



*Your know-how partner in sustainable energy sector*

## **PROJECT DESCRIPTION**

**Efficient CHP-plant 300 kW**



**Our pilot plant near Tulln**

***Our CHP-plant is usable in modular construction system from 150 kW up to 1,5 MW thermal power and delivers from 30 kw up to 300 kW electrical power.***

**V.E.P. Fördertechnik GesmbH  
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Abfallbehandlungsanlagen

# Fördertechnik Gesellschaft mbH

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## 1. GENERAL

Planned is the construction of a 300 kW facility including NEUMOT to generate power (60 kW) and to provide the thermal base load (approx. 220 kW over approx. 8 months). NEUMOT stands for a new type of maintenance-free steam motor supplied by a steam boiler (group 1 according to ABV (law for creation and implementation of steam boiler) heated by a combined heat source.

## 2. MODE OF OPERATION

The CHP is designed for a constant full-load operation throughout the whole season (approx. 11 months), a partial-load operation is not intended.

The waste heat from NEUMOT and the heat from the peak-load boiler will be stored together in 10 m<sup>3</sup> buffer storage resp. Supplied to a heat exchanger.

Should the buffer storage be unable to take the waste heat, then the NEUMOT will automatically switch off.

Heat and service water requirements for the connected properties will be met by this buffer storage.

The waste heat from the NEUMOT will serve as a return flow boost during the heating season.

The waste heat from the NEUMOT will heat the service water outside of the heating season.

## 3. NEUMOT GENERAL TECHNICAL DATA

Total thermal power:	300 kW
Useable output for the heat consumer:	approx. 220 kW
Generated electrical output:	60 kW



Download : <http://www.vep.at/assets/downloads/Project-description-CHP-plant-150-kW-with-NEUMOT-steam-engine.pdf>



EN ISO 9001, EN ISO 14001, SCC\*\*  
Zertifikate Nr. 20 100 82003614, 20 104 8205, 20 106 82003729  
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## 4. FUEL WOOD CHIPS

Water content:	up to W 40
Fuel size:	wood chips G 30 – G 50
Bulk density:	S 150 to S 250
Ash content:	A 1 – A 5

## 5. BIOMASS COMBUSTION PLANT

The plant is equipped with a discharge system: A partial mass flow of the fuel from the discharge system is transported to the NEUMOT using a conveying screw from where it will be pushed with the help of a stoker screw into the firing chamber. The proportioning of fuel mass flow follows continually. The combustion air quantity is adjusted with a rotation speed control to the combustion air fans, the firing chamber temperature, the remaining oxygen in the flue gas und further combustion chamber parameters.

- **Discharge screw**

The fuel is transported from the fuel bunker to the boiler house via a discharge screw with a drive motor (with a partially covered hutch). Two sprinklers with temperature sensors are fitted at the insertion screw in the boiler house which can open and flood the screw if overheated.

- **Cascade with fire gate**

Fuel is fed from the discharge screw to the insertion screw via a cascade with a built in fire gate and overflow indicator. In the event of a power cut the fire gate is brought into the safety position by a spring brake.

- **Boiler insertion screw (Stoker screw)**

The insertion screw consists of a simple stoker screw with a drive motor. The screw is easily replaced and is fitted with an overload safety device. The stoker screw runs idle after each insertion.



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## 6. NEUMOT OPERATING PRINCIPLE

- This steam motor works on the novel displacement principle that functions solely with rotating masses.
- The motor is completely encapsulated and transfers its driving torque via a permanent magnetic clutch.
- The steam motor drives an asynchronous generator which is fed into an existing network. Separate excitation will occur through this network. In the event of power failure the steam motor will be brought to a standstill by a substitute brake and the heating will be lowered to zero.
- The network will be separated from the motor in the event of a control breakdown and the steam motor brought to a standstill. The inserted step grate burner has been designed so that should the fans fail then no heat will be transferred to the steam producer. As a result, an impermissible increase of pressure as well as the overheating of the boiler walls can be ruled out.
- Waste steam (0.8 bar abs.) will be condensed on many levels (2-levels) by a steam jet condenser and heated to max. 450° C and fed to motor at the appropriate steam expansion phases. The pressure increase is approx. 5 bar. Therefore a max. of 10 bar at the highest level.
- The remaining waste steam will be condensed and fed to the boilers (2 boilers) with a joint feed water pump. The boiler produces a max. 32 bar of saturated steam and each serve a motive steam jet of the aforementioned steam jet condenser.
- By special design of the steam generator (natural circulating water pipe boiler each with an integrated economizer), the criteria can be met for the group 1 boiler class according to the law for the creation and implementation of steam boiler facilities for which no operational staff are required.
- The overheating coiled pipes are integrated in the irradiative part.
- The boiler capacities are adjusted and defined by the boiler pressure and the motive steam jets.



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## 7. STEAM GENERATOR GENERAL TECHNICAL

### Steam boiler:

Pressure: max. 32 bar  
Temperature: max. 250° C

### Super heater:

Pressure: max. 10 bar  
Temperature: max. 450° C

### Finish:

Standing water pipe heat exchangers are brick lined at the irradiative part. Two smoke collectors are equipped with a smoke tube coupling flange and a plaster cover.

The boiler material is steel.

The boiler is completely insulated against emissions with mineral wool and in a coated covering.

The boiler is designed according to the " law for creation and implementation of steam boiler (ABV), Steam boiler category 1".

### Legal foundations:

- Law for inspection of pressure equipment (DGÜW-V)
- Law for creation and implementation of steam boiler (ABV)
- Law for Steam boiler implementation (DKBG)

Our approval certificates made by the TÜV Austria GmbH, relating to legal regulations of ABV,DGÜW-V,DKBG are visible on request for any interested person.

Boiler capacity – heat: 300 kW  
Fuel water content: max. 40 %  
Environment temperature: 25°C  
Boiler entry temperature: 900° C  
Emissions temperature: <180° C





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## 8. FURNACE BOX

### **Finish:**

Burning of the above mentioned fuels will occur on an adjustable grate made from heat resistant, non flammable bricks of cast chrome-vanadium-steel.

The primary air supply occurs via a rotation speed controlled centrifugal fan, whereby the air supply in the grate is located between the cast segments. The mass flow of the primary air supply can be regulated via a motor valve which closes when the boiler is at a standstill.

The secondary air supply also enters the combustion chamber via a rotation speed controlled fan. Distribution of the secondary air occurs through steel pipes laid in the brickwork. The air supply is taken directly from the combustion chamber to the post-combustion area.

The dimensioning of the combustion chamber and the post-combustion area takes place with regard to a sufficient retention time of the yet unburned material in the hot chamber. The combustion chamber temperature is continually monitored, recorded and displayed on the control box.

The combustion air exhaust takes place in the boiler house.

### **Fire proof material:**

Fire proof material in layered construction made of fireclay A40H and M60H will be used for the fuel bed. In behind is high temperature insulation of insulating concrete ISO 25 and 100m mineral wool insulation.

### **Automatic ash removal:**

Ash is automatically removed from the combustion area by an ash screw into a side mounted container (approx. 100l).

The ash from the fuel bed and the multi cyclone will be collected in separate metal containers with wheels. The containers can be rolled out of the building and transported away by the appropriate vehicle.



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## 9. FLUE GAS CLEANING

Dust can be kept below the permissible emission levels through flue gas cleaning.

A cyclone separator will be used for the power-heat-coupling system.

Dust levels: < 150 mg/m<sup>3</sup>

Electrolytic filter will be used if lower limits are required.

## 10. CONTROL AND ADJUSTMENT CONTROL

- The distribution system will be wired according to the ÖVE. All entry and exit points clamped. All specifications comply with the current ÖVE.
- The entire control and adjustment control is housed in steel plate cabinets in the boiler room. Flexible, oil free wiring to peripheral equipment will be used. Where a higher temperature is expected, then siliconised coatings will be used.
- Each motor is fitted with an automatic safety motor protection relay and protected against phase failure. A signal contact will close should an over-current or short circuit occur. The 400V circuit can be switched off with a circuit breaker.
- A 24/12 V power supply is installed to supply the control panel, sensors and end switch.
- Construction of the organic matter combustion adjustment and the boiler adjustment: Adjustment occurs via an SPS control integrated in the switch cabinet. The working parameter, hours and eventual fault notifications are visible on the cabinet display panel.
- The electrical control equipment complies with EU regulations 73/23/EWG and is therefore permitted and compelled as result of the 1995 low voltage order to display the CE symbol.





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## 11. CONTROL FUNCTION

- The control takes over the regulation of the fuel – transport – primary – secondary air – emission fans and ash removal.
- The levels of each boiler are regulated independently from each other.
- The combustion output is controlled by the (highest) boiler pressure.
- The sensor signals, control parameters and their plausibility are continually monitored.
- Equally, a fault text is produced and the equipment will automatically shut down.
- The control tells apart the pre-heating, working and shut down phases.
- The amount of fuel is continually suited to the requirements via the boiler control program. The fuel mass flow is continually regulated to between 25% and 100% of the power output. Thereby balancing out the various fuel qualities.
- The combustion air mass flow is continually suited to 25% to 100% of the fuel mass flow. This occurs so that the residual oxygen concentration in the flue gas is controlled with regard to minimal toxic concentration in a specific equipment and fuel dependent value. In order to implement this control, various combustion fans are equipped with frequency formers and the residual oxygen in the flue gas is collected in an O<sup>2</sup>-Sonde.
- The low pressure in the combustion chamber is kept constant by the flue gas fan rotation speed control and is continually recorded. The flue gas fan is fitted with a frequency former.

## 12. CHIMNEY

The chimney is built as a dual walled stainless steel chimney system. Consisting of an inner pipe – Nr 1.4404, s = 0.5 mm, with d 250 – 300 mm. Mineral fibrous insulating layer and an outer pipe made of stainless steel - Nr. 1.4301, s = 0.6 mm. The chimney is equipped for a thermal permanent load of 400°C which will withstand up to 1000°C.

Unit: 300 kW  
Chimney height: approx. 8 m from base point



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## 13. EMPLOYEE PROTECTION

No employees will be permanently employed at the district heating plant as the plant runs fully automatically.  
All minor service, control, maintenance and repair work will be carried out by trained staff from VEP Fördertechnik GmbH.

## 14. FIRE PRECAUTIONS

Fire precautions according to the "Technical guidelines for preventative fire precaution TRVB H 118".  
The boiler room is designed as an individual fire area and is separated from the adjoining containers by a fireproof wall (F90).  
Optional free-standing container with distance limits.

- **Automatic extinguishing system (SLE)**

A sprinkler system at the insertion screw is planned which will initiate upon high temperature in the insertion channel.

- **Extinguishers**

Portable fire extinguishers according to the technical guidelines for preventative fire protection (TRVB) F 124/7 are planned for initial extinguishing.

- **Flame observation in the combustion chamber**

Flame observation in the combustion chamber will be provided by a flame temperature sensor and the boiler control.  
The equipment will shut down if the combustion parameters are exceeded or not met.

If the thermo elements are faulty then the control registers the maximum temperature which again results in a failure notification.

- **Pressure observation in the combustion chamber**

Low pressure in the combustion chamber is continually measured and kept to a constant value. if the specified value is not regulated then the equipment will shut down. The fault will be stored on the adjustment panel and logged.



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## 15. QUANTITY OF ASH

A total quantity of approximately 3 tonnes of ash is to be expected over the course of each year when the system is working at full power. Where suitable the ash can be used as fertilizer.

## 16. EMISSION LEVELS

Wood combustion facility (13% O<sub>2</sub>, 0°C 1013 kPa)  
The emission levels will be fixed following the "Law for combustion plants BGBL 331, 1997".

**Levels (guaranteed by rated output – a partial load operation is not intended):**

**Dust:**

150 mg/ Nm<sup>3</sup>, 13 % O<sub>2</sub>

**Total of unburned, organic, gas formed hydrocarbons:**

20 mg/ Nm<sup>3</sup>, 13 % O<sub>2</sub>

**Carbon monoxide:**

250 mg/ Nm<sup>3</sup>, 13 % O<sub>2</sub>

**Nitrogen oxide (NO<sub>x</sub>) given as nitrogen dioxide (N O<sub>2</sub>):**

250 mg/ Nm<sup>3</sup>, 13 % O<sub>2</sub>

**Flue gas temperature:**

180 °C



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## 17. THE CHP-PLANT IS MADE OF THE FOLLOWING COMPONENTS:

### Pos. 01

#### 1 Cascade distance with stoker screw

Length: ca. 1.200 mm

canal size: 250 x 250 mm

screwØ: 200 mm

#### Complete with:

- External servomotor
- Tested fire damper with shaft
- Contact thermostat incl. mounting
- Light beams for level control
- Burner screw with Kanal
- Torque support for burner and discharge screw

### Pos. 02

#### 1 Push grate burner as furnace chamber – SRB 5

- Special grate with hydraulically operated section movement
- Fitted hydraulic units with required switching component
- Combustion air for primarily and secondary air supply incl. butterfly valves
- Fuel niveau button for overfill protection
- Connection for furnace supply screw and ash discharge
- Height adjustable supports
- Thermal capacity: 200-350 kW





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## Pos. 03

### 1 Automatic ash removal

#### Complete with:

- Burner connection flange with collection pan
- Control
- Double screw shafts with flanged housing units with fitted ashtray
- 2 screw drives over gear motor
- Discharging screw with fitted ash box

## Pos. 04

### 1 Steam generator

- Once- through steam generator for the operation of thermal engine: Boiler material steel, produced according to the regulation for steam boiler implementation (DKBG) and the regulation for creation and implementation of steam boiler (ABV)
- **The steam generator generally consists of:**
  - Economizer
  - Evaporator
  - Super heater
- The pressure equipments accord to regulation for creation and implementation of steam boiler (ABV) category 1.
- Is laid out for operation/supply of 2 Neumot-electricity generators (2 x 30 kW) and for hot water heating supply. (using a plate heat exchanger)
- All necessary fittings for the operation and the operational control are included.
- **Note:**

The boiler is only suitable for operation as per our specifications prepared water.





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Max. steam temperature: 450°C  
Max. operating pressure: 32 bar  
Generated steam power: 300 kW ≈ 400 kg/h

Incl. boiler positing system or automatic cleaning process-driven using automatic jogging process

## Pos. 05

### 2 NEUMOT steam engines

#### Consisting of:

- > 2 Neumot axial steam piston engines designed for driving an asynchronous motor with electrical power of each 30 kW.  
Steam supply lines  
Stop valves required for the safe operation
- > Valves required for operation

## Pos. 06 - option

### 1 Chimney system

Stainless steel chimney Ø 250 - 300 mm, total height ≈ 6m

#### Consisting of:

- > Chimney stand
- > Normal pipe including the connecting pipe
- > Plaster
- > Muzzle end



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## Pos. 07

### 1 VEP- High-performance cyclone

- Rated power: 350 kW
- Exhaust gas volume: 1000 m<sup>3</sup> Nm<sup>3</sup> (10% CO<sub>2</sub> und N 70%)
- Capacity: 2.200 m<sup>3</sup>/h with max. 300°C
- Speed: 1.500 U/min
- P= 1,5 kW

#### Complete with:

- Exhaust fan: multicellular dust extractor that consists of several parallel connected axial cyclones
- The dust separator is well insulated with rock wool and a sheet jacket.
- The raw gas is evenly distributed between the cyclones and is set in rotation in the swirl devices of the depositions pipe.
- The cleaned flue gases are passed through the exhaust fan into the clean gas hood and to the chimney.

## Pos. 08 a

### 1 Control

Completely wired power controlled control cabinet for automatic biomass combustion together with control NEUMOT;

#### Complete with:

- Power protection for:  
burner screws, discharge screws, hydraulic, air fan, fire grate and ash removal drive;
- Control of hydraulic system, silo discharge, in-between screws and cross conveyor above light barrier, power control;
- Temperature limit safety thermostat;



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- Automatic speed control of primary and secondary air fan with flue gas (oxygen sensor).
- Speed control of the exhaust blower with vacuum unit and automatic ignition with hot air blower.
- Control cabinet built and tested according to ÖVE/VDE-guidelines.

## Pos. 08 b

### 1 Control unit for connecting and integration NEUMOT

#### Consisting of:

- > **Control unit**
  - Protection class IP54
  - Product Sarel incl. pedestal
- > **Power feedback unit**
  - Product Vacon
  - Voltage 400 Volt
  - Current 60 Ampere
- > **Material for the production of a functional cabinet for power feedback:**
  - Busbars
  - Fuses
  - Terminals for high power and control signals
  - Cable channels
  - Wiring
  - Power cable for input on site

## Pos. 09

### 1 Piping and wiring

- > Full steam piping  
steam generator – Neumot – steam generator
- > Complete flue gas piping  
burner – multi cyclon – chimney
- > Complete wiring of all sensors and motors in the cabinet





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## Pos. 10 - option

### 1 Visualization

#### Consisting of:

- PC (including all necessary components for operation)
- Flat screen 17"
- Inkjet
- Software for process visualization
- Profibus – data cable for connecting SPS - PC

