



Recovering Energy from Waste

Annual Performance Report

The Coventry and Solihull Waste Disposal Company Waste to Energy Plant Permit No EPR/NP3739PD/V005 Year 2016

Introduction

The Waste to Energy plant, which is located at Bar Road in Coventry, processes Municipal Household waste arising in the City of Coventry and the neighbouring borough of Solihull. Municipal household waste from other nearby local authorities is also processed at the plant.

The plant is operated by The Coventry and Solihull Waste Disposal Company Ltd.

For further information on the report, or for copies of the report the contact the following representatives of the operator;

R. Scawin	Compliance and Performance Manager
Telephone Number	024 7650 7400
M. Schilling	Environment, Health and Safety Advisor
Telephone Number	024 7650 7400

Plant Description

The main activity at the installation is thermal treatment of municipal waste and recovery of energy, in the form of heat which is converted to electricity for export to the grid. The installation also has the capability to export heat in the form of either High or Low Pressure steam to a district heating scheme operated by Engie UK. A limited amount of hazardous waste, containing less than 1% halogenated organic substances (as chlorine), is also burned with the municipal waste.

The installation includes waste receipt and storage, steam generation boilers, abatement of the exhaust gas, on-site storage of residues and all systems for controlling and monitoring combustion operation. The steam produced is used to drive 2 steam turbine driven generators.

The plant design is capable of processing approximately 315,000 tonnes of waste per annum/36 tonnes per hour in three combustion units (12 tonne per unit). The heat produced is used to generate 17.7MW of electricity and up to 16MW heat energy.

Refuse collection vehicles enter the reception hall and deposit their waste into a storage bunker. The material is then loaded by crane into each of the combustion units via feed hoppers from the storage bunker. After entering the combustion chamber via the refuse feed ram the material is allowed to fall onto the grate in a controlled manner. The moving grate mechanisms are used to agitate the waste as it progresses down to the ash discharge.

As the waste moves along, pre-heated primary air is introduced from beneath the grate enabling the waste to go through a series of drying and burning areas. Secondary air is introduced from above the grate for combustion control. Auxiliary gas fired burners are located in the combustion chamber both to heat it up on start-up and to maintain the final gas temperature if necessary. The hot gases are maintained at a minimum temperature of 850°C for 2 seconds in the combustion chamber before passing to the boiler, economiser and abatement plant. Each combustion unit is equipped with a 3-bank water tube boiler, raising steam at 17 bar and 208°C. Economisers are fitted downstream of each combustion unit to pre-heat the incoming feed water.

Combustion is controlled with the use of an infrared imaging computer system, which uses fuzzy logic systems to control various parameters of the plant, ensuring improved efficiency and emission performance when compared to fully manual control.

Each combustion unit is provided with its own gas cleaning and monitoring equipment. Gas cleaning comprises activated carbon injection, then dry scrubbing with hydrated lime. The gasses pass through bag filters to remove particulates prior to discharge to atmosphere via a single 92m stack. NOx control is achieved by Selective Non Catalytic Reduction (SNCR) using ammonium hydroxide injection.

Emissions from the stack are continuously monitored for particulates, carbon monoxide (CO), sulphur dioxide (SO₂), hydrogen chloride (HCl), oxygen (O₂), nitrogen oxides (NOx) and volatile organic compounds (VOC).

There is no discharge of process liquids to controlled waters. Uncontaminated surface and roof waters are discharged to the surface water drainage system, via penstock equipped interceptors. All process waste waters are discharged to foul sewer and these are treated at Finham Sewage Treatment Works, which is operated by Severn Trent Water.

Bottom ash from the combustion unit grate is quenched with water. The ferrous fraction from the bottom ash is then removed by magnetic separation. Both fractions are then conveyed to individual concrete storage bunkers prior to removal for reprocessing into aggregates or for recycling back into the steel industry.

Air Pollution Control Residues (APCR) from the bag filters are collected continuously and stored in an enclosed silo prior to removal from site for disposal.

Summary of plant operation

The plant consists of three separate combustion units that process up to a maximum of 12 tonnes of waste per hour.

There are two steam turbine driven electrical generating sets on the plant which convert the heat energy recovered from the combustion process into electricity. The generating sets are designated as G1 and G2. G1 has a capacity of 12.9MW and G2 a capacity of 4.8 MW. The process energy requirements are taken from the electricity generated and the surplus is exported to the grid. The plant also has the capacity to export heat, in the form of high pressure and low pressure steam.

The following table categorises the types and permitted maximum amounts of wastes processed.

EWC Code	Description	Amount
19 12 01	paper and cardboard (confidential waste separately collected)	≈ □ 5%
19 12 12	other wastes (including mixtures of materials) from mechanical treatment of wastes other than those mentioned in 19 12 11	
20 01 01	paper and cardboard	≈ 5%
20 01 08	biodegradable kitchen waste	≈ □ 1%
20 02 01	biodegradable waste	≈ □ 1%
20 03 01	mixed municipal waste	≈ 90%
20 03 02	waste from markets	
20 03 07	bulky waste	
20 03 99	municipal waste not otherwise specified	
02 03 04	Wastes unsuitable for consumption or processing	
20 01 11	Textiles other	
13 07 01*	fuel oil and diesel	<1%
13 08 99*	wastes not otherwise specified	
15 02 02*	absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances	
15 02 03	absorbents, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02	
16 07 08*	waste containing oil	
19 12 10	Combustible waste (refuse derived fuel)	
19 01 99	Wastes not otherwise specified	≈ □ 0.1%

Plant Performance

During 2016 the plant processed 282,849 tonnes of municipal waste.

During 2016 the plant operated for the following hours on each combustion unit:

Combustion Unit	Operating hours	Actual Percent availability	Planned Percent availability
1	7741.6	88.13%	87%
2	8387.0	95.48%	
3	8070.5	91.88%	

During 2016 there were planned outages for the following reasons:

- Water washes were performed on all three units.
- Planned maintenance took place on units 1, 2 and 3, including the cleaning of economisers on all streams.
- The cooling towers were cleaned and chlorinated.
- No cable washes were performed in total during the year, as these have been replaced with on-line explosive cleaning, which was undertaken on 27 occasions.

Other periods which were not accounted for by the planned availability to actual availability figures were primarily due to unplanned faults, such as feed blockages, fan bearing faults, boiler tube leaks, etc.

The following table describes the type, amount and destination/treatment of residues produced by the process

Residue description	Quantity produced (tonnes)	Destination/treatment
Incinerator Bottom Ash	45,992	Recycled in aggregates
Air pollution Control residue	10,924	Treatment prior to final landfill
Incinerated metal	8,020	Recycled

The total energy generated by the plant in 2016 was:

Total electricity generated	124,196 MWh
Total electricity consumed on site	22,049 MWh
Total electricity to the grid	102,062 MWh

The electricity exported to the grid is equivalent to the average needs of approximately 25,000 – 30,000 houses.

The heat provided to the District heating scheme was 19,525 MWh_{Thermal}

Summary of plant emissions

The Continuous Emission Monitoring System (CEMS) continuously monitors the emissions to air of the following pollutants on each unit:

- Oxides of Nitrogen
- Carbon Monoxide
- Volatile Organic Compounds (Hydrocarbons)
- Particulates
- Sulphur Dioxide
- Hydrogen Chloride
- Ammonia

The CEMS continuously monitors the Dry and Wet Oxygen content of the gasses for each unit to correct the data to normalised conditions. It also continuously monitors the gas flow rates for each unit to calculate mass released.

The emissions to air from the process remained compliant with the EPR Permit Emission Limit Values for half hourly averages for all notifiable pollutants, except as described in the section “Summary of plant compliance” which follows this section.

A summary table of the mass emissions for the year is shown in Appendix 1, with emissions per unit shown in Appendix 2.

Graphs of the monthly average concentration for emissions of all notifiable pollutants on the three combustion units are shown at the end of this document in Appendix 3.

The mass emission results for heavy metals, cadmium, mercury, dioxins and hydrocarbons are extrapolated from the third party periodic monitoring carried out during the year. These results remain compliant and do not indicate any significant deviation on previous results.

Periodic sampling was carried out by an external sampling house for emissions to air (including AST), IBA and APCR during the year in accordance with the operating permit. All the results sampled were below the Environmental Permit Emission Limit Values. Where applicable the results were comparable with the data generated by the Continuous Emissions Monitoring equipment.

Periodic measurements are taken of the pollutants measured continuously and also the following on each unit.

- Heavy Metals
- Mercury
- Cadmium & Thallium
- Hydrogen Fluorides
- Dioxins
- PCB.s

Abnormal operations

During 2016 there were 2 incidents of abnormal operations.

Date	Unit/s	Parameter	Reason
25/02/2016	1 + 2	CEMs	Loss of CEMs data
27/09/2016	3	CEMs	Loss of FID data

Total hours of abnormal operation during 2016 was 9 hours 55 minutes.

Stream 1 – 3 hr 15 mins

Stream 2 – 3 hr 15 mins

Stream 3 – 3 hr 25 mins

Permit Exceedances

There were no permit exceedances reported to the Environment Agency during 2016, which is the first year since the Permit was granted that the plant has operated without a breach of the ELV's.

Summary of plant compliance

Complaint Type	2009	2010	2011	2012	2013	2014	2015	2016
Odour	4	0	2	1	1	1	0	0
Noise	3	4	0	0	0	2	1	0
Dust	4	0	0	0	0	0	0	0
Misc	1	0	0	0	0	0	0	0

There were no substantiated complaints which were found to relate to our environmental impacts during the year. We did receive two complaints in the period; one related to noise and another to odorous smoke. Neither could be attributed to plant activity and both sources were some considerable distance from the plant. Closer neighbours reported no issues and no abnormal conditions took place on site.

Summary of plant improvements

During 2016 as part of our EPR Permit improvement programme we completed the following improvements:

Flood emergency response plan and flood risk survey, including some preventative works to help reduce flood risk.

A 'Fin-Fan' condensing system was installed to enable full waste incineration to continue during periods of low or even zero steam demand, such as during turbine shut downs and trips.

The combustion chamber roof tubes were replaced on unit 1.

The economiser element was renewed on unit 1.

A full review of plant control system alarms was undertaken in preparation for a control system alarm upgrade in 2017.

G2 turbine generator control system was upgraded in March.

Summary of information made available

The Company has a Website (<http://www.cswdc.co.uk>) where the public can access information about the Company and its processes, including monthly updated emissions data.

An information brochure, which includes a process flow diagram, can be obtained upon request to the Company's office.

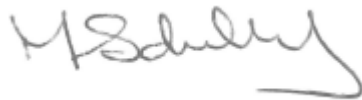
Information on emission releases to air may be obtained from the public registers which are held at the following addresses:

Coventry City Council
Environmental Services dept
Broadgate House
Broadgate
Coventry

Environment Agency
Sentinel House,
9 Wellington Crescent,
Fradley Park,
Lichfield,
Staffordshire,
WS13 8RR

Visits to the plant may be arranged by contacting the Company's office

CSWDC Ltd
Bar Road
Coventry
CV3 4 AN
Tel: 024 7650 7400
Fax: 024 7650 7404



M Schilling, Environment, Health and Safety Advisor
January 2017

APPENDIX 1

MASS RESULTS SUMMARY

	HCl	SO ₂	Nox	CO	HC	DUST	NH ³
2016	2.82	69.26	301.05	23.51	1.59	3.18	N/A
2015	2.77	61.76	275.03	24.91	0.44	2.31	N/A
2014	2.82	46.28	257.55	20.75	0.98	1.57	N/A
2013	2.68	36.50	213.19	19.64	0.82	0.94	1.21
2012	1.01	35.35	224.16	37.53	0.90	1.19	1.92
2011	1.37	40.47	239.24	34.67	0.30	1.92	2.75
2010	2.03	39.05	212.89	33.89	0.68	2.60	1.94
2009	3.68	23.79	255.2	29.67	0.51	2.04	N/A
2008	4.31	12.11	248.3	30.39	1.004	4.07	N/A
2007	7.07	9.6	247.3	30.28	0.51	2.6	N/A
	HF	METALS	CAD	HG	DIOXINS	CO ₂	
2016	0.11	0.07	0.0025	0.001	0.0027	223506	
2015	0.26	0.01	0.0005	0.0007	0.0006	223505	
2014	0.37	0.05	0	0.004	0.0107	195332	
2013	0.37	0.05	0.0000	0.0040	0.0103	96334	<i>Inaccurate calcs used</i>
2012	0.23	0.05	0.0030	0.0027	0.0022	127771	
2011	0.33	0.095	0.0005	0.0002	0.0040	154251	
2010	0.33	0.097	0.0004	0.00018	0.0039	147040	
2009	0.05	0.03	0.0006	0.0027	0.0305	140564	
2008	0.08	0.09	0.0026	0.00015	0.0036	143902	
2007	0	0.053	0.0009	0	0.0087	146230	

In Tonnes except Dioxins (grams)

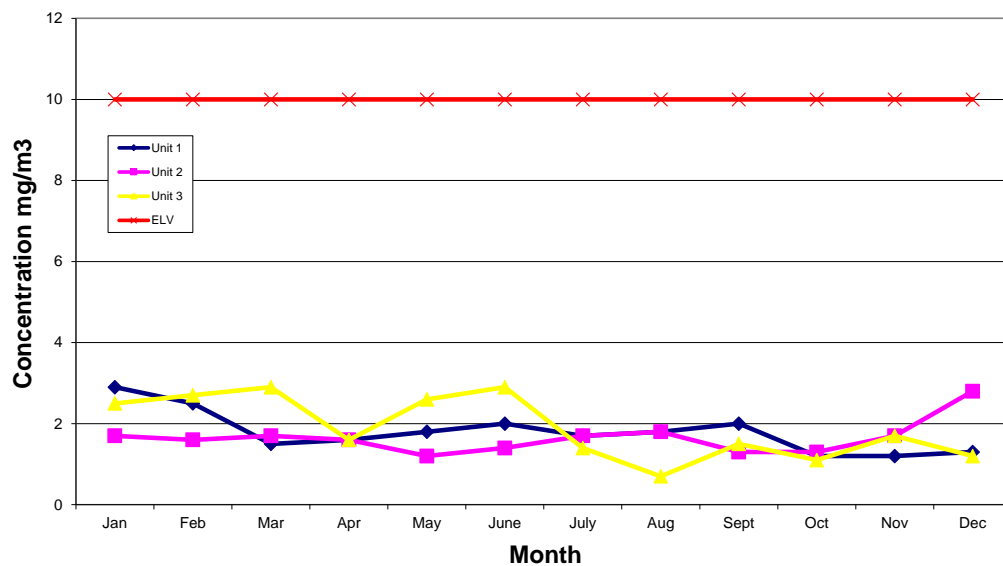
APPENDIX 2

TOTAL EMISSIONS (T) PER UNIT

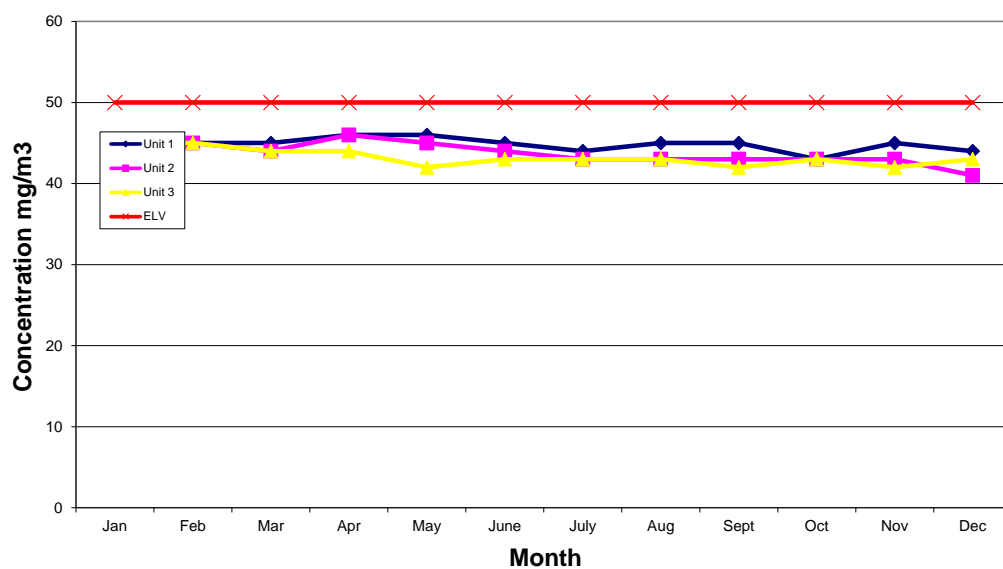
	HCL	SO ₂	Nox	CO	HC	Dust
UNIT 1	0.97	24.27	103.72	9.07	0.00	0.65
UNIT 2	0.90	23.67	103.32	6.77	0.08	1.68
UNIT 3	0.95	21.32	94.01	7.67	0.06	0.84

APPENDIX 3

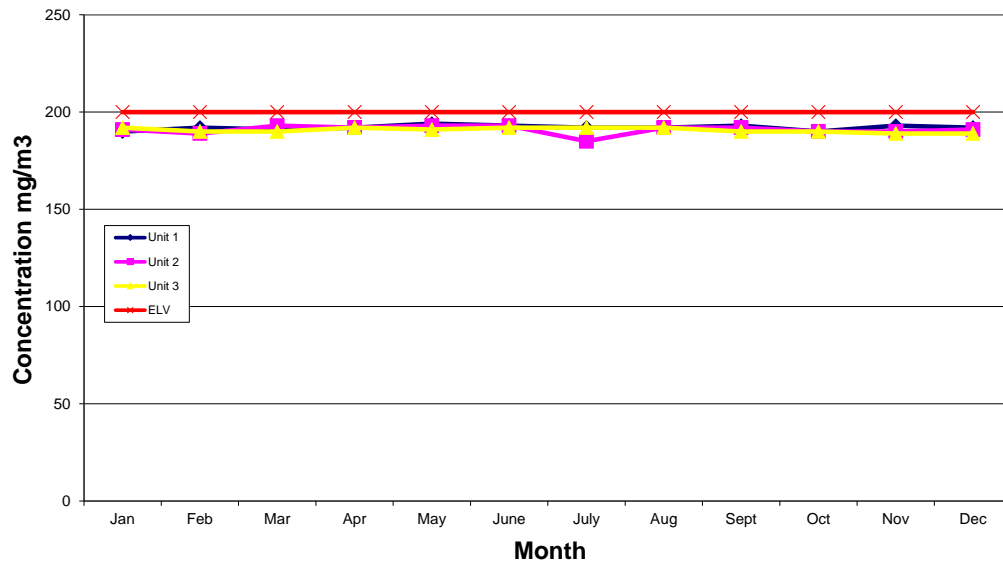
Monthly Averages - Hydrogen Chloride



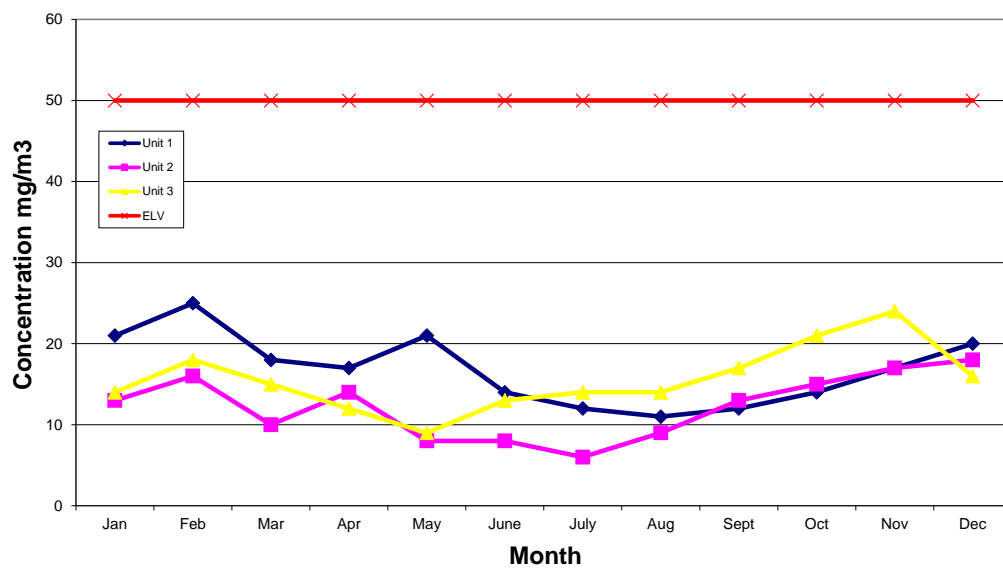
Monthly Averages Sulphur Dioxide



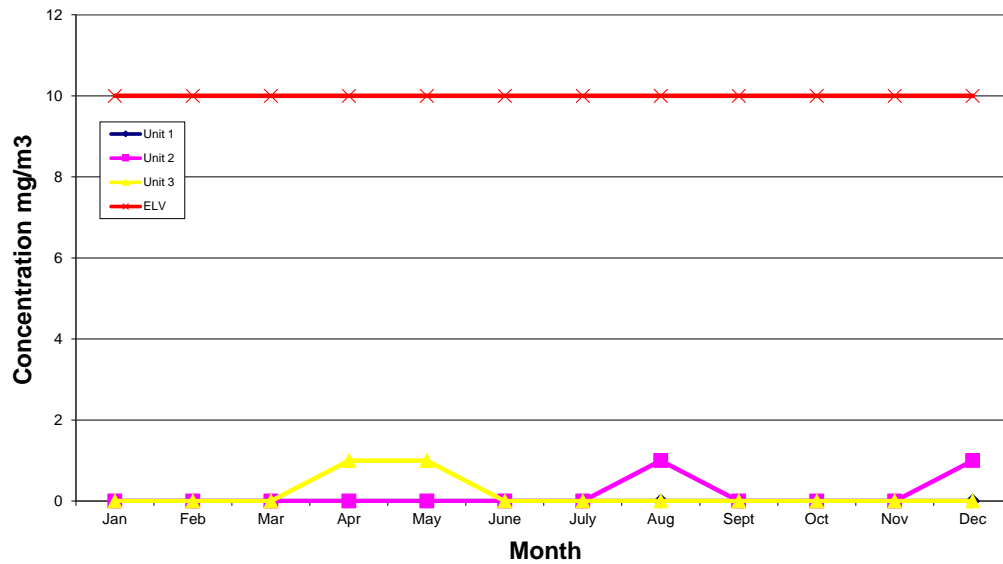
Monthly Averages - Oxides of Nitrogen



Monthly Averages - Carbon Monoxide



Monthly Averages VOCs



Monthly Averages - Particulates

