



SAFE WASTE DISPOSAL –
SENSIBLE RECOVERY

2022

Economically efficient – ecologically consistent

Our corporate objective can be summed up in one sentence: we want to provide low-cost thermal treatment of the maximum available waste that we receive, using the MVR facilities to generate electricity and district heating, produce reusable materials and largely avoid creating waste in the process, while maintaining high standards of plant safety, occupational health and safety for our employees, and environmental compatibility.

This publication, which is our current Environmental Statement in accordance with the Eco-Management and Regulation (EC) No. 1221/2009 (EMAS III) shows why speaking of commercial and ecological sense in the same breath is not a contradiction in terms. MVR has published annual Environmental Statements since 2000. It will continue to update the Environmental Statement every year. Our environmental management system applies for internal and external employees on the grounds of MVR and includes all processes on the site.



Economically efficient procedures: The high utilisation rate for the energy and materials in the waste we treated is once again clearly documented by the 2021 operating results.

MVR has been a partner of UmweltPartnerschaft Hamburg (Hamburg Eco-Partnership) since 2003 through its voluntary services to environmental protection.

- EMAS environment management system
- ISO 14001 environment management system

This also includes the Partnership for Air Quality and Low-Pollution Mobility. In this context, we would like to make an active contribution to reducing traffic-related air pollutants.



Another aspect of our effective utilisation of waste as a “raw material” has been the additional extraction of district heating water since October 2004. This can reach a capacity of up to 20 MW of heat which could serve about 2,500 homes. A further heat extraction is currently being planned.

For a further increase of the cost-effectiveness we work in close co-operation with Anlage Müllverwertung Borsigstraße GmbH (MVB). We can work more effectively, pool our knowledge and save costs by working more closely together, exchanging information and opinions, and by sharing staff in some areas. Closer co-operation will also help us in reaching our environmental goals.

Our objectives p.02

How our plant works p.04

What we produce p.06

How we look after our environment p.10

How we guarantee protection p.20

What we want to improve p.22

Flow chart p.24

Basic data p.25

Environmental aspects p.26

Our environmental policy:

Waste incineration means offering a viable and ecological alternative to other methods of waste disposal and waste treatment.

Renewable raw materials account for more than 50 % of the residual waste, therefore the provision of heat and electricity can be a substitute for fossil fuels, helping to protect the environment and halt climate change. Internal consumption of energy must also be minimised within the bounds of economic feasibility in order to optimise the external use of power and heat.

In addition to the provision of usable energy, the intention is to make products which can be largely recycled in order to enable quality materials to be returned to the economy. Therefore the best available technology is used with due consideration for economic efficiency.

The organisational structure and schedule of responsibilities are designed to meet the economic aims of MVR and its environmental targets in line with policy. Suitably qualified and skilled staff are available.

Safe working practices protect the workforce and the environment. The employees are therefore repeatedly instructed on adopting a safety-conscious approach and are regularly trained and briefed in environmental awareness.

The environmental stewardship of MVR is manifested in its strict observance of the binding obligations (laws, directives, ordinances and the stipulations set out in the permits). An operational supervision unit has been put in place to ensure that this standard is upheld, bringing a self-regulatory dimension in addition to the oversight duties of the supervisory authorities.

The operational supervision unit checks and monitors the impact of the plant on the surrounding environment. Appropriate measures are taken to counteract potential problems.

The aim is to achieve a high level of plant availability in order to make efficient use of materials and energy although the safety of the plant and the workers and the protection of the environment take precedence.

The environmental performance of MVR is subject to a process of continuous improvement. Decisions related to the environment can only be taken on the basis of a full examination of all the relevant factors. We also seek to exert influence on our business partners to this end.

MVR operates a policy of openness towards its own employees, the public, industry professionals and the regulatory authorities (interested parties), taking a proactive approach to providing information.

The environmental policy is regularly reviewed by the senior management of MVR in order to accommodate more recent insights or changes to the regulatory or social framework.

Releasing energy – recovering



4▶

Our plant is situated in the south-west of Hamburg, in the port area of Hamburg-Altenwerder. In the north, it is bordered by the Köhlbrand Bridge, in the east by the Köhlbrand basin, in the south by the site of port operator Hansaport Hafenbetriebsgesellschaft and in the west by the Rugenberger Damm embankment.

A fold-out flow chart of the plant's processes can be found on page 24.

MVR is designed to handle a throughput of approx. 320,000 Mg of municipal waste. Waste recovery is performed in two process lines, each with grate firing and a steam generator with a waste throughput of 21.5 Mg per hour.

The waste incineration process releases energy in the form of heat in the flue gases. This heat is used to convert the boiler feed water (demineralised water) in the steam generator into steam which is then used in a steam turbine that is coupled with a generator to produce electrical energy (power).

Any electricity produced which is surplus to own requirements is fed into the Hamburg grid.

Steam is tapped from the steam turbine for the plant's own use (e.g. for heating or hydrochloric acid treatment) and, in particular, for the supply of district heating (steam and heating water).

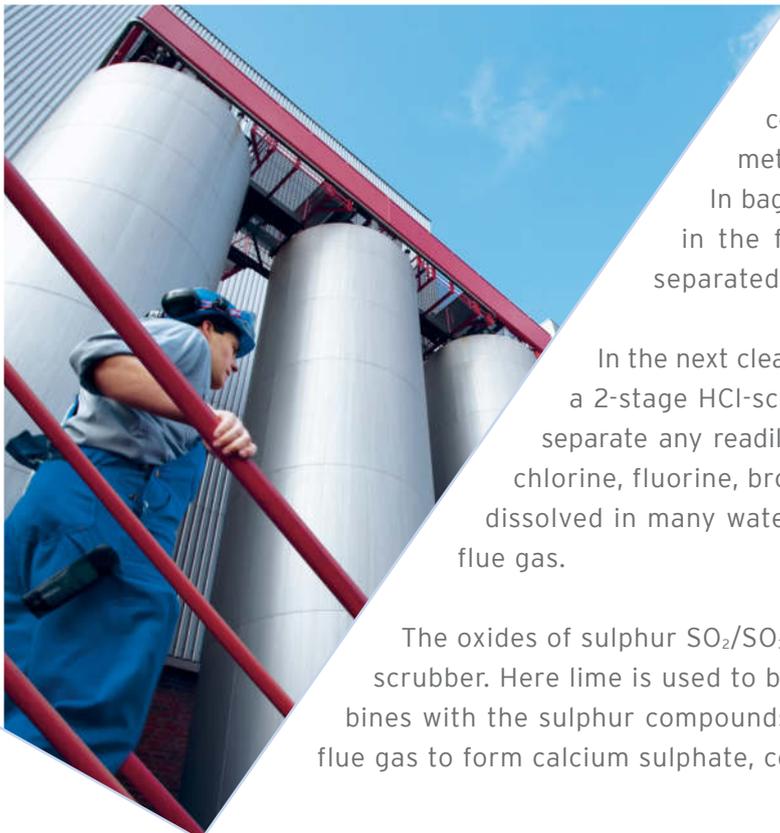
To ensure a constant supply of steam to our industrial clients and, as of October 2004, the supply of district heating, the plant operates two additional auxiliary steam generators which are fired with natural gas.

raw materials

In parallel with waste incineration and recovery of energy, flue gas cleaning begins in the boiler by ensuring an optimum incineration process. The nitrogen oxides are reduced by spraying ammonia water into the combustion chamber (SNCR method).

Each incineration/steam-generating process line has its own flue gas cleaning unit. Adsorbent that has already been used in bag house filter 2, but with a low uptake, is added to the flue gas leaving the boiler.

Flow chart (see p. 24)



The adsorbent consists of a mixture of 70% trass and 30% hearth furnace coke. This mixture ensures that any heavy metals and organic pollutants are separated. In bag house filter 1, any residual dust particles in the flue gas from the steam generator are separated together with the adsorbent.

In the next cleaning process, the flue gas passes through a 2-stage HCl-scrubber where process water is added to separate any readily soluble halogen compounds containing chlorine, fluorine, bromine and iodine. Any harmful gases are dissolved in many water droplets and thus separated from the flue gas.

The oxides of sulphur SO_2/SO_3 are separated by a neutral single-stage scrubber. Here lime is used to bind the oxides of sulphur. The lime combines with the sulphur compounds and part of the residual oxygen in the flue gas to form calcium sulphate, commonly known as gypsum.

For central heating – for domes

The energy released by thermal recovery is used twofold: to generate heat and power. The quantity and “quality” of the waste received play an important role here.

To a large extent, residual waste consists of combustible material and therefore has a calorific value (energy content) comparable to that of lignite (brown coal). The steam generators in the MVR plant are designed for waste with calorific values ranging from 6.5 to 14 MJ/kg. For comparison: lignite has a calorific value of around 10 MJ/kg.

The heat created by the incineration is used to produce steam from demineralised water. The MVR steam generators have a very high level of efficiency in comparison with other systems because of the great extent to which the energy in the waste gas is utilised.

In 2021 the MVR plant achieved an R1 energy efficiency factor of 0.83 (cf. Annex II of Directive 2008/98/EC, without climate-correction factor).

Overview of steam supplies

Year	Steam supplied MWh	Heating water supplied MWh	Heat utilisation (usable heat as a percentage of total energy input) %
2018	523,846	31,673	52.3
2019	523,392	18,699	51.6
2020	530,340	22,492	53.4
2021	532,270	26,684	54.0



Steam supplies: The steam is supplied to industrial clients and households in the form of process steam and heating steam. Uninterrupted supply is contractually guaranteed. To meet this obligation, the plant has two auxiliary steam generators on standby, each with a production capacity of approx. 20 MW (giving about 25 Mg/h of steam).

The quantity of heat supplied to our steam clients largely depends on the customers’ production requirements and the weather.

The only way to improve the efficiency of the heat supplies is to reduce the input of primary energy (using less gas and more waste) and to level out demand by acquiring additional customers.

tic power



Since autumn 2004, MVR has also been supplying district heating in the form of hot water (heating water) to an HanseWerk Natur supply area in Harburg-Neuwiedenthal/Neugraben.

Approx. 26,700 MWh were produced in 2021. This brought the heat utilisation rate to 54.0%. Here, too, the customers want these heat supplies to be guaranteed by MVR's auxiliary boilers as far as possible.

Electricity generation: MVR's extraction condensing turbine can generate a maximum electricity output of 29 MW in straight electricity generation, known as the condensing mode. During heat off-take, electricity generation is reduced to around 6 MW at maximum possible steam output.

Simultaneous production of electricity (power) and heat is known as combined heat-and-power generation (CHP operation). In this mode generation of the two energy types, heat and power, is particularly efficient.

Overview of electricity consumption

Year	Total electricity production MWh	Grid infeed / produced by CHP generation MWh	In-house electricity requirements MWh	Electricity purchased MWh
2018	80,857	41,926/31,703 ¹⁾	42,866	3,934/2,026 ²⁾
2019	83,531	44,818/35,511 ¹⁾	41,661	2,893/1,557 ²⁾
2020	75,777	37,975/30,035 ¹⁾	40,644	2,842/1,719 ²⁾
2021	75,129	36,593/28,096¹⁾	41,195	2,660/2,660²⁾

1) in accordance with the CHP Act of 1 April 2002 2) proportion from renewable energies

For the construction sector —

In addition to energy products in the form of power and heat, substances of commercially available quality are produced in the course of waste incineration and flue gas cleaning at MVR, namely slag, scrap metal, acid and gypsum.

Slag: After combustion, what is left on the grate are the non-combustible components of the waste plus the inert (no longer capable of reacting) materials produced during combustion, which are known as slag or bottom ash.



The bottom ash is washed with additional water in the slag extraction unit to reduce the content of readily soluble salts. It is sifted, broken up and freed from unburned components in order to produce a tested and approved building material comparable to a mineral mixture made from processed building rubble. The unburned components of the bottom ash are returned to the waste bunker to pass through the incineration process once more.

The slag is of high quality as a result of the washing process in the extraction unit and its extensive mechanical treatment. The proportion of soluble minerals is comparatively low and the residual separable metal content is close to 0%.

The slag complies with the relevant technical guidelines and delivery conditions currently in force. It was also marketed in the year 2021 over the company Hanseatisches Schlackenkontor GmbH (www.schlackenkontor.de) and is involved mainly in road and path construction.

The slag treatment separates the scrap iron and non-ferrous metals which can then be reused as raw materials in smelteries. In the external slag storage facility, non-ferrous metals are again separated in a downstream non-ferrous metal separation of the already processed slag.

Scrap iron: The scrap iron, separated from the bottom ash using magnets, only contains very small amounts of bottom ash residues. The scrap metal produced by MVR thus easily meets the scrap metal industry's purity requirements, which stipulate an iron content of more than 92% for scrap from waste incineration plants.

Non-ferrous metals: An eddy-current process is used to separate, and thus recover, more than 90% of the non-ferrous metals (not separable with magnets) from the slag. These metals are mostly aluminium, copper and brass, but pieces of chromium steel are also included. The mixed scrap goes to an external company.

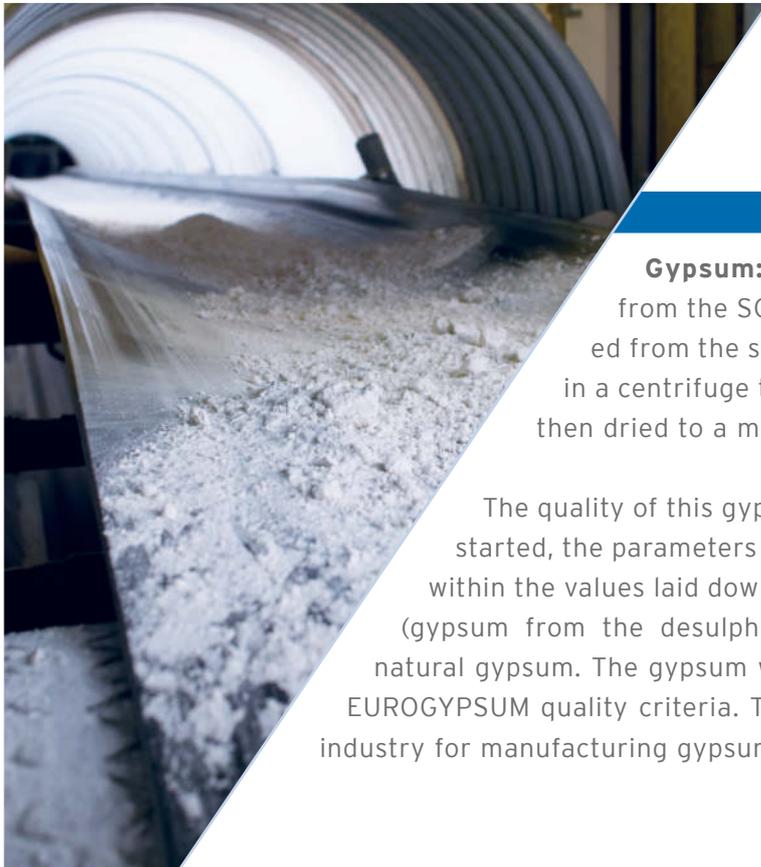
for industry

Hydrochloric acid: The acid scrubbing process used in the flue gas treatment system produces raw hydrochloric acid (HCl) with a strength of 10 % to 12 %. This is sent to a rectifying unit (operated separately), where its concentration increases to 30%. Various treatment stages remove chlorine as well as other halogen compounds such as bromine, iodine and fluorine, and also ammonia, particulates, and other inorganic and organic impurities, after which HCl gas is produced from the pre-treated crude acid in a distillation process. Demineralised water is used to prepare hydrochloric acid with a concentration of 30% from this HCl gas. Diligent operation of the rectifying unit and intensive checks mean that conformity of the hydrochloric acid to EN 939 can be guaranteed.



◀9

By-products (see p. 24)



Gypsum: A gypsum suspension is removed from the SO₂ scrubber and the gypsum is separated from the suspension. The gypsum is then washed in a centrifuge to remove any readily soluble salts and then dried to a moisture content of less than 10 %.

The quality of this gypsum is very high. Since our operations started, the parameters to be monitored have always been well within the values laid down in the Beckert Study for FGD gypsum (gypsum from the desulphurisation units of power plants) and natural gypsum. The gypsum which is generated corresponds to the EUROGYPSUM quality criteria. The gypsum is supplied to the building industry for manufacturing gypsum plaster.

Waste incineration – the cleanest solution

On 1 June 2005 a new law was introduced prohibiting the landfill of untreated waste. In our opinion, thermal recovery is an economically and ecologically superior process offering the best alternative. Compared with mechanical-biological treatment or landfill, we find incineration in a plant such as MVR provides by far the most environmentally friendly method for the treatment and recovery of waste, and the cost is roughly the same.

In 2021, MVR received some 344,030 Mg of non-hazardous waste which was subjected to thermal treatment, a figure well in excess of the 320,000 Mg per year contractually agreed with Stadtreinigung Hamburg (Hamburg's municipal refuse collection service).

10▶

The quantity of waste received has progressed as follows:

Waste received	
Year	Waste received Mg
2018	341,860
2019	342,614
2020	336,735
2021	344,030



Residual waste – reduction through concentration

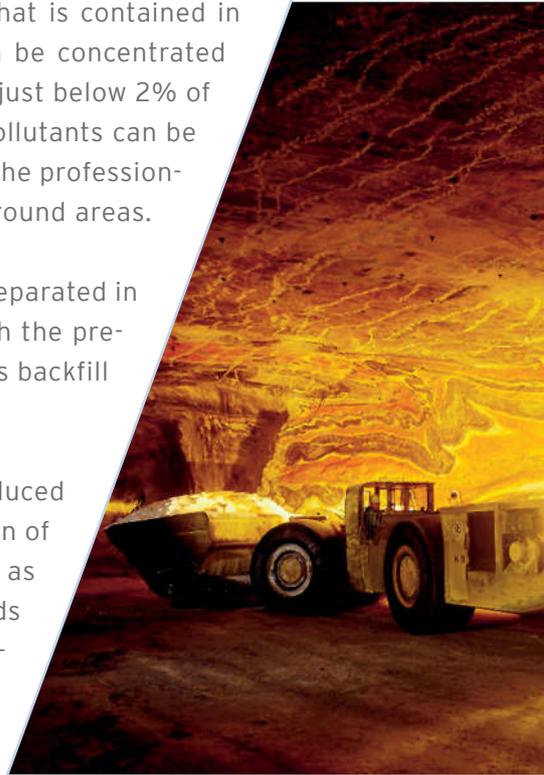
Thermal waste recovery cannot make every substance that is contained in the waste simply disappear. However, the pollutants can be concentrated into a small fraction of residual material that amounts to just below 2% of the original quantity of waste. The vast majority of the pollutants can be taken out of circulation in this way. We take great care in the professional and safe storage of these residual materials in underground areas.

Particulates: At 26 kg/Mg of waste, the amount of dust separated in the waste gas purification system is roughly on a par with the previous year (25 kg/Mg). All of the particulates were used as backfill material in salt mines, and thus recovered.

Mixed salts: The hydrochloric acid rectification unit produced mixed salts in aqueous solution (brine with a concentration of 20%). These composite minerals remove halogens such as bromine, iodine, fluorine and also ammonium compounds from the materials cycle and they are then safely deposited in scoured-out salt caverns.

Raw acid: The availability of the HCl rectification plant in 2021 was over the previous year's level. Due to major repair work, however, around 2,352 Mg of crude acid had to be disposed of. Measures to improve the plant are being planned.

Pollutants: The organic pollutant dioxin is initially destroyed by incineration, but dioxins are later partly reformed in the boiler. These are removed in the flue gas cleaning process.



Residual waste (see p. 24)

Raw acid disposed of	
Year	Raw acid disposed of Mg
2018	2,032
2019	2,294
2020	3,696
2021	2,352

Emissions – we're doing fine

The emissions are still very low. A large part of the measured values are below the relevant detection limit. In 2021, both the emitted loads and the specific (volume-related) values were again well below the permitted values (see table). The utilisation rate of the permitted loads was between 0.0 % (HF, Hg) and 86.6 % (nitrogen oxide).

It is to be considered that the limit values of the MVR are in-part significantly below the values of 17. BImSchV prescribed by law.

The somewhat higher SO₂ values from 2015 can be attributed to experiments in power saving. In the meantime both lines have each been equipped with an SO₂ washer pump with frequency converter. First a control value of 8 mg/Nm³ was adjusted in the cleaned gas in order to determine under which conditions this conversion brings about the required success. In discussion with the monitoring authority, the control value was then lowered to 5 mg/Nm³ for a longer experiment. With this mode of operation, around 500 MWh of electricity can be saved per line compared with the previous unregulated mode of operation, while always reliably complying with the limit values. Meanwhile this operating mode has been authorised by government authorities for continuous operation.

Although the statistics are good, it is inevitable that limits will sometimes be exceeded for short periods. This can be due to various reasons, such as poor-quality waste, breakdown of components or (in rare cases) operating errors.

The number of such incidents has dropped significantly in recent years as a result of continuous process improvement and training sessions for the crew with specific goals in mind. In 2019 99.997 % of the half-hour average values were adhered to; in 2020 it was 99.986 % and in 2021 it was 99.950 %.

12 ▶

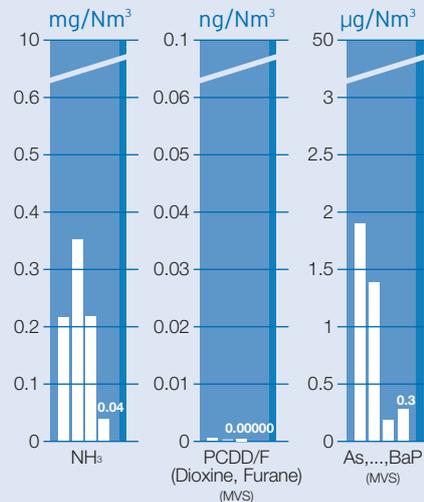
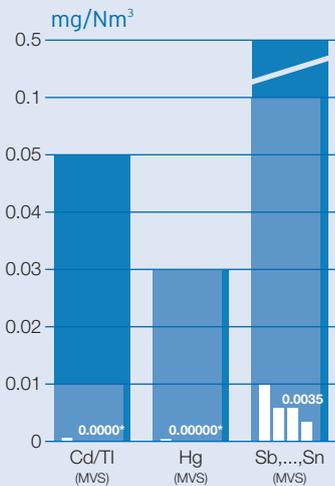
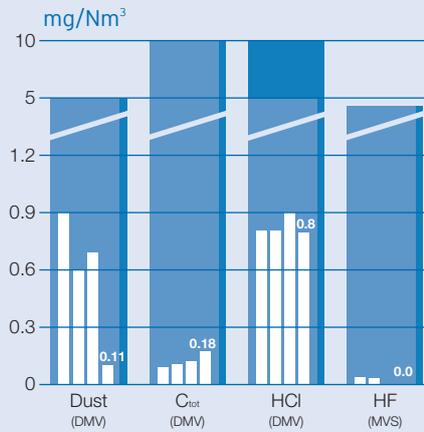
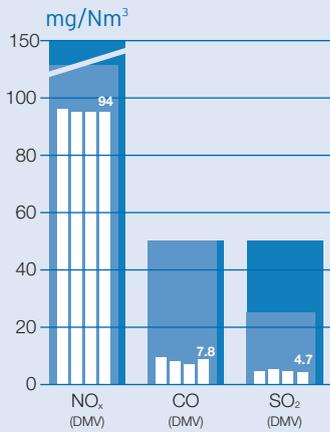


Emission loads

	Year	NO _x ¹⁾ kg	CO kg	SO ₂ kg	Dust kg	C _{tot} kg	HCl kg	HF kg	NH ₃ kg	Cd/Tl g	Hg g	Sb,...,Sn kg	PCDD/F mg	As,...,BaP kg
Annual load ²⁾	2021	136,357	15,994	7,680	639	360	1,232	0*	98	0*	0.00*	5	0.034	0.45
Limit value (annual load)		157,542	78,771	23,631	4,726	12,603	4,726	158	-	3,150	31,510	79	79	79 ³⁾
Utilisation of the load	2017	87.4%	29.6%	22.6%	22.8%	3.6%	9.5%	33.5%	-	24.8%	1.1%	13.8%	0.6%	2.8%
limit value	2018	88.7%	24.8%	34.0%	39.3%	1.6%	28.3%	32.0%	-	25.2%	1.1%	18.6%	0.4%	3.4%
	2019	88.5%	20.2%	38.3%	36.1%	1.7%	29.4%	28.6%	-	0.0*	0.0*	10.7%	0.1%	2.5%
	2020	85.9%	17.1%	32.6%	35.8%	2.2%	30.0%	0.0*	-	0.3%	0.0*	10.4%	0.9%	0.4%
	2021	86.6%	20.3%	32.5%	13.5%	2.9%	26.1%	0.0*	-	0.0*	0.0*	6.2%	0.0*	0.6%

1) including auxiliary steam generators 2) limit value according to the 17th Emission Control Ordinance 3) From 2012: determination of mass flows with nonvalidated values

Emission concentration



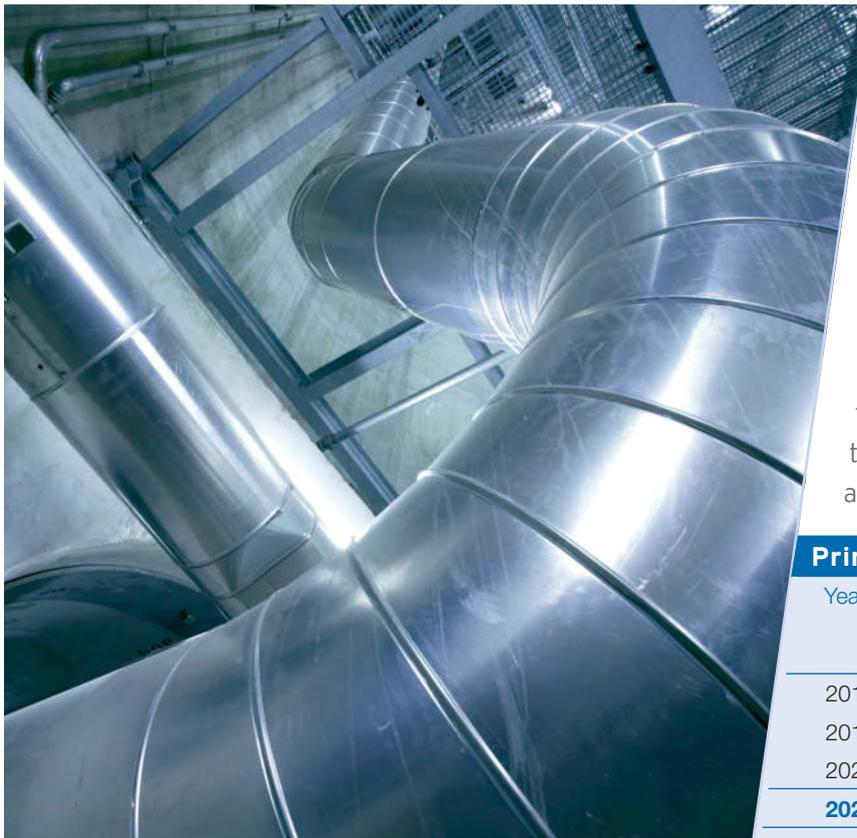
Permissible limit value according to the 17th Emission Control Ordinance

Limit-value permission: daily mean values (DMV) or mean value of samples (MVS)

Values measured in 2018–2021 (2021 also stated in figures).

* From 2019, a new calculation basis for analysis values below the limit of quantification (LC): instead of using half the LC as before, the values will be set to zero, as is standard practice throughout Germany.

Overview of energy consumption – utilisation instead of wastage



In 2021, MVR used some 9,100 MWh of heating oil/ natural gas in the waste boilers and about 31,400 MWh of natural gas in the auxiliary steam generators to provide process steam and hot water for their customers.

The requirement on primary energy is basically influenced by the take-up of the customers, by the weather and by the time availability and performance availability of the garbage vessels.

14▶

For various reasons, MVR has to use primary energy - fuel oil/natural gas - in addition to waste. Primary energy is used intermittently in the waste-fired boilers in order to ensure the minimum combustion temperature even in unfavourable conditions. And natural gas is also used in the auxiliary steam generators if the energy acquired from the waste does not suffice in order to supply the district-heating customers of the MVR on cold days.

Primary energy

Year	Waste boilers MWh	Auxiliary steam generators MWh	Total MWh
2018	7,340	26,050	33,390
2019	9,670	16,850	26,520
2020	5,740	31,220	36,960
2021	9,100	31,400	40,500

The high time and capacity availability of the waste-fired boilers has made a significant contribution to the saving of primary energy.

In-house steam consumption

Year	In-house steam consumption MWh
2018	117,125
2019	101,988
2020	95,330
2021	98,107

Use of operational resources – less is more

The use of vital operational resources, i.e. materials that are necessary to operate the plant and to improve the production yield, is similar to that in previous years. The fluctuations are mainly due to the different compositions of waste and the quality of the water from the River Elbe. The increase in activated carbon is related to a complete exchange in all three bunker emergency vents.

Other operational resources*

Year	Activated charcoal Mg	Aluminium chloride Mg	Calcium chloride Mg	Iron chloride Mg	Sodium hydroxide Mg	Hydrochloric acid ¹⁾ Mg
2019	19	124	9.6	30	635	986
2020	38	162	4.8	41	539	1,118
2021	0	130	0	29	548	1,053

* annual amounts received

1) from MVR's own HCl production

CO₂ – saving where we can



Approximately 50% of municipal solid waste is derived from biogenic sources (National Inventory Report published by the Federal Environment Agency (UBA)). Since MVR makes optimum use of the energy released by waste incineration, the consumption of primary energy is correspondingly reduced.

MVR's auxiliary steam generators must comply with the Greenhouse Gas Emissions Trading Act. For the fourth period of operation from 2021 to 2025, MVR receives 20,715 certificates (1 certificate corresponds to 1 Mg CO₂) in total¹⁾. In 2021 6,232 of these were required.

1) 7,682 certificates were issued in 2016. Each year, the number decreases due to corrective factors to 7,038 in 2020.

Water – every drop counts

Drinking water: In 2021, MVR purchased 1,643 m³ of drinking water, mainly for sanitary purposes, most of which was released into the sewage network of Hamburg’s municipal sewage system.

Rainwater: In 2021, approx. 13,200 m³ of rainwater were collected from roofs and traffic areas for use as process water, e.g. for slag washing or flue gas cleaning.

Water from the River Elbe: There are strict regulations regarding the amount of water MVR can extract from the Elbe for use as cooling water in its turbine condensers. The specified amount of water may only be heated by max. 6.0 °C in the summer* and by max. 7.5 °C in the winter* and must not exceed the temperature of 28 °C when discharged back into the river. The MVR complied with regulations: in 2021, the cooling water throughput amounted to approx. 28.3 million m³ of river water, only about 71% of the quantity* permitted. The max. heating in summer operation was 6.0 K and in winter operation was 7.5 K. The oxygen content of the water is increased close to saturation limit by way of cascades in the outlet structure. Boiler feed water for steam generation has to be fully cleaned and demineralised. The water for this is taken from the cooling-water flow and treated. After using the heat from the steam supplied, our customers return about 60 % as condensate which is then treated and reused. In 2021, around 403,650 m³ of water from the Elbe had to be cleaned and demineralised to compensate for the loss. The process of neutralising the minerals and pollutants produces neutralisation waste water in the water and condensate-treatment plant. The plant was enlarged in 2004 to reduce the concentration of pollutants in the water (in particular, filterable substances). In 2021, around 42,200 m³ of treated waste water from the neutralisation process was channelled into the Elbe.

16 ▶



* Amended water law permit
 Summer operation: 01.04 – 30.11
 Winter operation: 01.12 – 31.03
 Quantity again reduced by a third
 Monitoring values as sliding 6-hour average values

Water collection

Year	Rain water m ³	Water from the Elbe			Public water supply Drinking water m ³	Waste water ¹⁾	
		Cooling water m ³	of which boiler feed water m ³	Fire extinguishing water/ process water m ³		Cooling water m ³	Neutralisation waste water m ³
2019	12,703	27,802,000	388,879	141,572	489	27,413,000	41,257
2020	12,371	28,407,000	389,510	94,913	374	28,017,103	43,462
2021	13,192	28,273,400	403,650	119,580	1,643	27,869,750	42,173

1) directly channelled into the Köhlbrand

Noise pollution and operational disruptions – all under control



MVR is located in the heart of Hamburg's port area.

The noise level in the vicinity of this industrial area, where there is a large amount of traffic, is relatively high. MVR complies with all the relevant noise level limits along its site boundaries. The Workplace Ordinance relating to areas within the site is also strictly adhered to. In the few parts of the plant where soundproofing is restricted by technical limitations, either soundproof casing has been fitted or else hearing protection is mandatory for employees.

Operational disruptions can have adverse effects on the environment. In 2021 there were 11 operational interruptions in all, 2 of which were scheduled stoppages (overhaul) and 9 unplanned stoppages for various reasons. None of the operational disruptions were malfunctions as defined in the Statutory Ordinance on Hazardous Incidents, and none of them had any effects on the area outside of the plant premises. Dealing with the effects of the disruptions caused no problems. There were no serious work-related accidents.

Flora and fauna – protecting biotopes



18▶

Obviously the construction of MVR's plant had an adverse effect on the flora and fauna on the site during the building phase. Approx. 43,870 m² were sealed through buildings and traffic areas.

MVR has created green spaces on the undeveloped areas of the site to compensate for this and has planted vegetation on approx. 7,000 m² of roof space. As an additional measure, MVR has purchased a 13-hectare site (Höfnermoor) about 4 km south of the plant and restored it to its original marsh-like condition.

A major finding of the expert appraisal of the compensatory measures, which was carried out in recent years and completed in 2005, was that the substitute area had developed favourably. The measures for improvement stipulated in the final report will be carried out on an ongoing basis.

Area consumption

MVR grounds m ²	of which sealed m ²	of which near-natural m ²	Near-natural areas away from MVR m ²
61,600	43,870	17,730	132,500

Establishing connections – having an influence

In addition to the environmental effects described above that are directly attributable to MVR, its operations also have indirect environmental effects. An overall examination of the environment was therefore carried out as part of MVR's approval application. On this basis, MVR continually pursues all the environmental aspects of its operations in accordance with the EU directive.

a) Directly attributable environmental aspects are assessed on an annual basis and their development is continuously monitored.

b) The indirect environmental aspects include the quality of the products and of the waste which can for the most part be marketed. Only if the materials delivered by MVR meet the required quality criteria can natural resources be spared. The recycling should not entail a concentration of harmful substances in the recovered substance cycle. High quality standards are demanded of our materials in the light of this aspect. They are subject to ongoing quality control. The marketing and handling of the proper disposal of the residual materials are organised by an externally accredited company, enabling the benefit of experience and the exploitation of synergies.

The philosophy adopted for the procurement of operating resources is similar. Any by-products from other production processes or treated substances which are available are used if they are of the requisite quality (e.g. ammonia water, heating oil). We are constantly searching for alternatives to hazardous substances. In this respect we also try to encourage environmentally responsible behaviour and production processes in the companies with which we work.

Another aspect of indirect environmental relevance is the noise nuisance caused by delivery vehicles coming onto the site. The main delivery service provider, the Stadtreinigung Hamburg municipal refuse collection authority, claimed that all its vehicles are low in noise and pollutant emissions.

Management system – organisati



20 ▶

At MVR, under the motto “Action, not reaction” we take an active part in environmental protection, making a significant contribution to preserving the natural basis of life and to making our company a safe place. To reach this goal, MVR has a unified management system that is under constant development and takes into consideration the requirements concerning environmental protection, health and safety at work, and risk management as it performs its duties. All our employees are actively involved in our environmental protection and health and safety activities. There are two levels at which the company ensures that the statutory, regulatory and corporate requirements are adhered to.

Level 1

Principles; integrated management; environmental protection policy, objectives, and programme; regulated structures and processes; assignment of responsibility and authorisation.

Level 2

Operating and shift-related instructions; instructions on action in the event of malfunctions; detailed regulations concerning work routines and action.

We regularly conduct environmental company audits during which we assess the application and effectiveness of our system, our compliance with legal requirements and the achieved environmental performance.

ng success



The technical director is wholly responsible for MVR's environmental protection. He is responsible for the development and application of, as well as compliance with, the binding obligations, applicable in environmental protection, as well as in the area of occupational safety. The director delegates important executive duties in this field to the Head of Operational Quality Control. As the Environmental Management Officer working in accordance with DIN ISO 14001 and the EMAS III regulation, he is responsible for implementing, maintaining and developing the environmental and safety management system. He performs the statutory duties as the company officer responsible for waste, emission protection and water pollution prevention, and coordinates the tasks performed by outside contractors.

The Head of Operational Quality Control is assisted by the Safety Engineer, who also observes the tasks of an Environmental Management Agent.

Other staff members have been appointed to oversee radiation protection and health and safety at the workplace.

The duties of the hazardous materials officer, data protection officer and fire protection officer were outsourced by MVR.

Committees meet to discuss and monitor the effective execution of these duties and ensure that the staff and works council are involved.

Environmental objectives – doing our homework

MVR already meets the highest environmental standards. However, we do not cease to strive for even better environmental compatibility. Our environmental targets and programme will continue to be updated every year.

Emissions

Reduction of sulfur oxide emissions in the clean gas:

The use of a frequency-controlled scrubber pump at both SO₂ scrubbers (Environmental Program 2018-2019) has reduced the pressure level at the scrubber nozzles below full-load operation. This results in a deteriorated spray pattern, and the separation efficiency falls short of its potential. To compensate for this, the uppermost (third) nozzle level is to be designed so that it can be switched off by means of a flap, so that in partial load operation of the scrubber pump to maintain an optimum pressure in the system and thus a good spray pattern for SO₂ separation.

(2021-2022, maintenance, 30 thousand EURO per line)

Reduction of diesel engine emissions:

The 2 diesel industrial trucks currently still used in plant transport are now to be replaced by equally efficient electric forklifts. (2021-2022, production, 250 thousand EURO per forklift)

Energy efficiency, electromobility and resource conservation

Increase energy efficiency for higher heat extraction:

The Free and Hanseatic City of Hamburg is planning to develop further heat sources south of the Elbe to supply the Hamburg district heating network. MVR can make a significant contribution to this. In 2020, a feasibility study was carried out in detail to carry out preliminary planning and investigate the development of additional heat utilization potential by replacing the steam turbine and a flue gas heat exchanger (ECO 2) upstream of the HCl scrubber.

By implementing the project, an additional district heating capacity in the order of 20 MW could be generated without increasing the fuel input. With the realization of the project, a total CO₂ reduction of about 45,000 t CO₂ /a would be achieved. The future heat supply of MVR will be increased from 30,000 MWh to 122,900 MWh. At the same time, the electricity feed-in will also increase from 40,000 MWh to 73,500 MWh due to the new backpressure turbine.

(2021-2027, production, 28 million EURO)

Promotion of electric mobility:

MVR will install four parking spaces for electric vehicles and ten parking spaces for e-bikes, including charging stations, as part of the environmental partnership. The parking spaces are scheduled to be installed in 2022. (2021-2022, maintenance)

Establish and operate a hydrogen generation and hydrogen fueling station:

An electrolysis station and filling station for hydrogen is to be built on the MVR site. It will be operated with electricity from waste incineration (5 MW electr.) and will produce up to 90 kg/h of hydrogen, on the one hand to enable waste vehicles with fuel cells to refuel at MVR, and on the other hand to supply hydrogen to third parties for use in the transport sector with the aid of a filling plant with two trailers. (2021-2025, production, 12 million EURO)

Improved non-ferrous separation (NF separation) in slag processing:

Optimization of non-ferrous (NF) metal separation in MVR's slag preparation process is expected to recover even more NF metals for the highest possible value recovery and reduce the residual metal content of the slag. It is expected to separate about 450 Mg of additional nonferrous metals (NF fine) per year. (2021-2023, production)

Conversion to LED lighting and testing the use of motion detectors:

As an ongoing process, all areas of MVR will be successively assessed to determine if the use of LED lighting and motion detectors is appropriate. (2022-2024, maintenance, 30 thousand EURO/a)

Our environmental performance at a glance

The following table contains the most important key indicators for the last five years in accordance with EMAS III.

Energy efficiency		2017	2018	2019	2020	2021
Steam and hot water supplied	(MWh/Mg _{waste})	1.6	1.6	1.6	1.6	1.6
In-house steam consumption	(MWh/Mg _{waste})	0.32	0.34	0.30	0.28	0.29
Primary energy input (fuel oil/natural gas)	(MWh/Mg _{waste})	0.12	0.10	0.08	0.11	0.12
Electricity production	(MWh/Mg _{waste})	0.20	0.24	0.24	0.25	0.22
In-house electricity consumption	(MWh/Mg _{waste})	0.12	0.13	0.12	0.11	0.12
Proportion of electricity consumption from renewable energies	(%)	44.4	44.4	53.8	60.5	100.0

Material efficiency		2017	2018	2019	2020	2021
Ammonia water	(kg/Mg _{waste})	2.5	2.6	2.8	2.9	2.6
Adsorbent	(kg/Mg _{waste})	1.8	2.1	2.2	2.2	1.8
Quicklime	(kg/Mg _{waste})	1.4	1.5	1.6	1.4	1.6
Sodium hydroxide	(kg/Mg _{waste})	1.3	1.6	1.9	1.6	1.6
Hydrochloric acid	(kg/Mg _{waste})	2.6	3.1	2.9	3.3	3.1

Water		2017	2018	2019	2020	2021
Consumption of cooling water	(m ³ /Mg _{waste})	78	93	81	84	82
Consumption of water from the Elbe	(m ³ /Mg _{waste})	1.1	1.3	1.4	1.3	1.4

By-products/waste		2017	2018	2019	2020	2021
Slag	(kg/Mg _{waste})	201	217	204	201	202
Boiler particulates	(kg/Mg _{waste})	14	14	14	13	13
Filter particulates	(kg/Mg _{waste})	14	14	14	13	13
Raw acid disposed of	(kg/Mg _{waste})	5	6	7	11	7

Biological diversity		2017	2018	2019	2020	2021
Area used (developed)	(m ² /Mg _{waste})	0.13	0.13	0.13	0.13	0.13

Emissions		2017	2018	2019	2020	2021
CO ₂ emissions *	Mg	338,927	347,474	354,030	340,076	334,975
	(Mg/Mg _{waste})	969	1,016	1,033	1,010	974
SO ₂ emissions	(kg/Mg _{waste})	0.015	0.024	0.026	0.023	0.022
NO _x emissions	(kg/Mg _{waste})	0.393	0.409	0.407	0.402	0.393
Particulate emissions	(kg/Mg _{waste})	0.0030	0.0054	0.0050	0.0050	0.0008

* 50% of which has no impact on climate change, in relation to the waste (NIR UBA (National Inventory Report published by the Federal Environment Agency))
CO₂ calculation for municipal waste, natural gas and heating oil with reference to emission factors, cf. <https://wiki.prtr.bund.de/wiki/Emissionsfaktoren>.
Other substances identified as greenhouse gases, such as CH₄, N₂O, hydrofluorocarbons, perfluorocarbons and SF₆, are not relevant.

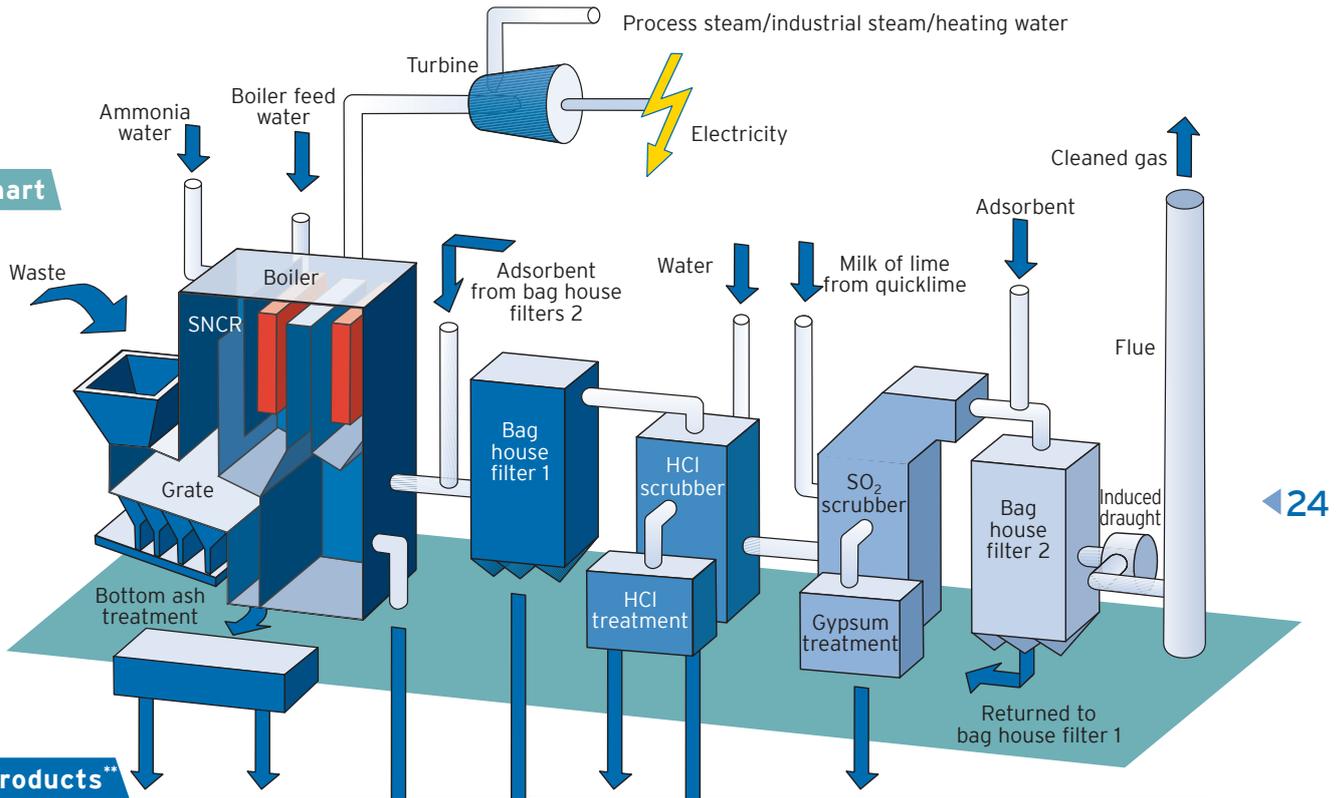
Flow chart:

p. 15 Operational resources*

Year	Ammonia water Mg	Boiler feed water Mg	Quicklime Mg	Adsorbent Mg
2018	897	408,898	527	707
2019	951	388,879	548	767
2020	974	389,510	488	727
2021	893	403,650	545	617

* annual amounts received

p. 5 Flow chart



p. 8/9 By-products**

Year	Slag Mg	Scrap metal Mg	Hydrochloric acid Mg	Gypsum Mg
2018	74,057	10,202	4,141	768
2019	69,917	10,061	3,972	822
2020	67,781	10,348	3,021	741
2021	69,407	10,473	2,780	703

** annual amounts delivered Non-ferrous from reworking: 2015 303 Mg

p. 11 Residual waste**

Year	Boiler particulates Mg	Filter particulates Mg	Raw acid disposed of Mg	Mixed salts Mg
2018	4,782	4,782	2,032	2,266
2019	4,753	4,753	2,294	2,275
2020	4,226	4,226	3,696	2,129
2021	4,508	4,508	2,352	2,590

** annual amounts delivered

Basic data

Quantity of waste received	norm. Mg/h	2 x 21.5
	max. Mg/h	2 x 23.0
Calorific value range	kJ/kg	6,500–14,000
Auxiliary fuel: natural gas/fuel oil		
Waste delivery weekdays		0–24 h
Number of trucks per day		approx. 150

Supplies to the plant

Tipping hall

Length	m	approx. 51
Width	m	approx. 33
Height (roadway height)	m NN	approx. 20
Number of tipping bays		12

Waste bunker

Length	m	approx. 50
Width	m	approx. 20
Storage height (max.)	m	approx. 30
Floor thickness	m NN	0
Storage volume	m ³	approx. 20,000

Waste bunker - mechanical equipment

Cranes	Number	2
Type/working load	–/Mg	Polyp/4.5
Bulky-waste shredders	Number	1
Throughput	Mg/h	15

Storage of process materials

Fuel oil	m ³	300
Ammonia water in reserve	m ³	3 x 80
	m ³	1 x 80
Lime silo	m ³	60
Adsorbent	m ³	70
Aluminium chloride	m ³	20
Sodium hydroxide	m ³	20
Chemicals (total)	m ³	approx. 55

Incineration

(data for each incineration line, normal values)

Grate firing

Stepped feeder grate		2
Width	m	6.25
Length	m	10.2
Rated thermal input	MW	60.0

Steam generator

Flues		4
Steam	Mg/h	72
Steam pressure	bar	44
Temperature	°C	400
Flue gas exhaust temperature	°C	170

Combustion air system

Primary air (max.)	Nm ³ /h	67,186
Secondary air (max.)	Nm ³ /h	48,761

Turbine

District heat offtake max.:		
District heat	MW	70
Electricity (gross)	MW	6
Electricity offtake:		
District heat	MW	0
Electricity (gross)	MW	approx. 29
Plant use	MW	approx. 5

Flue gas data at flue

related to normalised dry conditions and to oxygen content of operation

◀25

Volume flow (design)	m ³ /h	80,000
Oxygen content (design)	% bV	8.5
Process O ₂	% bV	< 7
Temperature	norm. °C	125
	max. °C	150
Permitted annual average values:		
Particulate	mg/m ³	3
HCl (hydrogen chloride)	mg/m ³	3
SO ₂ (oxides of sulphur)	mg/m ³	15
HF (hydrogen fluoride)	mg/m ³	0.1
NO _x (oxides of nitrogen)	mg/m ³	100
C _{tot} (total carbon)	mg/m ³	8
CO (carbon monoxide)	mg/m ³	50
Cd, Tl (cadmium, thallium)	mg/m ³	0.002
Hg (mercury)	mg/m ³	0.02
Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V+Sn	mg/m ³	0.05
As+BaP+Cd+Co+Cr *)	mg/m ³	0.05
PCDD/PCDF, I-TE (dioxins, furans)	ng/m ³	0.05

*) in accordance with the amendment of the 17th Emission Control Ordinance in 2003

Personnel

Total employed trainees		102
		3

Audited – certified

Declaration of the environmental verifier on the audit and validation activities:

The undersigned, Stefan Krings EMAS Environmental Verifier with the registration number DE-V-0168 accredited or authorized for 38.2 (NACE code), (waste treatment and disposal), here with confirms that he has verified that the organization as stated in the 2022 Environmental Statement of Müllverwertung Rugenberger Damm GmbH & Co. KG Rugenberger Damm 1, 21129 Hamburg, registration number D-131-00027, has fulfilled all the requirements of Regulation (EC) No. 1221/2009 taking into consideration the Ordinance (EU) 2017/1505 dated 28.08.2017 as well as VO (EU) 2018/2026 dated 20.12.2018 of the European Parliament and the Council of 25 November 2009 concerning the voluntary participation of organizations in a joint Eco-Management and Audit Scheme (EMAS) system.

The signature on this Declaration confirms that

- the audit and validation was carried out in complete compliance with the requirements of Regulation (EC) No. 1221/2009 taking into consideration the Ordinance (EU) 2017/1505 dated 28.08.2017 as well as VO (EU) 2018/2026 of 20.12.2018,
- the findings of the audit and validation confirm that there was no indication of any deviations from the relevant environmental regulations,
- the data and information of the updated 2022 Environmental Declaration of Müllverwertung Rugenberger Damm GmbH & Co. KG provide a reliable, credible and correct view of all the organisation's activities within the areas stipulated in the Environmental Declaration.

Ratingen, signed on 04-May-2022



Stefan Krings
Accredited
environmental verifier
(DE-V-0168)

This Environmental Statement was issued by MVR Müllverwertung Rugenberger Damm GmbH & Co. KG in April 2022 and declared valid by the accredited environmental verifier. The next consolidated Environmental Statement is expected to be presented in 2023.

Contacts:

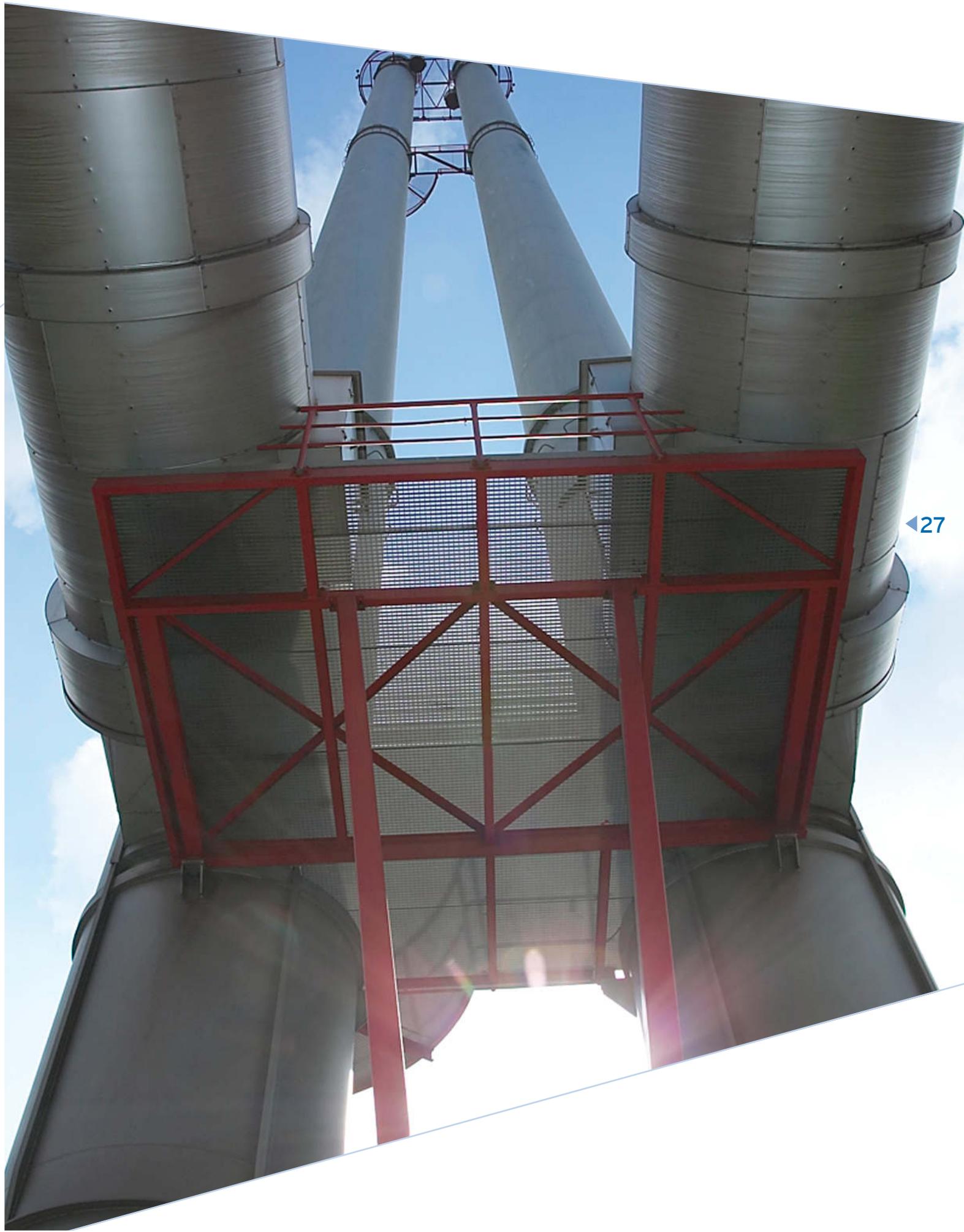


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MVR