Production of Bio-Methanol

INSIGHTS FOR POLICY MAKERS

Methanol is one of the most important and versatile platform chemicals for chemical industry. It is mainly used to produce other chemicals such as additives for gasoline, solvents and anti-freezes, or used in the biodiesel production process. Current research efforts focus particularly on how to use methanol to produce transportation fuels (e.g. after conversion to dimethyl ether) and plastics.

The current global methanol production is about 45 million tonnes per year, and is mostly based on fossil fuels, mainly natural gas. However, methanol can also be produced from other carbon-containing feedstock, including biogas, biomass, waste streams and CO_2. Bio-methanol (also called renewable methanol) is chemically identical to conventional methanol. The main advantage of bio-methanol is the reduction of fossil fuel use and greenhouse gas emissions compared to conventional methanol production, and the possibility to convert into bio-methanol (by gasification) a range of renewable feedstock. However, the production cost of bio-methanol is estimated between 1.5 and 4 times higher than the cost of natural gas-based methanol, which – at current fossil fuel prices - ranges from €100/t to €200/t. Bio-methanol production costs also depend significantly on feedstock prices, plant set-up and local conditions.

Current bio-methanol demonstration projects focus mainly on using waste and by-product streams from other industrial processes as feedstock, which offer the best economics. Particularly, glycerine - a by-product from biodiesel production - and black liquor from pulp and paper industry are considered as the basic feedstock (a commercial scale plant producing bio-methanol from glycerin is in operation in the Netherlands). In Iceland, renewable methanol is also produced by combing hydrogen and CO_2. Other potential feedstock includes biogas from landfills or solid organic waste, and bagasse (i.e. milled sugarcane fiber). The current demonstration projects benefit from favorable conditions such as low feedstock prices (glycerin), strong integration with conventional industrial processes (pulp and paper) or very inexpensive renewable electricity (Iceland). Depending on the presence of such kind of local conditions, other early or niche opportunities for bio-methanol production exist, e.g. integrated production with bio-ethanol from sugarcane, co-feeding biomass feedstock and fossil fuels, and co-production of heat, electricity and other chemicals.

The use of locally grown biomass for methanol production can make countries less dependent on fossil energy imports, reduce greenhouse gas emissions compared to methanol production from fossil fuels, and could stimulate local economies and employment. Co-feeding of renewable feedstock in natural gas- or coal-based methanol production facilities can be used to gradually introduce bio-methanol production and reduce the environmental impact of the conventional methanol production.

However, the use of biomass feedstock to produce bio-methanol may compete with the use of biomass for other products and commodities such use biofuels for transportation, electricity and heat from biomass, and other biomass-based products such as biogas, chemicals and plastics. In this situation, it is important that the available biomass feedstock is used in the optimal way. One way to promote the optimal use of biomass is to fully credit the environmental advantages across the entire life cycle, from feedstock production to the end-use. A range of policy options – including eco-labeling, incentives, carbon tax, information campaigns - can help promote the optimal use of the biomass resources.

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