VEOLIA

Appendix I(ii)

Chlorine content analysis

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Woodlawn ARC - Chlorine Content Analysis of Feedstock

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Purpose	The purpose of this document is to describe the chlorine content of the feedstock analysed as part of the auditing of waste for the Woodlawn Advanced Energy Recovery Centre (ARC).

Scope	This document applies to the Woodlawn ARC project only
Review Frequency	N/A

Contents

Revision History

Revision	Date	Document Status
A	07/10/2022	FINAL issue

1. Introduction

Veolia engaged consultants to undertake two campaigns of auditing and characterisation of the potential feedstock for the Woodlawn ARC.

The waste characterisation project involved:

- Sampling and sorting of residual municipal solid waste (MSW) and commercial and industrial (C&I) waste from incoming loads to Veolia's Banksmeadow Transfer Terminal;
- Establishment of calorific value (CV);
- Chemical analysis at a NATA accredited laboratory.

Campaign 1 was conducted from 8 June 2021 to 17 June 2021.
Campaign 2 was conducted from 29 November to 3 December 2021.

Learnings from campaign 1 were implemented in campaign 2, and as a result, the sampling and testing methodology was refined between the two campaigns.

See document "Waste Auditing Methodology" for more details.

1.1. Summary

For campaign 1, a single composite sample was compiled each day for laboratory testing, from each of the 16 individual waste categories mixed in the proportions of the day's sampling. At the laboratory, the individual categories were tested for moisture content, and eight composite samples were subjected to CV and chemical analysis.

For campaign 2, individual waste categories were kept separate and a sample of each was sent to the laboratory for moisture content, CV and chemical testing. Campaign 2 also included an additional six waste categories (22 in total) and sieving of samples to establish the particle distribution.

For both campaigns, chlorine levels were below 1%.

Campaign	Waste Type	Measurement	Chlorine %
1	MSW	Mean of 4 days composite samples	0.42
1	C&I	Mean of 4 days composite samples	0.73
2	MSW	SImulated from individual tests	0.50

2. Campaign 1

2.1. Results

Raw results of chlorine analysis and moisture content of each composite sample are shown below.

		Cl	Water
		% (db)	% (ar)
Day 1	MSW	0.75	47.6
Day 2	MSW	2.93	46.2
Day 3	MSW	0.75	53.7
Day 4	MSW	1.35	54.4
Day 5	C&I	0.84	44.0
Day 6	C&I	0.84	53.9
Day 7	C&I	0.59	31.2
Day 8	C&I	0.82	48.4

The results expressed as a dry basis (db) have to be adjusted for moisture content thus:
$[Value\ \%(db)]\ \times\ (1\ -\ [Moisture\ content\ \%(ar)])\ =\ [Adjusted\ \%]$

For example, for Day 1:
$0.75\%\ \times\ (1\ -\ 47.6\%)\ =\ 0.39\%$

		Cl
		%
Day 1	MSW	0.39
Day 2	MSW	1.58
Day 3	MSW	0.35
Day 4	MSW	0.62
Day 5	C&I	0.47
Day 6	C&I	0.39
Day 7	C&I	0.41
Day 8	C&I	0.42
Mean	**Total**	**0.58**
Mean	**C&I**	**0.73**
Mean	**MSW**	**0.42**

It can be seen that on Day 2 the chlorine content of the composite sample was greater than 1%, however this was caused by a sampling error that resulted in the Day 2 composite sample containing 21% PVC. This was as a result of a large PVC inflatable boat being included in the sample. It is unrealistic to assume that 21% of the waste feedstock of the ARC would be made up of PVC. Nevertheless, the mean average of the adjusted chlorine percentage is 0.58% even including the anomalous Day 2 result.

3. Campaign 2

3.1. Results

Raw results showing the overall waste composition (proportion of each waste category), chlorine analysis on a dry basis and moisture are shown below.

	Composition	Cl	Water
	%	% (db)	% (ar)
Organics	39.88	0.92	69.90
Recyclable Paper	0.84	0.06	15.10
Recyclable Cardboard	1.64	0.18	14.00
Other Paper & Cardboard	12.81	0.59	48.60
Cartons	0.29	0.14	24.10
Composite	0.61	1.41	9.70
Textiles	7.66	0.79	48.60
Nappies/Hygiene	7.84	0.02	75.20
Plastics - PET	0.95	3.14	11.20
Plastics - HDPE	0.38	0.09	9.80
Plastics - PVC	0.07	15.00	10.80
Plastics - Film	11.17	3.06	38.90
Plastics - Other	3.24	0.72	16.40
Combustible Material	0.63	0.30	18.60
Glass	1.50		0.10
Metals - Ferrous	1.36		3.00
Metals - Non Ferrous	0.33		29.40
Non Combustible/Inert	0.31		3.80
Ewaste	0.81		0.10
Other Hazardous	0.94		
Fines	5.59	0.75	54.00
Other	1.15	2.64	14.50

The results expressed as a dry basis (db) have to be adjusted for moisture content thus:
$[Value\ \%(db)]\ \times\ (1\ -\ [Moisture\ Content\ \%(ar)])\ =\ [Adjusted\ \%]$

For example, for Organics:
$0.92\%\ \times\ (1\ -\ 69.9\%)\ =\ 0.28\%$

	Composition	Cl
	%	%
Organics	39.88	0.28
Recyclable Paper	0.84	0.05
Recyclable Cardboard	1.64	0.15
Other Paper & Cardboard	12.81	0.30
Cartons	0.29	0.11
Composite	0.61	1.27
Textiles	7.66	0.41
Nappies/Hygiene	7.84	0.00
Plastics - PET	0.95	2.79
Plastics - HDPE	0.38	0.08
Plastics - PVC	0.07	13.38
Plastics - Film	11.17	1.87
Plastics - Other	3.24	0.60
Combustible Material	0.63	0.24
Glass	1.50	
Metals - Ferrous	1.36	
Metals - Non Ferrous	0.33	
Non Combustible/Inert	0.31	
Ewaste	0.81	
Other Hazardous	0.94	
Fines	5.59	0.35
Other	1.15	2.26

The moisture adjusted values are then adjusted for the composition (proportion of each category) to simulate a composite sample thus:

$$[Value\ \%]\ \times\ [Composition\ \%]\ =\ [Composite\ \%]$$

For example, for Organics:

$$0.28\%\ \times\ 39.88\%\ =\ 0.11\%$$

	Composition	Cl
	%	%
Organics	39.88	0.11
Recyclable Paper	0.84	0.00
Recyclable Cardboard	1.64	0.00
Other Paper & Cardboard	12.81	0.04
Cartons	0.29	0.00
Composite	0.61	0.01
Textiles	7.66	0.03
Nappies/Hygiene	7.84	0.00
Plastics - PET	0.95	0.03
Plastics - HDPE	0.38	0.00
Plastics - PVC	0.07	0.01
Plastics - Film	11.17	0.21
Plastics - Other	3.24	0.02
Combustible Material	0.63	0.00
Glass	1.50	
Metals - Ferrous	1.36	
Metals - Non Ferrous	0.33	
Non Combustible/Inert	0.31	
Ewaste	0.81	
Other Hazardous	0.94	
Fines	5.59	0.02
Other	1.15	0.03
SUM	**100.00**	**0.50**

The sum of the values is used to evaluate the total chlorine content. Therefore the total chlorine expected in the waste feedstock is 0.5%.