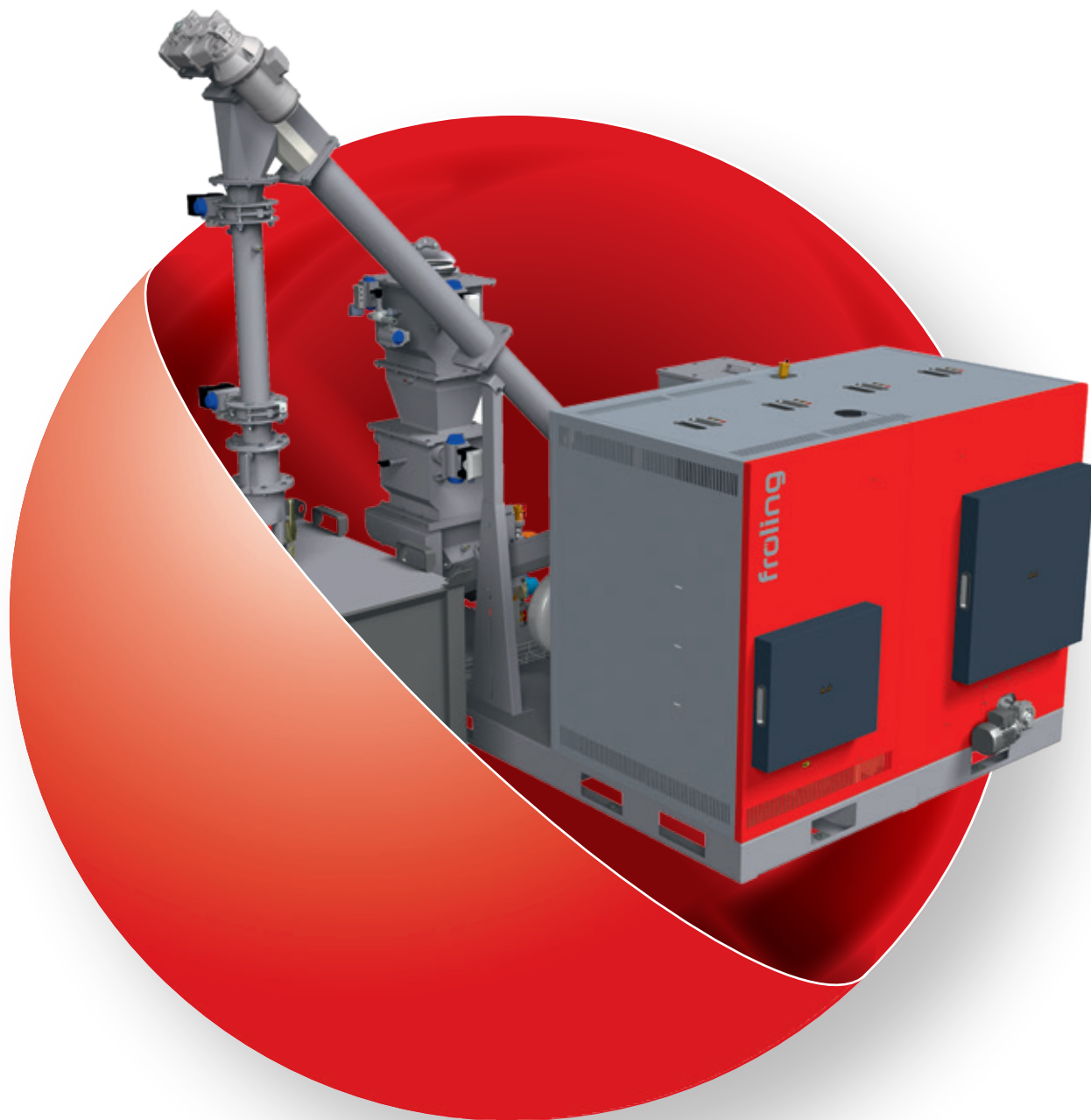


CHP

WOOD COMBINED HEAT AND POWER



BETTER HEATING

HEAT AND ELECTRICITY  
FROM WOOD



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# GARANTIERTE QUALITÄT UND SICHERHEIT AUS ÖSTERREICH

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For almost sixty years Froling has specialised in the efficient use of wood as a source of energy. Today the name Froling stands for modern biomass heating technology. Froling firewood, wood chip and pellet boilers are successfully in operation all over Europe. All of our products are manufactured in our factories in Austria and Germany. Froling's extensive service network ensures that we can handle all enquiries quickly.

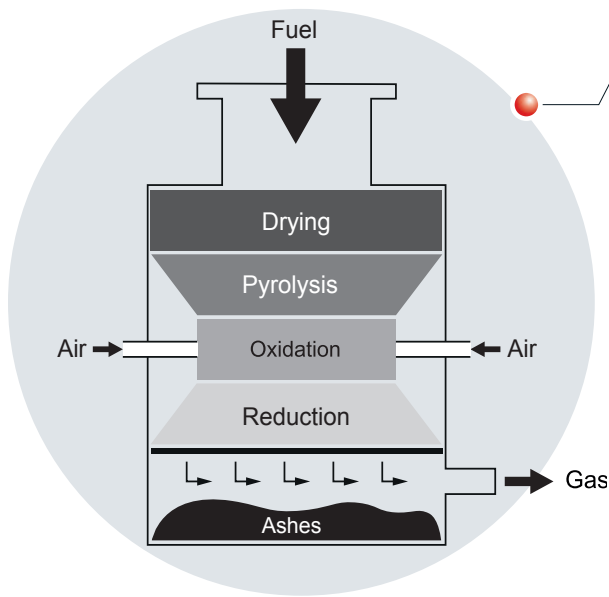
- International pioneer in technology and design
- Sophisticated fully automatic operation
- Excellent environmental compatibility
- Environmentally responsible energy efficiency
- Renewable and CO<sub>2</sub>-neutral fuel
- More comfort for you



Froling wood gasifier is the product of years of intensive research. The result is a highly efficient system which leaves nothing to be desired in terms of efficiency and reliability.

- Advantages:**
- Compact design and easy to maintain
  - Fully automated operation
  - Dry gas purification - no build-up of condensation
  - Uses a state-of-the-art and sturdy industrial engine (high efficiency)
  - Gas engine ignited by wood gas:
    - no derived fuel required
    - no engine start-up with generator
  - Quality product of Austria
  - One-stop shop - complete system supplier: Boiler, fixed bed gasifier, chamber discharge systems including materials handling technology
  - Extensive customer service network
  - TÜV concept in place for authorities (emissions, machinery safety, noise, explosion protection, process engineering etc.)

## How wood gas is extracted



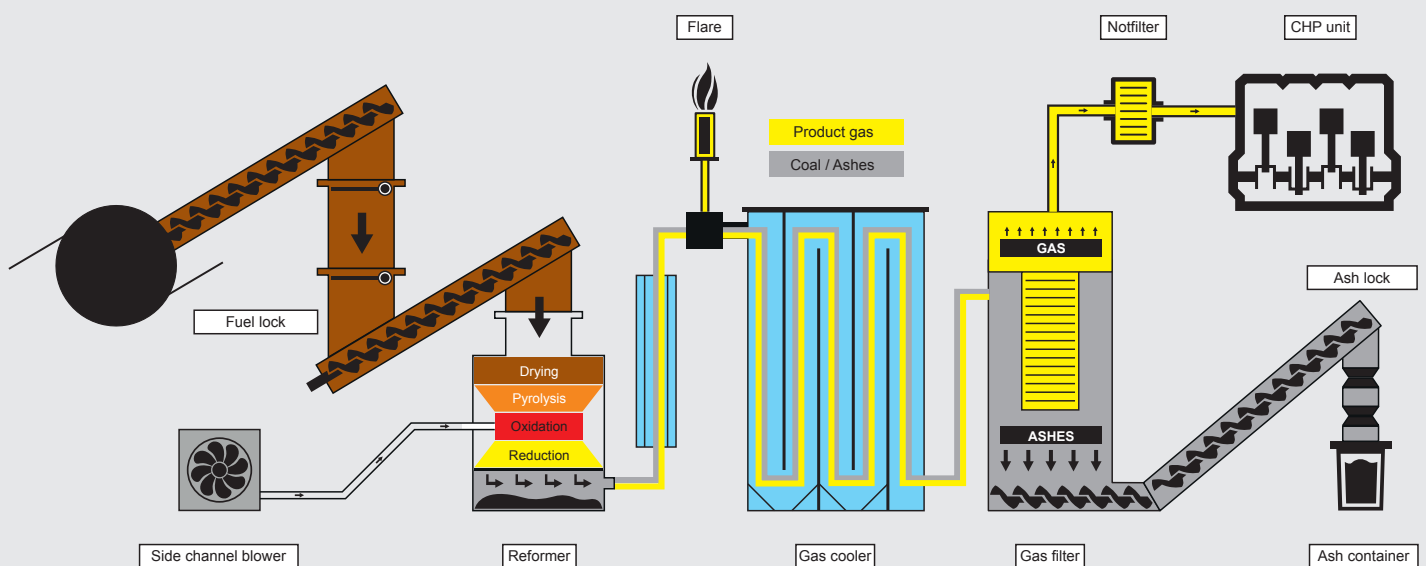
The method of gasifying wood and subsequently extracting wood gas is a multistage, thermochemical conversion process, similar to combustion. Unlike combustion, however, the process is specifically interrupted so that not only carbon dioxide and water are produced, but also flammable gas, which is converted to electricity and heat in a gas engine. The wood gasifier is fuelled by natural untreated wood chip. Via a twin-flap lock, the wood chip is transported by the stoker screw into the reformer. Inside the reformer, the wood chips are gasified in a downstream procedure consisting of the following stages:

- Drying (up to ~ 200 °C)
- Pyrolysis (~ 200 °C to 600 °C)
- Oxidation (up to ~ 1200 °C)
- Reduction (~ 900 °C)

During the pyrolysis stage, chemical products (such as tar, coke, CO, CO<sub>2</sub>, H<sub>2</sub>, CH<sub>4</sub>) are created and partially burnt or cracked in the oxidation zone. In the reduction zone the wood chip is then converted to very low-tar wood gas thanks to the special design and regulation of the gasifier. The generated wood gas is cooled down to approx. 110°C in a tubular water/gas heat exchanger and dry-cleaned in a fabric filter with mechanical cleaning. The coal and ash accumulated is transported by feed screws from the gas filter, through an ash lock and into a supply bin. The cooled and purified wood gas is then fed into the gas control line of the gas engine. The heat from the engine cooling, flue gas heat exchanger, wood gas cooling and any mixture cooling is recovered and transferred to the connected heating network using the plate heat exchanger. During the starting process, the lower quality wood gas is burnt-off automatically with a gas flare positioned right after the reformer.

## Schematic view:

The Froling wood gasifier is an autothermal fixed bed downstream gasifier. The diagram below shows the operating principle of Froling's fixed bed gasifier:



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## IT'S THE TECHNOLOGY THAT MAKES THE DIFFERENCE

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The motto of the Froling engineers when optimising the Imbert fixed bed gasifier was “to perfect a tried and tested concept.” Based on the findings from their systematic analysis of the system, they have been able to update the design. As a result, Froling's wood gas generator delivers virtually tarless producer gas. For this reason the gas engine can be started directly with pure producer gas.

### Gas engine with maximum efficiency

Froling's CHP fixed bed gasifier knows no compromise. Only premium quality parts are used, from the fuel infeed to the generator. Round the clock full load operation at maximum efficiency ensures that the system is economical to run. The gas motor has been a successful component of many gas CHP units for years. The system has exceptional emissions and efficiency ratings in this class. All of the components are put together, preassembled and subject to extensive system testing at the Froling plant.

The complete system is tested by TÜV Austria. Efficiency and system safety is confirmed by the relevant certificates.



### Control cabinet and control system made by Froling

We leave nothing to chance. For decades it has been Froling's policy not to rely on others. That is why, when it came to the CHP fixed bed gasifier, we again relied solely on in-house development and production. And that's why even the control cabinet is constructed in our very own electrical engineering department. The control system, consisting of a premium industrial PLC with 10.1" touchscreen operation, was also developed and programmed by Froling engineers. The control cabinet controls and monitors all functions. The corresponding visualisation software offers both the operator and the customer service support engineers end-to-end analysis and optimisation of the system.



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## INNOVATIVE VARIANTS

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The development of the Froling CHP fixed bed gasifier is a process that began 10 years ago. We have, therefore, been able to tap into a huge pool of experience and can guarantee the operators the relevant operating and functional safety. The first customer systems have already been in successful operation for some years.

In the meantime, our customers across the globe have been impressed by many of our projects. Based on our experiences with these systems, we have produced two different models. They guarantee the customer the best possible solution tailored to his requirements:



### A) Container system

The entire system is installed in a high quality container. It is commissioned at the factory and is ready for operation. The system is only dispatched once it has been successfully put into operation and can continue to be used by the customer straight away.

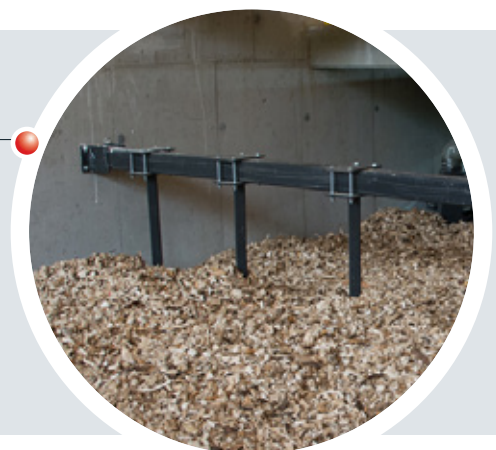


### B) Indoor system

The wood gasifier and CHP unit are both assembled and pre-installed on a steel platform. The system is pre-wired. The relevant components are connected up on site, installed and started up by Froling's qualified customer service engineers.

### Systems for fuel optimisation

The concentration determines the efficiency of the system. That is why Froling believes in preparing the fuel suitable for gasification (drying and filtering) outside of the system. This serves to maximise the system efficiency, as a step-by-step approach allows for targeted and efficient operation. Froling also offers specially developed component solutions with exceptional efficiency here. We would love to find the perfect concept to meet your demands. Our experienced engineers have excellent expert knowledge.



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## PRACTICE PROVES

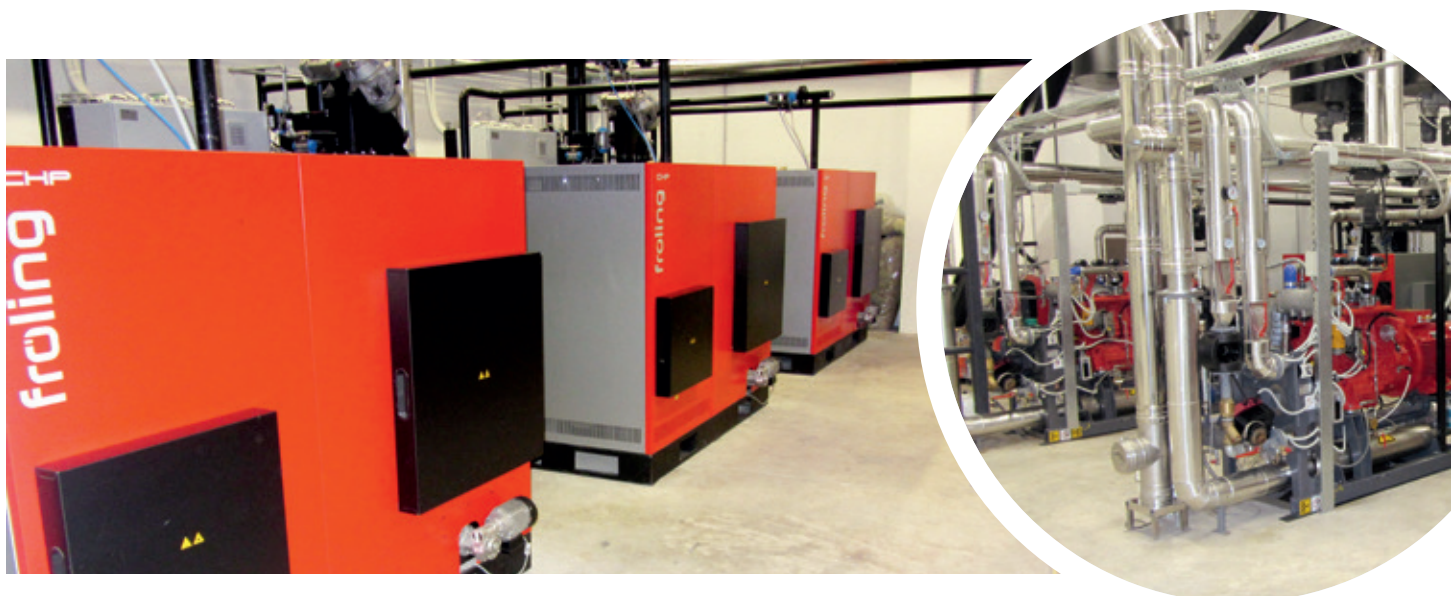
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Opting for a wood gasifier requires extensive consideration. Unlike simple heat generators, these systems need to perform for as many annual working hours as possible. Therefore, besides the fatigue resistance of the components, the efficiency of every single operating hour is an important factor in the economic success of a project.



Grabner bioenergy, AT-Wenigzell

Originally designed for three systems, a fourth gasifier was installed in the project in summer 2016. In exactly the first year of operation, over 8400 operating hours were clocked up using every single CHP unit.



Suhodolnik district heating and heating wood dryer, SI-Nazarej

The Suhodolnik wood processing plant in Slovenia is not far from Ljubljana. Ten Froling fixed bed gasifiers have successfully been in permanent operation here since the start of 2013.

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## THE DIFFERENCE

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Froling's technology is reliable in the long term. Many satisfied customers confirm our performance.



### Osserhotel, GE-Silbersbach

This family-run hotel in the Bavarian Forest relies on sustainable energy production. Besides wood chip heating, a Froling wood gasifier has been providing heat since the end of 2014.



### Jennersdorf district heating, AT-Jennersdorf

The borough with over 4000 inhabitants has been partly heated for years by a wood chip system. To optimise summer operation, four Froling wood gasifiers not only provide heat, they also generate 200 kW of power at the same time. The Froling system includes a fuel drying feature on the sliding floor, representing exceptional efficiency for its kind as it primarily uses the waste heat from the plant room. The wood chips rejected as being unsuitable after the filtering of the fuel is burnt by a Froling wood chip boiler.



### Molzbachhof, AT-Kirchberg am Wechsel

The Superior Hotel in the hills of the Wechsel region not only meets its own heating requirements, it also supplies Sachsenbrunn school via a small district heating network.

The system comprises two CHP units which each generate 50 kW of electricity and 100 kW of heat per hour. Two Froling 400 kW and 250 kW wood chip boilers were installed to cover the peaks. The efficient sliding floor drying technology and fuel filtering were also designed by Froling.

Technical specifications		CHP		
Power consumption	kW	46	50	56
Thermal output	kW	95	105	115
Wood chip consumption	kg/h	35	37	40
Fuel heating output	kW	170	181	198

All values (rounded) as per TÜV test - dependent upon fuel quality used and type of operation.

The ecodesign requirements according to VO (EU) 2015/1189, Annex II, point 1. are met.

Your Froling partner

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