Exhaust purification

The exhaust purification comprises several highly-efficient purification stages. The accruing pollutants are effectively converted into air components in accordance with the state-of-the-art or, by adding chemicals such as milk of lime or activated coke, are bound so that their reaction products are carefully isolated. The goal is the certain compliance with the specified emission limits, which are measured at the end of the plant on the stack and then documented. At the same time, not only Federal Republic and thus European limits are maintained but also the reduced limits of the Struktur- und Genehmigungsdirektion Süd *(roughly "South Structure and Approval Management")*.

In detail, the exhaust gas purification facilities comprise the following purification states:

- SNCR plant *(selective non-catalytic reduction)* with injection of aqueous ammonia in the first boiler draft above the furnace to reduce the NOx emissions while developing air components, i.e. nitrogen gas and water vapour
- Spray absorber with admixing of milk of lime over an atomizing wheel for temperature reduction and preseparation of acidic exhaust gas constituents such as SO_2, HCl and HF
- Activated coke proportioning before the fabric filter to bind dioxins/furans, heavy metals and other pollutants
- Fabric filter to separate out dusts
- Preliminary scrubber with injection of scrub water to reduce acidic pollutant components
- Main scrubber with injection of milk of lime to remove the remaining exhaust gas constituents as well as mercury

Running both scrubber stages saturates the exhaust gas with water vapour. For that reason, on the stack mouths a water vapour flag can be seen as a symbol for the »exhaust gas scrubbing«.

Resource protection and efficiency

The delivered wastes predominantly originate in the region of south-west Germany. Also the predominant portion of the residual substances that arise during the incineration process are used as raw materials in the immediate vicinity. As a result, the low transport distances meet the objective for climate protection.

The rainwater and the operational cleaning water are collected and conveyed as process water to the exhaust purification process. That saves valuable ground and surface water.

Perfect utilisation of the energy contained in the waste makes the Mainz WTE one of the most highly efficient waste incinerators in Germany. In 2012, the European Framework Directive on Waste was adopted into German law. It stipulates that waste-to-energy plants with a high degree of energy efficiency must receive recycler status. Struktur- und Genehmigungsdirektion Süd *(roughly "South Structure and Approval Management")* in Neustadt secured the recycler status in accordance with the energy efficiency formula.

Visitors and the public

If you are also interested in having a look at our environmentally friendly waste incineration we would be glad to welcome you. Please call to make arrangements. More information is available in the Internet at www.mhkw-mainz.de

www.mhkw-mainz.de

Entsorgungsgesellschaft Mainz mbH

Waste-to-energy plant Mainz

Disposal security and environmental protection at the highest level

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At the KMW AG site in the Ingelheimer Aue Mainz industrial area, Entsorgungsgesellschaft Mainz mbH *(EGM)* had its WTE plant with two incineration lines *(calorifier and exhaust purification)* erected from June 2001 to November 2003 by the Martin GmbH supplier consortium. Building a third incineration line with the related exhaust purification commissioned in 2008 increased the firing rate by about half again to approximately 340,000 tons per year.

The main condition when looking for a location and for implementing the plant was the consequent integration of the infrastructure of the power plant site with the aim of fully utilising the synergy effects. Part of the steam produced by the WTE is supplied to the adjacent 400-MW gas and steam turbine power plant (*CC power plant)*. Without using additional primary energy, the steam is superheated there to about 550°C for efficient conversion into electrical energy. Another part of the generated steam has been being converted into electrical energy in the extraction condensing turbine (20 MW) erected in 2009.

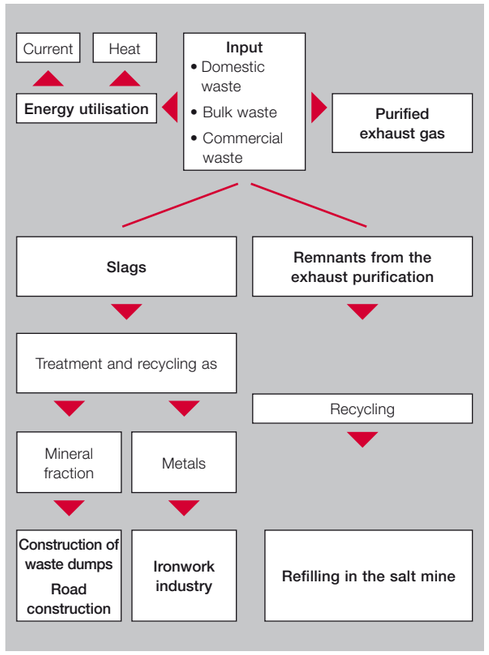
The energy bound in the waste and its utilisation for electricity, process steam and district heating generation make the Mainz WTE a model energy solution. In the last analysis, the calorific value of the supplied wastes lies significantly over the calorific value of, e.g., Rhineland raw lignite – in other words the waste should be considered a fuel.

To secure adequate use of waste as a fuel, EGM has concluded appropriate supply contracts for energy utilisation with KMW AG. The district heating distribution is taken care of by Heizkraftwerk GmbH Mainz.

Waste volume

The operationally necessary plant utilisation is secured by disposal contracts with the City of Mainz to dispose of the wastes from the city area and the Counties of Mainz-Bingen along with the Donnersberg County as well as disposal and utilisation contracts concluded with REMONDIS GmbH. With the Mainz WTE, the disposal security of a region with over 500,000 residents is permanently and reliably guaranteed.

One major advantage of thermal waste treatments is that the waste, depending on its composition during incineration, loses an average of 90% of its volume and approx. 70% of its weight. At the same time, the waste volume that needs to be buried in landfill sites and the pollutants it contains are significantly reduced.
The nearly inert incineration slag that accrues during incineration along with the waste remnants separated during the exhaust purification are put into specifically approved treatment and recycling plants as can be seen in the graphical representation:



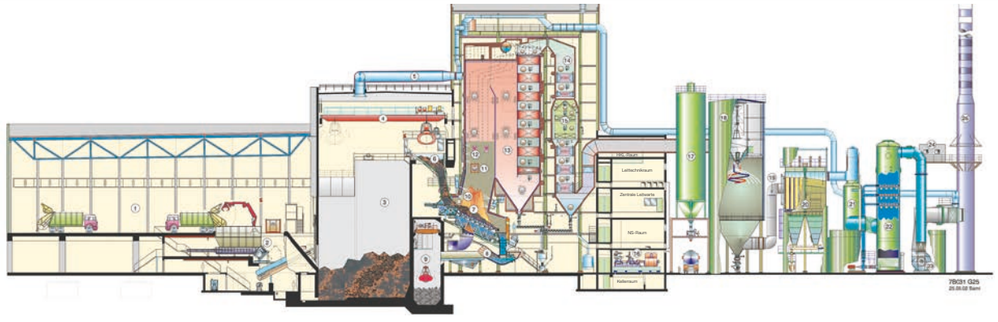
Waste receipt

The waste is delivered to the WTE in waste collection vehicles and electronically registered on the scales. Here a check is made to see if the waste corresponds to the declaration and is approved for incineration in the Mainz WTE. The vehicles unload their wastes in an enclosed unloading bay into the refuse bunker through one of 7 dumping points. The delivered bulk refuse is separately crushed in rotating shears and put into the refuse bunker through a conveyor belt. Biological refuse from separate collection in the City of Mainz is filled through refuse chutes into large compaction bins and brought to recycling. The crane systems installed in both refuse bunkers plus ingenious waste management ensures homogeneous and constant incineration of the remaining waste. Extracting the necessary combustion air from the refuse bunker generates underpressure, preventing the escape of odorous emissions into the unloading bay and the ambient air.

Thermal treatment

The reciprocating grates installed in the Mainz WTE *(MARTIN system)*, which permits flexible reaction to market-related changes in the waste composition, guarantee a high rate of disposal security and cost effectiveness. The feed chutes in the three incineration lines are used to put the residual wastes onto the incineration grates with the aid of ram feeders. To start-up each incineration line, gas burners are used that preheat the combustion chamber to the required minimum incineration temperature of 850°C. Since the waste has a high calorific value and combusts independently, no additional primary energy needs to be supplied after the gas burner is shut-down. The combustion air needed to incinerate the wastes is extracted from the waste bunker, preheated through heat exchangers and blown into the fire chamber. The incineration temperature is higher than 1,000°C. The energy released during incineration is bound into the water-steam circuit in the 4-draught vertical boiler. That ensures that the delivery commitments for energy utilisation can be met. The electricity fed into the 110-kV grid corresponds to the electrical demand of more than 60,000 households.
A partial quantity of the generated steam covers the house load of all heat and electricity consumers in the plant. The remaining incineration wastes that are still left over after an approx. one-hour dwell time on the incineration grates are sent through a wet ash extractor into the slag bunker. The remaining slag is externally treated in a treatment plant in several process steps. That separates the metallic portions from the mineral fraction. Iron waste and non-ferrous metals are recycled in the ironwork industry and the mineral fraction is used in depot and road construction as a substitute material for new products. Consequently, even the incineration slag is conveyed to substance recycling.

The plant schematic shows the technical individual components of the plant.



Martin®ROST

Tracks	=	3
Number of stages	=	13

Technical Data

Waste throughput capacity in total	=	43	Mg/h
at waste calorific value	=	9,815	kJ/kg
Gross heat load	=	136	MW
Superheated steam pressure	=	43.3	bar
Superheated steam temperature	=	400	°C
Exhaust gas temperature	=	190–230	°C

Legend

1 Unloading bay
2 Bulk refuse crushing
3 Waste bunker
4 Waste crane
5 Bunker extraction
6 Charging hopper
7 Reciprocating grate and fire chamber
8 Slag extractor
9 Slag bunker with slag crane
10 Sec. air + fluid slurry injection
11 Auxiliary and start-up burner
12 SNCR nitrogen reduction
13 Steam generator
14 Soot blower
15 Slip catalyst
16 House load turbine unit
17 Dust silo
18 Spray absorber
19 Adsorbent injection
20 Fabric filter
21 Preliminary scrubber
22 Scrubber
23 Draught fan
24 Analyses container
25 Stack