Müllverwertung Rugenberger Damm

SAFE WASTE DISPOSAL – SENSIBLE RECOVERY

2025

with the data from 2021 to 2024

MVR

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.

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Economically efficient procedures: The high utilisation rate for the energy and materials in the waste we treated is once again clearly documented by the 2024 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.

UMWELT PARTNER 2025

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 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 substituted for fossil fuels, helping to protect the environment and halt climate change.

MVR is taking another step towards protecting the environment as a core objective by identifying topics relevant to climate protection and implementing them. 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.

MVR is also examining how the path to climate-neutral waste treatment can be achieved while maintaining economic viability.

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

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).

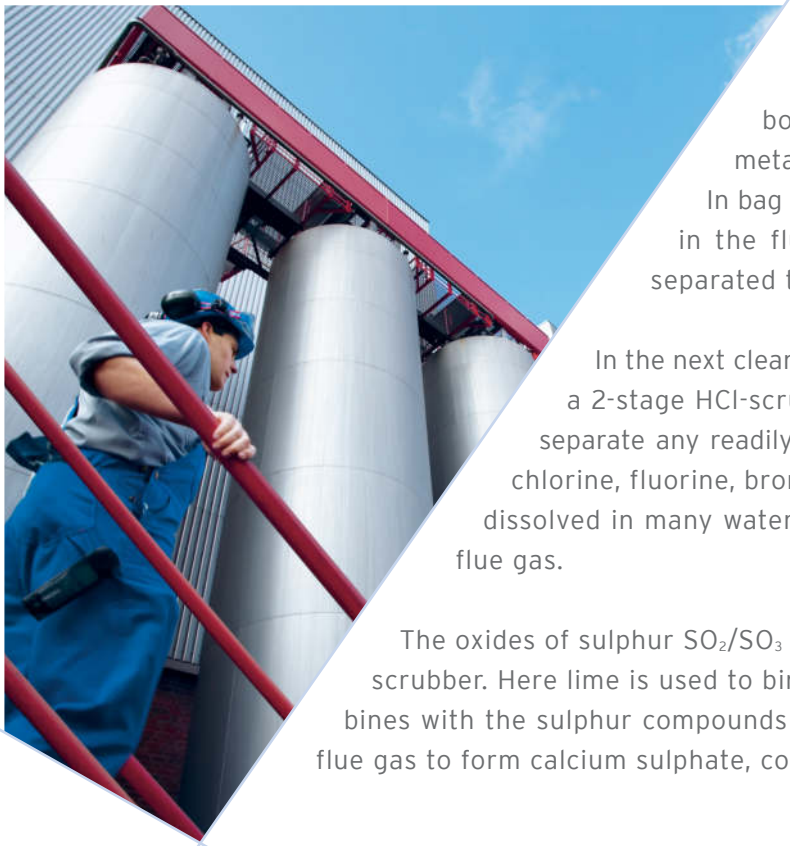
To ensure a constant supply of steam to our industrial clients and, as of October 2004, the supply of district heating, the plant operates two additional auxiliary steam generators which are fired with natural gas.

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).

Flow chart (see p. 24)

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.



The adsorbent consists of a mixture of 70 % trass and 30 % Activated carbon. 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 2023 the MVR plant achieved an R1 energy efficiency factor of 0.81 (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) %
2021	532,270	26,684	54.0
2022	540,635	32,949	55.0
2023	547,202	27,032	55.6
2024	**537,480**	**24,952**	**55.4**

* Values from invoicing

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. 24,952 MWh were produced in 2024. This brought the heat utilisation rate to 55.4%. Here, too, the customers want these heat supplies to be guaranteed by MVR's auxiliary boilers as far as possible.

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.

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 offtake, electricity generation is reduced to around 6 MW at maximum possible steam output.

Overview of electricity consumption

Year	Total electricity production MWh	Grid infeed / produced by CHP generation MWh	In-house electricity requirements MWh	Electricity purchased MWh
2021	75,129	36,593/28,096[1)]	41,195	2,660/2,660[2)]
2022	77,600	38,244/29,845[1)]	40,791	1,435/1,435[2)]
2023	69,012	30,403/26,2331)	40,878	2,269/2,269[2)]
2024	**69,118**	**29,595/24,587[1)]**	**41,412**	**1,889/1,889[2)]**

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 previous year over the company Hanseatisches Schlackenkontor GmbH (www.schlackenkontor.de) and is involved mainly in road and path construction.

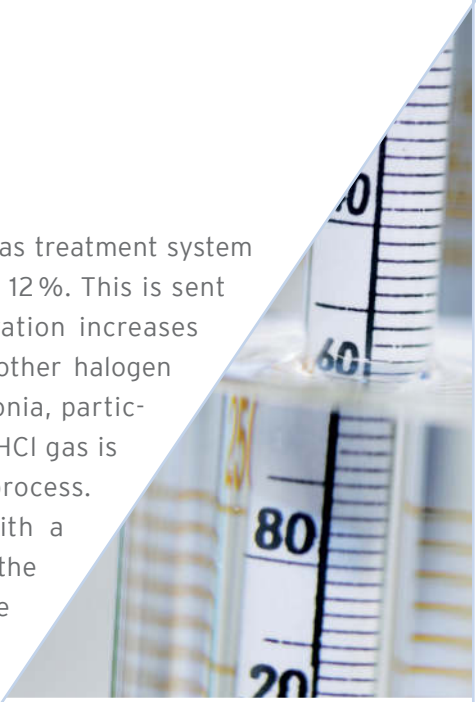
The slag treatment separates the scrap iron and non-ferrous metals which can then be reused as raw materials in smelteries. In the external slag storage facility, non-ferrous metals are again separated in a downstream non-ferrous metal separation of the already processed slag.

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.



By-products (see p. 24)

Gypsum: A gypsum suspension is removed from the SO_2 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 2024, MVR received some 338,390 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).

The quantity of waste received has progressed as follows:

Waste received

Year	Waste received Mg
2021	344,030
2022	344,691
2023	338,873
2024	**338,390**

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 28kg/Mg of waste, the amount of dust separated in the flue gas cleaning system is at approximately the same level as the previous year (27kg/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 2024 was once again significantly above/below the previous year's level. As a result of further major repair work, around 3,300 Mg of raw acid nevertheless had to be disposed of.

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
2021	2,352
2022	8,493
2023	4,801
2024	**3,326**

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 2024, 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 85.2 % (nitrogen oxide).

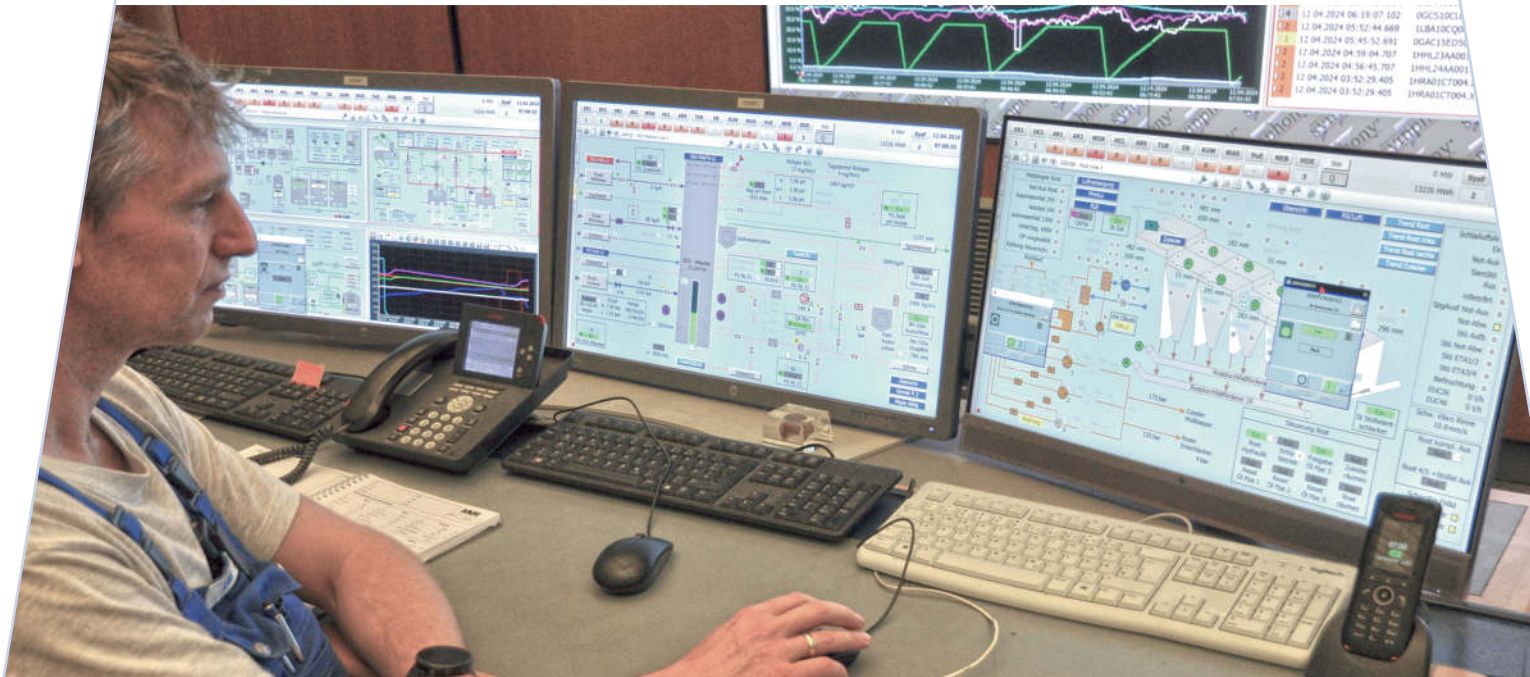
It is to be considered that the limit values of the MVR are in-part significantly below the values of 17. BImSchV prescribed by law.

The somewhat higher SO_2 values from 2015 can be attributed to experiments in power saving. In the meantime both lines have each been equipped with an SO_2 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 2022 99.998 % of the half-hour average values were adhered to; in 2023 it was 99.999 % and in 2024 it was 99.995 %.

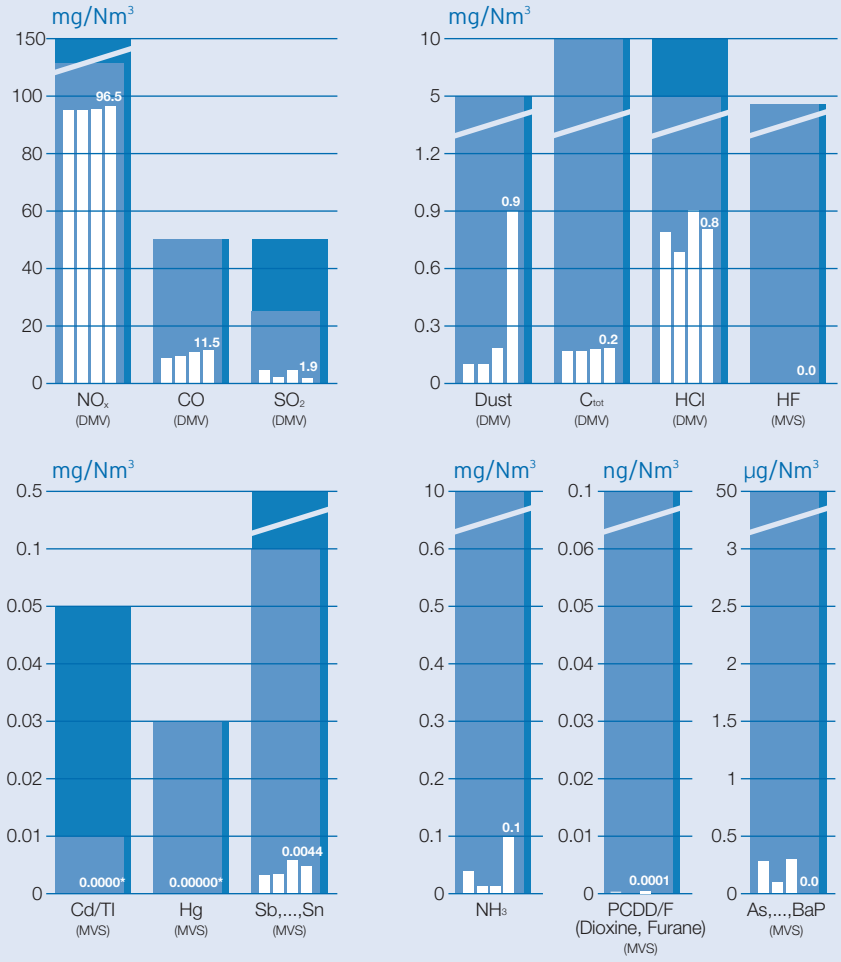


Emission loads

	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[3]	**2024**	**134,278**	**21,695**	**3,021**	**1,543**	**368**	**1,109**	**0.0***	**117**	**0.0***	**0.0***	**6.0**	**0.18**	**0.034**
Limit value (annual load)		157,542	78,771	23,631	4,726	12,603	4,726	158	15,754	3,150	31,510	79	79	79[2]
Utilisation of the load	2020	85.9%	17.1%	32.6%	35.8%	2.2%	30.0%	0.0*	1.9%	0.3%	0.0*	10.4%	0.9%	0.4%
limit value	2021	86.6%	20.3%	32.5%	13.5%	2.9%	26.1%	0.0*	0.6%	0.0*	0.0*	6.2%	0.0*	0.6%
	2022	85.5%	24.0%	20.2%	14.0%	3.0%	22.7%	0.0*	0.2%	0.0*	0.0*	5.9%	0.0*	0.2%
	2023	83.6%	27.2%	31.7%	17.3%	3.1%	29.0%	0.0*	0.1%	0.0*	0.0*	10.5%	2.3*	0.6%
	2024	**85.2%**	**27.5%**	**12.8%**	**32.6%**	**2.9%**	**23.5%**	**0.0***	**0.7%**	**0.0***	**0.0***	**7.6%**	**0.2***	**0.0%**

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



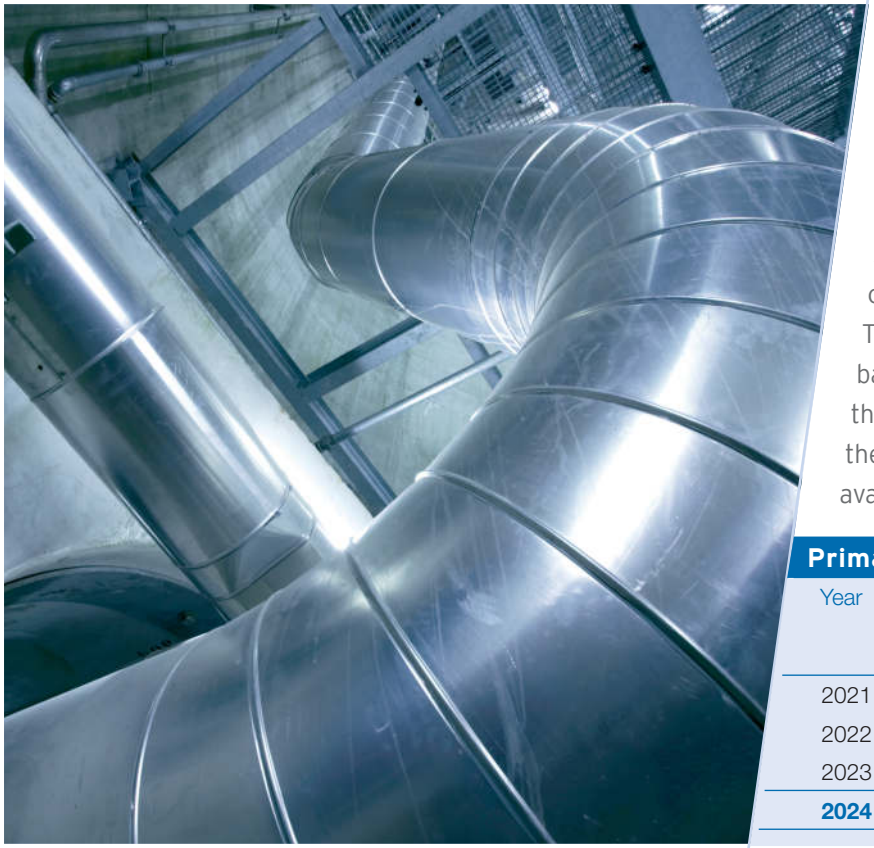
Permissible limit value according to the 17th Emission Control Ordinance

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

Values measured in 2021–2024 (2024 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 2024, MVR used some 16,993 MWh of heating oil/natural gas in the waste boilers and about 46,880 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.*

Primary energy

Year	Waste boilers MWh	Auxiliary steam generators MWh	Total MWh
2021	9,100	31,400	40,500
2022	8,260	28,000	36,260
2023	13,950	42,180*	56,130
2024	**16,993**	**46,880***	**63,873**

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.

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
2021	98,107
2022	95,954
2023	90,150
2024	**87,770**

* Notably, customer demand was higher while system availability was slightly lower in 2023 and 2024. This is why the use of natural gas was greater than usual.

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.

Other operational resources*

Year	Activated charcoal Mg	Aluminium chloride Mg	Calcium chloride Mg	Iron chloride Mg	Sodium hydroxide Mg	Hydrochloric acid [1] Mg
2022	4	77	0	32	595	908
2023	0	128	0	32	619	993
2024	**1**	**110**	**38**	**30**	**630**	**733**

* annual amounts received 1) from MVR's own HCl production

CO_2 – 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 CO_2) in total. In 2024 9,239 certificates were required.

Water – every drop counts

Drinking water: In 2024, MVR purchased 4,913 m^2 of drinking water, mainly for sanitary purposes, most of which was released into the sewage network of Hamburg's municipal sewage system.

Rainwater: In 2024, approx. 16,800 m^3 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 2024, the cooling water throughput amounted to approx. 31.4 million m^3 of river water, only about 78.5% of the quantity* permitted. The max. heating in summer operation was 5.8 K[1)] and in winter operation was 7.1 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 2024, around 473,000 m^3 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 2024, around 42,234 m^3 of treated waste water from the neutralisation process was channelled into the Elbe.

* 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	Water from the Elbe			Public water supply	Waste water [1)]	
		Cooling water	of which boiler feed water	Fire extinguishing water/ process water	Drinking water	Cooling water	Neutralisation waste water
	m^3	m^3	m^3	m^3	m^3	m^3	m^3
2022	12,755	25,762,000	450,070	72,530	3,381	25,312,250	44,365
2023	16,302	26,329,000	475,100	127,880	3,450	25,854,000	43,226
2024	**16,826**	**31,366,000**	**473,000**	**78,600**	**4,913**	**30,893,000**	**42,234**

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 2024 there were 13 operational interruptions in all, 2 of which were scheduled stop-pages (overhaul) and 11 unplanned stoppages for various reasons. None of the operational disruptions were malfunctions as defined in the Statutory Ordinance on Hazardous Incidents. Dealing with the effects of the disruptions caused no prob-lems. There were no serious work-related accidents.

Flora and fauna – protecting biotopes

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 m²	of which sealed m²	of which near-natural m²	Near-natural areas away from MVR m²
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.

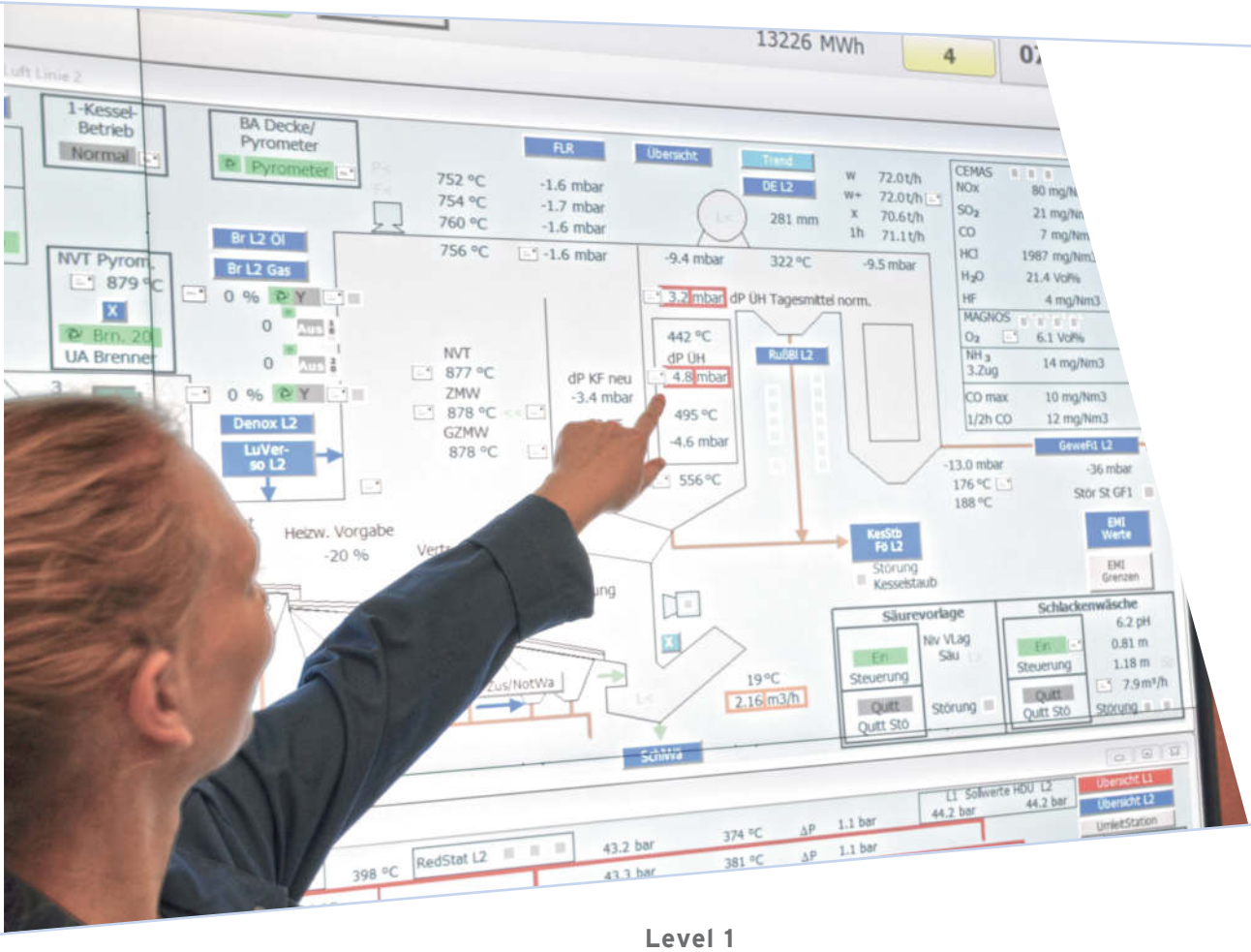
a) Directly attributable environmental aspects are assessed on an annual basis and their development is continuously monitored.

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 and also equipped with blind spot monitors.

Management system – organisi



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

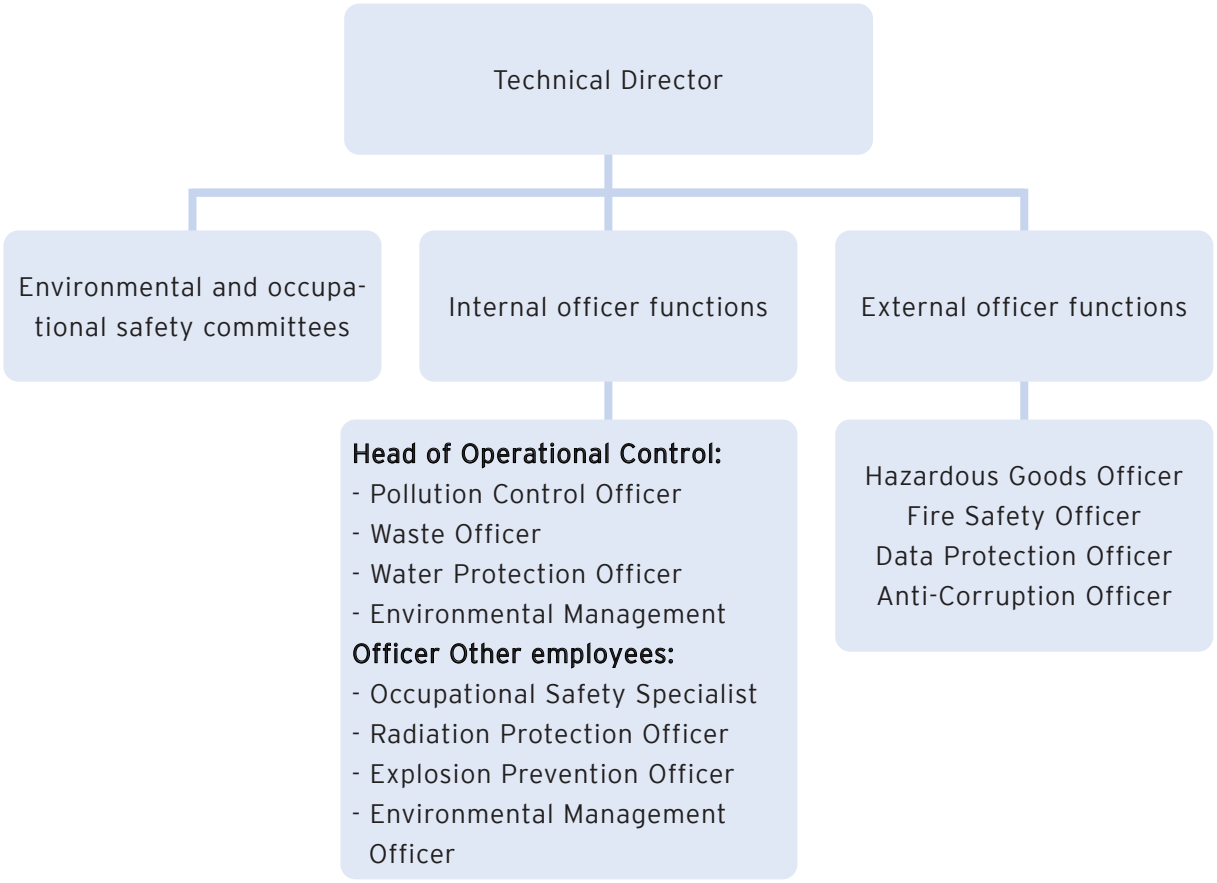
The Technical Director bears overall responsibility for environmental protection at MVR. He is responsible for developing, implementing and complying with the applicable legal and regulatory requirements in the areas of environmental protection and occupational safety. Various tools have been introduced to support this at MVR, such as an environmental committee, an occupational safety committee and regular training and instructions.

The committees that have been set up advise and monitor the fulfilment of tasks and ensure the involvement of the workforce and the works council.

The improvement suggestion scheme and involvement of the works council both continue to play an important role in the overall success.

The Technical Director delegates essential environmental management tasks to the Head of Operational Control. He is designated together with the Management Representative as Environment Management Representative in accordance with DIN ISO 14001 and the EMAS III Regulation and is responsible for maintaining and developing the Environmental and Safety Management System. He also performs the legally-mandated functions of company representatives for waste, emissions and water protection and coordinates the activities of external officers.

The company representative functions are allocated externally and internally as shown by the following organisational chart:



Environmental objectives – doing our homework

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 Hamburg's district heating grid. MVR can play an important role here. In 2020, preliminary planning was carried out by means of a feasibility study and the development of additional heat utilisation potential analysed via replacement of the steam turbines and integration of a flue gas heat exchanger (ECO 2) in front of the HCl scrubber. For process-related technical reasons, the integration of ECO 2 was not pursued further. This means that the increase in energy efficiency and heat extraction is largely being generated via the replacement of turbines.

Implementation of the project would allow approximately 23 MW in additional district heat output without increasing fuel use. Project realisation will therefore mean a CO_2 reduction of approximately 43,700 tonnes of CO_2 per year. In future, MVR heat supply will increase from 30,000 MWh to 139,500 MWh. At the same time, the new back-pressure turbine will increase power input from 40,000 MWh to 68,000 MWh. The general planner commissioned with the task is currently at the detail planning stage. The approval procedure has begun. **(2021-2027, production, 39.5 million EURO)**

Promoting e-mobility:

MVR has set up ten parking spaces for electric vehicles and ten spaces for e-bikes, including charging columns. The parking spaces were originally planned for mid-2022, but implementation was deferred due to the organisational process. The car charging columns and e-bike spaces were constructed in 2024. The car charging columns are not yet operational as the final details still have to be clarified with the energy provider. **(2021-2023, maintenance)**

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

By optimising the separation of non-ferrous (NF) metal in the slag treatment process at MVR, the aim is to retrieve yet more NF metals for the highest possible quality of recovery and to reduce the residual metal content of the slag. It is expected that approximately 450 Mg of additional NF metals (NE fine) will be separated per year. The concept was revised once again in 2024 and will now be implemented in 2025. **(Original planning: 2021-2023, implementation now 2025, production)**

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

In a continuous process, all areas of MVR are being scrutinised to see whether the use of LED lighting and, if necessary, motion detectors makes sense. **(2022-2024, but continued beyond 2025, maintenance, EUR 30,000 per year)**

Increasing the energy efficiency of induced draughts on both lines:

The integrated induced draught fans are currently equipped with one vane control system each. This regulates the respective load case and the necessary negative pressure in the combustion chamber. From an energy standpoint, however, vane control systems are loss-prone throttle regulators, especially in partial load operation. To increase the electrical energy efficiency of the entire plant, the existing induced draught fans are being replaced by new induced draught fans run on frequency converters. Using these frequency converters, the speed of the new fans can be precisely adapted to every load case and therefore to every flue gas volume flow. This means that the electrical power consumption of the induced draughts is set to the economic and technical optimum in the load case. It is expected that 2.6 GWh of electrical energy will be saved per year. **(2025-2027, production, 3.8 million EURO)**

The following projects were completed in 2024

Reduction in diesel engine emissions:

The last two diesel floor conveyors currently still in operation in plant traffic were also replaced in 2024 with equally-capable electronic forklifts. This means that a total of four electronic forklifts have been newly commissioned.

(2021-2023, production, EUR 250,000 per forklift)

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		2020	2021	2022	2023	**2024**
Steam and hot water supplied	(MWh/Mg_{waste})	1.6	1.6	1.7	1.7	**1.7**
In-house steam consumption	(MWh/Mg_{waste})	0.28	0.29	0.28	0.26	**0.26**
Primary energy input (fuel oil/natural gas)	(MWh/Mg_{waste})	0.11	0.12	0.11	0.17	**0.19**
Electricity production	(MWh/Mg_{waste})	0.25	0.22	0.23	0.20	**0.20**
In-house electricity consumption	(MWh/Mg_{waste})	0.11	0.12	0.12	0.11	**0.12**
Proportion of electricity consumption from renewable energies	(%)	60.5	100.0	100.0	100.0	**100.0**
Material efficiency						
Ammonia water	(kg/Mg_{waste})	2.9	2.6	2.5	2.3	**2.4**
Adsorbent	(kg/Mg_{waste})	2.2	1.8	1.5	1.5	**1.5**
Quicklime	(kg/Mg_{waste})	1.4	1.6	1.3	1.5	**1.2**
Sodium hydroxide	(kg/Mg_{waste})	1.6	1.6	1.7	1.8	**1.9**
Hydrochloric acid (Internal requirements)	(kg/Mg_{waste})	3.3	3.1	3.5	3.0	**1.9**
Water						
Consumption of cooling water	(m^3/Mg_{waste})	84	82	75	78	**93**
Consumption of water from the Elbe	(m^3/Mg_{waste})	1.3	1.4	1.4	1.7	**1.6**
By-products/waste						
Slag	(kg/Mg_{waste})	201	202	205	197	**241**[1)]
Boiler particulates (Filter dust recycling)	(kg/Mg_{waste})	13	13	13	13	**14**
Filter particulates (190113*)	(kg/Mg_{waste})	13	13	13	13	**14**
Raw acid disposed of (190106*)	(kg/Mg_{waste})	11	7	25	14	**10**
Biological diversity						
Area used (developed)	(m^2/Mg_{waste})	0.13	0.13	0.13	0.13	**0.13**
Emissions						
CO_2 emissions *	Mg	340,076	334,975	332,019	320,624	**310,824**
	(kg/Mg_{waste})	1,010	974	962	946	**919**
SO_2 emissions	(kg/Mg_{waste})	0.023	0.022	0.014	0.022	**0.009**
NO_x emissions	(kg/Mg_{waste})	0.402	0.393	0.390	0.389	**0.397**
Particulate emissions	(kg/Mg_{waste})	0.0050	0.0018	0.0019	0.0024	**0.0046**

* 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))
CO_2 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 CH_4, N_20, hydrofluorocarbons, perfluorocarbons and SF_6, are not relevant.
1) One-off effect due to extensive mining of waste heap at MVR.

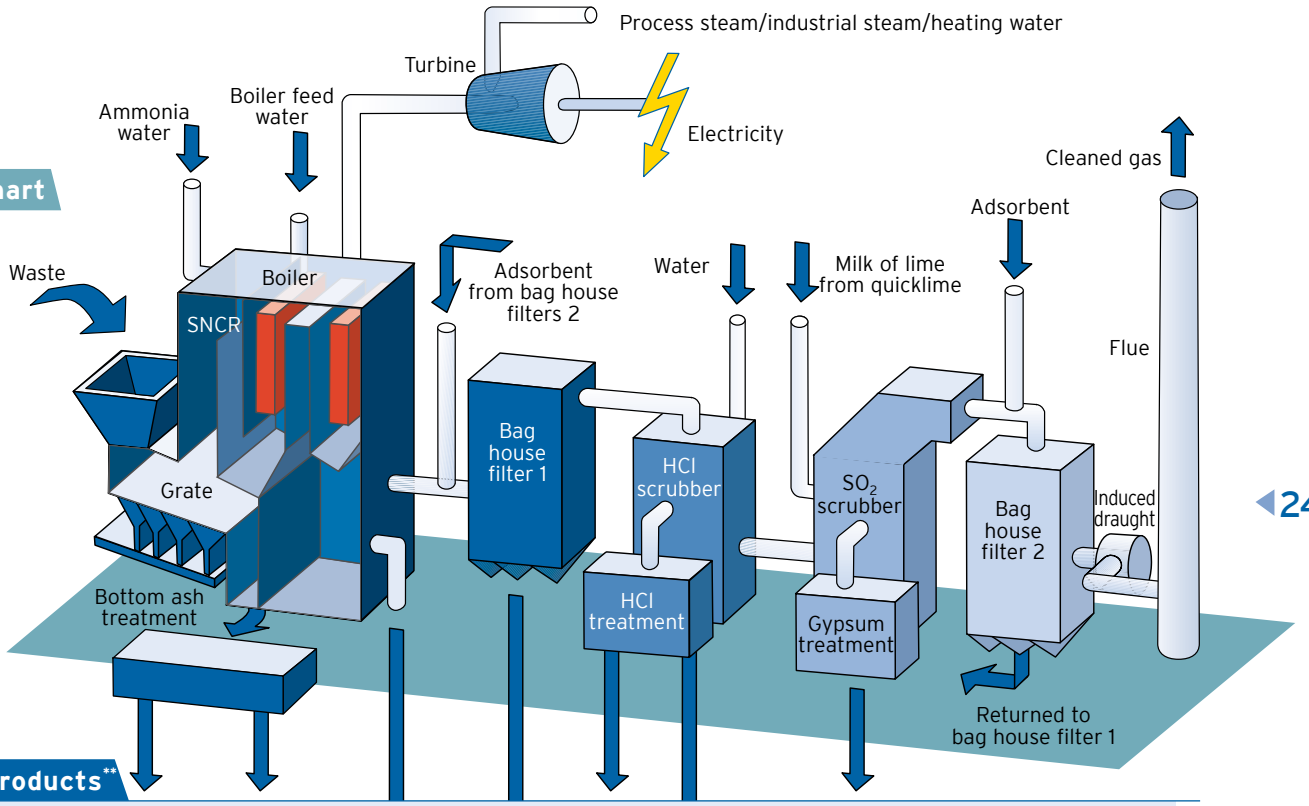
Flow chart:

p. 15 Operational resources*

Year	Ammonia water Mg	Boiler feed water Mg	Quicklime Mg	Adsorbent Mg
2021	893	403,650	545	617
2022	878	450,070	438	503
2023	775	475,100	509	499
2024	**823**	**473,000**	**405**	**495**

* annual amounts received
In addition, we purchased 288 Mg of hydrochloric acid 30% in 2022, as our own production was not always available.

p. 5 Flow chart



p. 8/9 By-products**

Year	Slag Mg	Scrap metal Mg	Hydrochloric acid Mg	Gypsum Mg
2021	69,407	10,473	2,780	703
2022	70,822	9,943	1,356	624
2023	66,886	9,415	2,381	626
2024	**81,557**	**10,271**	**2,979**	**478**

** 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
2021	4,508	4,508	2,352	2,590
2022	4,630	4,630	8,493	2,021
2023	4,573	4,573	4,801	2,383
2024	**4,797**	**4,797**	**3,326**	**2,244**

** annual amounts delivered

24

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	m^3	3 x 80
in reserve	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	116
trainees	3

Audited – Validated

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 authorised for 38.2 (NACE code), (waste treatment and disposal), hereby confirms that he has verified that the organisation as stated in the 2025 Environmental Statement of MVR Müllverwertung Rugenberger Damm GmbH at the site Rugenberger Damm 1, D-21129 Hamburg, registration number D-131-00027, has fulfilled all the requirements of Regulation (EC) No. 1221/2009 of the European Parliament and the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), taking into consideration Commission Regulation (EC) 2017/1505 of 28 August 2017 as well as Commission Regulation (EU) 2018/2026 of 19 December 2018.

The signature on this Declaration confirms that

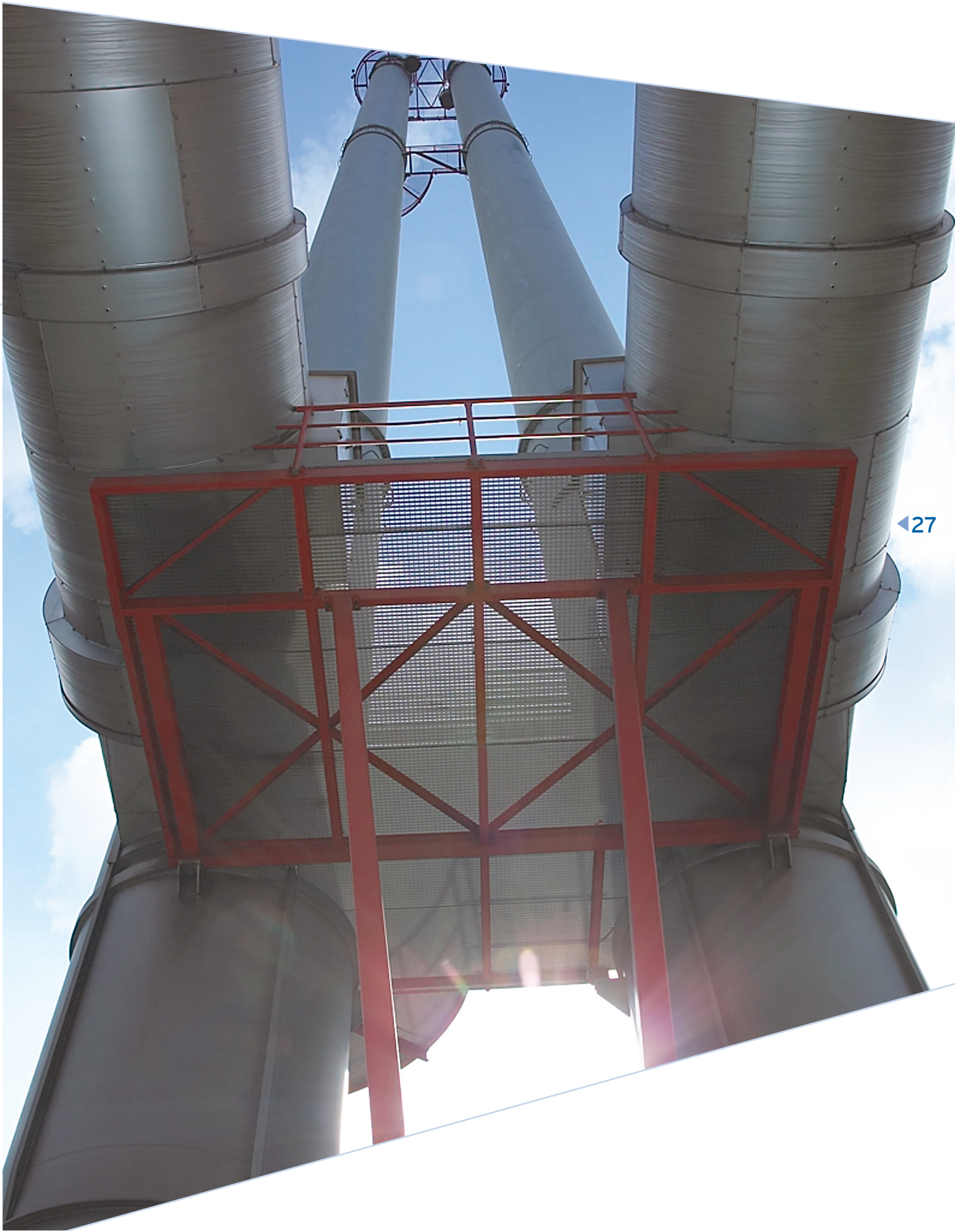
- the audit and validation was carried out in complete compliance with the requirements of Regulation (EC) No. 1221/2009 taking into consideration the Ordinance (EU) 2017/1505 dated 28.08.2017 as well as VO (EU) 2018/2026 of 20.12.2018,
- the findings of the audit and validation confirm that there was no indication of any deviations from the relevant environmental regulations,
- The data and information in the updated 2025 Environmental Statement of MVR Müllverwertung Rugenberger Damm GmbH provide a reliable, credible and truthful account of all of the organisation's activities at the Rugenberger Damm site within the scope specified in the Environmental Statement.

Ratingen, signed on 12-05-2025

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

EMAS
VALIDATED
INFORMATION
REG.NO. D-131-00027

This Environmental Statement was issued by MVR Müllverwertung Rugenberger Damm GmbH in May 2025 and declared valid by the accredited environmental verifier. The next consolidated Environmental Statement is expected to be presented in 2026.



A company of

STADTREINIGUNG.HAMBURG

MVR MÜLLVERWERTUNG RUGENBERGER DAMM GmbH
Rugenberger Damm 1 • 21129 Hamburg • Germany • Telephone: +49 (0) 40/741 86-100
E-mail: mvr@mvr-hh.de • www.mvr-hh.de • within the Vattenfall Europe New Energy GmbH association

MVR