIC) where hecarried out research on the synthesis and testing of new catalysts and development of materials. During this period he also spent time at the Institut für Anorganische Chemie von Kiel, and gained a Masters in environmental management and engineering from the EOI. In 2006 he began work as scientific researcher in the multinational company Nubiola Inorganic Pigments at the central R&D Department in Barcelona, where he managed the research workgroup of new pigments based on advanced materials. in 2007 he bgan working with the PERSEO and ATENEA projects in IMECAL, after training in the Department of Biomass in the unit of renewable energies of CIEMAT. Rafael has experience in scientific papers and patents manufacture, and management of research teams and projects.

BIOMAP

Dr. Julie TOLMIE (Technical Coordinator), Data Scientist, Centre for Computing in the Humanities, King's College London

There are several projects on biofuels production and use in fleets across Europe and beyond, however there is nowhere a navigable resource providing both interrelationships and information on the projects themselves, their objectives, their status and if completed, their results. The BIOMAP project has been designed as a visual navigable dissemination and mapping tool for Biofuels production and use in Europe and beyond.

BIOMAP mapping tool is developing in the framework of the FP7 project "Development of Time-enabled Mapping and Dissemination Tool for Biofuels Projects". The aim of the project is to develop a powerful and fully accessible "Time-enabled Mapping and Dissemination Tool for Biofuels Projects" to facilitate the dissemination of projects that are either ongoing or have been completed but are still running under market conditions.

The BIOMAP tool is based on the use of electronic maps (such as Google Maps) and combined with a navigational structure linking interrelated entities. It maps activities on biofuels projects across different sectors and programmes, for example: Bioethanol, Biodiesel, European Commission Framework Programmes, National Programmes. It also incorporate mechanisms to enable a synthesis of information displayed on selected maps, for example a calculation of total funding across the projects located in a particular geographical region or a specified timeframe (e.g. period 2003-2005, or duration of FP6). In addition, because of its unique focus on interactions between similar aspects of related projects, the BIOMAP can be employed to disseminate and showcase both the evolution and current state of networking activity across Europe.

Continues overleaf...

The BIOMAP project continues for 24 months starting from the 15 September 2008. The BIOMAP partnership includes the following organisations:
Exergia S.A., Greece
KCL/King's College London, UK
ACL/University of Sydney, Australia
SenterNovem, The Netherlands
EBB, Belgium
eBIO, Belgium

Dr Julie Tolmie (PhD in Mathematical Sciences) is a Data Scientist and Research Associate at the Centre for Computing in the Humanities, King's College London, where she works in the structural mapping of research groups, projects and advanced ICT methods in the UK Higher Education Sector and across EU Framework Programmes. Active in the UK visualization community, she represents 3DVisA, the 3D Visualisation in the Arts Network within vizNET, the UK Visualization Support Network, initiating and mapping national visualisation events across the Arts & Humanities and Sciences & Engineering. Prior to moving to Europe, she held a faculty position in the School of Interactive Arts and Technology at Simon Fraser University where she worked in the 3D stereo visualisation of particle systems and in the structural mapping of systems of patterns in game design.

The ECN/HVC project for BioSNG

Bram van der Drift (ECN), Patrick Bergman (HVC)

ECN has been developing a system for the conversion of dry lignocellulosic biomass into natural gas quality gas: BioSNG or Substitute Natural Gas from biomass. Technology choices have been based on the desire to have large-scale BioSNG plants with high overall efficiency. The ECN concept is based on so-called MILENA indirect gasification and OLGA tar removal.

The ECN concept offers 70% efficiency from biomass to BioSNG. A lab-scale system is available at ECN. A 1 MW pilot system at ECN is under commissioning for the two main parts of the system: the MILENA gasifier and the OLGA tar removal.

HVC is a waste company, which is expanding its activities towards renewable energy. Joining the development of the BioSNG-concept perfectly fits in with HVC's ambitions in the medium and long term. HVC intends to realize two demonstration plants to demonstrate the ECN-concept. The first demo plant will be a ~10 MW CHP plant to demonstrate the combination of the MILENA and OLGA-processes. This will be operated from 2012. The second demo plant will be a ~50 MW SNG plant in which the MILENA and OLGA are up-scaled and further gas cleaning and methanation will be added. These additional units will be supplied by a large EPC, which will soon be involved in the development.