Kalka-Sorpeyðingarstöð Suðurnesja
Útblástursmælingar

SORPEYÐINGARSTÖÐ SUÐURNESJA-ÚTBLÁSTURSMÆLINGAR

GREINARGERÐ

VERKNÚMER:	12079-011	DAGS:	2016-11-29
VERKÞÁTTUR:	01	NR.:	09
UNNIÐ FYRIR:	Sorpeyðingarstöð Suðurnesja		
VERKEFNISSTJÓRI:	Birgir Tómas Arnar		
HÖFUNDUR:	Birgir Tómas Arnar	YFIRFARIÐ:	GÞJ
DREIFING:	Jón Norðfjörð, Ingþór Karlsson		

Mælingar í útblæstri frá reykháfi Kölku, sorpeyðingarstöð Suðurnesja, voru framkvæmdar 5. október 2016 af starfsmönnum Verkís hf. Síur voru vigtaðar hjá Rannsóknarþjónustunni Sýni ehf. Síur og díoxín var efnagreint á rannsóknarstofu Scientific Analysis Laboratories Ltd. Í Bretlandi.

Verkís hf. | Ofanleiti 2, 103 Reykjavík | 422 8000 | verkis.is | verkis@verkis.is

Efnisyfirlit

Yfirlit yfir töflur

1 Inngangur

Verkís hf. í samstarfi við Rannsóknarþjónustuna Sýni ehf. tók að sér mælingar í útblæstri frá reykháfi Kölku, sorpeyðingarstöðvar Suðurnesja. Í reykháfi var mældur hraði á útblásturslofti, rykmagn og gildi á súrefni (O_2), koldíoxíði (CO_2), nituroxíði (NO_x), vetnisklóríði (HCl), vetnsiflúoríði (HF), díoxín/fúrönum og lífrænu kolefni (TOC). Þungmálmar voru einnig efnagreindir í útblæstrinum. Síur og díoxín var efnagreint á rannsóknarstofu Scientific Analysis Laboratories Ltd. í Bretlandi. Niðurstöður mælinga sjást hér í töflunni að neðan.

Mælingar á rykmagni, CO_2, HF, HCl og NO_x byggjast á 30 mínútna meðaltölum, aðrar mælingar standa yfir lengur. Sjá nánar í töflu 1.1.

Allir útreikningar í töflu miðast við staðalaðstæður (STP), 273K (0°C) og 101,3 kPa, þurrt loft miðað við 11% súrefnisinnihald (O_2). N/m³ svarar til eins rúmmetra af lofti við staðalaðstæður.

Tafla 1.1 Helstu niðurstöður mælinga

Mælingar í útblæstri						
Mæliþáttur	***Mæligildi (meðaltöl)***	***Umr. mv. 11% O_2***	***Losunarmörk Dagleg meðalgildi m.v. 11% O2***	***Losunarmörk 30 mín meðaltal m.v. 11% O_2***	***Útstreymis-magn***	***Tímasvið***
Rykmagn í útblæstri	3,5 mg/Nm³	4,7 mg/Nm³	10 mg/Nm³	30 mg/Nm³	0,0 kg/klst	3x30 mín
Nituroxíð (NO_x)	158,0 mg/Nm³	190,1 mg /Nm³	400 mg/Nm³	-	1,0 kg/klst	3x30 mín
Kolmónoxíð (CO)	45,7 mg/Nm³	55,0 mg/Nm³	50 mg/Nm³	100 mg/Nm³	0,3 kg/klst	3x30 mín
Brennisteinsdíoxíð (SO_2)	0,0 mg/Nm³	0,0 mg/Nm³	50 mg/Nm³	200 mg/Nm³	0,0 kg/klst	3x30 mín
Lífrænt kolefni (TOC)	0,0 mg/Nm³	0,0 mg/Nm³	10 mg/Nm³	20 mg/Nm³	0,0 kg/klst	1x30 mín
Vetnisklóríð (HCl)	0,3 mg/Nm³	0,4 mg/Nm³	10 mg/Nm³	60 mg/Nm³	0,0 kg/klst	2x30 mín
Vetnisflúroíð (HF)	0,5 mg /Nm³	0,6 mg/Nm³	1 mg/Nm³	4 mg/Nm³	0,0 g/klst	2x30 mín
Díoxín /Fúrön (I-TEQ)	0,16 ng/Nm³	0,18 ng/Nm³	0,1 ng/Nm³	-	1,0 µg/klst	6x60mín
Cd+Tl	0,002 mg/Nm³	0,002 mg/Nm³	0,05 mg/Nm³	-		1x30 mín
Hg	0,0 mg/Nm³	0,0 mg/Nm³	0,05 mg/Nm³	-		1x30 mín
∑Pb+Cr+Cu+V+Ni+As+Sb+Co+An	0,46 mg/Nm³	0,62 mg/Nm³	0,5 mg/Nm³	-		1x30 mín
Súrefni, O_2	12,7%	-		-	-	6x60 mín
CO_2	6,2%	-		-	-	6x60 mín
Hitastig mælibúnaðar	35°C	-		-	-	-
Hitastig útblásturslofts	168°C	-		-	-	-
Rakainnihald útblásturslofts	10%	-		-	-	-
Loftþrýstingur á mælistað	720 mmHg					
Lofthraði útblásturslofts	12,0 m/s	-		-	-	-
Loftmagn	5.503 Nm³/klst	-		-	-	-

2 Mælingar

2.1 Mælingar í útblæstri

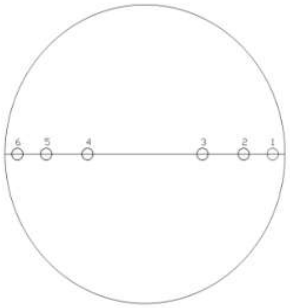
2.1.1 Hraðamælingar

Lofthraði var mældur í þversniði reykháfs í 6 punktum, sbr. mynd hér að neðan[1].

Tafla 2.1 Helstu kennistærðir reykháfs á mælistað

	Stærðir	Eining
Innra þvermál reykháfs	0,80	m
Flatarmál	0,503	m^2

Tafla 2.2 Niðurstöður hraðamælinga

			
Pkt. nr.	***Staða í rás (cm)***	***Mældur hraði (m/sek)***	***Mældur hraði (m/sek)***
1	3,5	11,2	11,2
2	11,8	11,2	11,9
3	23,6	11,2	12,6
4	56,4	11,9	13,2
5	68,2	12,6	11,9
6	76,5	11,9	12,6
	$V_{meðal}$	**11,7**	**12,2**

$V_{meðal}$=12 m/sek

[1] Frávik frá EN 13284 staðlinum sem gerir ráð fyrir að mælt sé í 6 punktum á tveimur línum sem eru hornréttar hvor á aðra í mæliplaninu. Þetta orsakast að því að einungis eitt gat er aðgengilegt til mælinga á reykháfi.

2.1.2 Heildarryk

Þrjú ryksýni voru tekin með ryksafnara með glertrefja síu. Ryksafnaranum er stungið inn í reykháfinn og loftstraumur sogaður út í gegnum hann með jafnhraðasýnatöku (isokinetic sampling). Niðurstöður mælinga eru gefnar í eftirfarandi töflu.

Losunarmörk miðast við 11% súrefnisinnihald (O_2) í reykháfi. Því þarf að margfalda mældan rykstyrk í reykháfunum með eftirfarandi stuðli:

$$f_{c,O_2} = \frac{21 - \varphi_{O_2,ref}}{21 - \varphi_{O_2,m}}$$

Þar sem $\varphi_{O2,ref}$ er viðmiðunargildið (11%) og $\varphi_{O2,m}$ er mælt súrefnisgildi í reykháfi.

Tafla 2.3 Niðurstöður rykmælinga

Ryk í útblæstri				
Mæliröð nr.	Mælt rykmagn	Ryk í síu	Tími	Rykmagn (O_2 11%, þurrt)
1	6,4 mg/Nm³	2,1 mg	11:28-11:48	7,1 mg/Nm³
2*	0,0 mg/Nm³	0,0 mg	12:31-13:01	0,0 mg/Nm³
3	0,6 mg/Nm³	0,2 mg	13:16-13:46	0,8 mg/Nm³

*Ekki mælanlegt í síu

2.1.3 Nituroxíð (NO_x)

Nituroxíð (NO_x) var mælt með Madur GA-12 plus gasmæli og mældist um 158 mg/Nm³ eða 190 mg/Nm³ umreiknað að 11% súrefni.

2.1.4 Vetnisklóríð (HCl)

Vetnisklóríð (HCl) var mælt samhliða rykmælingum og dregið í gegnum glerflöskur með vökvalausn (afjónað vatn). Vetnisklóríð (HCl) mældist 0,3 mg/Nm³ eða 0,4 mg/Nm³ umreiknað að 11% súrefni.

2.1.5 Vetnisflúoríð (HF)

Vetnisflúoríð var mælt samhliða rykmælingum og dregið í gegnum glerflöskur með vökvalausn (0,1 M NaOH). Reyndist magnið 0,5 mg/Nm³ eða 0,6 mg/Nm³ umreiknað að 11% súrefni.

2.1.6 Díoxín/fúrön

Díoxín og fúrön voru mæld í útblæstrinum með jafnhraðasýnatöku í 6 klst. samfellt. Styrkur þessara efna mældist 0,18 ng/Nm³ umreiknað að 11% súrefni. Notuð var s.k. „Filter/condenser" aðferð skv. ÍST EN 1948.

2.1.7 Þungmálmar

Eftirfarandi þungmálmar voru efnagreindir í síum og lausnum og styrkur þeirra reiknaður í rúmmáli útblástursloftsins. Málmar voru mældir með ICP-OES eftir upplausn í saltpéturssýru og peroxíði skv. EPA aðerð nr. 3051. Styrkur þungmálma í útblæstri sést í töflu 1.1.

- Summa: Kadmíum (Cd) og þallíum (TI)
- Kvikasilfur (Hg)
- Summa: Blý (Pb), króm (Cr) kopar (Cu) og vanadíum (V), Nikkel (Ni), Arsen (As), antímon (Sb), kóbolt (Co) og mangan (Mn)

2.1.8 Annað

Súrefni í útblæstrinum mældist að meðaltali 12,7%, rakainnihald útblásturslofts var um 10% og hitastig þess að meðaltali 168°C.

3 Mælinákvæmni

3.1.1 Mælinákvæmni

Taflan hér að neðan sýnir nákvæmni, gefna upp í %, sem búast má við í mælingunum ef notaðar eru þær aðferðir sem vísað er í eða frá framleiðanda tækjabúnaðar.

Tafla 3.1 Nákvæmni í mældum gildum

Mælinákvæmni		
Mæliþáttur	% nákvæmni	Mæliaðferð
Ryk	±15%	EN 13284
TOC	±15%	-
HCl	±30%	EN 1911
HF	±20%	ISO 15713
CO	±5%	Skv. framleiðanda gasmælis
NO_x	±5%	Skv. framleiðanda gasmælis
SO_2	±5%	Skv. framleiðanda gasmælis
NH_3	±20%	-
O_2	±5%	Skv. framleiðanda gasmælis
Þungmálmar	±15%	EN 14385
Díoxín og fúrön	±30%	EN 1948
Hraði	±3%	ISO 10780
Hitastig	±5%	EN 14790
Raki	±20%	EN 14790

Viðauki 1 – Niðurstöður efnagreininga

Verkís hf
B.t. Birgis Tómasar Arnars
Ofanleiti 2
103 Reykjavík

SÝNI

NIÐURSTÖÐUR EFNA- OG ÖRVERUGREININGA

Sýni nr.: E-6159-16

Gerð sýnis:	Síur	**Móttekið:**	18.10.2016
Sendandi:	Verkís hf	**Rannsakað:**	19.10.2016
Sýnataka:	Verkís hf	**Verkkaupi:**	Verkís v/ **Kalka**

Nr. Sýnis	Merking sýnis	Þyngd fyrir notkun (g)	Þyngd eftir notkun (g)	Ryk (mg)
E-6159	Sía nr. 51	1.6818	1.6839	2.1
	Sía nr. 52	1.5921	1.5910	E.m.
	Sía nr. 53	1.3602	1.3604	0.2

Athugasemdir: Síurnar voru þurrkaðar við 103°C í 2 klst. E.m: Ekki mælanlegt.

Reykjavík, 25. nóvember 2016

Þorvaldur Snæbjörnsson
Efnafræðingur

RANNSÓKNARÞJÓNUSTAN SÝNI EHF. • LYNGHÁLSI 3 • 110 REYKJAVÍK • KT. 410493-2689 • SÍMI 512 3380 • FAX 512 3399

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Scientific Analysis Laboratories Ltd

Certificate of Analysis

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Report Number: 608881-1

Date of Report: 22-Nov-2016

Customer: Verkis
Ofanleiti 2
103 Reykjavik
Iceland

Customer Contact: . Birgir Arnar

Customer Job Reference:
Date Job Received at SAL: 20-Oct-2016
Date Analysis Started: 24-Oct-2016
Date Analysis Completed: 03-Nov-2016

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs
All results have been reviewed in accordance with Section 25 of the SAL Quality Manual

UKAS TESTING
1549

Report checked and authorised by :
Lauren Clarke
Project Manager

Issued by :
Lauren Clarke
Project Manager

Summary Of Results

Filter

Dioxins

				ITEQ Toxic Equivalents ng	
SAL Reference	**Customer Sample Reference**	**Analysis**	**Symbol**	**Lower Bound**	**Upper Bound**
608881 001	FILTER NO 54	Dioxins and Furans (BS EN 1948:06)	WU	0.0034	**0.0087**

Composite (XAD Trap + Wash)

Dioxins

				ITEQ Toxic Equivalents ng	
SAL Reference	**Customer Sample Reference**	**Analysis**	**Symbol**	**Lower Bound**	**Upper Bound**
608881 005	Combined BOTTLE MARKED DIOXIN + XAD + WASHING BOTTLE	Dioxins and Furans (BS EN 1948:06)	WU	1.2	**1.2**

Composite (Filt, Trap, Wash)

Dioxins

				ITEQ Toxic Equivalents ng	
SAL Reference	**Customer Sample Reference**	**Analysis**	**Symbol**	**Lower Bound**	**Upper Bound**
608881 009	Combined METHOD BLANK	Dioxin and Furan - Method Blank (BS EN 1948:06)	WU	0.0	**0.0069**

Sampling Recoveries

SAL Reference	**Customer Sample Reference**	**Determinand**	**Sampling Recovery %**
608881 005	Combined BOTTLE MARKED DIOXIN + XAD + WASHING BOTTLE	1,2,3,7,8-PeCDF	106
		1,2,3,7,8,9-HxCDF	112
		1,2,3,4,7,8,9-HpCDF	126

Filter

Customer Sample Reference : FILTER NO 54
SAL Sample Reference : 608881 001

BS EN 1948 specifies a list of information that should be available within reports. This is extensive, so in the interest of reports being concise the information is omitted. The EA are content with this being the case. Note that all the information is recorded and can be made available on request.

Dioxins and Furans (BS EN 1948:06)

Technique : GC/MS (HR)

					ITEQ Toxic Equivalents ng	
Determinand	**Symbol**	**LOD ng**	**Result ng**	**Internal Recovery %**	**Lower Bound**	**Upper Bound**
2,3,7,8-TCDD	WU	0.0020	<0.0020	96	0.0	**0.0020**
1,2,3,7,8-PeCDD	WU	0.0020	<0.0020	103	0.0	**0.0010**
1,2,3,4,7,8-HxCDD	WU	0.0020	<0.0020	76	0.0	**0.00020**
1,2,3,6,7,8-HxCDD	WU	0.0028	<0.0028	81	0.0	**0.00028**
1,2,3,7,8,9-HxCDD	WU	0.0022	<0.0022		0.0	**0.00022**
1,2,3,4,6,7,8-HpCDD	WU	0.0070	**0.071**	98	0.00071	**0.00071**
OCDD	WU	0.0070	**0.17**	91	0.00017	**0.00017**
				Dioxins Totals :	0.00088	**0.0046**
2,3,7,8-TCDF	WU	0.0020	<0.0020	86	0.0	**0.00020**
1,2,3,7,8-PeCDF	WU	0.0020	<0.0020		0.0	**0.00010**
2,3,4,7,8-PeCDF	WU	0.0020	<0.0020	103	0.0	**0.0010**
1,2,3,4,7,8-HxCDF	WU	0.0025	**0.0054**	76	0.00054	**0.00054**
1,2,3,6,7,8-HxCDF	WU	0.0025	**0.0059**	73	0.00059	**0.00059**
2,3,4,6,7,8-HxCDF	WU	0.0025	**0.011**	73	0.0011	**0.0011**
1,2,3,7,8,9-HxCDF	WU	0.0025	<0.0025		0.0	**0.00025**
1,2,3,4,6,7,8-HpCDF	WU	0.0050	**0.027**	87	0.00027	**0.00027**
1,2,3,4,7,8,9-HpCDF	WU	0.0050	<0.0050		0.0	**0.00005**
OCDF	WU	0.014	<0.014	98	0.0	**0.00001**
				Furans Totals :	0.0025	**0.0041**
				Totals :	**0.0034**	**0.0087**

Composite (XAD Trap + Wash)

Customer Sample Reference : Combined BOTTLE MARKED DIOXIN + XAD + WASHING BOTTLE

SAL Sample Reference : 608881 005

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Dioxins and Furans (BS EN 1948:06)

Technique : GC/MS (HR)

					ITEQ Toxic Equivalents ng	
Determinand	**Symbol**	**LOD ng**	**Result ng**	**Internal Recovery %**	**Lower Bound**	**Upper Bound**
2,3,7,8-TCDD	WU	0.0020	**0.10**	100	0.10	**0.10**
1,2,3,7,8-PeCDD	WU	0.0019	**0.59**	108	0.30	**0.30**
1,2,3,4,7,8-HxCDD	WU	0.0022	**0.37**	93	0.037	**0.037**
1,2,3,6,7,8-HxCDD	WU	0.0021	**0.67**	97	0.067	**0.067**
1,2,3,7,8,9-HxCDD	WU	0.0021	**0.50**		0.050	**0.050**
1,2,3,4,6,7,8-HpCDD	WU	0.0031	**3.5**	103	0.035	**0.035**
OCDD	WU	0.0038	**3.0**	105	0.0030	**0.0030**
				Dioxins Totals :	0.59	**0.59**
2,3,7,8-TCDF	WU	0.0022	**0.26**	90	0.026	**0.026**
1,2,3,7,8-PeCDF	WU	0.0020	**0.48**		0.024	**0.024**
2,3,4,7,8-PeCDF	WU	0.0020	**0.67**	98	0.34	**0.34**
1,2,3,4,7,8-HxCDF	WU	0.0023	**0.71**	87	0.071	**0.071**
1,2,3,6,7,8-HxCDF	WU	0.0025	**0.64**	81	0.064	**0.064**
2,3,4,6,7,8-HxCDF	WU	0.0022	**0.76**	90	0.076	**0.076**
1,2,3,7,8,9-HxCDF	WU	0.014	<0.014		0.0	**0.0014**
1,2,3,4,6,7,8-HpCDF	WU	0.0043	**1.2**	94	0.012	**0.012**
1,2,3,4,7,8,9-HpCDF	WU	0.0043	**0.23**		0.0023	**0.0023**
OCDF	WU	0.0038	**0.33**	105	0.00033	**0.00033**
				Furans Totals :	0.61	**0.61**
				Totals :	**1.2**	**1.2**

Composite (Filt, Trap, Wash)

Customer Sample Reference : Combined METHOD BLANK
SAL Sample Reference : 608881 009

BS EN 1948 specifies a list of information that should be available within reports. This is extensive, so in the interest of reports being concise the information is omitted. The EA are content with this being the case. Note that all the information is recorded and can be made available on request.

Dioxin and Furan - Method Blank (BS EN 1948:06)

Technique : GC/MS (HR)

					ITEQ Toxic Equivalents ng	
Determinand	**Symbol**	**LOD ng**	**Result ng**	**Internal Recovery %**	**Lower Bound**	**Upper Bound**
2,3,7,8-TCDD	WU	0.0020	<0.0020	108	0.0	**0.0020**
1,2,3,7,8-PeCDD	WU	0.0020	<0.0020	118	0.0	**0.0010**
1,2,3,4,7,8-HxCDD	WU	0.0020	<0.0020	75	0.0	**0.00020**
1,2,3,6,7,8-HxCDD	WU	0.0020	<0.0020	83	0.0	**0.00020**
1,2,3,7,8,9-HxCDD	WU	0.0020	<0.0020		0.0	**0.00020**
1,2,3,4,6,7,8-HpCDD	WU	0.058	<0.058	94	0.0	**0.00058**
OCDD	WU	0.23	<0.23	69	0.0	**0.00023**
				Dioxins Totals :	0.0	**0.0044**
2,3,7,8-TCDF	WU	0.0020	<0.0020	101	0.0	**0.00020**
1,2,3,7,8-PeCDF	WU	0.0020	<0.0020		0.0	**0.00010**
2,3,4,7,8-PeCDF	WU	0.0020	<0.0020	115	0.0	**0.0010**
1,2,3,4,7,8-HxCDF	WU	0.0020	<0.0020	82	0.0	**0.00020**
1,2,3,6,7,8-HxCDF	WU	0.0020	<0.0020	82	0.0	**0.00020**
2,3,4,6,7,8-HxCDF	WU	0.0020	<0.0020	81	0.0	**0.00020**
1,2,3,7,8,9-HxCDF	WU	0.0020	<0.0020		0.0	**0.00020**
1,2,3,4,6,7,8-HpCDF	WU	0.018	<0.018	86	0.0	**0.00018**
1,2,3,4,7,8,9-HpCDF	WU	0.015	<0.015		0.0	**0.00015**
OCDF	WU	0.035	<0.035	92	0.0	**0.00004**
				Furans Totals :	0.0	**0.0025**
				Totals :	**0.0**	**0.0069**

Index to symbols used in 608881-1

Value	Description
AR	As Received
W	Analysis was performed at another SAL laboratory
U	Analysis is UKAS accredited

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Certificate of Analysis

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Report Number: 609298-1

Date of Report: 08-Nov-2016

Customer: Verkis
Ofanleiti 2
103 Reykjavik
Iceland

Customer Contact: . Birgir Arnar

Customer Job Reference:
Date Job Received at SAL: 20-Oct-2016
Date Analysis Started: 26-Oct-2016
Date Analysis Completed: 07-Nov-2016

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation
This report should not be reproduced except in full without the written approval of the laboratory
Tests covered by this certificate were conducted in accordance with SAL SOPs
All results have been reviewed in accordance with Section 25 of the SAL Quality Manual

UKAS TESTING
1549

Report checked and authorised by :
Lauren Clarke
Project Manager

Issued by :
Lauren Clarke
Project Manager

SAL Reference: 609298
Customer Reference:

Filter Analysed as Filter
Metals suite

				SAL Reference	**609298 001**
				Customer Sample Reference	**FILTER 51**
				Test Sample	**AR**
Determinand	**Method**	**LOD**	**Units**	**Symbol**	
Antimony	ICPMS (HF BS EN 14385)	0.5	µg	U	**1.7**
Arsenic	ICPMS (HF BS EN 14385)	0.5	µg	U	**15**
Cadmium	ICPMS (HF BS EN 14385)	0.5	µg	U	<0.5
Chromium	ICPMS (HF BS EN 14385)	1	µg	U	**76**
Cobalt	ICPMS (HF BS EN 14385)	0.5	µg	U	<0.5
Lead	ICPMS (HF BS EN 14385)	0.5	µg	U	**5.2**
Copper	ICPMS (HF BS EN 14385)	0.5	µg	U	**6.9**
Manganese	ICPMS (HF BS EN 14385)	1.0	µg	U	**28**
Mercury	CVAFS (HF Digest BS EN 13211)	0.01	µg	U	<0.01
Nickel	ICPMS (HF BS EN 14385)	1.0	µg	U	**12**
Thallium	ICPMS (HF BS EN 14385)	0.5	µg	U	**0.8**
Vanadium	ICPMS (HF BS EN 14385)	0.5	µg	U	**7.2**

SAL Reference: 609298
Customer Reference:

Impinger(DI water) Analysed as Impinger(DI water)
HCL

					SAL Reference	**609298 002**	**609298 003**	**609298 004**
					Customer Sample Reference	**HCL - 1**	**HCL - 2**	**HCL - 3**
					Test Sample	**AR**	**AR**	**AR**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Hydrogen Chloride	IC	0.05	mg/l	U		(13) <0.05	(13) **0.56**	(13) **0.14**
Volume	Vol	1	ml	U		**41**	**37**	**37**

SAL Reference: 609298
Customer Reference:

Impinger (sodium hydroxide) Analysed as Impinger (sodium hydroxide)
Miscellaneous

					SAL Reference	**609298 005**	**609298 006**	**609298 007**
					Customer Sample Reference	**HF - 1**	**HF - 2**	**HF - 3**
					Test Sample	**AR**	**AR**	**AR**
Determinand	**Method**	**LOD**	**Units**	**Symbol**				
Hydrogen Fluoride	IC (acetate separation method)	0.05	mg/l	U		(13) **0.93**	(13) **0.09**	(13) **0.12**
Volume	Vol	1	ml	U		**35**	**38**	**38**

Index to symbols used in 609298-1

Value	Description
AR	As Received
13	Results have been blank corrected.
U	Analysis is UKAS accredited

MARCHWOOD SCIENTIFIC SERVICES
Unit 1A.2(a) North Road
Marchwood Ind. Park
Marchwood
Southampton
SO40 4BL

TEST REPORT

Verkís Ltd
Ofanleiti 2
103 Reykjavík
Iceland

Certificate No.	116/9405rev1 Page 1 of 1
Date received	08/11/2016
Purchase Order	503289942

22nd November 2016 Supplement to test Certificate No. 116/9405.

Re. Analysis of Air Emission Samples-

Please find below the tabulated results for the sample received for analysis.

Results of Analysis-

Analysis	Filter 53	Units
TOC	0.04	mg

Reported by: J Fursman
Position: Director
For/on behalf of Marchwood Scientific Services Ltd.