

2019 Status report on thermal gasification of biomass and waste

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INTRODUCTION

IEA Bioenergy Task 33 monitors the status of thermal gasification in its member countries, and publishes a Status report every three years. This report is based on contributions from member countries representatives and offers an overview of pilot, demonstration and commercial gasification projects in each member country of IEA Bioenergy Task 33-. The full version of the Country reports from each member country, including research activities on thermal gasification of biomass and waste can be found at the Task 33 website (<http://task33.ieabioenergy.com/>) in the section "Participants and Country Reports".

In the last years, a shift in the area of thermal biomass and waste gasification can be observed.

- Starting with **feedstock**: times when installations only focus on clean woody biomass are nearly gone. The price of this feedstock is increasing each year, thus also waste wood or other waste materials like sludge are more and more in focus of scientists as well as of producers and operators of thermal biomass gasification facilities.
- Other parameter, which changed with time is the purpose of **utilization of product gas**. Heat or combined heat and power (CHP) production still dominates in small scale gasification, whereas in large scale, the production of gaseous or liquid biofuels or co-firing is more and more relevant.
- The **combination of different technologies** such as wind power or PV, combined with electrolysis to hydrogen, feeding into thermal gasification to increase the amount of biofuels production (hybrid systems), or thermal gasification as a technology for balancing the electrical grid, are further ideas on how to push this thermochemical technology ahead to be competitive at the market also without subsidies.

GASIFICATION PROJECTS

One part of the IEA Bioenergy Task 33 website is a **gasification facilities database**, where pilot, demonstration and commercial facilities and their description can be found.

In **small scale**, there are nowadays more than 1500 thermal gasification facilities in operation worldwide. In Europe, most operational facilities were produced by companies Burkhardt GmbH,

Holzenergie Wegscheid GmbH and Spanner Re² GmbH. Further producers are Urbas Maschinenfabrik GmbH, Syncraft, Lipro, Volter and Glock Ökoenergie GmbH. As the number of small scale gasification units is so high, it is impossible to register all of them in the gasification facilities database. In this case, only reference facilities from each company can be found in the database.

In **larger scale**, we would like to draw attention to these facilities:

- The **GoBiGas project**, aiming to demonstrate the production of bio-methane from biomass via gasification in Gothenburg, Sweden, was initiated in 2005. At the beginning 2 phases were planned; the investment decision for phase 1 was taken in 2010 and the first gasification started in 2013.
 - **Performance goals:**
 - Biomass to biomethane 65 - 70%
 - Energy efficiency > 90%
 - **Phase 1:**
 - Demonstration plant
 - Evaluation, R&D programme
 - 20 MW generating 160 GWh/year
 - In operation early 2013
 - Allothermal (in-direct) gasification
 - **Phase 2:**
 - 80-100 MW generating 640-800 GWh/year
 - In operation after evaluation of Phase 1
 - Technology not yet chosen



**Official start-up
October 28, 2013.**

 Göteborg Energi

The plant has operated for over 12,000 hours until in May 2018 the plant was shut down and mothballed. The decision was taken for economic reasons, especially in relation to the sales value of bio-methane, which had not followed the projections, and continued operation of the plant would not be profitable. The project is described in detail in "The GoBiGas Project. Demonstration of the Production of Biomethane from Biomass via Gasification. Anton Larsson, Ingemar Gunnarsson, Freddy Tengberg. Göteborg Energi AB 2018").

- **Red Rocks Biofuels** is constructing an advanced biofuels production facility in Lakeview, Oregon to convert 136,000 tons of woody biomass into 15 million gallons per year of biofuels including jet fuel and diesel. The biomass gasification technology, a steam reforming process is licensed from TCG Global. Syngas clean-up and conditioning, including tar removal, is being designed by Fluor. Conversion of syngas to biofuels will be achieved using Fischer-Tropsch technology provided by Velocys and EFT, with upgrading achieved through hydrocracking and fractionation technology provided by Haldor Topsoe and others. Approximately 40% of the product will be Fischer-Tropsch jet fuel with an additional 40% diesel fuel. The remaining 20% is naphtha which will be sold for a gasoline blendstock. An offtake agreement for the jet fuel has been established with FedEx. Red Rocks Biofuels broke ground on the Lakeview facility July 2018 and the plant is currently under construction. Completion is expected by mid-2020 with operations to begin later that year.

The Status report on thermal gasification of biomass and waste 2019 updates the report from 2016 and is available at the IEA Bioenergy Task 33 website at:

<http://www.task33.ieabioenergy.com/content/Task%2033%20Projects>