



**Powered by GASEK**  
**WOOD GASIFYING SOLUTIONS**



# WOOD GAS IS CLEAN, RENEWABLE AND FAVOURABLE ENERGY

The GASEK technology allows replacing fossil fuels by wood gas. Along with the development of the technology, wood gasification has become one of the solutions in the field of generating renewable and environmentally friendly energy. Reduction of consumption of fossil fuels, such as oil and coal, benefits the environment. It also reduces environmental hazards associated with transporting imported fuels.

The GASEK wood gas, generated as the end-result of the gasification process, contains very low quantities of emissions and microparticles, which are hazardous for the environment – after the cleaning process the particle concentration of the product gas is virtually non-existent. The remaining microparticles burn in the motor or in the burner in heat generation. Exhaust gas primarily consists of carbon dioxide and water vapour.



**Energy consumption increases, crude oil prices have risen year in, year out**

*According to estimates, global energy consumption is expected to rise by 53% from 2008 to 2035. As concerning different sources of energy, use of renewable energy is predicted to increase the most, but conventional fossil fuels consumption will also continue to grow and the fuels retain their leading position on the global energy market. In 2035, fossil fuels are still expected to cover nearly 80% of the world's energy consumption. At the same time, crude oil wholesale prices have risen year in, year out. Over the last ten years, the Brent crude oil price has doubled, and over the next ten years the rise in oil prices is expected to accelerate. [US EIA International Energy Outlook 2011]*

# GASEK GAS PRODUCTION UNITS

**The GASEK technology can be utilised at any locations where gaseous fuel and clean-burning gas are needed.**

GASEK manufactures Gas Production Units (GPU) used for generating wood gas adjusted to the customer's needs out of wood chips. The GASEK GPU is a key component of many CHP (Combined Heat and Power) plants, where it produces clean wood gas for heat and power production units by different manufacturers.

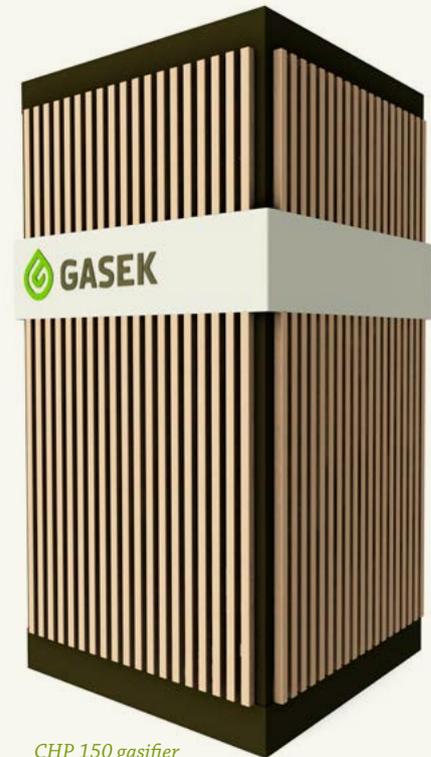
The GASEK GPU is also suitable for factories where use of fossil fuels for steam or heat generation is discontinued. In such cases, oil burners are replaced by gas burners and oil tanks by wood chip storage and the GASEK GPU. The GASEK GPU comprises patented GASEK Gasifier and integrated Filter system selected based on the gas application. The gasification and cleaning process is controlled by an advanced automation system.

## **GASEK CHP GPU 150**

*Produces 150 kW of clean gas for motor use. Depending on the motor, electric capacity amounting to 35-45 kW and heat capacity amounting to 100 kW can be obtained from this amount of gas. The unit's integrated gas cleaning assembly allows efficient removal of microparticles and acids prior to gas combustion in the motor.*

## **GASEK CHP GPU 500**

*Produces 500 kW of clean gas for motor use. Depending on the motor, electric capacity amounting to 100-125 kW and heat capacity amounting to 350 kW can be obtained from this amount of gas. The unit is equipped with an integrated dry filtering system used for convenient dry ash removal directly to the ash container.*



*CHP 150 gasifier  
encapsulated*

## **GASEK HEAT GPU 500 and GASEK HEAT GPU 1M**

*Produces 500 kW or 1 MW of gas and heat for combustion applications. The GASEK HEAT GPU's are designed to convert nearly 100% of the wood's energy to gas and heat. The amount of ash reaching the boiler is almost non-existent, since any ash is removed from the gasifier and fly ash is removed by a cyclone preceding the burner.*

# GASEK CHP

GASEK's CHP (Combined Heat and Power) plant is a combined unit for generating electricity and heat, which is well suited, for instance, for small and medium sized businesses as well as for energy generation in remote communities

## Wood chips

GASEK CHP plants have been designed for a wide scale of fuels. Chip moisture content may even reach up to 35%.

## Wood chip supply

A GASEK CHP can be delivered as a turnkey solution, in which case the chip storage and supply are integrated into the same container.

## Gasifier

The GASEK gasifier is the heart of the unit. Patented technology ensures excellent cleanness of the gas even as it leaves the gasifier.



## Gas Production Unit (GPU)

A GASEK GPU is a modular solution comprising the gasifier and gas filtering system. Different GPU options are available for indoor or outdoor installation. The gasifier and filter components can also be detached from each other and installed separately.

## Gas filtering

The gas filtering system cleans the gas of microparticles and other impurities harmful for the motor. GASEK offers several gas filtering solutions of its own and technologies of its partners.

## Wood gas

The wood gas generated by a GASEK GPU is very clean and can be used for fuel as it is.

## CHP / GENSET

GASEK units have been designed for use with CHP/GENSET solutions from different manufacturers.

*CHP power plants that are based on GASEK technology are available also in GASEK's partners' brand name.*

# GASEK HEAT

The GASEK HEAT technology is especially suitable for industrial heat production solutions where fossil fuels are to be replaced. HEAT solution can be connected directly to a former oil boiler after burner replacement.

## GASEK gasifier

Patented gasification technology ensures almost full utilisation of the wood's energy by converting it to gas and heat. Clean, pure ashes are automatically removed to container.

## Wood chips

Moisture content normally 25%, with integrated dryer even 45%

## Wood chips transfer

A chip dryer can be integrated in the supply system.

## Hot gas blower

The hot gas blower by GASEK has been designed as a part of the solution.

## Start-up burner

Start-up burners manufactured by GASEK take care of gas combustion during starting. Starting gas can also be released through stack, in which case a start-up burner is not required.

## Cleaning cyclone

Cleaning cyclones manufactured by GASEK remove fly ash from the gas.

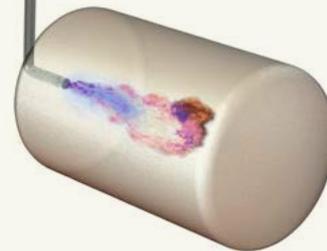


## Burner

Leading burner manufacturers supply industrial burners suitable for wood gas.

## Boiler

GASEK HEAT solution is integrated with an existing boiler that needs not be modified.



## Wood gas

Wood gas is transferred while hot. This keeps the piping clean and the wood's energy is utilised to the maximum extent.

## Automation

Automation is integrated with the factory's automation system. Remote control of the equipment is possible.

# BUSINESS CASE FINLAND

## FUEL OIL VS. WOOD CHIPS

LIGHT FUEL OIL	HEAVY FUEL OIL	WOOD CHIPS
95,6 €/MWh	69 €/MWh	18,4 €/MWh
SAVINGS LIGHT FUEL OIL	SAVINGS HEAVY FUEL OIL	
77,20 €/MWh	50,6 €/MWh	

## GASEK HEAT: Heating oil replacement by wood chips

### FUEL SAVINGS

PRODUCTION 1 MW	6000 h
Annual savings, Light fuel oil	463 200 €
Annual savings, Heavy fuel oil	303 600 €

## GASEK CHP: Electricity and thermal energy production with Wood chips

### PRODUCTION CALCULATION: CHP 150

ELECTRICITY	THERMAL POWER	WOOD CHIP CONSUMPTION	
35 kW	100 kW	0,208 m <sup>3</sup> /h	
ANNUAL USAGE	PRODUCED ELECTRICITY	PRODUCED THERMAL ENERGY	WOOD CHIPS CONSUMED
6000 h	210 MWh	600 MWh	1248 m <sup>3</sup>

### FUEL SAVINGS

**EXAMPLE:** Purchased electricity (120€/MWh) and heating oil (95,6 €/MWh). CHP 150 power plant operated by own wood chips (Wood chips costs 2€/m<sup>3</sup>) 6000h per year: 210 MWh \* 120 €/MWh + 600 MWh \* 95,6€/MWh – 1248m<sup>3</sup> \* 2 €/m<sup>3</sup>

**ANNUAL SAVINGS: 80 064 €**

*The actual production numbers varies depending on the motor size and quality of the wood chips. FOR ADDITIONAL INFORMATION: [WWW.GASEK.FI](http://WWW.GASEK.FI)*

# RESEARCH AND DEVELOPMENT

GASEK's wood gasification technology is based on long-term research and development efforts. Among the company's establishers and employees are numerous leading wood gasification developers and researchers from Finland with many decades of practical experience. At GASEK, long-term experimental R&D has been refined into a documented product development process; as a consequence, technology has given rise to efficient practical solutions. At the gasification research laboratory in the premises of GASEK factory in Reisjärvi, our research and development teams have at their disposal multiple gasifier units of different size and intended for different assemblies. In addition to basic gasification research, for example, the performance of different wood species in gasification processes and the efficiency of various motors and CHP units if used with GASEK GPUs are examined at the laboratory.



# REFERENCES

## Steam generating plant, Tornio

GASEK HEAT GPU 500

- Replaces oil in steam production
- Produces wood gas at 500 kW capacity for combustion in a 1 MW boiler
- Installation is in progress

## District heating power plant, Reisjärvi

GASEK CHP GPU 150

- IC motor, 30 kW electric capacity
- Generates electricity for local thermal power plant, the heat is supplied to district heating network
- Installed in 2010

## Farm, Somero

GASEK CHP GPU 150

- IC motor, 40 kW electric capacity
- Generates heat and electricity for the farm's facilities and grain drying
- Installed in 2011



*Steam generating plant in Tornio  
GASEK HEAT GPU 500*

## Hotel/restaurant, Reisjärvi

GASEK CHP GPU 100

- Stirling motor, 9 kW electric capacity
- Generates electricity and replaces light fuel oil in heating. Excess electricity is supplied to local power grid.
- Installed in 2011



*Farm in Somero, GASEK CHP GPU 150*

## Partner program

Are you interested in GASEK technology as part of your own energy solution? With help of our international partner program our customers can easily and swiftly start to offer their own energy solutions for their customers. The partner program will be tailored according to partner's specific needs. Please contact us for more information.



**GASEK is an industry leader in wood gasification research and product development. We design and manufacture wood chip-fuelled gas production units allowing production of clean and renewable energy out of wood chips. Our technology is applicable in numerous different power plant solutions. Contact us to learn more about the cost savings offered to you by our solutions.**

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### **GASEK Partner**

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