Sorpeyðingarstöð Suðurnesja-Kalka
Útblástursmælingar

SORPEYÐINGARSTÖÐ SUÐURNESJA-KALKA-ÚTBLÁSTURSMÆLINGAR

GREINARGERÐ

VERKNÚMER:	09300008	DAGS:	2017-02-01
VERKÞÁTTUR:	01	NR.:	03
UNNIÐ FYRIR:	Umhverfisstofnun		
VERKEFNISSTJÓRI:	Birgir Tómas Arnar		
HÖFUNDUR:	Birgir Tómas Arnar	YFIRFARIÐ:	GÞJ
DREIFING:	Sigrún Ágústsdóttir, Umhverfisstofnun		

Mælingar í útblæstri frá reykháfi Sorpeyðingarstöðvar Suðurnesja, Kölku, voru framkvæmdar þann 21. desember 2016 af starfsmönnum Verkís hf. Síur og díoxín var efnagreint á rannsóknarstofu Scientific Analysis Labortories Ltd. (SAL) 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 Sorpeyðingarstöðvar Suðurnesja, Kölku. Í reykháfnum var mældur hraði, hitastig útblásturslofts, rykmagn og styrkur á díoxín/fúrönum. Þungmálmar voru einnig efnagreindir í útblæstrinum.

Síur og díoxín var efnagreint á rannsóknarstofu Scientific Analysis Laboratories (SAL) í Bretlandi. Niðurstöður mælinga sjást hér í töflunni að neðan.

Allir útreikningar í töflu 1.1 og losunarmörk sem eru tilgreind þar miðast við staðalaðstæður (STP), 273K (0°C) og 101,3 kPa, þurrt loft miðað við 11% súrefnisinnihald (O_2).

1 N/m³ svarar til eins rúmmetra af lofti við staðalaðstæður.

Tafla 1.1 Niðurstöður mælinga í útblæstri

Mælingar í útblæstri						
Mæliþáttur	***Mæligildi (meðaltöl)***	***Umr. mv. 11% O_2***	***Losunarmörk Dagleg meðalgildi m.v. 11% O_2***	***Losunarmörk 30 mín meðaltal mv.v 11%O_2***	***Útstreymis-magn***	***Tíma-svið***
Rykmagn í útblæstri	53,8 mg/Nm³	68,9 mg/Nm³	10 mg/Nm³	30 mg/Nm³	0,3 kg/klst	3x30 mín
Díoxín /Fúrön (I-TEQ)	0,02 ng/Nm³	0,02 ng/Nm³	0,1 ng/Nm³	-	0,0 µg/klst	6x60mín
Cd+Tl	0,0 mg/Nm³	0,0 mg/Nm³	0,05 mg/Nm³	-	-	3x30 mín
Hg	0,0 mg/Nm³	0,0 mg/Nm³	0,05 mg/Nm³	-	-	3x30 mín
∑Pb+Cr+Cu+V+Ni+As+Sb+Co+Mn	0,2 mg/Nm³	0,3 mg/Nm³	0.25 mg/Nm³	-	-	3x30 mín
Súrefni, O_2	13,2%	-		-	-	6x60 mín
Hitastig mælibúnaðar	25°C	-		-	-	-
Hitastig útblásturslofts	169°C	-		-	-	-
Rakainnihald útblásturslofts	6,9%	-		-	-	-
Loftþrýstingur á mælistað	702,3 mmHg					
Lofthraði útblásturslofts	9,1 m/s	-		-	-	-
Loftmagn	4.202 Nm³/klst	-		-	-	-

2 Mælingar

2.1 Mælingar í útblæstri frá reykháfi

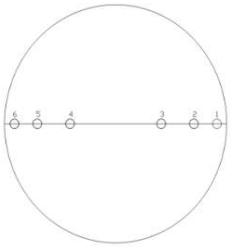
2.1.1 Hraðamælingar

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 reykháfs	0,503	m²

Tafla 2.2 Niðurstöður hraðamælinga



Pkt. nr.	*Staða í rás (cm)*	*Mældur hraði 1*	*Mældur hraði 2*
1	3,5	7,7	6,7
2	11,8	9,5	8,6
3	23,6	10,2	9,5
4	56,4	10,2	10,2
5	68,2	10,9	10,2
6	76,5	7,7	7,7

Meðalhraði lofts v_m=9,1 m/sek
Raunloftflæði= 7.967 m³/klst

[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.

Tafla 2.3 Niðurstöður rykmælinga

Ryk í útblæstri				
Mæliröð nr.	Mælt rykmagn	Ryk í síu	Tími	Rykmagn (þurrt, 11% O_2)
1 (sía #94)	96,0 mg/Nm³	51,6 mg	11:46-12:16	123,1 mg/Nm³
2 (sía #95)	21,0 mg/Nm³	11,1 mg	12:37-13:07	26,9 mg/Nm³
3 (sía #96)	44,3 mg/Nm³	19,9 mg	13:42-14:12	56,8 mg/Nm³

2.1.3 Díoxín/fúrön

Díoxín og fúrön voru mæld í útblæstrinum með jafnhraðasýnatöku. Notuð var s.k. „Filter/condenser" aðferð skv. ÍST EN 1948.

2.1.4 Þungmálmar

Eftirfarandi þungmálmar voru efnagreindir í síu og styrkur þeirra reiknaður í rúmmáli útblásturslofts skv. EN 14385 . Málmar voru mældir með ICP-OES eftir upplausn í saltpéturssýru og peroxíði skv. EPA aðferð nr. 3051. Styrkur þungmálma í útblæstri sést í töflu 1.2

- Summa: Antímon (Sb), Blý (Pb), Króm (Cr), Kopar (Cu), Mangan (Mn), Vanadíum (V), Arsen (As), Nikkel (Ni) og Kóbolt (Co).

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

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Scientific Analysis Laboratories Ltd

Certificate of Analysis

Hadfield House
Hadfield Street
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Manchester
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Tel : 0161 874 2400
Fax : 0161 874 2404

Report Number: 625872-1

Date of Report: 30-Jan-2017

Customer: Verkis
Ofanleiti 2
103 Reykjavik
Iceland

Customer Contact: Reports

Customer Job Reference: E1019
Date Job Received at SAL: 11-Jan-2017
Date Analysis Started: 12-Jan-2017
Date Analysis Completed: 18-Jan-2017

The results reported relate to samples received in the laboratory and may not be representative of a whole batch.
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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

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Report checked and authorised by :
Lauren Clarke
Project Manager

Issued by :
Lauren Clarke
Project Manager

Summary Of Results

Composite (XAD Trap + Filter)

Dioxins

				ITEQ Toxic Equivalents ng	
SAL Reference	**Customer Sample Reference**	**Analysis**	**Symbol**	**Lower Bound**	**Upper Bound**
625872 003	Combined FILTER #97 + XAD TRAP 12079001	Dioxins and Furans (BS EN 1948:06)	U	0.14	**0.14**
625872 006	Combined METHOD BLANK	Dioxins and Furans (BS EN 1948:06)	U	0.0	**0.0060**

Sampling Recoveries

SAL Reference	**Customer Sample Reference**	**Determinand**	**Sampling Recovery %**
625872 003	Combined FILTER #97 + XAD TRAP 12079001	1,2,3,7,8-PeCDF	105
		1,2,3,7,8,9-HxCDF	105
		1,2,3,4,7,8,9-HpCDF	96

Composite (XAD Trap + Filter)

Customer Sample Reference : Combined FILTER #97 + XAD TRAP 12079001

SAL Sample Reference : 625872 003

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	U	0.0020	**0.016**	106	0.016	**0.016**
1,2,3,7,8-PeCDD	U	0.0020	**0.048**	123	0.024	**0.024**
1,2,3,4,7,8-HxCDD	U	0.0021	**0.035**	94	0.0035	**0.0035**
1,2,3,6,7,8-HxCDD	U	0.0021	**0.071**	93	0.0071	**0.0071**
1,2,3,7,8,9-HxCDD	U	0.0021	**0.050**		0.0050	**0.0050**
1,2,3,4,6,7,8-HpCDD	U	0.0033	**0.34**	96	0.0034	**0.0034**
OCDD	U	0.0042	**0.36**	94	0.00036	**0.00036**
				Dioxins Totals :	0.059	**0.059**
2,3,7,8-TCDF	U	0.0022	**0.12**	92	0.012	**0.012**
1,2,3,7,8-PeCDF	U	0.0020	**0.067**		0.0034	**0.0034**
2,3,4,7,8-PeCDF	U	0.0020	**0.081**	115	0.041	**0.041**
1,2,3,4,7,8-HxCDF	U	0.0025	**0.074**	80	0.0074	**0.0074**
1,2,3,6,7,8-HxCDF	U	0.0023	**0.062**	89	0.0062	**0.0062**
2,3,4,6,7,8-HxCDF	U	0.0022	**0.077**	90	0.0077	**0.0077**
1,2,3,7,8,9-HxCDF	U	0.0022	**0.021**		0.0021	**0.0021**
1,2,3,4,6,7,8-HpCDF	U	0.0045	**0.15**	89	0.0015	**0.0015**
1,2,3,4,7,8,9-HpCDF	U	0.0045	**0.018**		0.00018	**0.00018**
OCDF	U	0.0045	**0.043**	88	0.00004	**0.00004**
				Furans Totals :	0.081	**0.081**
				Totals :	**0.14**	**0.14**

Composite (XAD Trap + Filter)

Customer Sample Reference : Combined METHOD BLANK
SAL Sample Reference : 625872 006

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	U	0.0020	<0.0020	96	0.0	**0.0020**
1,2,3,7,8-PeCDD	U	0.0020	<0.0020	118	0.0	**0.0010**
1,2,3,4,7,8-HxCDD	U	0.0020	<0.0020	87	0.0	**0.00020**
1,2,3,6,7,8-HxCDD	U	0.0020	<0.0020	93	0.0	**0.00020**
1,2,3,7,8,9-HxCDD	U	0.0020	<0.0020		0.0	**0.00020**
1,2,3,4,6,7,8-HpCDD	U	0.0080	<0.0080	95	0.0	**0.00008**
OCDD	U	0.0080	<0.0080	74	0.0	**0.00001**
				Dioxins Totals :	0.0	**0.0037**
2,3,7,8-TCDF	U	0.0020	<0.0020	106	0.0	**0.00020**
1,2,3,7,8-PeCDF	U	0.0020	<0.0020		0.0	**0.00010**
2,3,4,7,8-PeCDF	U	0.0020	<0.0020	112	0.0	**0.0010**
1,2,3,4,7,8-HxCDF	U	0.0020	<0.0020	82	0.0	**0.00020**
1,2,3,6,7,8-HxCDF	U	0.0020	<0.0020	80	0.0	**0.00020**
2,3,4,6,7,8-HxCDF	U	0.0020	<0.0020	89	0.0	**0.00020**
1,2,3,7,8,9-HxCDF	U	0.0020	<0.0020		0.0	**0.00020**
1,2,3,4,6,7,8-HpCDF	U	0.0080	<0.0080	92	0.0	**0.00008**
1,2,3,4,7,8,9-HpCDF	U	0.0080	<0.0080		0.0	**0.00008**
OCDF	U	0.0080	<0.0080	75	0.0	**0.00001**
				Furans Totals :	0.0	**0.0023**
				Totals :	**0.0**	**0.0060**

Index to symbols used in 625872-1

Value	Description
AR	As Received
U	Analysis is UKAS accredited

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Scientific Analysis Laboratories Ltd

Certificate of Analysis

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Tel : 0161 874 2400
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Report Number: 625879-1

Date of Report: 30-Jan-2017

Customer: Verkis
Ofanleiti 2
103 Reykjavik
Iceland

Customer Contact: Reports

Customer Job Reference: E1019
Date Job Received at SAL: 11-Jan-2017
Date Analysis Started: 13-Jan-2017
Date Analysis Completed: 20-Jan-2017

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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

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Report checked and authorised by :
Lauren Clarke
Project Manager

Issued by :
Lauren Clarke
Project Manager

SAL Reference: 625879
Customer Reference: E1019

Filter Analysed as Filter
(Sb, As, Cd, Cr, Co, Cu, Pb, Hg, Mn, Ni, Tl, V)

				SAL Reference	**625879 001**	**625879 002**	**625879 003**
				Customer Sample Reference	**94**	**95**	**96**
				Test Sample	**AR**	**AR**	**AR**
Determinand	**Method**	**LOD**	**Units**	**Symbol**			
Antimony	ICPMS (HF BS EN 14385)	0.5	µg	U	**17**	**2.9**	**14**
Arsenic	ICPMS (HF BS EN 14385)	0.5	µg	U	(13) **5.6**	(13) **4.7**	(13) **5.9**
Cadmium	ICPMS (HF BS EN 14385)	0.5	µg	U	**3.8**	**0.6**	**4.8**
Chromium	ICPMS (HF BS EN 14385)	1	µg	U	(13) **65**	(13) **75**	(13) **70**
Cobalt	ICPMS (HF BS EN 14385)	0.5	µg	U	**1.7**	**0.9**	**1.3**
Copper	ICPMS (HF BS EN 14385)	0.5	µg	U	(13) **24**	(13) **4.6**	(13) **18**
Lead	ICPMS (HF BS EN 14385)	0.5	µg	U	(13) **67**	(13) **6.7**	(13) **57**
Manganese	ICPMS (HF BS EN 14385)	1.0	µg	U	(13) **29**	(13) **14**	(13) **19**
Mercury	CVAFS (HF Digest BS EN 13211)	0.01	µg	U	(13,195) **0.24**	(13) **0.03**	(13) **0.03**
Nickel	ICPMS (HF BS EN 14385)	1.0	µg	U	(13) **9.6**	(13) **15**	(13) **5.9**
Thallium	ICPMS (HF BS EN 14385)	0.5	µg	U	<0.5	<0.5	<0.5
Vanadium	ICPMS (HF BS EN 14385)	0.5	µg	U	(13) **4.0**	(13) **3.1**	(13) **4.1**

Index to symbols used in 625879-1

Value	Description
AR	As Received
195	Due to levels found in the sample that are outside of the normal calibration range of the instrument, analysis was conducted on a diluted sample
13	Results have been blank corrected.
U	Analysis is UKAS accredited