MVV Environment Devonport EfW CHP Facility

Annual Performance Report 2017

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1.0 INTRODUCTION

This document represents the Annual Performance Report for MVV Environment Devonport EfW CHP Facility and has been submitted in compliance with Schedule 4 – Reporting of Environmental Permit EPR/WP3833FT, 'Functioning and monitoring of the incineration plant as required by condition 4.2.2'. This includes

(a) *a review of the results of the monitoring and assessment carried out in accordance with the permit including an interpretive review of that data;*

(b) *the annual production/ treatment data set out in schedule 4 table S4.2;*

(c) *the performance parameters set out in schedule 4 table 4.3 using the forms specified in table S4.4 of that schedule;*

(d) *the functioning and monitoring of the incineration plant in a format agreed with the Environment Agency. The report shall, as a minimum requirement, (as required by Article 12(2) of the Waste Incineration Directive) give an account of the running of the process and the emissions into air and water compared with the emission standards in the WID.'*

2.0 FACILITY INFORMATION

Plant Operator	MVV Environment Devonport Ltd
Name of Facility	Devonport EfW CHP Facility
EPR Permit Number	EPR/WP3833FT
Facility Address	Creek Road, Plymouth, Devon, PL5 1FL
Telephone Number	01752 393155

Devonport EfW CHP Facility became operational on 10 September 2015 following a 3-year construction period. The Facility is the first in the UK built by MVV Umwelt of Germany who have extensive experience of energy from waste management over the last 50 years. Waste produced by the City of Plymouth, West Devon and Torbay under an umbrella organisation, the South West Devon Waste Partnership (SWDWP), is processed at Devonport EfW, providing a long term, sustainable solution for waste disposal. It recovers heat energy from the waste to produce steam, which is used to heat Her Majesty's Naval Base (HMNB) and generates electricity which is supplied both to HMNB and the National Grid. Strict environmental controls and proven operating experience ensure that the Devonport EfW CHP Facility is a centre of excellence and a benchmark for the industry.

2.1 Technical details of the plant:

- Maximum Permitted Refuse throughput – 265,000 tonnes per annum, with approximately 31.1 tonnes per hour burning capacity
- Storage capacity – 47 days' full plant capacity (including 18 days bailed waste)
- Number of tipping bays – 5

- Steam output – 104 tonnes of steam per hour at 420*C and 60 bar(g)
- Flue gas treatment – urea, sodium bicarbonate and activated carbon followed by high performance bag filters, discharging into a 95-metre-high chimney
- Energy produced – maximum generating capacity 25.5MW

The Devonport EfW CHP Facility provides sustainable waste management for all the domestic waste in the City of Plymouth, West Devon and Torbay.

The ERF is regulated by the Environment Agency and is certified in compliance with:

- ISO 9001: 2008
- ISO 14001: 2004,
- BS OHAS 18001: 2007
- ISO 50001: 2011

The list of waste types which can be accepted at the site are given in Appendix 1.

3. OPERATIONAL INFORMATION

Table 1 : Operational Details 2017		
Operational hours	7,977	Hours
Total Waste Incinerated	250,992	Tonnes
Electricity Exports to National Grid	177,690	MWh
Incinerator Bottom Ash Produced	63,546	Tonnes
APC Residues	7,734	Tonnes

3.1 Solid Residue Outputs

The Incinerator Bottom Ash (IBA) is transported by Maen Karne to Victoria Wharf Quay, Plymouth where it is stored before being shipped to The Netherlands by Rock Solid of Rhijnvis Feithlaan 158c, 1813 KV Alkmaar. The IBA is reprocessed in The Netherlands into many different graded aggregates, ferrous and non-ferrous metal products, which are then utilised in the construction and metal industry.

The fine particulate matter, known as Air Pollution Control Residue (APCr), is removed from the process by a fabric filter and stored in sealed silos ready for collection. The APCr is sent to the FCC Environment site located in Leeds, Yorkshire where it is neutralised and formed into filter cake before final disposal in landfill.

In line with MVV Environment Devonport's corporate responsibility, and as a Permit requirement, a Duty of Care Audit is conducted at these disposal points.

3.2 Water Discharges from Site

The water required for plant operations is reused extensively within the process and therefore few, or no water discharges are released from the facility. When required, water discharges are released from the plant in accordance with the Permit. Samples are taken from a sampling point in the Water Treatment Plant and analysed for the parameters listed in the Trade Effluent Discharge Consent (TEDC) issued and regulated by South West Water. The pH limits permitted by the Permit were varied in 2017 to mirror the TEDC of 6-10.

Water outflow from the Water Treatment Plant in m^3/hr together with temperature and pH of the mixed plant discharge and site grey water in the KIO tank located on the site are reported to the Environment Agency quarterly.

The results compared with emission limits are summarised in Table 2.

Table 2 : Water Discharge 2017

Parameter	Reporting period				Limit
	Q1	Q2	Q3	Q4	
Flow Rate m^3/h (Daily average)	0.73	0.42	0.35	0.59	No EP limit
pH (Mean)	7.57	7.65	7.62	7.22	6-10
Temperature °C (mean)	16.85	18.6	20.56	20.95	No EP limit

3.3 Flue Gases

All gaseous emissions generated during the combustion process pass through an extensive flue gas cleaning process which begins in the boiler itself where the maintenance of good combustion conditions ensures complete burn out of combustible elements and dioxin and furan emissions are controlled. Liquid Urea is injected into the combustion chamber to treat oxides of nitrogen. Gases exit the boiler and Sodium bicarbonate is injected between the two economisers to neutralise acid gases, activated carbon is added to remove metals and dioxins, and finally gases pass through the bag filter house to complete reaction and remove any remaining particulates. The cleaned gases are finally released into the atmosphere through the chimney stack.

In compliance with the WID and EPR Permit requirements, the flue gases are continuously monitored using MCERTS accredited equipment. In addition to the Continuous Emissions Monitoring System (CEMS), an extractive sampling campaign is undertaken quarterly by an approved service supplier. The organisation used for analysis and monitoring are accredited by the United Kingdom Accreditation Service (UKAS) and the Environment Agency's Monitoring Certification Scheme (MCERTS).

3.3.1 Continuous and Extractive Emissions Monitoring

The parameters measured, and the frequency of monitoring are summarised in Table 3.

Table 3: Frequency of Measured Emissions in Year 2/3 of operation 2017

Parameter	Frequency		
	Continuous	Jan – June (Q1 and Q2)	July – Dec (Q3 and Q4)
Particulate Matter	✓		
TOC	✓		
Hydrogen Chloride	✓		
Oxides of Nitrogen	✓		
Carbon Monoxide	✓		
Sulphur Dioxide	✓		
Ammonia		✓	✓
Nitrous Oxide		✓	✓
Hydrogen Fluoride		✓	✓
Mercury		✓	✓
Cadmium & Thallium		✓	✓
Heavy metals (As, Sb, Mn, Co, Cu, Ni, Cr, V)		✓	✓
Dioxins and Furans		✓	✓
Dioxin-like PCBs		✓	✓
PAHs		✓	✓

The results of the quarterly extractive campaign in comparison to WID and Permitted limits are summarised in Table 4.

Table 4: Six-monthly Extractive Testing Results

Parameter	Result Q1 / Q2	Result Q3 / Q4	Emission Limit
Nitrous Oxide	15.4 mg/m^3	10.5 mg/m^3	No Limit Applied
Hydrogen Fluoride	0.22 mg/m^3	0.06 mg/m^3	2 mg/m^3
Mercury and its compounds	0.0051 mg/m^3	0.001 mg/m^3	0.05 mg/m^3
As, Sb, Pb, Cr, Cu, Mn, Ni, V and their compounds	0.058 mg/m^3	0.029 mg/m^3	0.5 mg/m^3
Cadmium, Thallium and their compounds	0.0021 mg/m^3	<0.001 mg/m^3	0.05 mg/m^3
Dioxins and Furans (I -TEQ) +	0.0031 ng/m^3	0.0039 ng/m^3	0.1 ng/m^3

Dioxins and Furans (WHO – TEQ Humans and Mammals) +	0.0031 ng/m^3	0.0039 ng/m^3	No Limit Applied
Dioxins and Furans (WHO – TEQ Fish) +	0.0038 ng/m^3	0.0031 ng/m^3	No Limit Applied
Dioxins and Furans (WHO – TEQ Birds) +	0.0049 ng/m^3	0.0055 ng/m^3	No Limit Applied
Dioxin-like PCBs (WHO – TEQ Humans & Mammals) +	0.00087 ng/m^3	0.000638 ng/m^3	No Limit Applied
Dioxin-like PCBs (WHO – TEQ Fish) +	0.000045 ng/m^3	0.000028 ng/m^3	No Limit Applied
Dioxin-like PCBs (WHO – TEQ Birds) +	0.0029 ng/m^3	0.001092 ng/m^3	No Limit Applied
PAHs Total	1.96 µg/m^3	1.043 µg/m^3	No Limit Applied

+ Concentrations shown are Upper Limit (worst case where <LOD = LOD)

3.3.2 Continuous Monitoring

The CEMS for the period of 1st January 2017 through to 31st December 2017 was in service for 100% of the WID operational hours. The equipment is meticulously serviced, maintained, and calibration checks are routinely conducted.

The maximum half hourly average, and daily averages are reported to the Environment Agency monthly. The data is also uploaded on to the company website on a weekly basis and can be viewed at: https://www.mvv.de/en/mvv_energie_gruppe/mvv_umwelt/beteiligungen/mvv_environment_1/devonport/links_downloads/index.jsp

3.3.3 Annual Emissions

The annual mass emissions of the periodically monitored parameters are summarised in Table 5.

Table 5 : Annual Mass Emissions

Parameter	Units	2017 Total
Hydrogen Fluoride	Kg	227.11
Mercury	Kg	5.12
Heavy Metals total	Kg	71.57
Cadmium & Thallium	Kg	2.44
Dioxins and Furans (NATO I-TEQ)	Kg	0.00000592
PAHs	Kg	2.31
PCBs (WHO TEQ)	Kg	0.00000124

3.3.4 Review of Emissions

All recorded and reported emissions, from extractive testing have remained below the emission limit values throughout 2017 and are within acceptable ranges for the plant.

The recorded and reported emissions, from CEMS show 4 instances of exceedance of the ½ hourly CO Emission Limit Value of 100 mg/m^3, these were as follows –

- 18/07/17 Following a site blackout due to a lightning strike at a local substation (182 & 438.5 mg/Nm3)
- 15/11/17 As the result of a boiler safety valve failure (164.6 mg/Nm^3)
- 27/11/17 Fan tripped due to loss of end stop position feedback ultimately leading to loss of oxygen supply (251.1 mg/Nm^3)
- 30/11/17 Coincident with a feed chute blockage but with no other indicators of poor combustion conditions. (108.9 mg/Nm^3)

The recorded and reported emissions, from CEMS show 1 instances of exceedance of the ½ hourly TOC Emission Limit Value of 10 mg/m^3,

- 18/07/17 also because of site blackout due to a lightning strike at a local substation, of 25.1 mg/Nm^3.

31/08/17 A release of process water from a fractured underground pipe resulted in the loss of approximately 2 m^3 of water (pH 6-10) from the site.

4.0 USE OF REJECTED HEAT/CHP

The plant supplies District Heating to the Royal Navy Dockyard throughout the Winter Heating period Oct to April at a max rate of 30t/h at 170.c and 6.9bar. A limited supply is also continued through the summer months.

Every practicable opportunity to use the heat before being rejected at the Air-Cooled Condenser for beneficial local use is investigated. To date no cost effective or practicable options have become available. The site will continue to identify all possible opportunities and investigate the practicalities of its installation. All viable developments will be implemented at the earliest opportunity.

5.0 ENVIRONMENTAL CONTROLS

The management and staff of Devonport EfW CHP Facility are highly qualified and experienced within the sector. Reliable environmental controls and a robust management system ensure that compliance with the Waste Incineration Directive and EPR Permit is maintained.

MED staff are aware of the environmental impacts of their work and exercise an appropriate standard of good housekeeping, proportionate to the impacts of any potential emissions. Training and competency of

staff is controlled by the Facility Management in conjunction with the Integrated Management System and CARVAL dedicated HR software. The company identifies training requirements of its employees and provides suitable resources to ensure they have the required knowledge, skills and expertise to carry out their duties.

Table 6 : Facility Compliance Summary	
Exceedence of Emission Limit Values	4 ½ hourly exceedance CO 1 ½ hourly exceedance TOC 1 point source emission of water
Abnormal Operations	None
Enforcement Notices	None
Complaints	5 odour complaints received throughout year. 1 during planned outage. 9 noise complaints received.

APPENDIX 1

Permitted waste types and quantities for incineration plant	
Maximum quantity	Maximum total throughput = 265,000 tonnes per year. The aggregated throughput of waste codes 15 01 04, 15 01 07, 19 04 01, 19 12 02, 19 12 03 and 19 12 09 shall not exceed 5% by weight of the total throughput. The aggregated throughput of waste codes 04 01 08, 09 01 07 and 19 10 04 shall not exceed 1% by weight of the total throughput.
Waste code	**Description**
02	**Wastes from Agriculture, Horticulture, Aquaculture, Forestry, Hunting & Fishing, Food Preparation & Processing**
02 01	**Wastes from agriculture, horticulture, aquaculture, forestry, hunting & fishing**
02 01 02	Animal-tissue waste
02 01 03	Plant-tissue waste
02 01 04	Waste plastics (except packaging)
02 01 06	Animal faeces, urine and manure (including spoiled straw), effluent, collected separately and treated offsite
02 01 07	Wastes from forestry
02 01 09	Agrochemical waste other than those mentioned in 02 01 08
02 02	**Wastes from the preparation and processing of meat, fish & other foods of animal origin**
02 02 02	Animal-tissue waste
02 02 03	Materials unsuitable for consumption or processing
02 03	**Wastes from fruit, vegetables, cereals edible oils, cocoa, coffee, tea and tobacco preparation & processing; conserve production; yeast & yeast extract production, molasses preparation & fermentation**
02 03 04	Materials unsuitable for consumption or processing
02 05	**Wastes from the dairy products industry**
02 05 01	Materials unsuitable for consumption or processing
02 06	**Wastes from the baking and confectionery industry**
02 06 01	Materials unsuitable for consumption or processing
02 06 02	Wastes from preserving agents
02 07	**Wastes from the production of alcoholic and non-alcoholic beverages (except coffee, tea & cocoa)**
02 07 01	Wastes from washing, cleaning and mechanical reduction of raw materials
02 07 02	Wastes from spirits distillation
02 07 04	Materials unsuitable for consumption or processing
03	**Wastes from Wood Processing and the Production of Panels and Furniture, Pulp, Paper and Cardboard**
03 01	**Wastes from Wood Processing and the Production of Panels and Furniture**
03 01 01	waste bark and cork
03 01 05	sawdust, shavings, cuttings, wood, particle board and veneer other than those mentioned in 03 01 04
03 03	**Wastes from Pulp, Paper and Cardboard production and processing**
03 03 01	waste bark and wood
03 03 07	mechanically separated rejects from pulping of waste paper and cardboard
03 03 08	wastes from sorting of paper and cardboard destined for recycling
04	**Wastes from the Leather, Fur and Textile Industries**
04 01	**Wastes from the Leather and Fur Industry**
04 01 08	Waste tanned leather (blue sheeting's, shavings, cuttings, buffing dust) containing chromium
04 01 09	Wastes from dressing and finishing

04 02	**Wastes from the Textile Industry**
04 02 09	wastes from composite materials (impregnated textile, elastomer, plastomer)
04 02 10	organic matter from natural products (for example grease, wax)
04 02 21	Wastes from unprocessed textile fibres
04 02 22	Wastes from processed textile fibres
09	**Wastes from the Photographic Industry**
09 01	**Wastes from the Photographic Industry**
09 01 07	photographic film and paper containing silver or silver compounds
09 01 08	photographic film and paper free of silver or silver compounds
15	**Waste Packaging; absorbents, wiping cloths, filter materials and protective clothing not otherwise specified.**
15 01	**Packaging (including separately collected municipal packaging waste)**
15 01 01	Paper and cardboard packaging
15 01 02	Plastic packaging
15 01 03	Wooden packaging
15 01 04	Metallic packaging
15 01 05	Composite packaging
15 01 06	Mixed packaging
15 01 07	Glass packaging
15 01 09	Textile packaging
15 02	**Absorbents, wiping cloths, filter materials and protective clothing**
15 02 03	Absorbents, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02
17	**Construction and Demolition Wastes (Including excavated soil from contaminated sites)**
17 02	**Wood Glass and Plastic**
17 02 01	Wood
17 02 03	Plastic
17 09	**Other Construction and Demolition Wastes**
17 09 04	Mixed construction and demolition wastes other than those mentioned in 17 09 01, 17 09 02 and 17 09 03
19	**Wastes from Waste Management Facilities, off-site Waste Water Treatment Plants & Preparation of Water intended for Human Consumption / Industrial Use**
19 02	**Wastes from physico/chemical treatments of waste (including dechromatation, decyanidation, neutralisation)**
19 02 03	Premixed wastes composed only of non-hazardous wastes
19 02 10	Combustible wastes other than those mentioned in 19 02 08 and 19 02 09
19 04	**Vitrified waste and wastes from vitrification**
19 04 01	Vitrified waste
19 05	**Wastes from aerobic treatment of solid wastes**
19 05 01	Non-composted fraction of municipal and similar wastes
19 05 02	Non-composted fraction of animal and vegetable waste
19 05 03	Off-specification compost
19 06	**wastes from anaerobic treatment of waste**
19 06 04	digestate from anaerobic treatment of municipal waste
19 06 06	digestate from anaerobic treatment of animal and vegetable waste
19 08	**wastes from waste water treatment plants not otherwise specified**
19 08 01	screenings
19 10	**wastes from shredding of metal-containing wastes**
19 10 04	fluff-light fraction and dust other than those mentioned in 19 10 03
19 12	**Wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified**
19 12 01	Paper and cardboard
19 12 02	Ferrous metal
19 12 03	Non-ferrous metal

19 12 04	Plastic and rubber
19 12 07	Wood other than that mentioned in 19 12 06
19 12 08	Textiles
19 12 09	Minerals (for example sand, stones)
19 12 10	Combustible waste (refuse derived fuel)
19 12 12	other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11
20	**Municipal Wastes (Household and Similar Commercial, Industrial and Institutional Wastes) including separately collected fractions**
20 01	**Separately Collected Fractions (except 15 01)**
20 01 01	Paper and cardboard
20 01 08	Biodegradable food waste
20 01 10	Clothes
20 01 11	Textiles
20 01 25	edible oil and fat
20 01 37*	Wood containing dangerous substances (content of dangerous substances not to exceed in threshold for classification as hazardous waste)
20 01 38	Wood other than that mentioned in 20 01 37
20 01 39	Plastics
20 01 99	Other fractions not otherwise specified
20 02	**Garden and Park Wastes (including cemetery wastes)**
20 02 01	Biodegradable waste
20 02 03	Other non-biodegrable waste
20 03	**Other Municipal Wastes**
20 03 01	Mixed municipal waste
20 03 02	Waste from markets
20 03 03	Street sweeping residues
20 03 04	Street cleaning residues
20 03 06	Waste from sewage cleaning
20 03 07	Bulky waste
20 03 99	Municipal wastes not otherwise specified