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AB 994

Research laboratory
accredited by PCA,
Nr AB 994

Scopes of accreditation:

- concentration and mass measurements of flow of fine particles
- measurements of concentration and mass flow of SO₂, NO_x, CO
- concentration measurements of CO₂, O₂
- concentration and mass flow measurements of OWO
- sampling for mass concentration determination of PCDD/PDF and dioxin type PCB
- sampling for concentration determination of (As; Cd; Cr; Co; Cu; Mn; Ni; Pb; Sb; Tl; V)
- sampling for concentration determination of Hg
- sampling and determination of concentration and mass flow of HCl
- sampling and determination of concentration and mass flow of HF
- sampling for determining the concentration of individual gaseous organic compounds
- calibration of Automated Monitoring systems,
- QAL2 procedure
- annual performance test of Automated Monitoring Systems, AST procedure
- noise measurement from machinery, installations and industrial plants

Chorzów, December 3rd 2021
Our ref. No.: PW/04/12/21

Report No PW/04/12/21

on concentration measurements of dioxins, furans, heavy metals (As; Cd; Cr; Co; Cu; Mn; Ni; Pb; Sb; Tl; V and Hg) emitted into environment from stationary emission source No. 001 (waste incineration boiler stack), located at UAB Vilniaus Kogeneracinė Jėgainė, Jočionių g. 13, 02300 Vilnius

Client name and address:

UAB Vilniaus Kogeneracinė Jėgainė
Žvejų St. 14,
LT-09310 Vilnius

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1. PURPOSE AND SCOPE OF THE REPORT

Purpose of executed measurements was to determine the concentration and emission of dioxins, furans, heavy metals (As; Cd; Cr; Co; Cu; Mn; Ni; Pb; Sb; Tl; V and Hg) emitted to environment from stationary emission source No. 001 (waste incineration boiler stack), located at UAB Vilniaus Kogeneracinė Jėgainė, Jočionių g. 13, 02300 Vilnius

Measurements range:

- PCDD/DF emission and concentration,
- Heavy metals (As; Cd; Cr; Co; Cu; Mn; Ni; Pb; Sb; Tl; V and Hg) emission and concentration,

The measurements were carried out in accordance with the sampling plan and the described sampling methods.

Operating parameters of the technological installation was obtained from the customer's representative.

2. BASIS OF MEASUREMENTS EXECUTION

The measurements were taken according to the contract No VKJ_S_2020-263 dated December 16th 2020.

3. MEASUREMENT TEAM

The measurements taken on November 4th 2021 were executed by the following team:

- Grzegorz Bortel specialist - measurement team leader,
- Grzegorz Kurzeja specialist,
- Bartłomiej Glik specialist.

Test Report No PW/04/12/21**4. MEASUREMENT RESULTS SUMMARY**

Below are presented measurement results summary, full measurement results are presented in chapter no 6, at page 10, 12 and 14.

Stationary emission source No. 001 (waste incineration boiler stack)	Concentration of the substance in the gas in the reference conditions O2 ref. 11%	PCDDF*	ng/m3 ref.	0,005
	Emission limits	PCDDF	ng/m3 ref.	0,1
	Transgresssion	PCDDF	ng/m3 ref.	-
	Concentration of the substance in the gas in the reference conditions O2 ref. 11%	Cd*+Tl*	mg/m3 ref.	0,011
		Hg*	mg/m3 ref.	<0,002
		Sb*+As*+Cr*+Co*+Mn*+Cu*+Ni*+Pb*+V*	mg/m3 ref.	0,110
	Emission limits	Cd+Tl	mg/m3 ref.	0,05
		Hg	mg/m3 ref.	0,05
		Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V	mg/m3 ref.	0,50
	Transgresssion	Cd+Tl	mg/m3 ref.	-
		Hg	mg/m3 ref.	-
		Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V	mg/m3 ref.	-

*- the results obtained from the subcontractor (accredited)

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5. DESCRIPTION OF THE MEASUREMENT METHOD**Measurement of the gas volumetric flow**

The flow rate was determined according to ISO Standard PN-EN ISO 16911-1:2013 „Stationary source emissions - Manual and automatic determination of velocity and volume flow rate in ducts - Part 1: Manual reference method". Gravimetric dust monitor type MEGASYSTEM APIS X-1 and type "S" Pitot tube were used for the measurements. Measurement is accredited.

Accreditation range: differential pressure: > 5 Pa

Measurement O₂ content

The concentration of O₂ was determined using gas analyzer HORIBA PG-350 EU equipped with testing probe 2000 mm long. The measurements were taken according to the procedure described in measurement unit as well as to EN Standard PN-EN 14789:2017 "Stationary source emissions - Determination of volume concentration of oxygen O₂ - Reference method - Paramagnetism". Measurement is accredited.

Accreditation range: O₂ content: 3-21%

Measurement CO₂ content

The concentration of CO₂ was determined using gas analyzer HORIBA PG-350 EU equipped with testing probe 2000 mm long. The measurements were taken according to the procedure described in measurement unit as well as to ISO Standard PN-ISO 10396:2001 "Stationary Source Emissions - Sampling For The Automated Determination Of Gas Concentrations ". Measurement is accredited.

Accreditation range: CO₂ content: 0,1-20%

Measurement of heavy metals content

Sampling for the determination of concentrations and emissions of heavy metals (Cd, Tl, Sb , As, Cr, Co, Cu , Mn , Ni , Pb, V) was performed according to PN -EN 14385 : 2005. Analysis of metals (Cd , Tl , Sb , As, Cr, Co, Cu , Mn , Ni , Pb, V) was performed in the laboratory of OBIKŚ Sp. z o.o. in Katowice , accredited in this regard by the Polish Centre of Accreditation No. AB 213

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Measurement of mercury (Hg) content

Sampling for the determination of concentrations and emissions of mercury (Hg) was made according to PN -EN 13211 + AC : 2006. Analysis of mercury (Hg) was made in a laboratory OBiKŚ Sp. z o.o. in Katowice , accredited in this regard by the Polish Centre of Accreditation No. AB 213

PCDD+PCDF sampling and determination

PCDD/DF samples were taken according to the requirements of Polish Standard PN-EN 1948-1:2006 „ Stationary source emissions - Determination of mass concentration of PCDDs/PCDFs and dioxin-type PCBs - Part 1: Sampling of PCDDs/PCDFs”.

The three stages of PCDD/DF concentration and emission determination:

Stage I - sampling

For the determination of mass concentration of PCDD/DF proper sampling plays important role that affects following stages of the testing. The sampling were performed by means of the filtration and condensation method using PCDD/DF sampling conformed to European Standard PN-EN 1948-1:2006.

The following page shows the schematic diagram of the sampling system.

Stage II - laboratory analysis

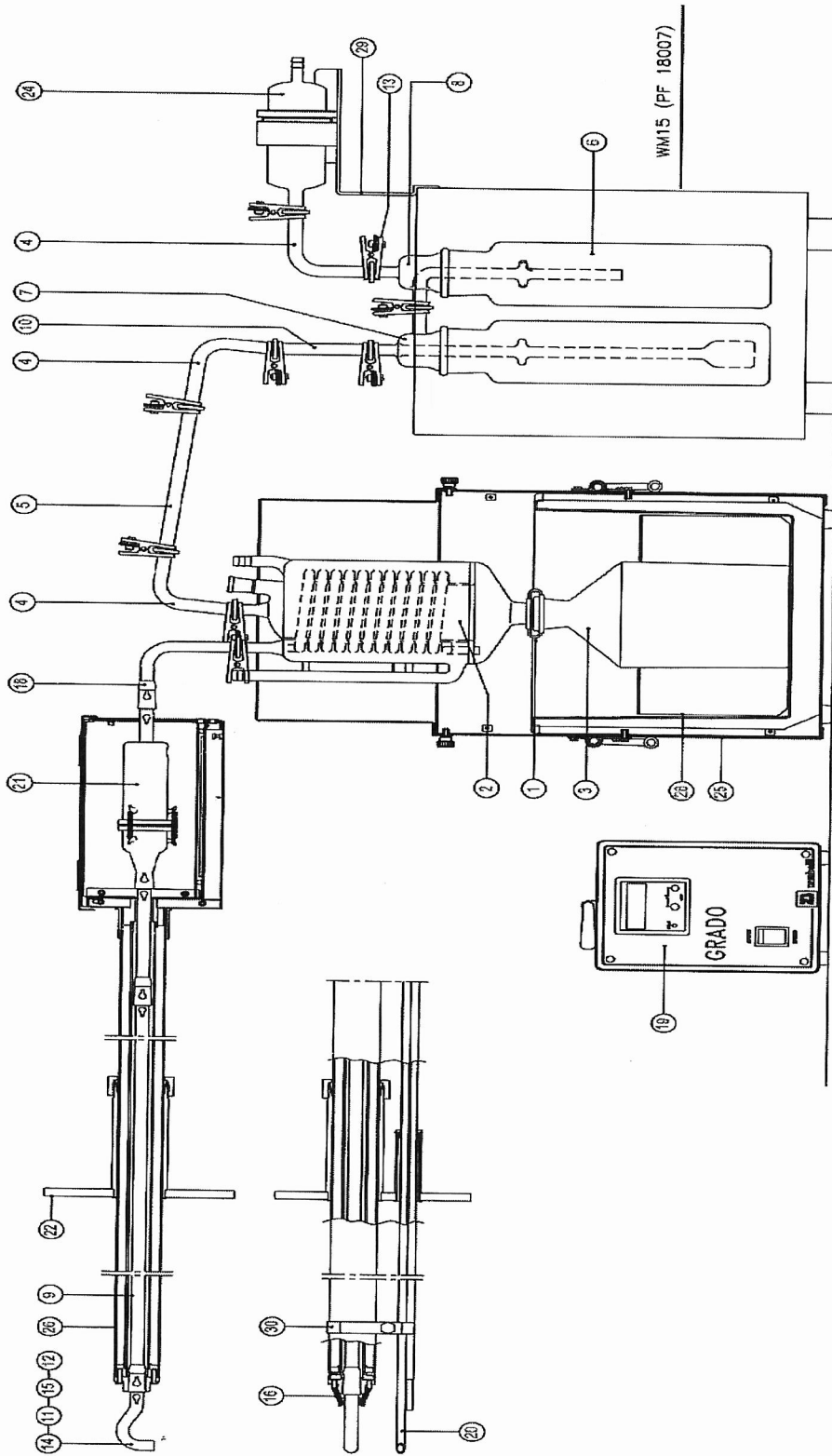
The samples were analysed at the ALS Czech Republic, s.r.o accredited laboratory following the CSN EN 1948-2,3 methodology: The determination of polychlorinated dibenzo-p-dioxine, dibenzofurans in emission samples with the method of isotop dillution using HRGC/HRMS.

The dioxin and furans analyses were conducted at the ALS Czech Republic, s.r.o. Laboratory, specifically accredited for the test by the Český Institut Pro Akreditaci, o.p.s. , No L1163.

Stage III - development and the results and discussion

The last stage includes results collection from the previous stages, emission calculation and PCDD/DF concentration as well as comparison to the standards in force.

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- Opis:
- 1. ferrule
 - 2. cooler
 - 3. condensation pot
 - 4,18. aspiration path - elbows
 - 5,10. aspiration path - tubes
 - 6-8. scrubbers
 - 9. aspiration path - probe tube
 - 11,12,14,15. - aspiration endings
 - 13. clamp
 - 16. holding springs
 - 17. aspiration controller
 - 19. temperature controller
 - 20. Pitot tube „S” - type
 - 21. filter casing
 - 22. yoke
 - 23. cooler coil
 - 24. gas dryer
 - 25. cooler casing
 - 26. heated probe
 - 28. cooler coil
 - 29.30. support

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6. MEASUREMENT RESULTS

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- 1) Plant or unit name¹⁾: **Stationary emission source No. 001 (waste incineration boiler stack)**
- 2) Flue gases cleaning unit¹⁾: **Evaporative cooler, hydrated lime and active carbon reactor, bag filters unit (2x4)**
- 3) Emission source load during measurements¹⁾: **Boiler load ~68,26 MW,**
- 4) Fuel type or material mass flow in process¹⁾: **Waste ~21,51 t/h**
- 5) Location of sampling and measurements: **in duct, after flue gases cleaning unit**

Measurement reference number			04-11-01		X	X	X		
Date of measurement			04.11.2021						
Measurement time range			10:34-11:13 11:16-11:55						
Scope of test		Unit	Results		Average	Uncertainty +/-	Method		
Meteorological conditions	Atmospheric pressure		hPa	998,5	998,5	998,5	0,9	PN-Z-04030-7:1994	
	Air temperature		oC	13	13	13			
Cross-section	Diameter		m	2,10					
	Area		m ²	3,4619					
The parameters of gas in line	Temperature		oC	38,0	37,0	37,5	0,8		
	Static pressure		Pa	-74,1	-68,3	-71,2	2,5		
	Differential pressure		Pa	91,7	86,8	89,3	0,7		
	Gas moistness grade X		kg/kg	0,053	0,053	0,053	0,0010		PN-EN 14790:2017
	Average velocity		m/s	10,2	9,9	10,0	0,2		PN-EN ISO 16911-1:2013
	Chemical composition	O ₂		%	7,40	7,50	7,45		0,19
		CO ₂		%	11,60	11,60	11,60	0,44	PN-ISO 10396:2001
	Wet gas density during testing		kg/m ³	1,126	1,130	1,128		PN-Z-04030-7:1994	
	Gas density in normal conditions		kg/m ³ N	1,302	1,302	1,302		PN-Z-04030-7:1994	
	Gas density in conventional conditions		kg/m ³ U	1,346	1,346	1,346		PN-Z-04030-7:1994	
Concentration in the gas at measurement conditions	As*		mg/m ³	<0,013829	<0,011372	<0,012601		PN-EN 14385:2005	
	Sb*		mg/m ³	<0,027659	<0,022744	<0,025201		PN-EN 14385:2005	
	Cd*		mg/m ³	<0,000332	<0,000273	<0,000302		PN-EN 13211:2006	
	Co*		mg/m ³	<0,001106	<0,000910	<0,001008		PN-EN 14385:2005	
	Mn*		mg/m ³	0,075824	0,063870	0,069847	0,017773	PN-EN 14385:2005	
	Cu*		mg/m ³	0,002213	0,004712	0,003463	0,000798	PN-EN 14385:2005	
	Ni*		mg/m ³	0,002213	0,002039	0,002126	0,000107	PN-EN 14385:2005	
	Pb*		mg/m ³	<0,006970	<0,005731	<0,006351		PN-EN 14385:2005	
	V*		mg/m ³	<0,001383	<0,001137	<0,001260		PN-EN 14385:2005	
	Cr*		mg/m ³	0,003319	0,003753	0,003536	0,000210	PN-EN 14385:2005	
	Tl*		mg/m ³	<0,013829	<0,011372	<0,012601		PN-EN 14385:2005	
Concentration in the gas at normal conditions	As*		mg/m ³ N	<0,015191	<0,012450	<0,013821		PN-EN 14385:2005	
	Sb*		mg/m ³ N	<0,030382	<0,024901	<0,027642		PN-EN 14385:2005	
	Cd*		mg/m ³ N	<0,000364	<0,000299	<0,000332		PN-EN 13211:2006	
	Co*		mg/m ³ N	<0,001216	<0,000996	<0,001106		PN-EN 14385:2005	
	Mn*		mg/m ³ N	0,083291	0,069926	0,076609	0,019494	PN-EN 14385:2005	
	Cu*		mg/m ³ N	0,002431	0,005159	0,003795	0,000875	PN-EN 14385:2005	
	Ni*		mg/m ³ N	0,002431	0,002232	0,002332	0,000116	PN-EN 14385:2005	
	Pb*		mg/m ³ N	<0,007657	<0,006275	<0,006966		PN-EN 14385:2005	
	V*		mg/m ³ N	<0,001519	<0,001245	<0,001382		PN-EN 14385:2005	
	Cr*		mg/m ³ N	0,003646	0,004110	0,003878	0,000230	PN-EN 14385:2005	
	Tl*		mg/m ³ N	<0,015191	<0,012450	<0,013821		PN-EN 14385:2005	

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Concentration of the substance in the gas in standard conditions	As*	mg/m3 U	<0,016537	<0,013553	<0,015045		PN-EN 14385:2005
	Sb*	mg/m3 U	<0,033073	<0,027106	<0,030090		PN-EN 14385:2005
	Cd*	mg/m3 U	<0,000397	<0,000325	<0,000361		PN-EN 13211:2006
	Co*	mg/m3 U	<0,001323	<0,001084	<0,001204		PN-EN 14385:2005
	Mn*	mg/m3 U	0,090669	0,076121	0,083395	0,021221	PN-EN 14385:2005
	Cu*	mg/m3 U	0,002646	0,005616	0,004131	0,000952	PN-EN 14385:2005
	Ni*	mg/m3 U	0,002646	0,002430	0,002538	0,000127	PN-EN 14385:2005
	Pb*	mg/m3 U	<0,008335	<0,006831	<0,007583		PN-EN 14385:2005
	V*	mg/m3 U	<0,001654	<0,001355	<0,001504		PN-EN 14385:2005
	Cr*	mg/m3 U	0,003969	0,004473	0,004221	0,000250	PN-EN 14385:2005
	Tl*	mg/m3 U	<0,016537	<0,013553	<0,015045		PN-EN 14385:2005
Concentration of the substance in the gas in reference conditions O2 ref. 11%	As*	mg/m3 ref.	<0,012159	<0,010039	<0,011099		PN-EN 14385:2005
	Sb*	mg/m3 ref.	<0,024318	<0,020079	<0,022199		PN-EN 14385:2005
	Cd*	mg/m3 ref.	<0,000292	<0,000241	<0,000267		PN-EN 13211:2006
	Co*	mg/m3 ref.	<0,000973	<0,000803	<0,000888		PN-EN 14385:2005
	Mn*	mg/m3 ref.	0,066668	0,056386	0,061527	0,015715	PN-EN 14385:2005
	Cu*	mg/m3 ref.	0,001945	0,004160	0,003053	0,000706	PN-EN 14385:2005
	Ni*	mg/m3 ref.	0,001945	0,001800	0,001873	0,000100	PN-EN 14385:2005
	Pb*	mg/m3 ref.	<0,006128	<0,005060	<0,005594		PN-EN 14385:2005
	V*	mg/m3 ref.	<0,001216	<0,001004	<0,001110		PN-EN 14385:2005
	Cr*	mg/m3 ref.	0,002918	0,003314	0,003116	0,000193	PN-EN 14385:2005
	Tl*	mg/m3 ref.	<0,012159	<0,010039	<0,011099		PN-EN 14385:2005
Gas volume flow	measurement conditions	m3/h	126996	123257	125127	2085	PN-EN ISO 16911-1:2013
	normal conditions	m3N/h	109801	106922	108362	1878	
	standard conditions	m3U/h	100867	98220	99544	4248	
	reference conditions O2 ref. 11%	m3ref./h	137179	132598	134888	6305	
The emission obtained by measuring	As*	kg/h	<0,001668	<0,001331	<0,001500		PN-EN 14385:2005
	Sb*	kg/h	<0,003336	<0,002662	<0,002999		PN-EN 14385:2005
	Cd*	kg/h	<0,000040	<0,000032	<0,000036		PN-EN 13211:2006
	Co*	kg/h	<0,000133	<0,000107	<0,000120		PN-EN 14385:2005
	Mn*	kg/h	0,009145	0,007477	0,008311	0,002468	PN-EN 14385:2005
	Cu*	kg/h	0,000267	0,000552	0,000409	0,000122	PN-EN 14385:2005
	Ni*	kg/h	0,000316	0,000262	0,000289	0,000040	PN-EN 14385:2005
	Pb*	kg/h	<0,000841	<0,000671	<0,000756		PN-EN 14385:2005
	V*	kg/h	<0,000167	<0,000133	<0,000150		PN-EN 14385:2005
	Cr*	kg/h	0,000400	0,000439	0,000420	0,000086	PN-EN 14385:2005
	Tl*	kg/h	<0,001668	<0,001331	<0,001500		PN-EN 14385:2005
Emission limits	Cd+Tl	mg/m3 ref.	0,05				
	Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V	mg/m3 ref.	0,50				
Transgresssion	Cd+Tl	mg/m3 ref.	-				
	Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V	mg/m3 ref.	-				

*- the results obtained from the subcontractor (accredited)

¹⁾-information obtained from the client

Test Report No PW/04/12/21Notes:

Normal conditions designate the temperature of 273 K and pressure of 101,3kPa, defining normal cubic meter m³N. The standard conditions designate the temperature of 273K, pressure of 101,3 kPa and dry gases (steam contents less than 5 g/kg of flue gas), defining standard cubic meter, m³U

The specified expanded uncertainty comes from standard uncertainty multiplied by expansion coefficient k = 2, which provides 95% level of confidence for normal distribution. Uncertainty takes into account the sampling and analysis.

Registry of samples delivered to the laboratory: P/43/11/21, P/44/11/21, P/45/11/21, P/46/11/21, P/47/11/21, P/48/11/21, P/49/11/21

Date of delivery to the laboratory: 06.11.2021

Date of analysis: 08.11.2021 - 24.11.2021

Field blanks:

ID/ number of sample	Type of substance	The criterion of the blank [mg/m ³] 11%O ₂	The value of the blank [mg/m ³] 11% O ₂	Result [+/-]
P/49/11/21	Cd+Tl	0,005	p.o.	+
P/49/11/21	Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V	0,05	p.o.	+

p.o. – below the limit of quantification.

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- 1) Plant or unit name¹⁾: **Stationary emission source No. 001 (waste incineration boiler stack)**
- 2) Flue gases cleaning unit¹⁾: **Evaporative cooler, hydrated lime and active carbon reactor, bag filters unit (2x4)**
- 3) Emission source load during measurements¹⁾: **Boiler load ~68,26 MW,**
- 4) Fuel type or material mass flow in process¹⁾: **Waste ~21,51 t/h**
- 5) Location of sampling and measurements: **in duct, after flue gases cleaning unit**

Measurement reference number			04-11-01		X	X	X		
Date of measurement			04.11.2021						
Measurement time range			11:58-12:37	12:39-13:18					
Scope of test		Unit	Results		Average	Uncertainty +/-	Method		
Meteorological conditions	Atmospheric pressure		hPa	996,8	995,3	996,1	0,9	PN-Z-04030-7:1994	
	Air temperature		oC	13	13	13			
Cross-section	Diameter		m	2,10					
	Area		m ²	3,4619					
The parameters of gas in line	Temperature		oC	38,0	38,0	38,0	0,8		
	Static pressure		Pa	-71,2	-67,7	-69,5	2,4		
	Differential pressure		Pa	85,6	86,7	86,2	0,7		
	Gas moistness grade X		kg/kg	0,053	0,053	0,053	0,0010		PN-EN 14790:2017
	Average velocity		m/s	9,9	9,9	9,9	0,2		PN-EN ISO 16911-1:2013
	Chemical composition	O ₂		%	7,50	7,40	7,45		0,19
		CO ₂		%	10,70	10,80	10,75	0,41	PN-ISO 10396:2001
	Wet gas density during testing		kg/m ³	1,119	1,118	1,118		PN-Z-04030-7:1994	
	Gas density in normal conditions		kg/m ³ N	1,296	1,297	1,297		PN-Z-04030-7:1994	
Gas density in conventional conditions		kg/m ³ U	1,340	1,341	1,340		PN-Z-04030-7:1994		
Concentration in the gas at measurement conditions	Hg*		mg/m ³	<0,002265	<0,002297	<0,002281		PN-EN 13211+AC:2006	
Concentration in the gas at normal conditions	Hg*		mg/m ³ N	<0,002490	<0,002530	<0,002510		PN-EN 13211+AC:2006	
Concentration of the substance in the gas in standard conditions	Hg*		mg/m ³ U	<0,002712	<0,002755	<0,002734		PN-EN 13211+AC:2006	
Concentration of the substance in the gas in reference conditions O ₂ ref. 11%	Hg*		mg/m ³ ref.	<0,002009	<0,002026	<0,002018		PN-EN 13211+AC:2006	
Gas volume flow	measurement conditions		m ³ /h	123008	123881	123444	2057	PN-EN ISO 16911-1:2013	
	normal conditions		m ³ N/h	106174	106770	106472	1845		
	standard conditions		m ³ U/h	97512	98041	97777	4173		
	reference conditions O ₂ ref. 11%		m ³ ref./h	131641	133336	132489	6193		
The emission obtained by measuring	Hg*		kg/h	<0,000264	<0,000270	<0,000267		PN-EN 13211+AC:2006	
Emission limits	Hg		mg/m ³ ref.	0,05					
Transgresssion	Hg		mg/m ³ ref.	-					

*- the results obtained from the subcontractor (accredited)

¹⁾-information obtained from the client

Test Report No PW/04/12/21

Notes:

Normal conditions designate the temperature of 273 K and pressure of 101,3kPa, defining normal cubic meter m³N. The standard conditions designate the temperature of 273K, pressure of 101,3 kPa and dry gases (steam contents less than 5 g/kg of flue gas), defining standard cubic meter, m³U

The specified expanded uncertainty comes from standard uncertainty multiplied by expansion coefficient k = 2, which provides 95% level of confidence for normal distribution. Uncertainty takes into account the sampling and analysis.

Registry of samples delivered to the laboratory: P/50/11/21, P/51/11/21, P/52/11/21, P/53/11/21, P/54/11/21

Date of delivery to the laboratory: 06.11.2021

Date of analysis: 08.11.2021 - 24.11.2021

Field blanks:

ID/ number of sample	Type of substance	The criterion of the blank [mg/m ³] 11%O ₂	The value of the blank [mg/m ³] 11% O ₂	Result [+/-]
P/54/11/21	Hg	0,005	p.o.	+

p.o. – below the limit of quantification.

Test Report No PW/04/12/21

- 1) Plant or unit name¹⁾: **Stationary emission source No. 001 (waste incineration boiler stack)**
 2) Flue gases cleaning unit¹⁾: **Evaporative cooler, hydrated lime and active carbon reactor, bag filters unit (2x4)**
 3) Emission source load during measurements¹⁾: **Boiler load ~68,26 MW,**
 4) Fuel type or material mass flow in process¹⁾: **Waste ~21,51 t/h**
 5) Location of sampling and measurements: **in duct, after flue gases cleaning unit**

Measurement reference number		04-11-01		X	X	
Date of measurement		04.11.2021				
Measurement time range		13:20-19:25				
Scope of test		Unit	Results	Uncertainty +/-	Method	
Meteorological conditions	Atmospheric pressure		hPa	991,8	0,9	
	Ambient temperature		oC	13	X	
Cross-section	Diameter		m	2,10		
	Area		m ²	3,4619		PN-Z-04030-7:1994
The parameters of gas in line	Temperature		oC	37	0,780	
	Static pressure		Pa	-64	2,210	
	Differential pressure		Pa	95	0,780	
	Gas moistness grade X		kg/kg	0,057	0,001	PN-EN 14790:2017
	Average velocity		m/s	10,4	0,1	PN-EN ISO 16911-1:2013
	Chemical composition	O ₂	%	7,7	0,2	PN-EN 14789:2017
		CO ₂	%	10,5	0,4	PN-ISO 10396:2001
	Wet gas density during testing		kg/m ³	1,114	X	PN-EN 14790:2017
	Gas density in normal conditions		kg/m ³ N	1,292		PN-EN 14790:2017
Gas density in conventional conditions		kg/m ³ U	1,339	PN-EN 14790:2017		
Concentration in the gas at measurement conditions	PCDDF*		ng/m ³	0,0056	0,0017	PN-EN 1948:2006
Concentration in the gas at normal conditions	PCDDF*		ng/m ³ N	0,0062	0,0019	PN-EN 1948:2006
Concentration of the substance in the gas in standard conditions	PCDDF*		ng/m ³ U	0,0067	0,0020	PN-EN 1948:2006
Concentration of the substance in the gas in reference conditions O ₂ ref. 11%	PCDDF*		ng/m ³ ref.	0,0050	0,0015	PN-EN 1948:2006
Gas volume flow	measurement conditions		m ³ /h	129863	2164	PN-EN ISO 16911-1:2013
	normal conditions		m ³ N/h	111897	1940	
	standard conditions		m ³ U/h	102165	4360	
	reference conditions O ₂ ref. 11%		m ³ ref./h	135879	6352	
The emission obtained by measuring	PCDDF*		ng/h	684,50	211,26	PN-EN 1948:2006
Emission limits	PCDDF*		ng/m ³ U	0,10	X	X
Transgresssion	PCDDF*		ng/m ³ U	-		

*- the results obtained from the subcontractor (accredited)

¹⁾-information obtained from the client

Test Report No PW/04/12/21Notes:

Normal conditions designate the temperature of 273 K and pressure of 101,3kPa, defining normal cubic meter m³N. The standard conditions designate the temperature of 273K, pressure of 101,3 kPa and dry gases (steam contents less than 5 g/kg of flue gas), defining standard cubic meter, m³U

The specified expanded uncertainty comes from standard uncertainty multiplied by expansion coefficient k = 2, which provides 95% level of confidence for normal distribution. Uncertainty takes into account the sampling and analysis.

Registry of samples delivered to the laboratory: P/41/11/21, P/42/11/21

Date of delivery to the laboratory: 06.11.2021

Date of analysis: 08.11.2021 - 24.11.2021

Field blanks:

ID/ number of sample	Type of substance	The criterion of the blank [ng/m ³] 11%O ₂	The value of the blank [ng/m ³] 11% O ₂	Result [+/-]
P/42/11/21	PCDD/DF	0,01	0,0017	+

Work parameters of measurement system:**PCDD/DF (PN-EN 1948:2006):**

sampling method:	condensation - adsorption method		
filter parameters:	19 x 90 mm, filter efficiency: 99,998 %		
sampling train:	2 measurement axis		
oxygen reference :	11 %		
time of dioxins and furans measurement:	13:20 – 19:25 (364,1 min)		
nozzle diameter:	6	mm	
probe temperature:	119	°C	
scrubbers temperature	4	°C	
aspired gas volume	5,34	m ³	
average sampling flow	14,7	l/min	
izokinetic ratio:	97,1	%	
leak test:	+ / +		
gas meter temperature	15,3	°C	
gas meter pressure	0	bar	
spiking pattern:	filter surface		
absorption solution:	100 ml H ₂ O dest. + 50 ml 2-etoksyetanol		
recovery:	56 %	¹³ C ₁₂ -2,3,4,7,8-PECDF,	/>50%/
	53 %	¹³ C ₁₂ -1,2,3,6,7,8-HxCDF,	/>50%/
	52 %	¹³ C ₁₂ -1,2,3,4,6,7,8 HpCDF.	/>50%/
TEQ sample mass:	0,033	ng	

H₂O (PN-EN 14790:2017)

Sampling train:	2 measurement axis
Sampling equipment:	titanium sampling line heated probe 2,0 m sampling pump: PT-01
Cartridge No:	H ₂ O content set No 1
Sampling No:	1
Sampling time:	39,3 min
Sampling speed:	~1,7 l/min
H ₂ O maas:	3,87 g
absorption efficiency:	98,5 %

Test Report No PW/04/12/21**O₂ paramagnetic (PN-EN 14789:2017):**

Range : 0 – 25 % [X]
 Calibration gas: O₂ – 20,018% [X] R/12/W
 N₂ – 99,99% [X] R/17/
 Sampling train: 2 measurement axis
 Sampling time/ average time: 364 min / 1 min

O ₂ concentration measurement (paramagnetic):		HORIBA PG-350E-EU			
check operation		unit	result	criterion	result +/-
„0” after adjustment, without sampling train		%	0,02	± 0,1 [%]*	+
„0” after adjustment, with sampling train	before measurement	%	0,03	± 0,5 [%]**	+
	after measurement	%	0,02	± 0,5 [%]**	+
„Span” after adjustment with sampling train /standard 20,018 % R/12/W analyzer range 25%/	before measurement	%	19,98	± 0,5 [%]**	+
	after measurement	%	20,05	± 0,5 [%]**	+
	before measurement time T90	%	18,1	> 18,02 [%]	-----
sec.		45	< 200 sec.	+	

*2 x repeatability „0”; **2% measurement range

Hg (PN-EN 13211 + AC:2006)

Sampling train: 2 measurement axis
 Sampling: isokinetic [x]
 nonisokinetic []
 Isokinetic ratio: 103,3 % / 105,4 %
 Sampling time: 39,3 min / 39,3 min
 Sampled volume: 0,084 m³ / 0,087 m³
 Impingers: impingers set No. 1 (absorption efficiency 97,5 %)
 Absorption solution: No. I (manganese (VII) potassium / sulfuric acid (VI))

Heavy metals (PN-EN 14385:2005)

Sampling train: 2 measurement axis
 Sampling: isokinetic [x]
 nonisokinetic []
 Isokinetic ratio: 104,5 % / 104,3 %
 Sampling time: 39,3 min / 39,3 min
 Sampled volume: 0,067 m³ / 0,089 m³
 Filter parameters: FT-50: Ø 0,50 mm, efficiency: 99,990 %, quartz (QMA)
 Impingers: impingers set No. 1 (absorption efficiency 99,0 %)
 Absorption solution: HNO₃/H₂O₂

Test Report No PW/04/12/21Statement of compliance with the specification/requirement:

The average value of the measurement series in the scope of dioxins and furans, mercury, heavy metals was assessed for compliance with the value of the emission standard for certain types of installations, fuel combustion sources and waste incineration or co-incineration devices. The laboratory has adopted the simple acceptance principle in accordance with ILAC-G8: 09/2019. The risk of incorrect acceptance / incorrect rejection for a result equal to the requirement / specification is 50%.

Decision-making bodies may adopt a different decision-making principle, which may have an impact on the outcome.

7. MEASUREMENT DEVICES

Name of measuring device		X1- Apis
Type of measuring device		Isokinetic sampler S/N 0142
Certificate	Calibration No	824-2373/19 824-2374/19 824-2372/19 824-2375/19 G-106/20-66/20
Issued by		INTROL Sp. z o.o. KATOWICE ZAP BESTWINKA
Date of issue the certificate of calibration		27.08.2019 28.08.2019 11.03.2020
Expiration date of the certificate of calibration		-

Name of measuring device		HORIBA
Type of measuring device		PG-350E-EU
Certificate	Calibration No	69/1/AW/21
Issued by		Laboserwis Sp. z o.o. Katowice
Date of issue the certificate of calibration		22.03.2021
Expiration date of the certificate of calibration		-

Name of measuring device		Sampler
Type of measuring device		PT-01
Certificate	Calibration No	851-2463/19 786-2245/19 G-161/21-111/21 R-286/16-186/16
Issued by		INTROL Sp. z o.o. KATOWICE ZAP BESTWINKA
Date of issue the certificate of calibration		29.08.2019 r. 12.08.2019 r. 04.05.2021 r. 24.08.2016 r.
Expiration date of the certificate of calibration		-

Test Report No PW/04/12/21**8. CERTIFICATE OF ACCREDITATION****POLSKIE CENTRUM AKREDYTACJI**
POLISH CENTRE FOR ACCREDITATIONSygnatariusz EA MLA
EA MLA Signatory**CERTYFIKAT AKREDYTACJI**
LABORATORIUM BADAWCZEGO
ACCREDITATION CERTIFICATE OF TESTING LABORATORY
Nr AB 994

Powiedza się, że: / This is to confirm that:

„PROFTECH” Sp. z o.o.
ul. Kurta Aldera 44, 41-506 Chorzówspełnia wymagania normy PN-EN ISO/IEC 17025:2018-02
meets requirements of the PN-EN ISO/IEC 17025:2018-02 standardAkredytowana działalność jest określona w Zakresie Akredytacji Nr AB 994
Accredited activity is defined in the Scope of Accreditation No AB 994Akredytacja pozostaje w mocy pod warunkiem przestrzegania
wymagań jednostki akredytującej określonych w kontrakcie Nr AB 994
This accreditation remains in force provided the Laboratory observes
the requirements of Accreditation Body defined in the Contract No AB 994Akredytacji udzielono dnia 30.01.2009 r.
Accreditation was granted on 30.01.2009DYREKTOR
POLSKIEGO CENTRUM AKREDYTACJI

LUCYNA OLBORSKA

Warszawa, dnia 9 grudnia 2019 roku

Test Report No PW/04/12/21

9. DIOXINS AND FURANS ANALYSIS RESULTS



Attachment no. 1 to the Certificate of Analysis for work order PR21A8783

Sample:

P/41/11/21

Measurement results PCDD/Fs:

Sample:		P/41/11/21		Final extract [μl]:		60	
				Injection volume [μl]:		4	
				Acquisition date [d.m.y h:m]:		01.00 0:00	
2,3,7,8-PCDD/Fs	Result [ng/sample]	Limit of Detection [ng/sample]	Limit of Quantification [ng/sample]	¹ I-TEFs	I-TEQ Upperbound [ng/sample]		
2,3,7,8-TCDD	< 0.0033	0.0033	0.0067	1	0.0033		
1,2,3,7,8-PeCDD	< 0.0042	0.0042	0.0085	0.5	0.0021		
1,2,3,4,7,8-HxCDD	< 0.0061	0.0061	0.012	0.1	0.00061		
1,2,3,6,7,8-HxCDD	< 0.0061	0.0061	0.012	0.1	0.00061		
1,2,3,7,8,9-HxCDD	< 0.0061	0.0061	0.012	0.1	0.00061		
1,2,3,4,6,7,8-HpCDD	< 0.0067	0.0067	0.013	0.01	0.00067		
OCDD	< 0.013	0.013	0.026	0.001	0.00013		
2,3,7,8-TCDF	0.011	0.0025	0.0049	0.1	0.0011		
1,2,3,7,8-PeCDF	0.014	0.0026	0.0051	0.05	0.00069		
2,3,4,7,8-PeCDF	0.016	0.0026	0.0051	0.5	0.0079		
1,2,3,4,7,8-HxCDF	0.05	0.0072	0.014	0.1	0.005		
1,2,3,6,7,8-HxCDF	0.057	0.0072	0.014	0.1	0.0057		
1,2,3,7,8,9-HxCDF	< 0.0072	0.0072	0.014	0.1	0.00072		
2,3,4,6,7,8-HxCDF	0.04	0.0072	0.014	0.1	0.004		
1,2,3,4,6,7,8-HpCDF	< 0.044	0.022	0.044	0.01	0.00044		
1,2,3,4,7,8,9-HpCDF	< 0.022	0.022	0.044	0.01	0.00022		
OCDF	< 0.024	0.024	0.048	0.001	0.00024		
I-TEQ from quantified 2,3,7,8-PCDD/Fs - "Lowerbound"					0.024		
I-TEQ from 2,3,7,8-PCDD/Fs - "Mediumbound"					0.029		
Maximum possible I-TEQ - "Upperbound"					0.033		
PCDDs	Result [ng/sample]	PCDFs	Result [ng/sample]				
Tetra-CDDs	< 0.073	Tetra-CDFs	0.47				
Penta-CDDs	< 0.059	Penta-CDFs	0.68				
Hexa-CDDs	< 0.061	Hexa-CDFs	0.15				
Hepta-CDDs	< 0.013	Hepta-CDFs	< 0.087				
OCDD	< 0.013	OCDF	< 0.024				

¹I-TEF according to NATO.

Limits of quantification are defined as double of the detection limits.

The limit of detection is defined as the amount of analyte producing a signal with S/N₂≥3.

The value of the detection limit is mentioned as the actual value at the acquisition date.

Measurement uncertainty is expressed as a double (k=2) relative standard deviation (RSD%), and corresponds to 95% confidence interval.

Estimation of uncertainty of each 2,3,7,8-PCDD/F congener is 30% and total I-TEQ is 20%.

These values were ensured by analyses of certified reference material under conditions of internal reproducibility.

Results marked with "<" are below limit of detection or quantification.

"Lowerbound" and "Upperbound" are levels defined in Regulation 2017/644 and EN 1948-4.

"Mediumbound" is levels defined in Regulation 2017/644.

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Attachment no. 1 to the Certificate of Analysis for work order PR21A8783

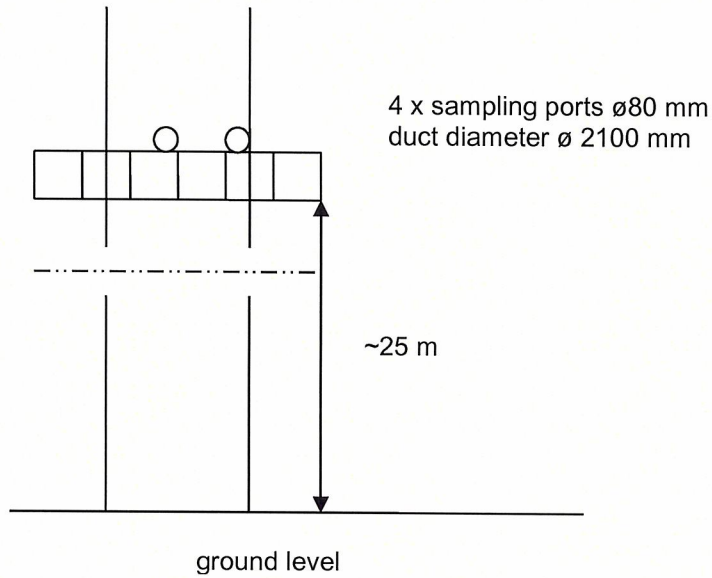
Sample: P/41/11/21


Standards recovery:

Sample:		P/41/11/21			
		Final extract [µl]:		60	
		Injection volume [µl]:		4	
		Acquisition date [d.m.y h:m]:		0.1.00 0:00	
Extraction standard	Recovery	Acceptable range [%]		Accept. rec. with respect to	
PCDDs	[%]	Basic	Extended	basic range	extended range
13C12 - 2,3,7,8-TCDD	80	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,7,8-PeCDD	98	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,4,7,8-HxCDD	80	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,6,7,8-HxCDD	90	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,4,6,7,8-HpCDD	44	40 - 130	20 - 150	YES	-
13C12 - OCDD	41	40 - 130	20 - 150	YES	-
PCDFs					
13C12 - 2,3,7,8-TCDF	76	50 - 130	30 - 150	YES	-
13C12 - 2,3,4,7,8-PeCDF	98	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,4,7,8-HxCDF	55	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,6,7,8-HxCDF	55	50 - 130	30 - 150	YES	-
13C12 - 2,3,4,6,7,8-HxCDF	67	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,4,6,7,8-HpCDF	49	40 - 130	20 - 150	YES	-
13C12 - OCDF	48	40 - 130	20 - 150	YES	-
Sampling standard	Recovery	Acceptable range		Rec. in range?	
	[%]	[%]			
13C12-1,2,3,7,8-PeCDF	56	> 50		YES	
13C12-1,2,3,7,8,9-HxCDF	53	> 50		YES	
13C12-1,2,3,4,7,8,9-HpCDF	52	> 50		YES	

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10. MEASUREMENT PLANE SCHEME



Approved by

.....
Name and Signature **DYREKTOR**
inż. Dariusz Guja

END OF REPORT

