IEA Bioenergy

Gasification is not a new technology. First small-scale applications of producer gas included lighting, cooking, heating and vehicle fuelling. Nowadays, biomass gasification is mainly used for efficient heat and power production and co-firing at small- and medium-scale plants. But development is expected to lead to large-scale synthesis of biofuels and chemicals.

SYNGAS AS FEEDSTOCK FOR BIOFUEL PRODUCTION

Syngas produced from biomass gasification can be used as feedstock for the production of a wide range of **biofuels** such as methanol, ethanol, hydrocarbon fuels (gasoline, kerosene, diesel, DME), hydrogen, or synthetic natural gas (SNG). Unlike first-generation biofuels, syngas is generated from lignocellulosic biomass, and therefore does not compete with food supply.

Bio-DME project (Sweden).

Research and development is focused on the production of **"drop-in" biofuels** from gasification syngas. There are currently many demonstration projects all around the world.

EXAMPLES OF NOVEL PROCESSES

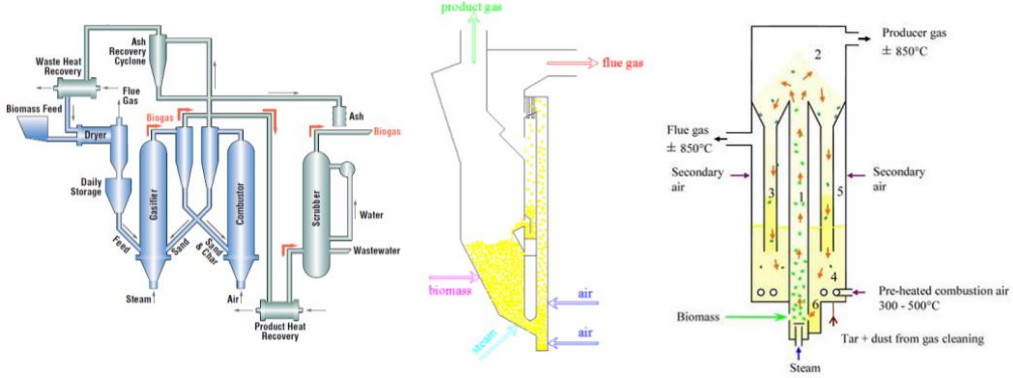
Paths for ethanol production from syngas can be classified in direct catalytic synthesis (which produces a mixture of methanol and ethanol), and **syngas fermentation**. The latter allows acceptable ethanol yields at much lower times than fermentation of starch- or cellulose-based materials.

LanzaTech's Freedom Pines biorefinery (USA) for ethanol production from syngas fermentation.

Extremely high temperatures (~ 4000°C) during **plasma gasification** allow the complete dissociation of the feedstock into syngas. Therefore, there is a complete destruction of tars and other gas contaminants at the expense of a high power consumption. Moreover, an inert molten slag is co-produced. Although fuel-flexible, this technology is particularly promising for waste gasification (industrial or municipal waste, hazardous wastes, tyres...).

Westinghouse plasma torch for gasification plants.

Indirect gasification consists of the separation of the gasification and combustion stages in different reactors, heat being transferred between them. Indirect gasification allows the production of a N_2-free gas without the need for an air separation unit, as well as complete conversion of the fuel without the need for high gasification temperatures. Therefore, indirect gasification seems suitable for synthesis applications.



Indirect gasification concepts (from left to right): SilvaGas, FICFB , MILENA.

Examples of indirect gasification technologies include SilvaGas (USA), FICFB (TUV, Austria), and MILENA (ECN, Netherlands).