

Engineering & Competence

Thermal waste utilisation plant Zwentendorf/Dürnrohr



EVN

abfallverwertung nö

Know-how & application

The thermal waste utilisation plant at Zwentendorf/Dürnrohr in Lower Austria is Austria's largest and most advanced facility for waste incineration. At a capacity of more than 500,000 tons per year, it implements a unique concept: environmentally sound waste treatment combined with a method to extract the energy contained in the garbage to generate electricity and heat, and a logistic system to transport the waste and residuals by rail.



Customised logistics by rail

The Zwentendorf/Dürnrohr plant is located in the middle of the state of Lower Austria. From every corner of its territory of 20,000 km² trains transport some 200,000 tons of waste to the plant, along spikes of some 100 km in length. Household and bulk waste from Lower Austria is loaded from garbage trucks onto trains at transshipping points. Next to households, EVN Abfallverwertung NÖ counts several major private waste disposal businesses in every part of Austria among its customers which deliver 90% of their industrial waste by rail.

Since January 2004, EVN Abfallverwertung NÖ has been exploiting the energy trapped in household, bulk and industrial waste in its plant at Zwentendorf/Dürnrohr. A new third line operating along this "waste-to-energy" principle, launched in April 2010, has almost doubled the throughput capacity of the plant. The waste is processed round the clock throughout the year. Total investment: € 270m for a cleaner environment.

The plant design rests on three pillars:

■ **The focus of the design is on achieving the ecologically best possible treatment of waste:** destroying the organic pollutants at incineration temperatures in excess of 1,000°C, concentrated collection and extraction of indestructible pollutants through a modern three-stage flue gas cleaning system and dumping of the residuals at controlled conditions. The result: the pollutants contained in the waste from everyday products are safely and reliably removed from the air and water cycle.

■ **The choice of a site right next to the coal and gas power plant of Dürnrohr** allows using all of the energy contained in the waste to generate electricity,

district heating and process steam for the industry, thus saving on fossil fuels and going light on natural resources. Using the steam from the incinerator saves the caloric power plant 100,000 tons of coal and 10m m³ of natural gas per year. The result: reduced emission rates and thus better air quality throughout the region.

■ **The logistics involved in all this is also a one-of-a-kind system:** In order to ensure that the incoming waste and outgoing residuals are transported with as little harm to the environment as possible, 90% of the deliveries are made by special containers on rail. Trucks are used only to ferry in garbage from the near vicinity. Similarly, almost all the residuals are removed by rail. The result: the method used by EVN Abfallverwertung NÖ avoids additional emissions from road transport, and incidentally saves on some 40,000 truck runs a year.

Transparency and acceptance are key elements of the concept implemented by EVN Abfallverwertung NÖ. Including the population in the planning and implementation process has paid off: at a poll held in 1997, 74% of the citizens voted in favour of constructing the plant.

Environment & accountability

Controlled incineration is the most expedient way of waste management: it reduces the garbage volume to some 10% and destroys the pollutants contained in it. The residuals can be recycled or dumped without any danger to the environment. The energy released by incineration is harnessed to generate energy at the neighbouring Dürnrrohr power plant.

Transparent and open: plant tours for visitors

EVN Abfallverwertung NÖ wants to show its guests how much garbage they produce and what happens to it. Construction works for the 3rd line included an extension and redesign of the visitors' gallery which is now available for guided tours to all interested parties. Visitors pass through a garbage and fire tunnel, get a good view of the waste bunker and boiler house and watch films on the construction and engineering of the plant.

Every one of us produces some 450 kg of garbage a year. Even after painstaking recovery and recycling, 180 kg of this are left over as residual and bulk waste. Dumped on landfills in the past, such untreated refuse is an ecological time bomb – it lays to waste valuable land, its pollutants contaminate the soil, air and groundwater. Rehabilitating dumps comes at a high cost. Consequently, the Austrian Landfill Ordinance has banned the dumping of untreated waste on landfills since 2004.

The chief purpose of a waste incinerator is to destroy the pollutants contained in the garbage. Nevertheless, waste has the calorific value of lignite – a kilogram of waste delivers some 10 MJ of energy. What was previously thrown away on waste heaps is now used as a precious source of energy.

A location in the direct vicinity of the Dürnrrohr coal- and gas-fuelled power station offered a great opportunity: the energy contained in the waste allows the Dürnrrohr plant to save 100,000 tons of coal and 10m m³ of natural gas a year. The result: conservation of natural resources, mitigation of the greenhouse effect, improved air quality in the region and a better CO₂ balance. The plant offers an energy potential of 210 MW. The waste delivered to it is used to generate electricity for 170,000 households and district heating for the community of Zwentendorf and for two-thirds of the state capital of St. Pölten. In addition, process steam is supplied to the AGRANA bioethanol plant.

“Waste-to-energy” is the future-proof combination of thermal waste treatment and energy generation. EVN Abfallverwertung NÖ is creating new standards for handling waste in Austria: the waste left over after recycling is incinerated in the state-of-the-art plant with due regard to environmental concerns, thereby generating energy and producing valuable materials such as gypsum and scrap iron. Only about 10% of the original volume remains, in the form of slag that can be dumped on landfills without any risk to the groundwater or is used for road construction.

It goes without saying that emissions to and impacts on the surrounding are subject to end-to-end monitoring. Daily emission rates can be viewed by all interested parties on the homepage of EVN Abfallverwertung NÖ.

Pollutant	Unit	Statutory limits EU Directive	Statutory limits AVV*	Approved values (licence)	Average operating values	Reduction over licence values
NO _x	mg/m ³	400	100	70	50	-29%
Dust	mg/m ³	30	10	8	1	-88%
CO	mg/m ³	100	100	50	20	-60%
SO ₂	mg/m ³	200	50	50	20	-60%
Corganic	mg/m ³	20	10	8	1	-88%
HCl	mg/m ³	60	10	7	<1	-86%
Heavy metals**	mg/m ³	0.5	0.5	0.5	<0.1	-80%
Hg	mg/m ³	0.05	0.05	0.05	<0.01	-80%
HF	mg/m ³	4	0.7	0.3	<0.1	-67%
Cd+Tl	mg/m ³	0.05	0.05	0.02	<0.01	-50%
Dioxins	ng TE/m ³ ***	0.1	0.1	0.1	<0.05	-50%

* Austrian Ordinance Governing the Incineration of Waste

** Total from As, Pb, Cr, Co, Cu, Mn, Ni, Sb, V

*** Nanogram toxicity equivalent

Engineering & function

Operating with state-of-the-art engineering, the thermal waste utilisation plant at Zwentendorf/Dürnrohr provides an ecologically and economically optimised solution to the waste problem. EVN Abfallverwertung NÖ built its three lines in just two years each and now runs Austria's largest and most advanced waste incinerator.

01 WASTE DELIVERY

A unique logistic concept: 90% of the incoming waste and almost all outgoing residuals from incineration are transported by rail in specially designed containers. Only 10% of the refuse is delivered by truck.

02 CONTAINER DISCHARGE

The plant is prepared for all types of delivery: part of the garbage is delivered in rail containers specially developed by EVN which are lifted off the train by an automated crane and transported to the two unloading stations; containers of NÖ BAWU are removed from the train by truck. Each container holds up to 14 tons of waste. Garbage trucks from the near vicinity discharge directly into the bunker. Special air locks and a vacuum in the bunker prevent any noxious smells from escaping. On weekdays, up to 2,000 tons of garbage arrive at the plant, delivered in some 250 containers.

03 WASTE BUNKERS

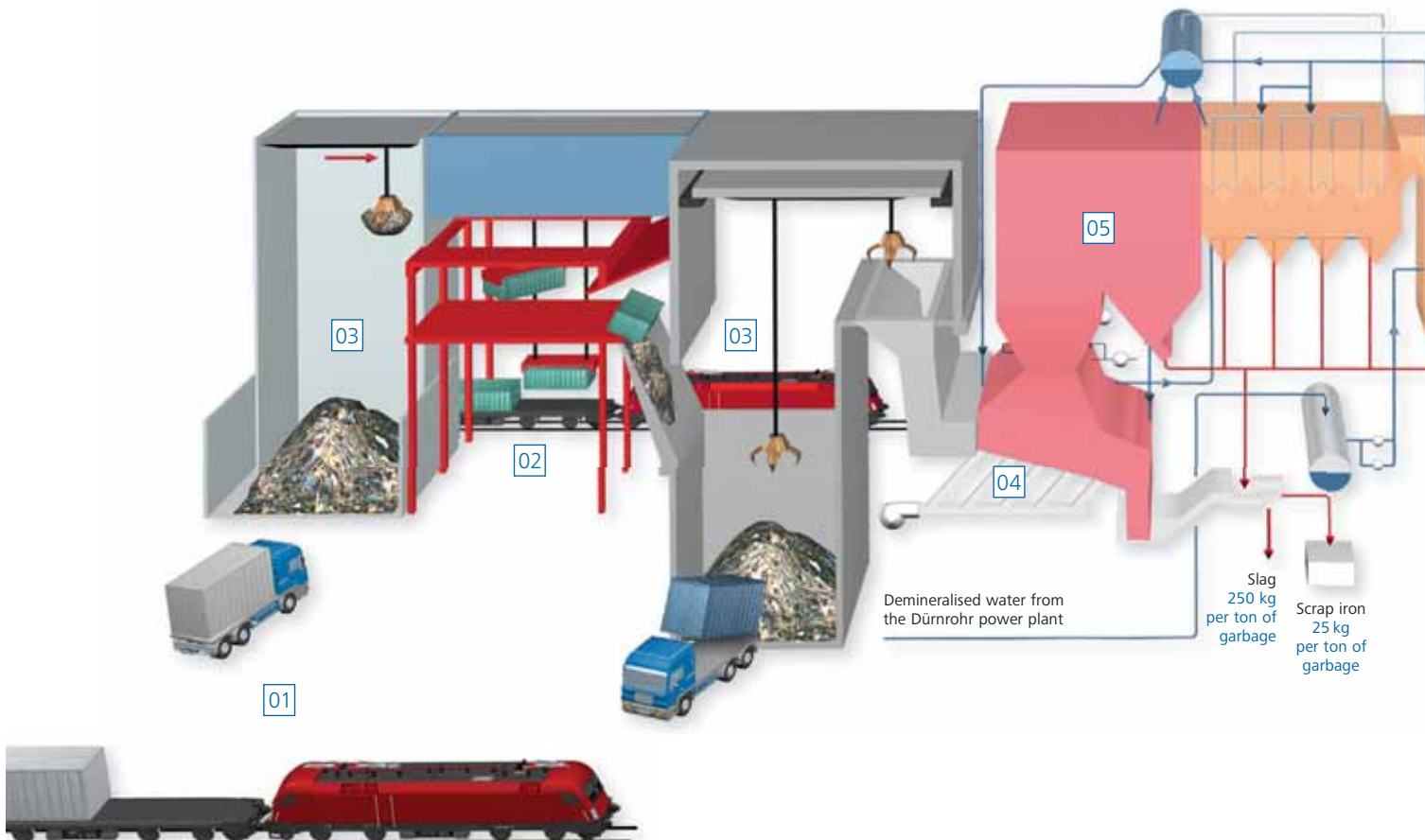
The two waste bunkers together hold up to 40,000 m³ of garbage – room enough for 70 single-family houses. The smaller first-line bunker, necessary for the logistic management of the delivery of over 500,000 tons of waste per year, is connected to the main bunker by a bridge. A crane moves the waste from the first to the main bunker which has a volume of some 30,000 m³. Here the waste is collected, mixed and fed to the grates of the three incineration lines. The main bunker also doubles as a reserve for weekends and holidays when no fresh waste comes in. The three clamshell cranes can each grip up to 10 m³.

04 GRATE FIRING

The grate and boiler are at the core of the plant. The hopper-shaped chute feeds the garbage onto the grate where it is incinerated at over 1,000°C, which suffices to destroy most of the pollut-

ants contained in the waste. The combustible elements are converted into flue gas, the rest is turned into ash and inert, rock-like slag. Natural gas is used only during the start-up phase until the plant has reached its final operating temperature of 850°C, after which the waste will burn on its own.

The grate consists of mobile bars which are set in an overlapping arrangement like roof tiles and which move the garbage slowly across the range until it is fully burned out. The air required for burning is injected from below through the grate bars as well as through the boiler throat above the grate. At a width of 10 metres, the third line was fitted with one of the largest grates available.



05 BOILER

The hot flue gas generated from incineration is put to work to obtain electricity: it flows into the waste heat recovery boiler which has tubing walls welded together gas-tight through which water is constantly circulating. The incoming flue gas gives off its heat to these heating surfaces of some 33,500 m² in size, thereby generating steam at a rate of about 260 tons per hour. The steam is delivered to the adjoining Dürnröhr power station where it is converted into energy. During this process the flue gas cools down to 170°C and is then fed to the three-stage flue gas cleaning system.

06 FABRIC FILTERS

The dry stage involves extracting dust from the flue gas and separating gaseous organic pollutants, such as dioxins and furans, as well as gaseous heavy metals. To this end the flue gas

passes through a fabric filter made of teflon and, if necessary, is additionally brought into contact with activated coke injected in powder form. The coke absorbs the pollutants and is then deposited in the fabric filter together with the dust captured in the flue gas. The collected dust is stored in ash silos and later dumped in landfills. The filter surface extends to some 14,400 m².

07 SCRUBBER

The wet stage starts out with the HCl scrubber (also known as "acid scrubber"), where chlorine and fluorine compounds are extracted from the flue gas, as are soluble heavy metals such as mercury. Next, sulphur dioxide is eliminated

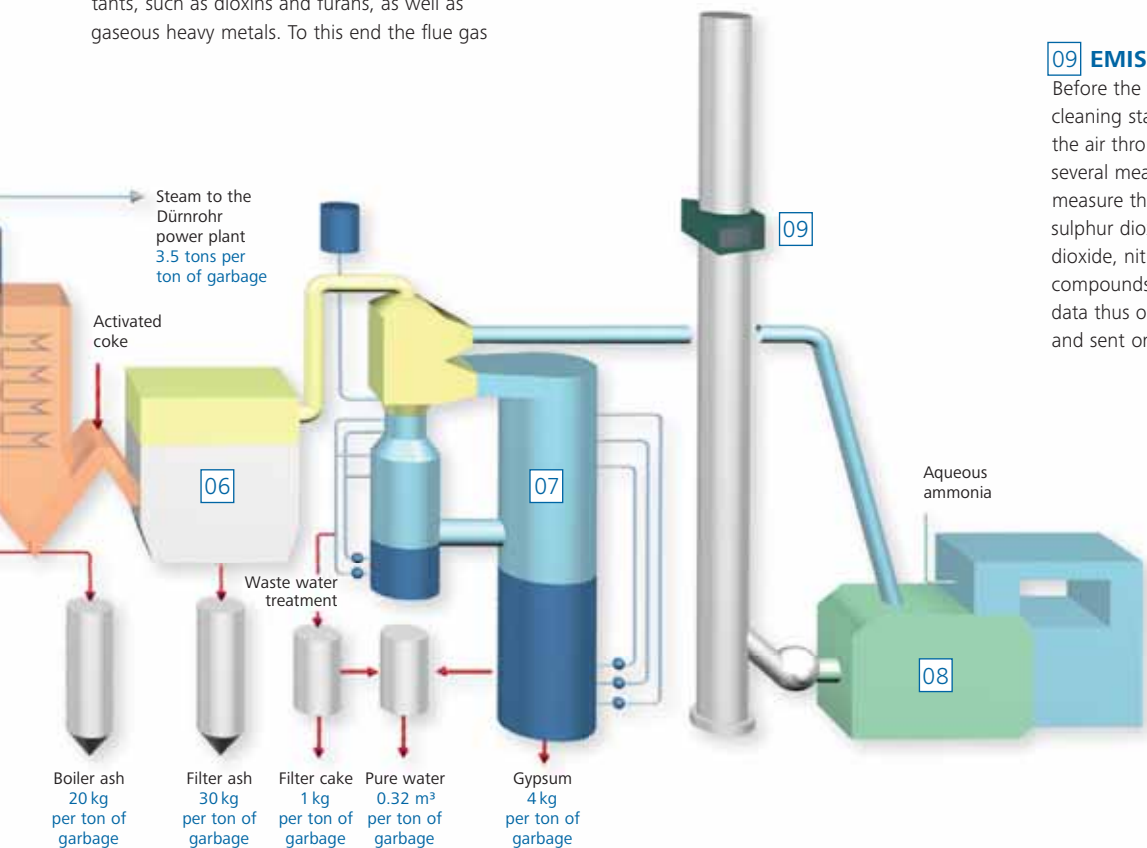
from the flue gas in the SO₂ scrubber ("gypsum scrubber") by the addition of a limestone suspension: the resulting gypsum can be used by the construction industry. The waste water from the wet stage undergoes neutralisation, precipitation and flocculation to be turned into harmless saline solutions and heavy metal slags of low solubility. The latter are dehydrated and solidified for later dumping together with the dust from the fabric filters.

08 DENOX SYSTEM

In a third stage known as DeNO_x or nitrogen oxide reduction, ammonia solution is injected into the flue gas flow, splitting the nitrogen oxide into steam and nitrogen – two normal components of the air we breathe and which can be released without any harm to the environment.

09 EMISSION MEASURING POINT

Before the flue gas, after flowing through three cleaning stations, is actually exhausted into the air through the smokestack, it needs to pass several measuring points which continuously measure the content of dust, hydrogen chloride, sulphur dioxide, carbon monoxide, carbon dioxide, nitrogen oxides, mercury and mercury compounds as well as total organic carbon. The data thus obtained are recorded in their entirety and sent online to the responsible authorities.



One ton of garbage yields 250 kg of inert, rock-like slag, 20 kg of boiler ash and 25 kg of scrap iron. Residuals from flue gas cleaning are 4 kg of gypsum, 30 kg of fabric filter ash and 1 kg of highly concentrated filter cake. The slag and boiler ash are harmless and can be dumped or used in road construction. The filter cake and filter ash undergo special treatment and are dumped. Scrap iron is recycled and gypsum is a valuable raw material for the construction industry.



For information on the thermal waste utilisation plant Zwentendorf/Dürnrohr please contact:

EVN Umweltholding und Betriebs-GmbH

EVN Platz
2344 Maria Enzersdorf, Austria
Felicitas Gruber, Public Relations
T: +43 2236 466 99-13402
F: +43 2236 466 99-14812
felicitas.gruber@evn-umwelt.at
www.evn-umwelt.at

EVN Abfallverwertung Niederösterreich GmbH

AVN Strasse 1
3435 Zwentendorf, Austria
Gernot Alfons, Plant Manager
T: +43 2277 261 21-13405
F: +43 2277 261 21-14813
gernot.alfons@evn-abfallverwertung.at
www.evn-abfallverwertung.at

EVN AG is a leading international listed energy and environmental services company, owned, by a 51% stake, by the State of Lower Austria, the country's largest federal province. On the basis of its state-of-the-art infrastructure, EVN offers its customers in Austria and 18 countries in Central, Eastern and Southeastern Europe electricity, gas, heat, water, waste incineration and related services from a single supplier.

EVN Abfallverwertung Niederösterreich GmbH is a company of the EVN AG Group and part of its environmental segment EVN Umweltholding und Betriebs-GmbH which has acquired a high level of know-how also in the supply of potable water and disposal of waste water that allows it to provide planning, building, financing and operation of waste incinerators implementing the waste-to-energy concept and the requisite transport logistics on a European basis. All its concepts are customised exactly to the needs of its customers and the requirements of the specific location.

The experience obtained in running the Zwentendorf/Dürnrohr plant enabled EVN to participate, in 2004, in a large-scale bidder selection process, which ultimately led to a contract from the City of Moscow to plan, build, finance and operate a thermal waste utilisation plant with an annual throughput of 360,000 tons of waste. The plant has been operating since September 2007. In July 2010, EVN was commissioned to build another plant in the Russian capital designed for an annual throughput of 700,000 tons. Further plants for venues in all of Europe are in their planning stage.

The thermal waste utilisation plant at Zwentendorf/Dürnrohr also serves as a competence centre where the know-how is constantly extended and EVN staff are trained in the specifics of waste incineration.

For more information visit us on the internet at www.evn.at or www.evn-abfallverwertung.at.