Production of methanol/DME from biomass: EFP06

In this project the production of DME/methanol from biomass has been investigated. Production of DME/methanol from biomass requires the use of a gasifier to transform the solid fuel to a synthesis gas (syngas) - this syngas can then be catalytically converted to DME/methanol. Two different gasifier types have been investigated in this project: • The Two-Stage Gasifier (Viking Gasifier), designed to produce a very clean gas to be used in a gas engine, has been connected to a lab-scale methanol plant, to prove that the gas from the gasifier could be used for methanol production with a minimum of gas cleaning. This was proved by experiments. Thermodynamic computer models of DME and methanol plants based on using the Two-Stage Gasification concept were created to show the potential of such plants. The models showed that the potential biomass to DME/methanol + net electricity energy efficiency was 51-58% (LHV). By using waste heat from the plants for district heating, the total energy efficiencies could reach 87-88% (LHV). • A lab-scale electrically heated entrained flow gasifier has been used to gasify wood and straw. Entrained flow gasifiers are today the preferred gasifier type for commercial coal gasification, but little information exists on using these types of gasifiers for biomass gasification. The experiments performed provided quantitative data on product and gas composition as a function of operation conditions. Biomass can be gasified with less oxygen consumption compared to coal. The organic fraction of the biomass that is not converted to gas appears as soot. Thermodynamic computer models of DME and methanol plants based on using entrained flow gasification were created to show the potential of such plants. These models showed that the potential torrefied biomass to DME/methanol + net electricity energy efficiency was 65-71% (LHV). Different routes to produce liquid transport fuels from biomass are possible. They include production of RME (rapeseed oil methyl ester), ethanol from fermentation or gasification based synthesis of DME, methanol, Fisher Tropsch fuels etc. A comparison of these different methods to provide biomass based transport fuels has shown that the gasification based route is an attractive and efficient technology.