

## CONVERT BIOGAS TO METHANOL OR/AND DME

Ann-Christine JOHANSSON<sup>1</sup>, Per HANARP<sup>2</sup>, Per-Ove PERSSON<sup>3</sup>

<sup>1</sup>ETC, <sup>2</sup>Volvo, <sup>3</sup>Hushållningssällskapet

Email: Per-Ove.Persson@hushallningssallsskapet.se

**Abstract.** Biogas is produced when organic material is broken down by means of microorganisms without access to oxygen. The gas mainly consists of methane and carbon dioxide and small amounts of steam, nitrogen, hydrogen sulfide and ammonia. Currently, the gas is used for production of heat and electricity or is being upgraded to e.g. fuel gas. In 2012, 26 farm based biogas facilities existed in Sweden, mainly based on manure, producing in total 47 GWh biogas (Statens energimyndighet, 2013). In these facilities the main part of the biogas was used for heat and electricity and only 1 GWh was upgraded. The reason why not a larger amount was upgraded is due to the economy. It is costly to compress and transport the gas, especially when the biogas production site is far from the commerce. One alternative to the present field of application can be to process the gas further to transportation fuels as methanol and di methyl ether (DME). The main advantages with methanol and DME compared to biogas are that it is easier to transport and that it can possibly be used as a fuel at the farm. Therefore, within the project Biogas Skaraborg that is run together with and through Hushållningssällskapet Skaraborg, it is of interest to evaluate the possibilities to convert biogas to primarily DME, but possibly also methanol. The aim with this report is to make a short and general literature survey in order to present available technologies and identify their possibilities and most important challenges for further consideration of this biogas upgrading route.

A number of different processes for the production of methanol and DME from biogas/natural gas have been developed, which are covered in this report. Among these processes, only a few focus on small scale production. However, the small scale processes are under development and some of them are predicted to be commercialized in the near future. According to Oberon fuels the efficiency of their process from biogas to DME is about 55%, which means that a small scale production of biogas of 6-15 GWh would produce 3-8 GWh/year DME. However, the costs and energy consumption for this type of process are not known. Another producer of small scale plants is Gas Technology, which process, compared to the others, is not based on catalytic synthesis. They claim that their process is cheaper compared to the others but on the other side the efficiency is probably lower.

To be able to produce and use DME in small scale on the farm the following is needed, required that the technology is commercialized and cost efficient: studies on how the fuel works in tractors; production of new tractors with modified engine; solutions to be able to distribute DME locally on the farm and externally; and solutions to take care of excess energy in shape of electricity and heat etc.