



Newsletter

vol.1/2017

Newsletter topic: Small scale gasification

Technology - overview

What is gasification?

Gasification is an intermediate step between pyrolysis and combustion. It is a two-step, endothermic process, a complete thermal breakdown of biomass particles into a combustible gas, volatiles and ash in an enclosed reactor (gasifier) in the presence of any externally supplied oxidizing agent (air, O_2 , H_2O , CO_2 , etc.) when equivalent ratio (ER), the stoichiometric amount of oxidizing agent, is < 1 . Stoichiometric amount is the theoretical amount of air or any other oxidizing agent required to convert the fuel completely.

More details about the gasification principle:
http://task33.ieabioenergy.com/content/thermal_gasification

Small scale gasification

There is no specific size differentiating small and large scale gasification, but in practice, small scale gasification is generally thought of as systems with up to 10 MW fuel input.

Feedstock:

As a feedstock biofuels, usually cellulosic based biofuels in the form of chips or pellets are used.

Technology:

According to the design of the fuel bed and the way how the fuel is brought into contact with the gasification agent, the gasifiers can be divided into fixed bed, fluidized bed and entrained flow gasifiers. The differences in the design of the gasification reactor are shown in the following figure.

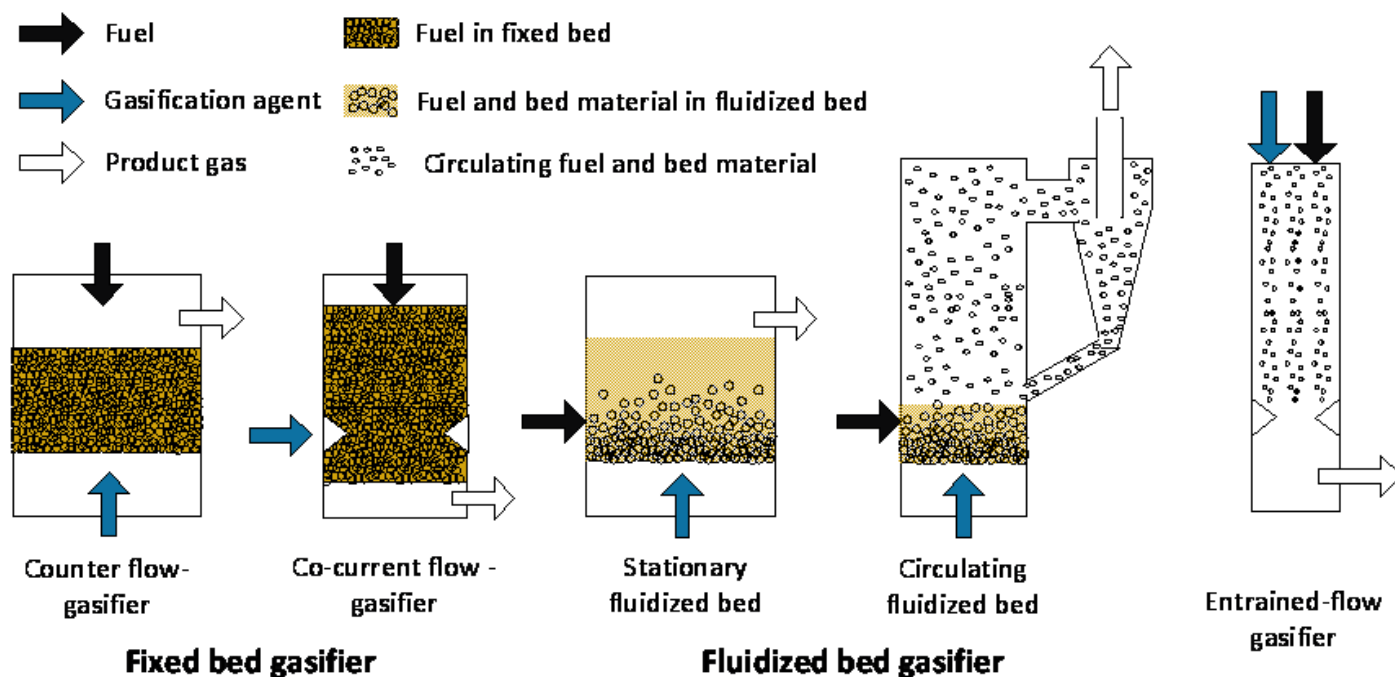


Figure 1: Fixed bed, fluidized bed and entrained flow gasifiers

For small scale gasification mostly fixed bed or staged gasification technology are used.

Products:

The main gasification products and byproducts are product gas, char, tar and ash. The product gas, also known as syngas or producer gas, is usually a mixture of mainly carbon monoxide (CO), hydrogen (H₂), methane (CH₄), and the inert species as carbon dioxide (CO₂), nitrogen (N₂), water steam (H₂O) and further minor compounds.

The product gas could be after cleaning and upgrading used for combined heat and power production (CHP), fuel synthesis, SNG-and/or hydrogen production, etc. In small scale gasification is product gas mostly used for CHP, but also byproducts as char and ash are becoming more relevant.

Companies and references

The following table and figure present an overview of manufacturers of small scale gasification systems. (source: FEE) As can be seen in the figure below Burkhadt GmbH and Spanner Re² GmbH are the leading companies in terms of total installed capacity, they are also leading in number of installed gasification units.

Table 1: Overview of manufacturers in Germany and abroad

A.H.T. Pyrogas Vertriebs GmbH	LiPRO Energy GmbH & Co. KG
Bauer Holzenergie GmbH & Co. KG	Maschinen- und Anlagenbau Werner GmbH,
Bernd Joos	KWS Strohmenger
Blue Tower GmbH	Mothermilk GmbH
BR Energy Group AG	Nexterra
Burkhardt GmbH	Pyrox Italia Srl
Christof Holding AG	Qalovis Farmer Automatic
Entrade Energiesysteme AG	Energy GmbH
EQTEC	ReGaWatt GmbH
Ettenberger GmbH & Co. KG / Biotech GmbH	REPOTEC GmbH
Fröling Heizkessel- und Behälterbau Ges.m.b.H.	Revogas in Burgeis IT
GLOCK Ökoenergie GmbH	Spanner Re2 GmbH
Gräbner Hans – Behälter- und Apparatebau	Stadtwerke Rosenheim GmbH & Co. KG
Holzgasanlagen	SynCraft GmbH
Hargassner GmbH	URBAS-Maschinenfabrik GmbH
Holzenergie Wegscheid GmbH	Volter Oy
Kohlbach Holding GmbH	GTS Syngas
Kopf Syngas GmbH & Co. KG	Xyloenergy GmbH
Ligento Green Power GmbH	Xylogas / EAF
	Energieanlagenforschung GmbH

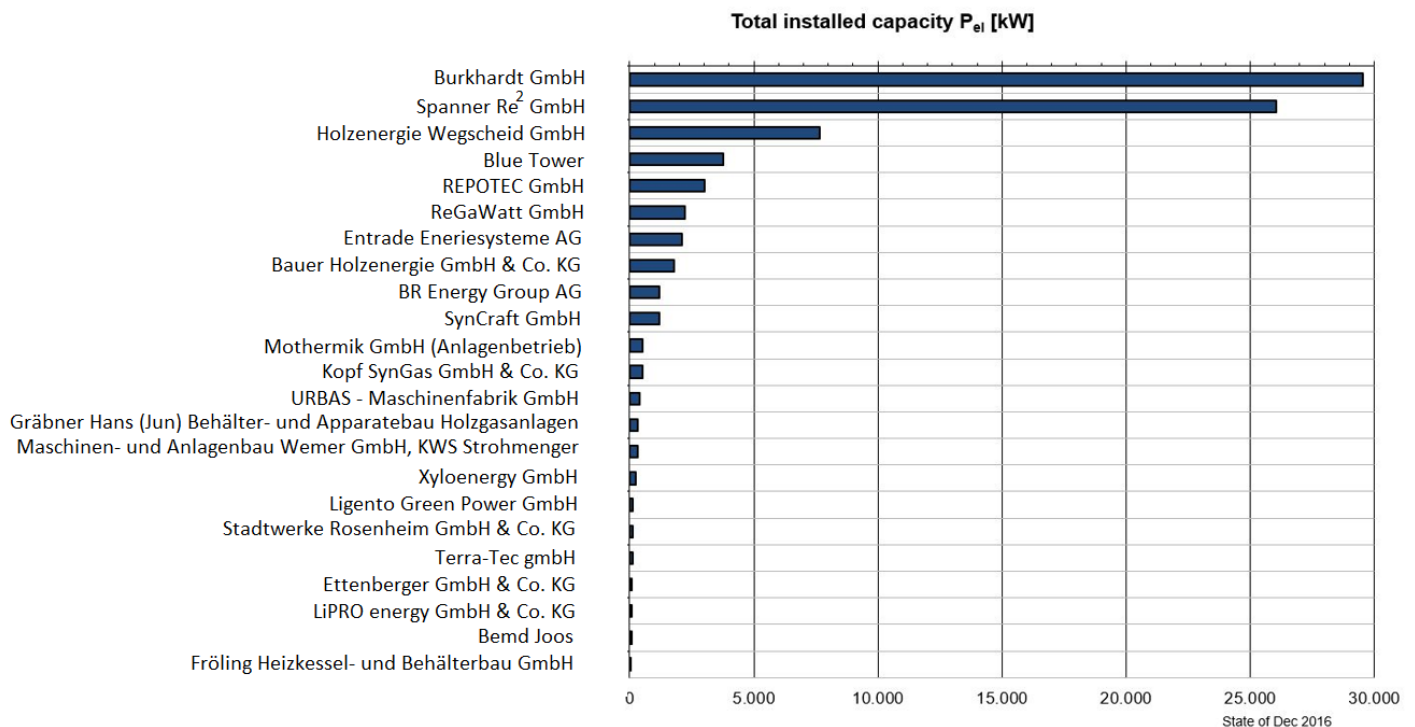


Figure 2: Total installed capacity - overview (source FEE)

Workshop “Small scale gasification for CHP”

The last IEA Bioenergy, Task 33 workshop took place on the 3rd May 2017 in Innsbruck (Austria) and was followed by a site visit to SynCraft and GE Jenbacher on the next day. It was organized by TU Wien (www.vt.tuwien.ac.at) and MCI Innsbruck (www.mci.edu).

The workshop program was divided into two sessions:

Session I:

Small scale gasification for CHP – experience reports

B. Böcker-Riese

Status quo from biomass gasification CHP-plant systems in Germany

P. Urbas, Urbas

Urbas small scale gasification for CHP

N. Davidsson, MEVA

Small-scale CHP with MEVA entrained flow gasification

R. Ljunggren, Cortus Energy

WoodRoll®– breakthrough technology for cleanest energy gas from biomass

M. Schneider, GE Jenbacher

Utilization of special gases with gas engines - Requirements and experiences

M. La Viletta, CMD Engine

CMD ECO20: a small-scale combined heat and power system at early commercialization based on gasification and syngas conversion in an ICE

G. Ronda, Ronda Engineering

Staged gasification by Ronda Engineering

Session II:

Byproducts from thermal gasification

M. Rügsegger, ETECA

Valorization of By-Products from Small Scale Gasification (SSG)

G. Aranda Almansa, ECN

Co-production of bio-energy and biochar

M. Huber, SynCraft

The carbon makes the difference - Decentralised wood power plant with valuable carbon as by-product

R. Post van der Burg, E. Eijmans, Torrgas

Modular gasification of torrefied biomass

T. Thomsen, DTU

Quality of ashes from thermal gasification of sewage sludge and biomass for use as CPK fertilizers



The workshop with 56 participants from 11 countries was very well attended and built a platform for information exchange, which is one of the aims of the Task 33.

All presentations as well as Workshop report can be found at the IEA Bioenergy Task 33 website (task33.ieabioenergy.com).



Photo 1: Site visit at SynCraft

Site visits to a new SynCraft CHP installation in Innsbruck as well as GE Jenbacher's manufacturing facility in Jenbach took place on May 4th.

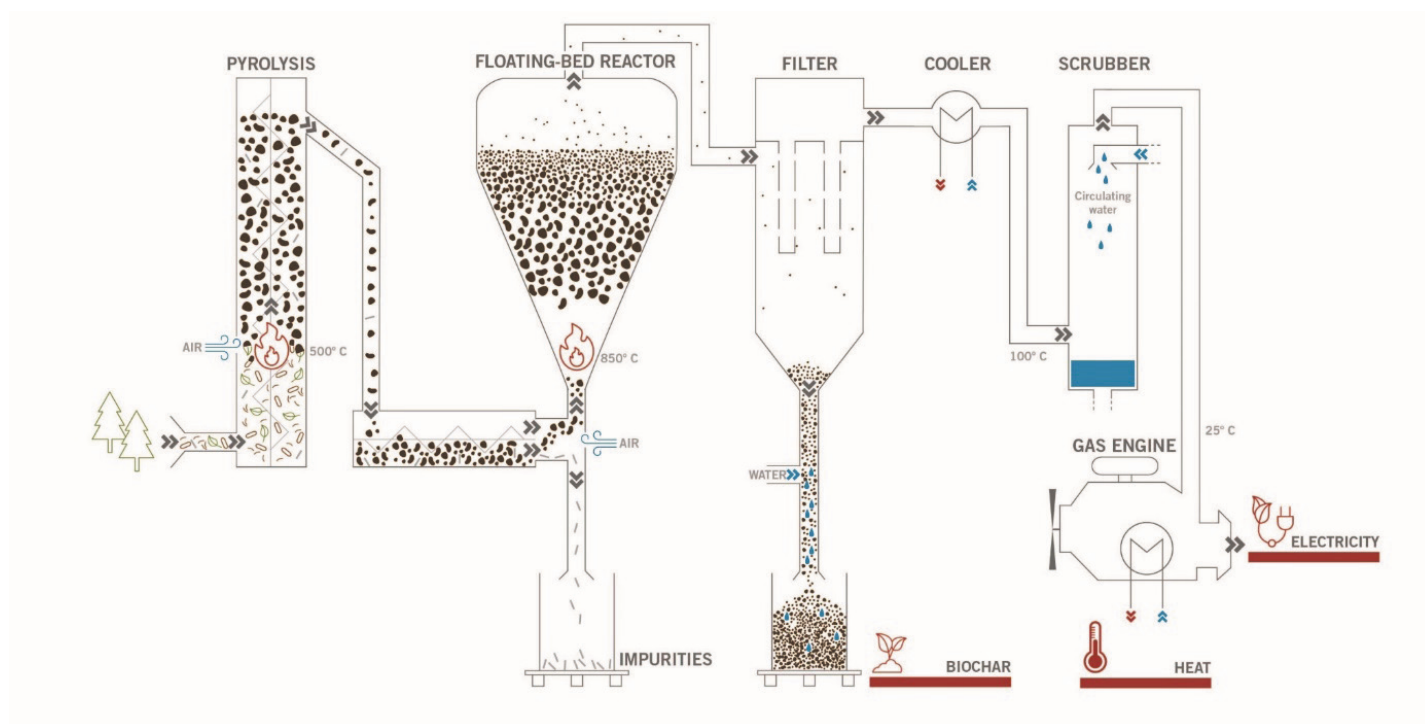


Figure 3: SynCraft gasification technology

SynCraft (www.syncraft.at) is a supplier of turn-key wood power plants based on floating bed gasification, it was founded in 2009. It produces decentralized wood power plants with total efficiency of 92% due to LT recovery. A valuable by product of biomass gasification is bio-char, which is produced at a quality sufficient for grilling. In the figure above the technology of SynCraft gasifier can be seen.

GE Jenbacher (www.ge.com) manufactures gas engines and cogeneration modules. It is part of their Distributed Energy portfolio of products and is one of their gas engine technologies.

During the excursion tour it was possible to visit the production halls and have a look to a production of GE Jenbacher engines.

Jenbacher emerged from the former Jenbacher Werke, which was founded in 1959 and manufactured gas and diesel engines, and locomotives. The company was bought out by General Electric in 2003 and was renamed GE Jenbacher GmbH & Co.

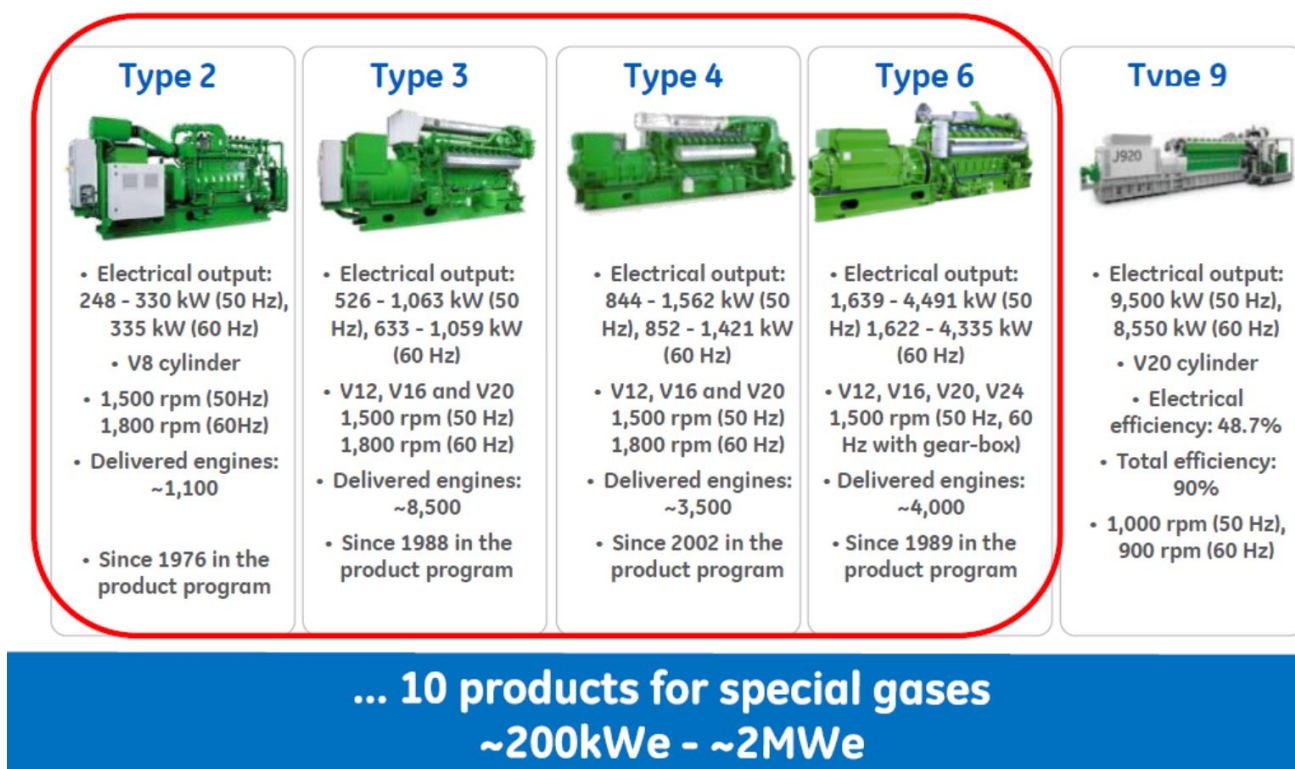


Figure 4: Jenbacher gas engines - products core portfolio



Photo 2: Site visit at GE Jenbacher

Upcoming events

23.-25. October 2017, Skive, Denmark

“Fluidized bed conversion“

– Task 33 meeting and joint workshop with FBC

05. December 2017, Innsbruck, Austria

9. International Conference on Applications of Biomass Gasification

All further information regarding the upcoming events can be found at task33.ieabioenergy.com

IEA Bioenergy Task 33 – Gasification of biomass and waste

task33.ieabioenergy.com

Task 33 is a working group of international experts with the aim to promote the commercialization of efficient, economical and environmentally responsible thermal biomass gasification processes.

The objectives of Task 33 are to monitor, review and exchange information on biomass and waste gasification research, development, and demonstration and to promote cooperation among the participating countries and industry to eliminate technological impediments to the advancement of thermal gasification of biomass and waste.

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The ultimate objective is to promote commercialization of efficient, economical, and environmentally preferable biomass and waste gasification processes, for the production of electricity, heat, and steam, for the production of synthesis gas for subsequent conversion to chemicals, fertilizers, hydrogen and transportation fuels, and also for co-production of these products.

Participating countries: Austria, Denmark, Germany, Italy, the Netherlands, Norway, Sweden, Switzerland and USA

Task Leader: Prof. Kevin Whitty, University of Utah, USA