Kratus ehf.
Útblástursmælingar

KRATUS EHF.-ÚTBLÁSTURSMÆLINGAR

GREINARGERÐ

VERKNÚMER:	09300008	DAGS:	2017-02-01
VERKÞÁTTUR:	01	NR.:	04
UNNIÐ FYRIR:	Umhverfisstofnun		
VERKEFNISSTJÓRI:	Birgir Tómas Arnar		
HÖFUNDUR:	Birgir Tómas Arnar	YFIRFARIÐ:	GÞJ
DREIFING:	Sigrún Ágústsdóttir, Umhverfisstofnun		

Mælingar í útblæstri frá reykháfi verksmiðju Kratus ehf. á Grundartanga var framkvæmd þann 22.-23. desember 2016 af starfsmönnum Verkís hf. Síur, díoxín og flúorlausnir 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 ofnreykháfi verksmiðju Kratus ehf. á Grundartanga. Út um reykháfinn streymir útsog frá ofni verksmiðjunnar. Í reykháfnum var mældur hraði og hitastig útblásturslofts, rykmagn og styrkur á díoxín/fúrönum. Einnig var magn gaskennds flúors mældur í útblæstrinum.

Síur, díoxín og flúorlausnir 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.

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

Tafla 1.1 Niðurstöður mælinga í útblæstri

Mælingar í útblæstri				
Mæliþáttur	***Mæligildi (meðaltöl)***	***Losunarmörk***	***Útstreymis-magn***	***Tímasvið***
Rykmagn í útblæstri	39,3 mg/Nm³	20,0 mg/Nm³	0,3 kg/klst	3x30 mín
Díoxín /Fúrön (I-TEQ) (Sía /XAD-2)	0,03 ng/Nm³	0,100 ng/Nm³	0,0 µg/klst	4x60mín
Vetnisflúoríð (HF)	0,3 mg/Nm³	2,50 mg/Nm³	0,0 kg/klst	3x30 mín
Hitastig mælibúnaðar	25°C	-	-	-
Hitastig útblásturslofts	39°C	-	-	-
Rakainnihald útblásturslofts	16,4%	-	-	-
Loftþrýstingur á mælistað	715,8 mmHg			
Lofthraði útblásturslofts	10,9 m/s	-	-	-
Loftmagn	6.601 Nm³/klst	-	-	-

2 Mælingar

2.1 Mælingar í útblæstri frá reykháfi

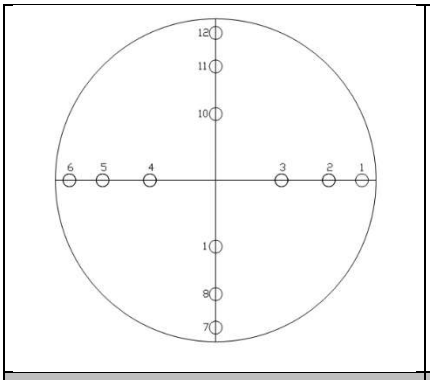
2.1.1 Hraðamælingar

Lofthraði var mældur í þversniði reykháfs í 12 punktum, sbr. mynd hér að neðan.

Tafla 2.1 Helstu kennistærðir reykháfs á mælistað

	Stærðir	*Eining*
Innra þvermál reykháfs	1,05	m
Flatarmál reykháfs	0,87	m²

Tafla 2.2 Niðurstöður hraðamælinga



Pkt. nr.	*Staða í rás (cm)*	*Mældur hraði*
1	4,6	11,2
2	15,4	11,2
3	31,0	11,7
4	74,0	11,7
5	89,6	12,2
6	100,4	11,2
7	4,6	11,2
8	15,4	11,7
9	31,0	10,7
10	74,3	9,5
11	89,6	10,1
12	100,4	8,9

Meðalhraði lofts v_m=10,9 m/sek
Raunloftflæði= 9.543 m³/klst

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)
1 (sía #92)	63,8 mg/Nm³	26,6 mg	0:35-1:05	76,3 mg/Nm³
2 (sía #93)	20,2 mg/Nm³	8,3 mg	1:11-1:41	24,2 mg/Nm³
3 (sía #98)	14,5 mg/Nm³	5,9 mg	1:45-2:15	17,3 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 Vetnisflúoríð (HF)

Vetnisflúoríð (HF) var mælt samhliða rykmælingu og dregið í gegnum glerflösku með vökvalausn (0.1 M NaOH).

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

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Report Number: 625864-1

Date of Report: 30-Jan-2017

Customer: Verkis
Ofanleiti 2
103 Reykjavik
Iceland

Customer Contact: Reports

Customer Job Reference: E1018
Date Job Received at SAL: 11-Jan-2017
Date Analysis Started: 13-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 (Filt, Trap, Wash)

Dioxins

				ITEQ Toxic Equivalents ng	
SAL Reference	**Customer Sample Reference**	**Analysis**	**Symbol**	**Lower Bound**	**Upper Bound**
625864 004	Combined FILTER #99 + XAD TRAP 1333001 + DIOXIN WASHING BOTTLE	Dioxins and Furans (BS EN 1948:06)	U	0.036	**0.036**
625864 008	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 %
625864 004	Combined FILTER #99 + XAD TRAP 1333001 + DIOXIN WASHING BOTTLE	1,2,3,7,8-PeCDF	97
		1,2,3,7,8,9-HxCDF	92
		1,2,3,4,7,8,9-HpCDF	99

Composite (Filt, Trap, Wash)

Customer Sample Reference : Combined FILTER #99 + XAD TRAP 1333001 + DIOXIN WASHING BOTTLE

SAL Sample Reference : 625864 004

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	0.0023	**0.0073**	85	0.0073	**0.0073**
1,2,3,7,8-PeCDD	U	0.0020	**0.015**	128	0.0075	**0.0075**
1,2,3,4,7,8-HxCDD	U	0.0024	**0.0047**	84	0.00047	**0.00047**
1,2,3,6,7,8-HxCDD	U	0.0022	**0.0085**	93	0.00085	**0.00085**
1,2,3,7,8,9-HxCDD	U	0.0022	**0.0050**		0.00050	**0.00050**
1,2,3,4,6,7,8-HpCDD	U	0.0034	**0.034**	95	0.00034	**0.00034**
OCDD	U	0.0039	**0.058**	104	0.00006	**0.00006**
				Dioxins Totals :	0.017	**0.017**
2,3,7,8-TCDF	U	0.0026	**0.029**	76	0.0029	**0.0029**
1,2,3,7,8-PeCDF	U	0.0020	**0.023**		0.0012	**0.0012**
2,3,4,7,8-PeCDF	U	0.0020	**0.022**	107	0.011	**0.011**
1,2,3,4,7,8-HxCDF	U	0.0026	**0.015**	76	0.0015	**0.0015**
1,2,3,6,7,8-HxCDF	U	0.0024	**0.013**	83	0.0013	**0.0013**
2,3,4,6,7,8-HxCDF	U	0.0020	**0.0099**	98	0.00099	**0.00099**
1,2,3,7,8,9-HxCDF	U	0.0020	**0.0027**		0.00027	**0.00027**
1,2,3,4,6,7,8-HpCDF	U	0.0044	**0.017**	91	0.00017	**0.00017**
1,2,3,4,7,8,9-HpCDF	U	0.0044	<0.0044		0.0	**0.00004**
OCDF	U	0.0042	**0.011**	94	0.00001	**0.00001**
				Furans Totals :	0.019	**0.019**
				Totals :	**0.036**	**0.036**

Composite (Filt, Trap, Wash)

Customer Sample Reference : Combined METHOD BLANK
SAL Sample Reference : 625864 008

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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	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 625864-1

Value	Description
AR	As Received
U	Analysis is UKAS accredited

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Scientific Analysis Laboratories Ltd

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Report Number: 625871-1

Date of Report: 30-Jan-2017

Customer: Verkis
Ofanleiti 2
103 Reykjavik
Iceland

Customer Contact: Reports

Customer Job Reference: E1018
Date Job Received at SAL: 11-Jan-2017
Date Analysis Started: 13-Jan-2017
Date Analysis Completed: 19-Jan-2017

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Report checked and authorised by :
Lauren Clarke
Project Manager

Issued by :
Lauren Clarke
Project Manager

SAL Reference: 625871

Customer Reference: E1018

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

Miscellaneous

	SAL Reference	625871 001	625871 002	625871 003
	Customer Sample Reference	HF1	HF2	HF3
	Test Sample	AR	AR	AR

Determinand	Method	LOD	Units	Symbol			
Hydrogen Fluoride	IC (acetate separation method)	0.05	mg/l	U	(13) **0.51**	(13) **0.38**	(13) **0.13**
Volume	Vol	1	ml	U	**41**	**41**	**38**

Index to symbols used in 625871-1

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