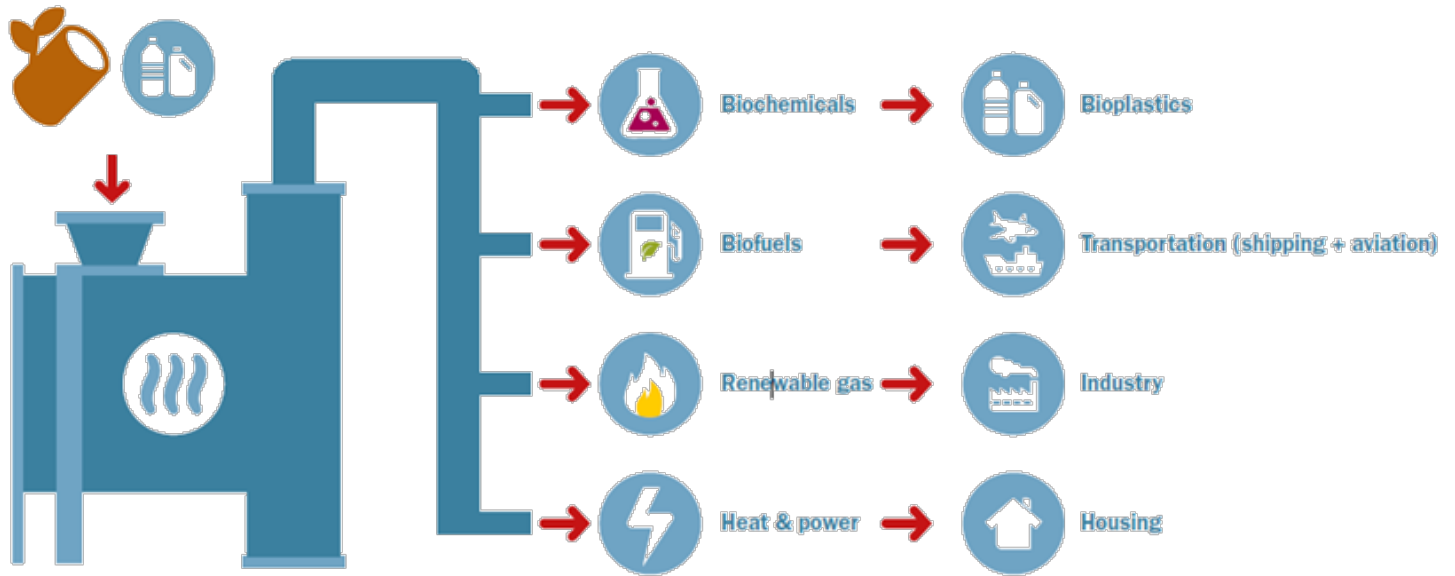


# GASIFICATION FOR THE BIOECONOMY



› **TNO** innovation  
for life

## FROM BIOMASS TO FUELS AND CHEMICALS

Gasification will play a mayor role in the energy transition by converting a wide range of organic and carbonaceous materials into a combustible gas, called product gas. This gas consists of  $H_2$  and  $CO$  (syngas) and instant chemicals, such as ethylene and benzene. Product gas can be used for a variety of end- products ranging from fuels to high-value chemicals.

TNO has a long standing history in bio-energy research focusing on high efficient thermal conversion technologies, optimization of existing technologies and developing technology to pre-commercial readiness. Indirect gasification is one of these technologies that allow the production of green energy, green chemicals and biofuels.

## MILENA - OLGA TECHNOLOGY

The MILENA OLGA technology has a long history at TNO. Both technologies were developed for high efficiency and maximizing the yield from any feedstock going into the gasifier. This has been successful, and as such the technology is now considered a standard platform, open for R&D activities.

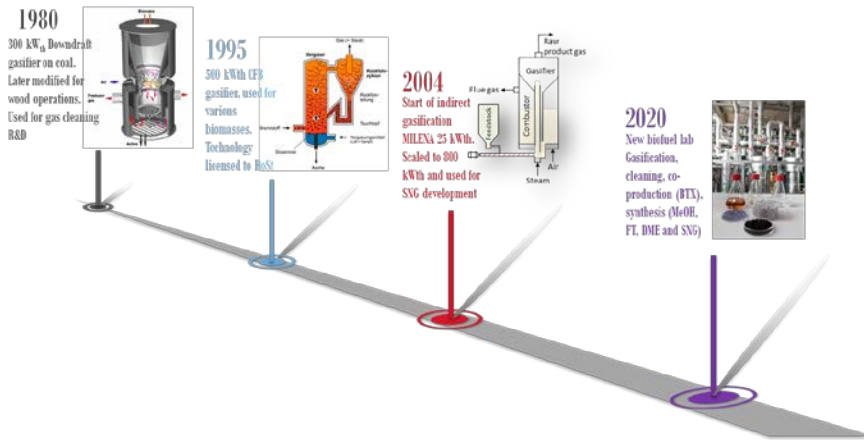
The MILENA-OLGA technology is commercially available at Synova ([synovapower.com](http://synovapower.com)).

Unique features of this technology are:

- 100% feedstock conversion;
- No waste (carbon or tar);
- Instant Green Gas (~15 vol%  $CH_4$ );
- Instant Chemicals (ethylene and benzene);
- Fuel flexible, ranging from wood (residues), agro-residues, RDF to high plastic containing streams.



# LONG EXPERIENCE IN GASIFICATION



The platform technologies were developed by learning from past technologies. For MILENA these are fixed bed-, BFB- and CFB- gasifiers. For OLGA these are, various scrubbers (water/oil), absorbents and cracking routes. This led to 8 patents on this gasification platform.

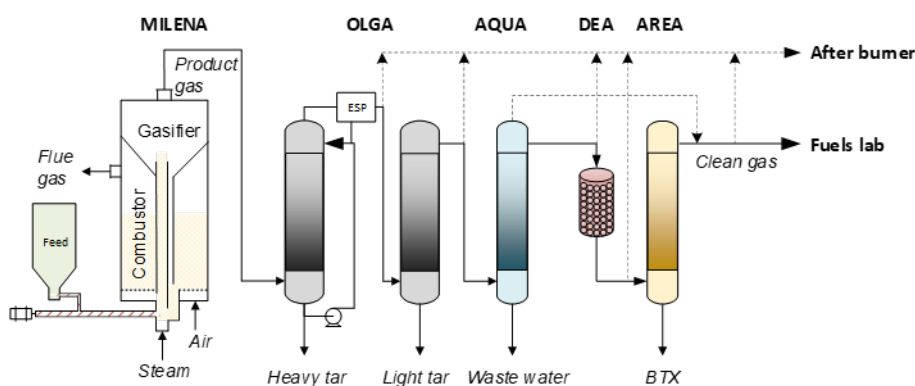
In 2020 a new laboratory for biofuels production from gasification became available at TNO. The new line up includes reforming, deep gas cleaning, compression and subsequent catalytic conversion facilities, enabling the cost efficient biofuel production with co-production of chemicals.

## READY TO BE PART OF THE ENERGY TRANSITION?

Research lies at the heart of our organization and therefore, we dedicate our international expertise and years of experience to the improvement and optimization of our client's process development. We ensure our solution is suitable to your application.

- Support and design of thermochemical processes to optimize the valorization of biomass and waste streams;
- enhance valorization options;
- Collaboratively develop gasification based systems for energy, chemicals and biofuels from a variety of biomass;
- Convert biomass all the way to Synthetic Natural Gas, Methanol, DME, Mixed Alcohols or other biofuels via Fischer-Tropsch and wax upgrading;
- Performance optimization of existing gasification systems;
- Perform technical due diligence on gasification based technologies.

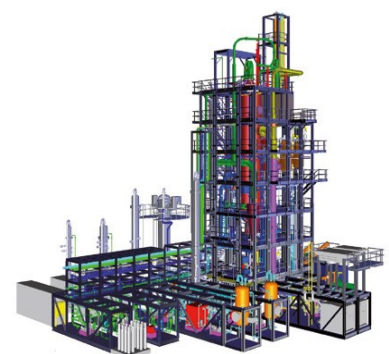
# INDIRECT GASIFICATION AND PRODUCT GAS CLEANING AT TNO



Our gas cleaning facilities include one unit for the conversion of olefins to aromatics (DEA) in order to increase the yield of liquid products. It also contains a scrubbing technology to absorb the BTX fraction from the gas (AREA). These technologies allow co-production schemes, that can increase the overall efficiency and optimize the profitability of Green Gas or biofuels production.

The lab scale unit operates on 3 - 5 kg/h of feedstock and produces up to 8 Nm<sup>3</sup>/h of wet gas. The line-up shown above is on the complete flow and after this a split is made for the fuels production facility.

TNO.NL



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