AVN_TECHNICAL DATA

THE THERMAL WASTE UTILISATION PLANT **ZWENTENDORF/DÜRNROHR**

avn
An Enterprise of the EVN Group

FACTS AND FIGURES

01_**PLANT**

DIMENSIONS

Total area: 86,000 m²
Built-up area: 7,990 m²
Enclosed space: 51,000 m³
Construction height excepting the smokestack: main components between 15.50 m and 45.20 m
Smokestack: 99.5 m
Construction materials: 50,000 tons of reinforced concrete; 4,000 tons of steel
Fire protection: pool holding 2,000 m³ of water; 3 fire pumps with redundant closed-circuit pipeline
Collection of surface water: reed water treatment plant and humus filter basin

SUPPLIERS

Process engineering: TBU DI Stubenvoll
Design: Planungsarge UV&P, ZWEC Zweifel Engineering und Consulting, TSI, Architekt Fialik, Ingenieurbüro Wagner, Statik DI Kramer
Weighbridge: Batsch
Bulk waste crushing plant: SID
Sewage sludge plant: MUT
Container unloading crane: KÜNZ
Container tilting system: Zaunrith
Garbage crane: Demag
Feeder: ALSTOM
Firing system control: ALSTOM
Grate: ALSTOM
Boiler: ALSTOM
Burner: Elco Klöckner
Slag remover: MUT
Steam generator: ALSTOM
Waste gas cleaning/process: RWE Solutions
Dedusting system: Lühr
Acid scrubber: RWE Solutions
Gypsum scrubber: RWE Solutions
DeNOx system: Integral Umwelttechnik
Waste water treatment system: GWT
ID fan: TLT
Smokestack: Steelcon
Process control: ABB
Field systems: ABB, Endress & Hauser, Yokogawa, Siemens
Controls & instruments: ABB
Emission analysis: ABB
IT/logistics: Berthold
General engineering: Integral
Construction: PORR
Logistics planning: Büro Hoffmann
Central dust collector: Dustcontrol
Electrics: Schmidberger
Fire alarm system: Tyco
Gas extinguishing system: Soltec
Foam extinguishing system and deluge system: Integral
Infrared bunker surveillance: Kaiser
Compressor: Kaeser

02_**DELIVERIES**

WASTE VOLUME (REFERENCE YEAR: 2004)

Waste volume treated: 323,000 tons
Household waste and industrial waste similar to household waste: 292,000 tons
Bulk waste: 5,490 tons
Shredder material (light fraction): 5,450 tons
Sewage sludge: 2,750 tons
Residues from waste paper processing: 16,650 tons
Hospital waste: 840 tons

AUTOMATED CRANE UNLOADING

Crane type: container travelling crane
Crane travelling gear: 2
Carrying capacity: 32 tons
Length of craneway: 104 m
Lift: 19.20 m
Crane gauge: 12.48 m

TRUCK UNLOADING

Vehicle type: twelve-wheel truck
Quantity: 3
Setup: hook, 90° tilting angle

FLUSH-MOUNTED WEIGHBRIDGE

Units: 2
Dimensions: 18 x 3 m (length x width)
Weighing range: 0 – 50 tons

WEIGHING SYSTEM

Fully automated weight registration with local monitors at entrance and exit
Truck and container registration by microwave technology
Automated weighing with truck and crane weighbridges
LAN interface to a central database

03_**WASTE BUNKER**

DELIVERY AND STORAGE

Bunker for solid waste
Volume: 40,000 m³
Useful volume: 25,000 m³
Solid waste tilting points: 5
Sewage sludge tilting points: 1
Waste categories: residual household and bulk waste, industrial waste similar to household waste; sewage sludge
Bulk waste processing: crushing; throughput of 25 tons/hr
Sludge waste processing: distributing plate with upstream separation

GARBAGE CRANE

Type: bridge crane
Units: 2
Carrying capacity: 17 tons
Transfer capacity: 115 tons/hr
Clam volume: 10 m³
Range: 26 m
Lift: 36 m

04_**FIRING**

FURNACE/GRATE FIRING

Lines: 2
Throughput per line: 24 tons/hr
Average calorific value: 10 MJ/kg
Incineration output: 60 MW per line
Furnace temperature: 1,200° C
Waste retention time on the grate: 1 hr
Garbage charging system:
chute and ram feeder
Ram/chute slope: 80°

GRATE

Type: feeder grate
Active grate surface: 94.4 m²
Length: 9.7 m
Width: 7.2 m
Slope: 10°
Water cooling: in part

AIR SUPPLY

Primary air supply:
Primary air is heated to 120° C by LP steam; primary air volume: 100,000 Nm³/hr
Secondary air is fed without prior heating:
Secondary air volume: 30,000 Nm³/hr
Secondary air temperature: 40° C
Injection point: constriction in the first pass

PLANT START-UP AND SHUT-DOWN

Gas burners: 3 per line
Firing performance: 13 MW per burner
Type: fan burner (monobloc)
Fuel consumption for cold-start heating:
6,000 – 8.000 Nm³

STEAM GENERATOR

Type: 5-pass boiler
Heating surface (total): ~8,500 m²
Radiant evaporation heating surfaces: ~2,000 m²
Convective evaporation heating surfaces: ~2,600 m²
Economiser surfaces: ~2,900 m²
Drum content: 7.4 m³ (half filling)
Flue gas temperature upstream of superheater: max. 650° C at the end of the cycle
Feedwater temperature: 130° C
Steam temperature: 380° C
Nominal pressure: 50 bar
Design pressure: 66 bar
Superheated steam volume: 74 tons/hr
Permissible superheated steam volume: 85 tons/hr
Cleaning of heating surfaces:
pneumatic beater and spray dripping system for the economiser

SLAG REMOVER

Type: wet-type slag remover (scraper)
Throughput: 15 tons/hr
Width: 4 m

05_**FLUE GAS CLEANING**

FLUE GAS CLEANING PLANT

Lines: 2
Components per line: 3
Waste gas flow rate per line: max. 150,000 Nm³/hr
Temperature of the raw gas (downstream of the boiler): 170° C
Temperature of the pure gas (upstream of smokestack): 130° C

DRY FLUE GAS CLEANING – FABRIC FILTER

Bag filter

Material: PTFE
Dimensions: 11 x 11 x 9 m (length x width x height)
Filter tubes: 3,840
Dimensions of filter tubes: flat tube 150 x 32 x 2,850 mm (length x width x height)
Filter surface: 4,096 m²
Separation: 1,500 kg/hr
Additives: activated carbon, limestone, hydrated lime

WET FLUE GAS CLEANING

Acid scrubber

Type: parallel flow scrubber
Volume: 144 m³
Absorbent: limestone
Absorbent throughput: up to 180 kg/hr
Flushed-out solvents: up to 4 m³/hr

Gypsum scrubber

Type: counterflow scrubber
Volume: 440 m³
Absorbent: limestone
Absorbent throughput: up to 130 kg/hr
Flushed-out solvents: up to 3 m³/hr

CATALYTIC NITROGEN OXIDE REDUCTION

Gas-gas heater/steam-gas heater

Calorific output: 5,700/2,000 kW

Ammonia water injection

Ammonia water consumption: ~2 kg/ton
Ammonia concentration: 25%

Catalyst

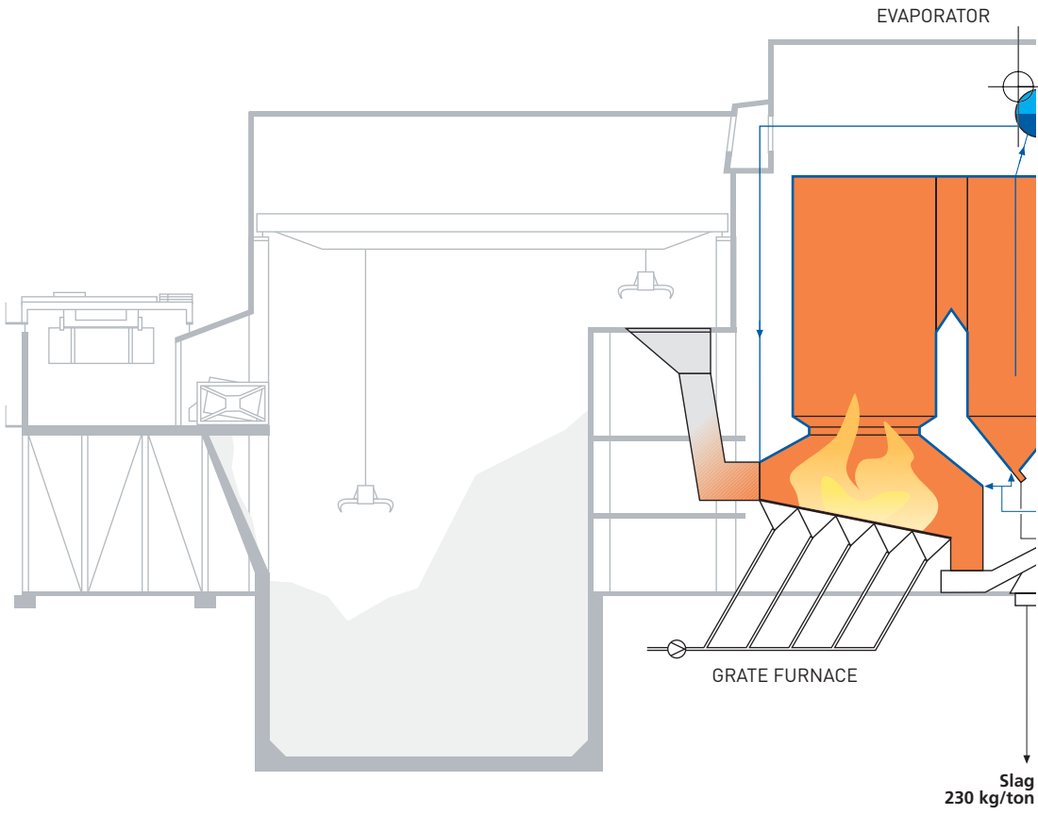
Dimensions: 1.0 x 5.8 x 7.1 m (length x width x height)
Volume: 27 m³
Supporting material: titanium oxide (TiO_2); inclusions of vanadium pentaoxide (V_2O_5), tungsten trioxide (WO_3)
Operating temperature: 230° C

TAIL-END ID FAN UPSTREAM OF THE SMOKESTACK

Units per line: 1
Delivery volume: 184,000 Nm³/hr
Pressure increase: 147 mbar
Speed: 1,490 rpm

SMOKESTACK

Type: steel, double mantle
Height: 99.5 m
Diameter: 2 m



06_ELECTRICS, CONTROLS AND INSTRUMENTS

VOLTAGE LEVELS

Feed: 10 KV
Low voltage: 690 V, 400/230 V
Control voltage: 24 V DC

CONTROLS

ABB Symphonie:
approx. 5,000 in- and outputs
PROFIBUS selection by optical fibre
Fail-safe control: HIMA
Large screen: 6 cubes of 70" each
(back projector, MAUELL)
Programmable logic controllers (SPS):
SIMATIC S7

EMISSION ANALYSIS

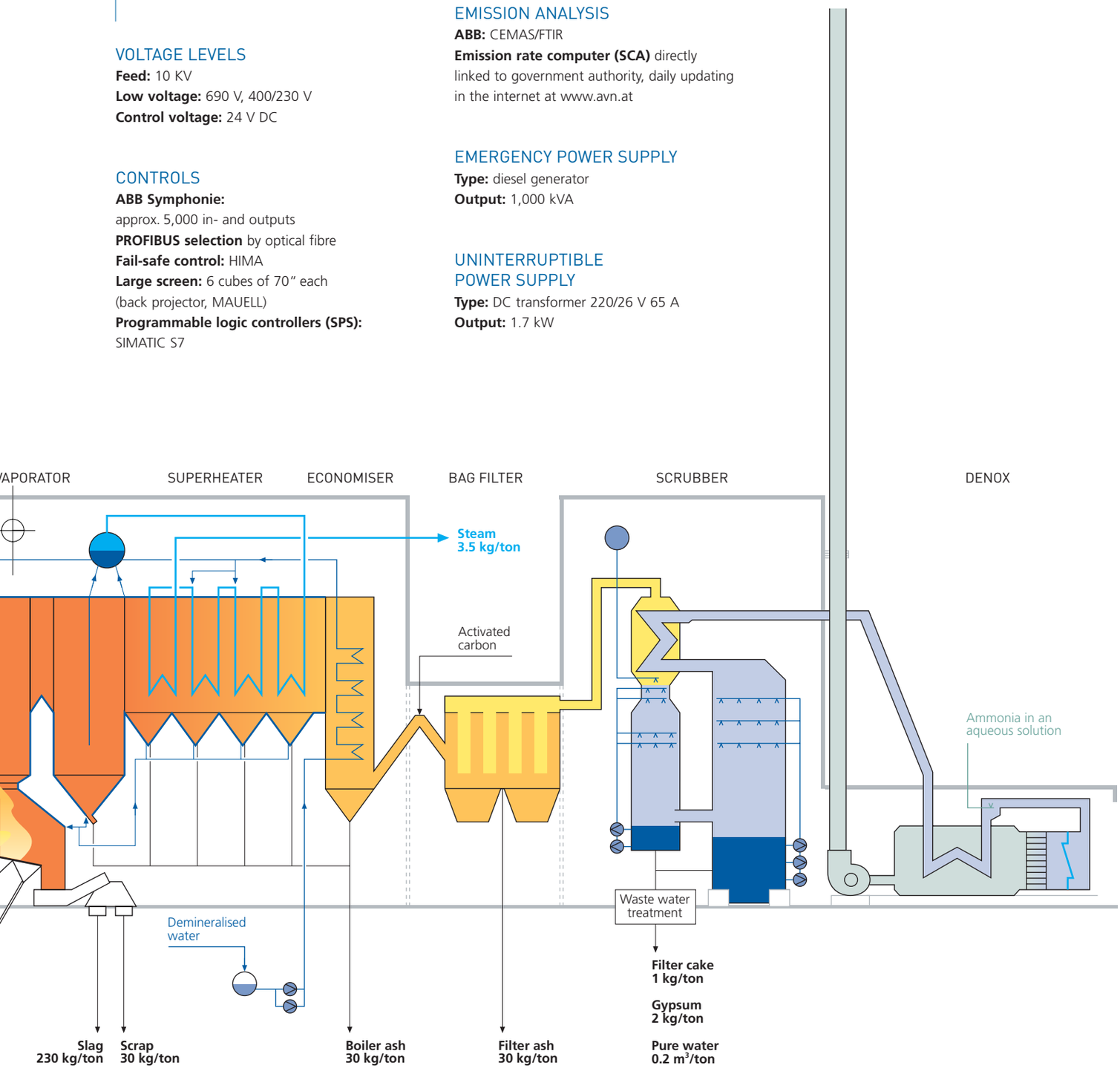
ABB: CEMAS/FTIR
Emission rate computer (SCA) directly linked to government authority, daily updating in the internet at www.avn.at

EMERGENCY POWER SUPPLY

Type: diesel generator
Output: 1,000 kVA

UNINTERRUPTIBLE POWER SUPPLY

Type: DC transformer 220/26 V 65 A
Output: 1.7 kW



TREATMENT AND RECOVERY OF RESIDUES

Slag and boiler ash
Dumped

Filter dust from the bag filters
Dumped in mines or above-ground under controlled conditions following special treatment and immobilisation

Waste water from wet absorption
Treatment in the following phases:
– neutralisation, precipitation, flocculation, sedimentation
– post-treatment: gravel filter, activated carbon filter, heavy metal ion exchanger
– final neutralisation

Residuals from treatment

Gypsum:
Gypsum industry – 2 kg/ton of waste

Treated waste water:
Discharge: 200 litres/ton of waste
Discharged into the Danube through premixing outfall ditches
Max. discharge temperature: 30° C

Neutralisation sludge filter cake:
Dumped in mines (~ 1 kg/ton of waste) or above-ground under controlled conditions following special treatment and immobilisation

COLLECTION OF RESIDUALS

Slag bunker
Dimensions: 20 x 10 x 15 m
(length x width x height)
Slag loading by crane onto rail or truck

Boiler ash silo for interim storage
Volume: 200 m³
Cone: heated
Boiler ash loading onto rail or truck

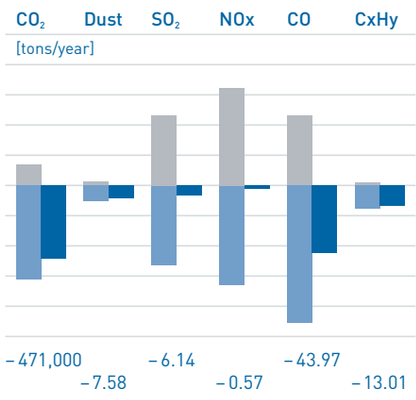
Bag filter ash silo for interim storage
Volume: 200 m³
Cone: heated
Bag filter ash loading onto rail or truck

Filter cake and gypsum container for collection and interim storage
Roller container: 6 x 2.5 x 2.5 m or 1.5 m
(length x width x height)
Loading: truck calls for container

Pollutant	Unit	Statutory limits EU Directive	Statutory limits LRV-K	Approved limits (notification)	Average operating values	Improvement over notification
NOx	mg/m³	400	100	70	50	– 29%
Dust	mg/m³	30	15	8	1	– 88%
CO	mg/m³	100	50	50	20	– 60%
SO_2	mg/m³	200	50	50	20	– 60%
Org. carbon	mg/m³	20	20	8	1	– 88%
HCl	mg/m³	60	10	7	< 1	– 86%
Pb+Zn+Cr	mg/m³	0.5	2	0.5	< 0.1	– 80%
As+Co+Ni	mg/m³	0.5	0.5	0.3	< 0.1	– 67%
Hg	mg/m³	0.05	0.05	0.05	< 0.01	– 80%
HF	mg/m³	4	0.7	0.3	< 0.1	– 67%
Cd	mg/m³	0.05	0.05	0.02	< 0.01	– 50%
Dioxins	ng TE/m³	0.1	0.1	0.1	< 0.05	– 50%

Statutory limits (EU and Austria), values approved for AVN and average operating values: a comparison

Emission reduction by cogeneration



08_**CO-GENERATION**

STEAM OUTPUT

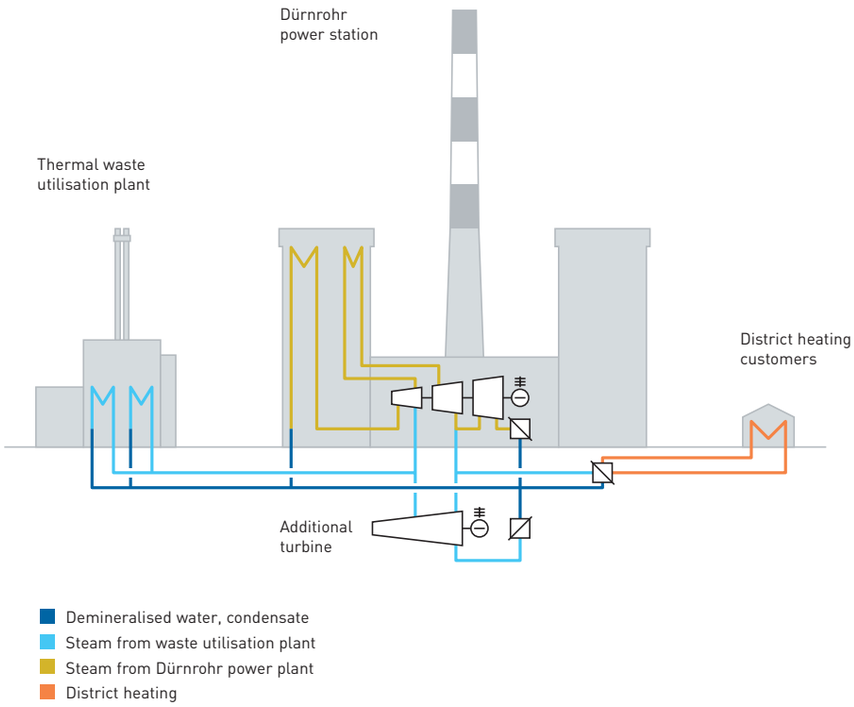
Total production: 150 tons/hr
Steam parameters: 50 bar, 380° C
Output to power plant: 120 tons/hr
Electricity generation: no internal electricity generation – all the steam is delivered to the Dürnrohr power station

Option A: power plant is operational

- Steam from the waste incinerator is fed into the IP steam system upstream of the reheater of the power station. With the waste incinerator operating at a thermal output of 120 MW, an electric efficiency rate of 31.9% can be achieved.
- Savings of hard coal and natural gas amount to approx. 50,000 tons and 1 million cubic metres respectively per year.

Option B: power plant not operational

- The IP steam from the waste incinerator is used to generate electricity in a dedicated condensing turbine. Electric efficiency is 21.2%.
- Steam is extracted from the turbine to supply the LP steam system of the power station and generate district heating.
- This so-called "summer turbine" is placed in the power station's turbine hall.



09_**PROJECT TIMEFRAME**

TIME SCHEDULE

February 1994:
decision by the Lower Austrian Diet
July 1994: formation of AVN
(owners: the State of Lower Austria and EVN at 50% each)
July 1994 – May 1995: feasibility study

June 1995 – April 1997:
search for and choice of location
June 1997: referendum at Zwentendorf, 74% approval
August 1997 – September 2000:
environmental impact analysis

Spring 1998: start of technical planning
31 July 1999: AVN fully owned by EVN
From February 2000: invitation for bids on technical components
5 September 2000: first-instance notification by the Lower Austrian State Government
19 June 2001: second-instance notification by the Environmental Senate at the Federal Ministry for Agriculture, Forestry, Environment and Water Management

July 2001 – December 2002:
construction phase
January 2003 – August 2003:
start-up and commissioning
5 April 2003: incinerator first fired up
September 2003: trial operation and final performance tests

1 January 2004: start of operation

For any questions on the thermal waste utilisation plant at Zwentendorf/Dürnrohr please contact:

EVN Umweltholding und Betriebs-GmbH
EVN Platz
A-2344 Maria Enzersdorf, Austria
Felicitas Gruber, Public Relations
Phone +43-2236-46699-50502
Fax +43-2236-46699-14812
felicitas.gruber@avn.at
www.evn.at
GPS: **E** 16° 18' 46", **N** 48° 05' 42"

AVN Abfallverwertung Niederösterreich Ges.m.b.H.
AVN Strasse 1
A-3435 Zwentendorf, Austria
Gernot Alfons, Plant Manager
Phone +43-2277-26121-50505
Fax +43-2277-26121-14813
gernot.alfons@avn.at
www.avn.at
GPS: **E** 15° 55' 58", **N** 48° 19' 38"

AVN Abfallverwertung Niederösterreich Ges.m.b.H. is a subsidiary of the EVN AG group and part of EVN Umweltholding which comprises water, waste water and all activities encompassing thermal waste utilisation. On a Europe-wide scale, these include planning, developing and operating thermal waste disposal plants and energy recovery systems from garbage, together with the requisite state-of-the-art transport logistics to ensure that waste is handled and utilised for the best possible benefit of the environment. Already back in 1994, EVN formed its first subsidiary active in thermal waste recycling at Zwentendorf/ Dürnrohr. A second plant of its kind was built in Moscow where it operates at a throughput of 360,000 metric tons of waste a year, and several more plants are in the pipeline.

EVN AG is an Austrian utility that offers its customers, mostly in Lower Austria, the largest state of Austria, electricity, gas, heat, water and associated services on the basis of a "one-stop shop" solution underpinned by the most advanced infrastructure. EVN consistently draws on its acquired know-how by diversifying into related business fields, such as thermal waste utilisation, water supply and waste water disposal. As a listed company, EVN works to participate in the dynamic growth perspectives of Central and Eastern Europe. To this end, it acquired majority stakes in two regional electricity utilities in South-eastern Bulgaria, thus contributing to the successful privatisation of the Bulgarian electricity sector, tripling its customer stock to 2.3 million and extending its power grid.

The EVN Group has obtained highly specialised know-how in water and thermal garbage treatment, two sectors which are of key importance for the infrastructure and which offer interesting business prospects in Austria and abroad.

Through its fully-owned subsidiary WTE, EVN operates waste water disposal plants in Zagreb and Moscow that offer state-of-the-art environmental technology, and is currently developing a potable water treatment plant for the City of Moscow. WTE is also involved in over 70 projects for potable and waste water plants in ten European countries, planning, building, financing and operating municipal and industrial water and waste water facilities.

For more information on the EVN Group please consult **www.evn.at**.