



**E.ON Energy from Waste**

**Hannover**

Modern technology meets flexible performance

***e.on***



## New energy from waste

Waste is a valuable raw material. The E.ON Energy from Waste plants process the energy potential contained in waste and generate environment-friendly power, district heating and process steam from it. Waste incineration is therefore not only an integral element of a modern and sustainable solid waste management, but at the same time an important component part of a balanced energy mix.

E.ON Energy from Waste develops, builds and operates waste incineration plants on a high technical and ecological level. With trendsetting, state-of-the-art technology we make a significant contribution to the protection of the environment and the climate.

### Understand the potential

The German Technical Regulations on Solid Municipal Waste (TASi) came into effect on 1 June 2005 after a 12-year transition period - a profound break in the field of solid waste management. TASi regulates that no untreated waste may be deposited on landfills any more. Against this background thermal waste treatment has proven itself as a cost-effective and environment-friendly solution at the same time.

### Recognise the potential

E.ON Energy from Waste stands for the generation of energy from waste as the fuel. Within the E.ON Energie AG all technical and operational know-how in the field of waste incineration is concentrated with us. Incineration capacities of more than 3 million tons of waste per year and dynamic synergies in a large network of plants makes us the market leader in Germany. The plants in our group of companies generate about 1.5 billion kilowatt hours of power and supplies more than a billion kilowatt hours of district heating.

### Manage the potential

We follow a visionary and simultaneously highly flexible marketing strategy that optimally serves all the plants in the group of companies. It comprises both waste acquisition and exact, proactive quantity planning and intelligent directing of the various material flow patterns. For our longstanding partnerships this ensures the highest level of reliable and safe waste disposal. By further upgrading/expanding our projects, the central management of material flow patterns increasingly gains in importance.

### Exploit the potential

The plant that came into operation in 2005 disposes of the residual waste of the Hildesheim administrative district, the state capital Hannover and partial quantities from the Celle waste disposal association. The plant has an incineration capacity of a total of 280,000 tons annually. Through its connection to three federal motorways our site in Hannover-Lahe provides for easy-access delivery. This way we avoid trips through residential areas for the transportation of waste materials.

# Efficient energy from waste

Thermal waste treatment holds tremendous benefits: **1.** Residual waste, which cannot be separated and salvaged as materials any more, is safely disposed of. **2.** Waste incineration reduces its volume by about 90% - the rest consists basically of reusable metals and slag that can be prepared as building material. **3.** E.ON Energy from Waste Hannover generates clean energy from waste. **4.** At the same time the plant extracts almost all substances harmful to the economic cycle.

## A strong team

All the E.ON Energy from Waste incineration plants consist of three sophisticated components: Thermal waste treatment, energy generation and flue gas purification. The optimal interplay between these areas in uninterrupted operation is guaranteed by our employees with a high level of technical expertise.

## The route of the waste

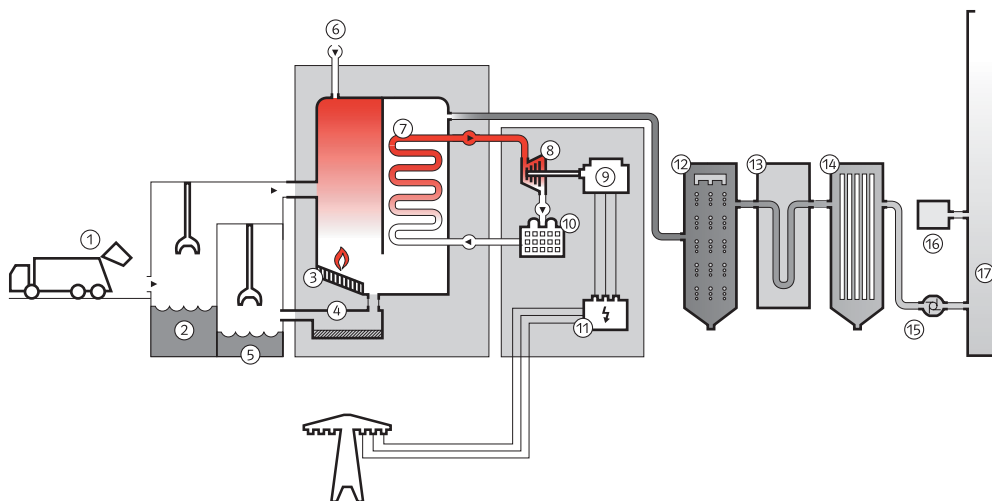
The delivery of the residual waste is the first step in the complete process. At the Hannover site about 1000 tons of waste is handled daily - from the adjacent mechanical-biological treatment plant (MBT) and from external sources. The waste bunker takes about 10,000 m<sup>3</sup> of residual waste, which ensures six days operation at full capacity. Because the air needed for the incineration is suctioned from the bunker, it is subject to constant negative pressure. This ensures that no odours escape.

The waste is also treated and prepared in the bunker for later incineration. With the aid of two crane grippers the delivered waste is mixed into a homogenous fuel in order to achieve a consistent as possible heating value - an indispensable requirement for consistent incineration at very different fractions such as solid waste from the MBT and normal household waste. In the furnace the continuous use of residual waste with a heating value of 8,000 to 18,000 kilojoules per kilogram is possible. A crane gripper grabs up to five tons residual waste, which is fed onto the fire grates of both incineration lines via a feeding hopper.



## Waste incineration plant Hannover

### Technical equipment overview of the stations



█ Steam cycle  
█ Flue gases

1 Delivery  
 2 Waste bunker  
 3 Incineration grate  
 4 Wet deslagger  
 5 Slag bunker  
 6 Ammonia water

7 Boiler  
 8 Turbine  
 9 Generator  
 10 Capacitor  
 11 Transformer  
 12 Spray absorber

13 Continuous flow reactor  
 14 Fabric filters  
 15 Induced draft (ID) fan  
 16 Emissions measurement  
 17 Chimney

### We do something with it

The incineration in the boiler has one objective: to completely destroy the harmful substances in the waste materials. Incineration takes place without the addition of fossil fuels. Oil burners are only used during start-up and shutdown in order to ensure the legally prescribed minimum temperature of 850°C. The waste is fully burnt out after a period of up to 60 minutes.

What remains is slag. This represents a mere 10% of the volume of the original waste material and is a useful final product after treatment and preparation. It is used as a gravel and crushed stone replacement in road-building and civil engineering. Metals are separated and recycled.

### „We blow off steam“

Every hour approximately 118 tons of steam are produced in both boilers by the thermal energy. This powers the shared turbine with downstream generator at a pressure of 40 bar and a temperature of 400°C. This way the Hannover site generates approximately 200,000 megawatt hours electrical energy per year, covering the electricity needs of more than 50,000 households. Per year, the operation of our plant replaces the use of more than 200,000 tons brown coal for power generation. The technical possibility of district heating extraction has already been prepared.

# Clean energy from waste

The modern E.ON Energy from Waste plants are equipped with a highly efficient flue gas purification system, which guarantees values well below the threshold. The emissions threshold values stipulated in the seventeenth German Federal Immission Control Regulation are safely kept.

## **Environmental protection from the start**

To only look at the flue gas purification plant when assessing the environmental sustainability, without taking the preceding process of incineration into account, is not enough. Critical hydrocarbon compounds such as dioxin and furan are destroyed by the prevalent incineration temperatures of more than 850°C. The already optimal operational conditions in the combustion chamber of the boiler impacts the reduction of other emission components such as carbon monoxide (CO) and nitrogen oxide (NO<sub>x</sub>). During denitrification according to the SNCR process, the nitrogen oxide is transformed into the environmentally neutral elements nitrogen and water by adding ammonia water.

## **No pardon for pollutants**

Flue gases leave the boiler with a temperature of approximately 230°C. It is cooled off to 180°C in the spray absorber with a milk of lime suspension, the optimal operating temperature. The substances dissolved in the liquid appear predominantly as salts. Potential, newly formed dioxins and furans as well as heavy metals are removed in the subsequent continuous flow absorber. At first the pollutants are bound with activated carbon and lime hydrate, which are, thinly distributed, injected into the flue gas stream.





### Decisive is what comes out at the end

Together with dust particles, the solids are deposited on the hoses of the fabric filters and again form an adsorbent layer. With compressed air pulses the deposits are removed at regular distances and subsequently safely deposited. The clean gas reaches the 70-metre high chimney through the induced draft (ID) fan and leaves it at a temperature of about 140°C.

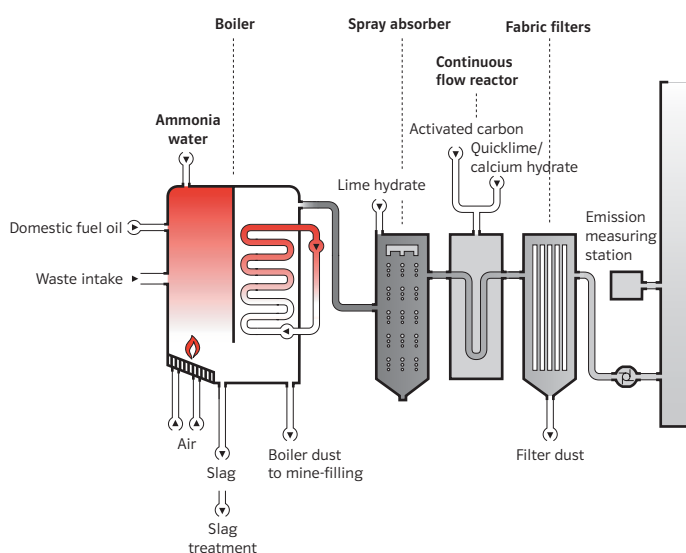
By means of this four-stage flue gas purification plant we demonstrably extract pollutants from the ecosystem. In addition, the Hannover site produces no wastewater. Contaminated water is used in the flue gas purification process via an internal pipeline system, among others. Rainwater is also collected and used as industrial water in the plant. This way fresh water is saved.

### Continuous transparency

Adherence to the strict emission threshold values of the seventeenth German Federal Immission Control Regulation (BImSchV) can be verified by the regulating authorities at any time based on the principle of the „glass chimney“. The emissions are constantly monitored by a measuring station at the chimney. The results are always available to the labour inspectorate in Hannover via a data link, and consequently the general public. In addition we provide information about the current emission values on the Internet and on a display board at the main gate of our factory grounds.

## Waste incineration plant Hannover

### Flue gas purification system



# Environment-friendly energy from waste

We consider waste a renewable raw material and a valuable resource for energy generation; in short, as renewable energy. By using the energy potential of waste E.ON Energy from Waste reduces the dependency on fossil energy sources and avoids emissions affecting the climate. As a waste management company and energy producer we, in the process, accept responsibility for the wellbeing and protection of people and the environment.

## Top-quality energy potential

The use of alternative energy sources such as waste offers the best possible protection of the climate. Residual waste largely exists of material from biological sources and is therefore to be considered a regenerative energy source. Its high energy content is comparable to that of brown coal: on average approximately 11,000 kilojoules per kilogram. The high heating value of the material makes it ideal for use as energy source.

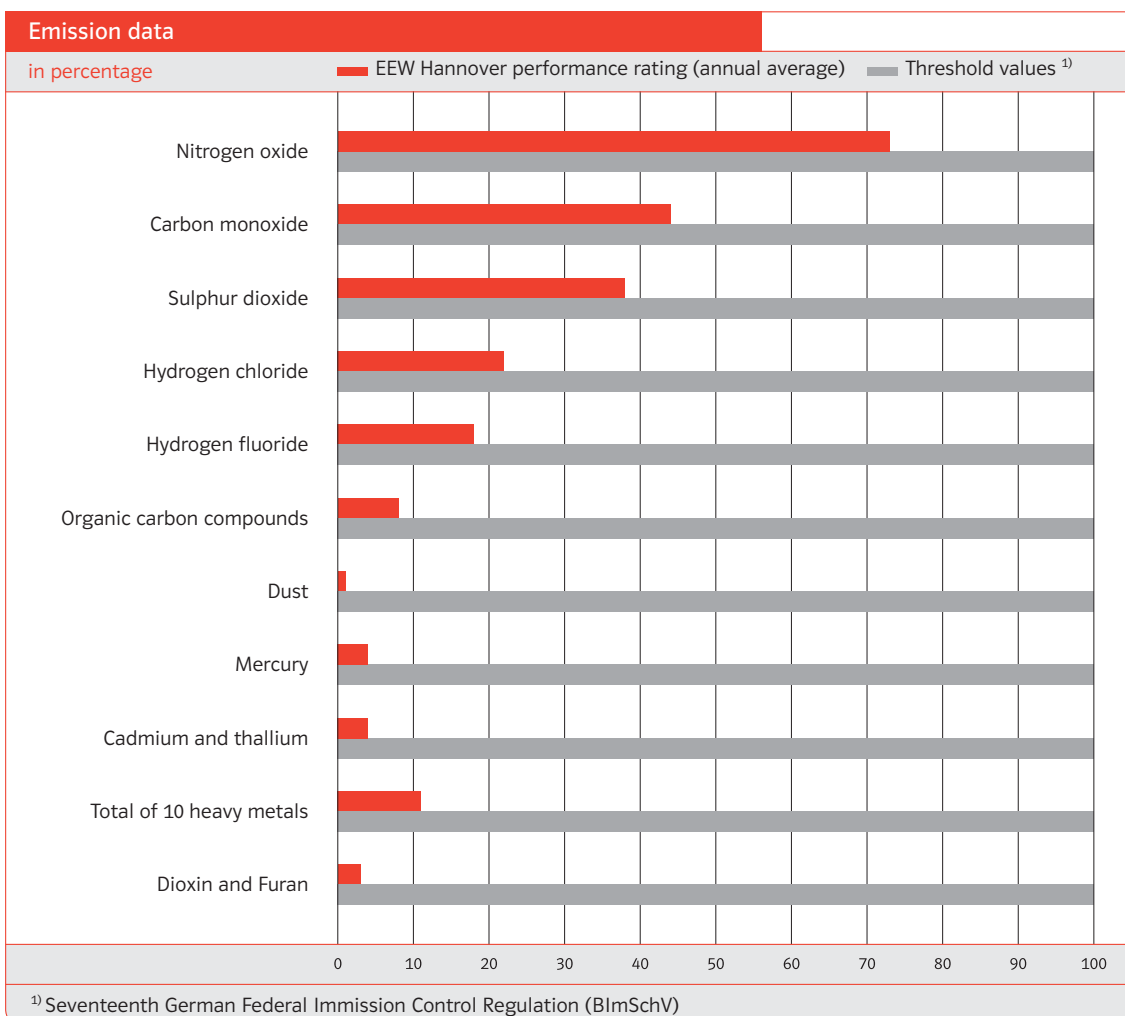
## Meaningful ecological actions

With the seventeenth German Federal Immission Control Regulation (BImSchV) coming into effect in 1990, threshold values were stipulated for German incineration plants, which were among the most stringent worldwide. E.ON Energy from waste put all the required measures in place, which not only comply with the values but falling well below the threshold. Apart from monitoring by the respective regulating authorities as additional controlling body – as well as our display at the main entrance – E.ON Energy from Waste Hannover publishes the current emission values on its own Internet site. To satisfy the need of the general public for information even more, we also offer onsite visits to our facilities in Hannover. With this commitment to transparency we underline the fact that our plants are indeed among the cleanest industrial plants.



### Waste incineration actively protects the environment

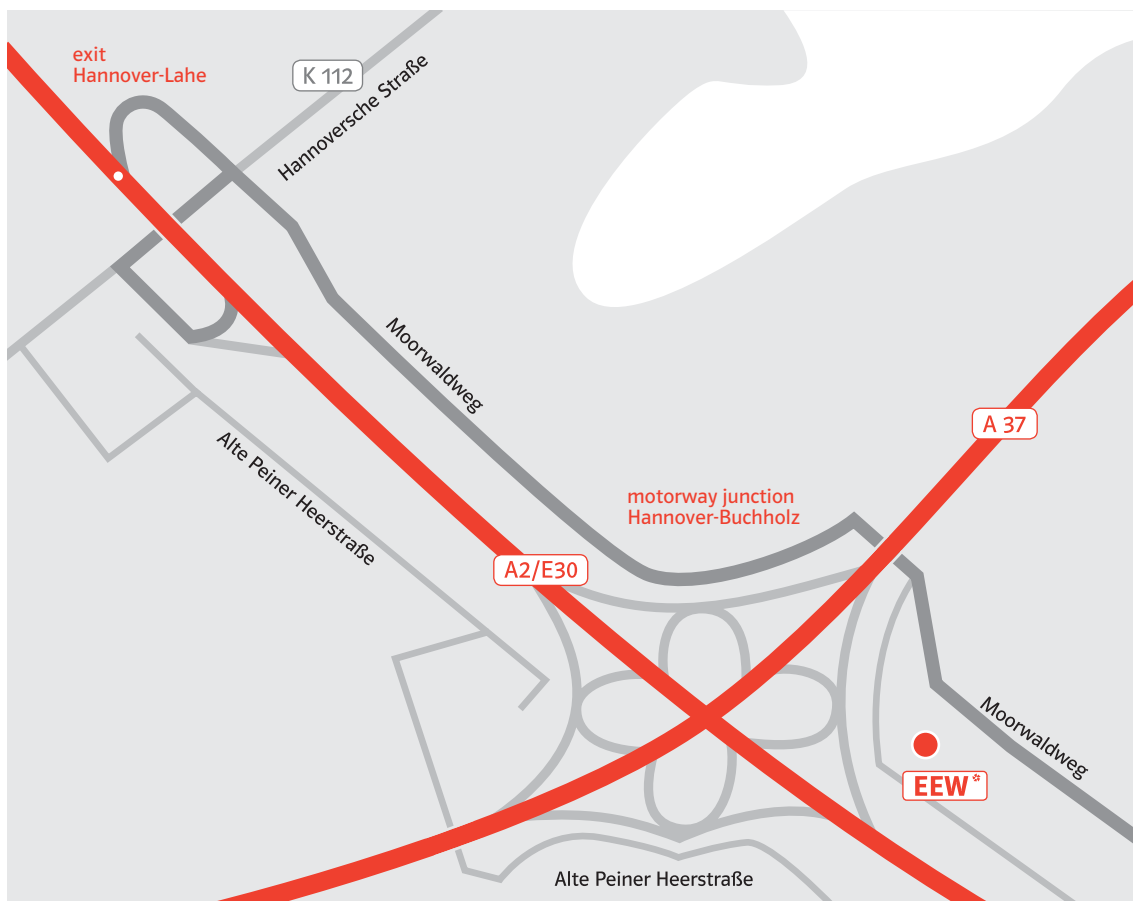
By generating energy through thermal waste treatment, we avoid the emission of carbon dioxide – in Hannover alone this equals more than 60,000 tons of carbon dioxide equivalents per year. Based on the average of 60% bio-generated components in waste, no more carbon dioxide is set free for its share in the burning process as was previously bound during its natural growth. This way the Hannover site actively contributes to environmental protection.





## Energy from waste live

We would be pleased if we have succeeded with this brochure to arouse your curiosity to learn more about us. No problem: You are most welcome to visit E.ON Energy from Waste Hannover as well as any of our other plant locations. Competent guides will explain the plant technology to you answer your questions regarding waste incineration. Please contact us and we will gladly discuss the details with you.





### The most important data at a glance

#### Complete plant

First operation	2005
Total investment	100 Million Euro
Capacity	280.000 tons per year
Number of incineration lines	2
Waste bunker storage volume	10,000 cubic metres

#### Incineration boiler

Heating value range of the waste	8-18 megajoule per kg
Incineration temperature	> 850 °C
Live steam pressure	40 bar
Live steam temperature	400 °C
Live steam quantity per line	58.8 tons per hour
Thermal output per line	52.5 megawatt

#### Energy output

Power generation	27.4 megawatt
District heating (extractable)	30 megawatt

#### Flue gas purification 4-stage/per line

Nitrogen oxide reduction (SNCR)	
Spray dryer/spray absorber	
Continuous flow reactor	
Fabric filters	



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