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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 SO<sub>2</sub>, NO<sub>x</sub>, CO
- concentration measurements of CO<sub>2</sub>, O<sub>2</sub>
- 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, September 23<sup>rd</sup> 2021  
Our ref. No.: PW/47/09/21

### **Report No PW/47/09/21**

**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

Developed by:

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Copy number: 1/3.....

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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 16<sup>th</sup> 2020.

**3. MEASUREMENT TEAM**

The measurements taken on September 1<sup>st</sup> 2021 were executed by the following team:

- Grzegorz Bortel                      specialist - measurement team leader,
- Grzegorz Kurzeja                    specialist,
- Karol Sodo                              technician.

**Test Report No PW/47/09/21****4. MEASUREMENT RESULTS SUMMARY**

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

Stationary emission source No. 001 (waste incineration boiler stack)	Concentration of the substance in the gas in the reference conditions O <sub>2</sub> ref. 11%	PCDDF*	ng/m <sup>3</sup> U	<b>0,002</b>
	Emission limits	PCDDF	ng/m <sup>3</sup> U	<b>0,1</b>
	Transgerssion	PCDDF	ng/m <sup>3</sup> U	-
	Concentration of the substance in the gas in the reference conditions O <sub>2</sub> ref. 11%	Cd*+Tl*	mg/m <sup>3</sup> U	<b>0,005</b>
		Hg*	mg/m <sup>3</sup> U	<b>0,002</b>
		Sb*+As*+Cr*+Co*+Mn*+Cu*+Ni*+Pb*+V*	mg/m <sup>3</sup> U	<b>0,062</b>
	Emission limits	Cd+Tl	mg/m <sup>3</sup> U	<b>0,05</b>
		Hg	mg/m <sup>3</sup> U	<b>0,05</b>
		Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V	mg/m <sup>3</sup> U	<b>0,50</b>
	Transgerssion	Cd+Tl	mg/m <sup>3</sup> U	-
		Hg	mg/m <sup>3</sup> U	-
Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V		mg/m <sup>3</sup> U	-	

\*- 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 O<sub>2</sub> content**

The concentration of O<sub>2</sub> was determined using gas analyzer HORIBA PG-350 EHR 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 O<sub>2</sub> - Reference method - Paramagnetism". Measurement is accredited.

Accreditation range: O<sub>2</sub> content: 3-21%

**Measurement CO<sub>2</sub> content**

The concentration of CO<sub>2</sub> was determined using gas analyzer HORIBA PG-350 EHR 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: CO<sub>2</sub> 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**

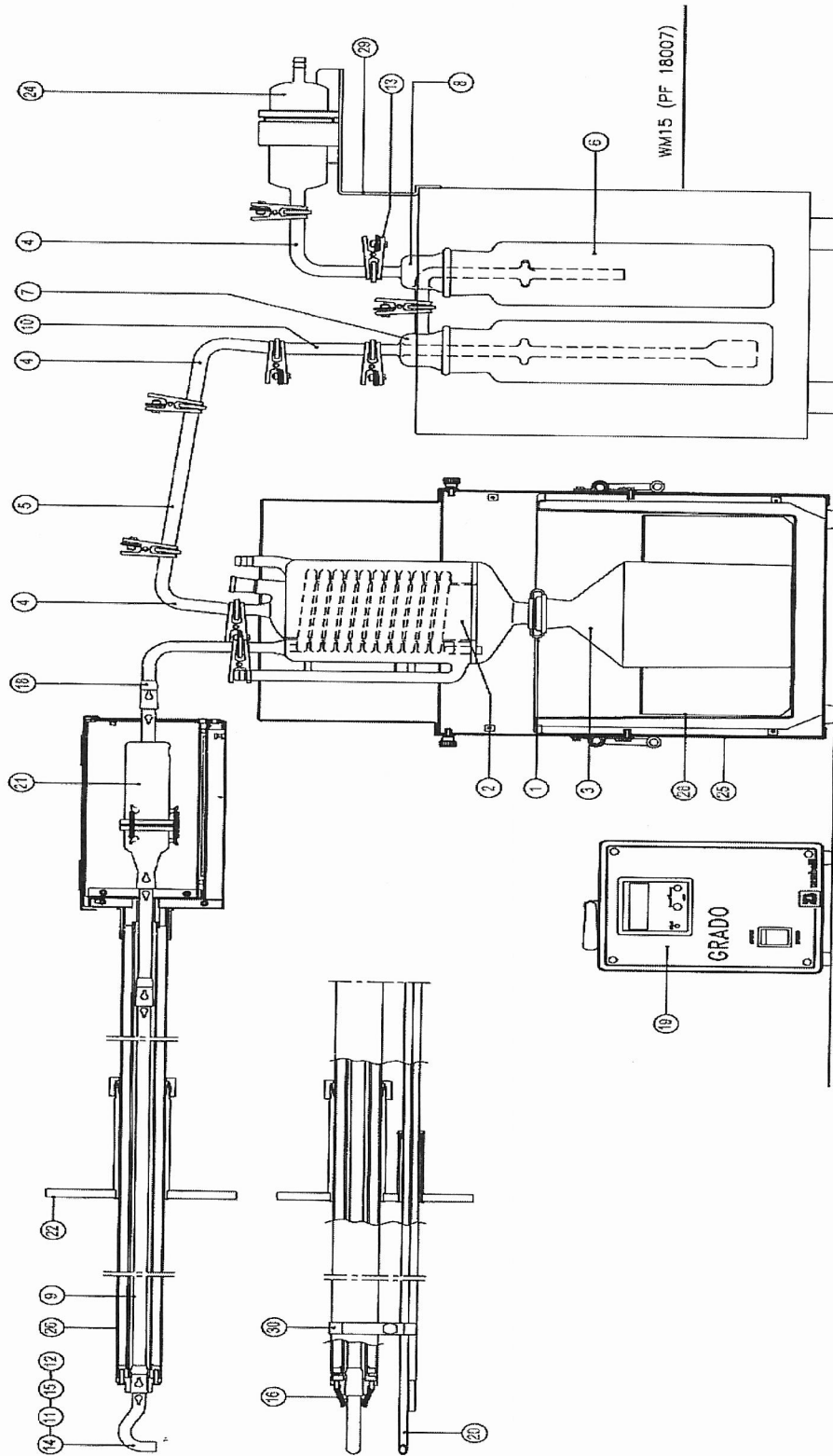
The samples were analysed at the ALS Czech Republic, s.r.o accredited laboratory following the CSN EN 1948-2,3 methodology: The determination of polychlorinated dibenzo-p-dioxine, dibenzofurans in emission samples with the method of isotop dillution using HRGC/HRMS.

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
  - 5,10. aspiration path - tubes
  - 13. clamp
  - 20. Pitot tube „S” - type
  - 25. cooler casing
  - 3. condensation pot
  - 6-8. scrubbers
  - 16. holding springs
  - 21. filter casing
  - 26. heated probe
  - 4,18. aspiration path - elbows
  - 9. aspiration path - probe tube
  - 17. aspiration controller
  - 22. yoke
  - 28. cooler coil
  - 11,12,14,15. - aspiration endings
  - 19. temperature controller
  - 24. gas dryer
  - 29,30. support

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**6. MEASUREMENT RESULTS**

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- 1) Plant or unit name<sup>1)</sup>: **Stationary emission source No. 001 (waste incineration boiler stack)**
- 2) Flue gases cleaning unit<sup>1)</sup>: **Evaporative cooler, hydrated lime and active carbon reactor, bag filters unit (2x4)**
- 3) Emission source load during measurements<sup>1)</sup>: **Boiler load ~46,18 MW,**
- 4) Fuel type or material mass flow in process<sup>1)</sup>: **Waste ~20,51 t/h**
- 5) Location of sampling and measurements: **in duct, after flue gases cleaning unit**

Measurement reference number		01-09-01		X	X	X		
Date of measurement		01.09.2021						
Measurement time range		10:34-11:14   11:17-11:56						
Scope of test		Unit	Results		Average	Uncertainty +/-	Method	
Meteorological conditions	Atmospheric pressure	hPa	998,0	998,4	<b>998,2</b>	0,9	PN-Z-04030-7:1994	
	Air temperature	oC	16	16	<b>16</b>			
Cross-section	Diameter	m	2,10					
	Area	m <sup>2</sup>	3,4619					
The parameters of gas in line	Temperature	oC	37,0	37,0	<b>37,0</b>	0,8		
	Static pressure	Pa	-61,7	-62,9	<b>-62,3</b>	2,2		
	Differential pressure	Pa	62,9	54,1	<b>58,5</b>	0,5		
	Gas moistness grade X	kg/kg	0,039	0,039	<b>0,039</b>	0,0013		PN-EN 14790:2017
	Average velocity	m/s	8,0	7,4	<b>7,7</b>	0,1		PN-EN ISO 16911-1:2013
	Chemical composition	O <sub>2</sub>	%	8,30	8,10	<b>8,20</b>		0,21
		CO <sub>2</sub>	%	11,00	11,20	<b>11,10</b>	0,43	PN-ISO 10396:2001
	Wet gas density during testing	kg/m <sup>3</sup>	1,137	1,138	<b>1,137</b>		PN-Z-04030-7:1994	
	Gas density in normal conditions	kg/m <sup>3</sup> N	1,311	1,312	<b>1,311</b>		PN-Z-04030-7:1994	
Gas density in conventional conditions	kg/m <sup>3</sup> U	1,344	1,345	<b>1,344</b>		PN-Z-04030-7:1994		
Concentration in the gas at measurement conditions	As*	mg/m <sup>3</sup>	<b>&lt;0,005685</b>			0,000708	PN-EN 14385:2005	
	Sb*	mg/m <sup>3</sup>	<b>&lt;0,011370</b>			0,001417	PN-EN 14385:2005	
	Cd*	mg/m <sup>3</sup>	<b>&lt;0,000136</b>			0,000017	PN-EN 13211:2006	
	Co*	mg/m <sup>3</sup>	<b>&lt;0,000455</b>			0,000057	PN-EN 14385:2005	
	Mn*	mg/m <sup>3</sup>	<b>0,026747</b>			0,007480	PN-EN 14385:2005	
	Cu*	mg/m <sup>3</sup>	<b>0,011474</b>			0,004296	PN-EN 14385:2005	
	Ni*	mg/m <sup>3</sup>	<b>0,004010</b>			0,001121	PN-EN 14385:2005	
	Pb*	mg/m <sup>3</sup>	<b>&lt;0,002865</b>			0,000357	PN-EN 14385:2005	
	V*	mg/m <sup>3</sup>	<b>&lt;0,000568</b>			0,000071	PN-EN 14385:2005	
	Cr*	mg/m <sup>3</sup>	<b>0,003827</b>			0,001068	PN-EN 14385:2005	
	Tl*	mg/m <sup>3</sup>	<b>&lt;0,005685</b>			0,000708	PN-EN 14385:2005	
	Hg*	mg/m <sup>3</sup>	<b>&lt;0,001699</b>			0,000212	PN-EN 13211+AC:2006	
	Concentration in the gas at normal conditions	As*	mg/m <sup>3</sup> N	<b>&lt;0,006312</b>			0,000787	PN-EN 14385:2005
Sb*		mg/m <sup>3</sup> N	<b>&lt;0,012622</b>			0,001573	PN-EN 14385:2005	
Cd*		mg/m <sup>3</sup> N	<b>&lt;0,000151</b>			0,000019	PN-EN 13211:2006	
Co*		mg/m <sup>3</sup> N	<b>&lt;0,000504</b>			0,000063	PN-EN 14385:2005	
Mn*		mg/m <sup>3</sup> N	<b>0,029694</b>			0,008305	PN-EN 14385:2005	
Cu*		mg/m <sup>3</sup> N	<b>0,012738</b>			0,004769	PN-EN 14385:2005	
Ni*		mg/m <sup>3</sup> N	<b>0,004452</b>			0,001245	PN-EN 14385:2005	
Pb*		mg/m <sup>3</sup> N	<b>&lt;0,003181</b>			0,000396	PN-EN 14385:2005	
V*		mg/m <sup>3</sup> N	<b>&lt;0,000631</b>			0,000079	PN-EN 14385:2005	
Cr*		mg/m <sup>3</sup> N	<b>0,004248</b>			0,001186	PN-EN 14385:2005	
Tl*		mg/m <sup>3</sup> N	<b>&lt;0,006312</b>			0,000787	PN-EN 14385:2005	
Hg*		mg/m <sup>3</sup> N	<b>&lt;0,001886</b>			0,000235	PN-EN 13211+AC:2006	

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Concentration of the substance in the gas in standard conditions	As*	mg/m3 U	<b>&lt;0,006720</b>			0,000837	PN-EN 14385:2005
	Sb*	mg/m3 U	<b>&lt;0,013440</b>			0,001675	PN-EN 14385:2005
	Cd*	mg/m3 U	<b>&lt;0,000161</b>			0,000020	PN-EN 13211:2006
	Co*	mg/m3 U	<b>&lt;0,000538</b>			0,000067	PN-EN 14385:2005
	Mn*	mg/m3 U	<b>0,031619</b>			0,008843	PN-EN 14385:2005
	Cu*	mg/m3 U	<b>0,013564</b>			0,005078	PN-EN 14385:2005
	Ni*	mg/m3 U	<b>0,004741</b>			0,001325	PN-EN 14385:2005
	Pb*	mg/m3 U	<b>&lt;0,003387</b>			0,000422	PN-EN 14385:2005
	V*	mg/m3 U	<b>&lt;0,000672</b>			0,000084	PN-EN 14385:2005
	Cr*	mg/m3 U	<b>0,004524</b>			0,001263	PN-EN 14385:2005
	Tl*	mg/m3 U	<b>&lt;0,006720</b>			0,000837	PN-EN 14385:2005
	Hg*	mg/m3 U	<b>&lt;0,002008</b>			0,000250	PN-EN 13211+AC:2006
Concentration of the substance in the gas in reference conditions O2 ref. 11%	As*	mg/m3 U	<b>&lt;0,005291</b>			0,000682	PN-EN 14385:2005
	Sb*	mg/m3 U	<b>&lt;0,010583</b>			0,001365	PN-EN 14385:2005
	Cd*	mg/m3 U	<b>&lt;0,000127</b>			0,000016	PN-EN 13211:2006
	Co*	mg/m3 U	<b>&lt;0,000424</b>			0,000055	PN-EN 14385:2005
	Mn*	mg/m3 U	<b>0,024896</b>			0,007012	PN-EN 14385:2005
	Cu*	mg/m3 U	<b>0,010680</b>			0,004014	PN-EN 14385:2005
	Ni*	mg/m3 U	<b>0,003733</b>			0,001051	PN-EN 14385:2005
	Pb*	mg/m3 U	<b>&lt;0,002666</b>			0,000344	PN-EN 14385:2005
	V*	mg/m3 U	<b>&lt;0,000529</b>			0,000068	PN-EN 14385:2005
	Cr*	mg/m3 U	<b>0,003562</b>			0,001001	PN-EN 14385:2005
	Tl*	mg/m3 U	<b>&lt;0,005291</b>			0,000682	PN-EN 14385:2005
	Hg*	mg/m3 U	<b>&lt;0,001557</b>			0,000201	PN-EN 13211+AC:2006
Gas volume flow	measurement conditions	m3/h	99703	92350	<b>96026</b>	1645	PN-EN ISO 16911-1:2013
	normal conditions	m3N/h	86452	80100	<b>83276</b>	1481	
	standard conditions	m3U/h	81188	75231	<b>78209</b>	5467	
	reference conditions O2 ref. 11%	m3U/h	103108	97048	<b>100078</b>	7281	
The emission obtained by measuring	As*	kg/h	<0,000546	<0,000506	<b>&lt;0,000526</b>	0,000075	PN-EN 14385:2005
	Sb*	kg/h	<0,001091	<0,001011	<b>&lt;0,001051</b>	0,000150	PN-EN 14385:2005
	Cd*	kg/h	<0,000013	<0,000012	<b>&lt;0,000013</b>	0,000002	PN-EN 13211:2006
	Co*	kg/h	<0,000044	<0,000040	<b>&lt;0,000042</b>	0,000006	PN-EN 14385:2005
	Mn*	kg/h	0,002567	0,002379	<b>0,002473</b>	0,000713	PN-EN 14385:2005
	Cu*	kg/h	0,001101	0,001020	<b>0,001061</b>	0,000404	PN-EN 14385:2005
	Ni*	kg/h	0,000385	0,000357	<b>0,000371</b>	0,000107	PN-EN 14385:2005
	Pb*	kg/h	<0,000275	<0,000255	<b>&lt;0,000265</b>	0,000038	PN-EN 14385:2005
	V*	kg/h	<0,000055	<0,000051	<b>&lt;0,000053</b>	0,000008	PN-EN 14385:2005
	Cr*	kg/h	0,000367	0,000340	<b>&lt;0,000354</b>	0,000102	PN-EN 14385:2005
	Tl*	kg/h	<0,000546	<0,000506	<b>&lt;0,000526</b>	0,000075	PN-EN 14385:2005
	Hg*	kg/h	<0,000163	<0,000151	<b>&lt;0,000157</b>	0,000022	PN-EN 13211+AC:2006
Emission limits	Cd+Tl	mg/m3 U	0,05				
	Hg	mg/m3 U	0,05				
	Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V	mg/m3 U	0,50				
Transgerssion	Cd+Tl	mg/m3 U	-				
	Hg	mg/m3 U	-				
	Sb+As+Cr+Co+Mn+Cu+Ni+Pb+V	mg/m3 U	-				

\*- the results obtained from the subcontractor ( accredited )

<sup>1)</sup>-information obtained from the client

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**Notes:**

Normal conditions designate the temperature of 273 K and pressure of 101,3kPa, defining normal cubic meter m<sup>3</sup>N. 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, m<sup>3</sup>U

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/09/09/21, P/10/09/21, P/11/09/21, P/12/09/21, P/13/09/21, P/14/09/21, P/15/09/21

Date of delivery to the laboratory: 02.09.2021

Date of analysis: 02.09.2021 - 20.09.2021

**Field blanks:**

ID/ number of sample	Type of substance	The criterion of the blank [mg/m <sup>3</sup> ] 11%O <sub>2</sub>	The value of the blank [mg/m <sup>3</sup> ] 11% O <sub>2</sub>	Result [+/-]
P/11/09/21	Cd+Tl	0,005	p.o.	+
P/14/09/21	Hg	0,005	p.o.	+
P/11/09/21	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 name<sup>1)</sup>: **Stationary emission source No. 001 (waste incineration boiler stack)**
- 2) Flue gases cleaning unit<sup>1)</sup>: **Evaporative cooler, hydrated lime and active carbon reactor, bag filters unit (2x4)**
- 3) Emission source load during measurements<sup>1)</sup>: **Boiler load ~46,18 MW,**
- 4) Fuel type or material mass flow in process<sup>1)</sup>: **Waste ~20,51 t/h**
- 5) Location of sampling and measurements: **in duct, after flue gases cleaning unit**

Measurement reference number		01-09-01		X	X		
Date of measurement		01.09.2021					
Measurement time range		12:00-18:04					
Scope of test		Unit	Results	Uncertainty +/-	Method		
Meteorological conditions	Atmospheric pressure		hPa	999,0	0,9	X	
	Ambient temperature		oC	16			
Cross-section	Diameter		m	2,10			
	Area		m <sup>2</sup>	3,4619			
The parameters of gas in line	Temperature		oC	37	0,530		
	Static pressure		Pa	-67	2,330		
	Differential pressure		Pa	64	0,530		
	Gas moistness grade X		kg/kg	0,041	0,001		PN-EN 14790:2017
	Average velocity		m/s	8,1	0,1		PN-EN ISO 16911-1:2013
	Chemical composition	O <sub>2</sub>	%	8,1	0,2		PN-EN 14789:2017
		CO <sub>2</sub>	%	11,3	0,4	PN-ISO 10396:2001	
	Wet gas density during testing		kg/m <sup>3</sup>	1,137		PN-EN 14790:2006	
Gas density in normal conditions		kg/m <sup>3</sup> N	1,311		PN-EN 14790:2006		
Gas density in conventional conditions		kg/m <sup>3</sup> U	1,345		PN-EN 14790:2006		
Concentration in the gas at measurement conditions	PCDDF*	ng/m <sup>3</sup>	0,002	0,001	PN-EN 1948:2006		
Concentration in the gas at normal conditions	PCDDF*	ng/m <sup>3</sup> N	0,002	0,001	PN-EN 1948:2006		
Concentration of the substance in the gas in standard conditions	PCDDF*	ng/m <sup>3</sup> U	0,003	0,001	PN-EN 1948:2006		
Concentration of the substance in the gas in reference conditions O <sub>2</sub> ref. 11%	PCDDF*	ng/m <sup>3</sup> U	0,002	0,001	PN-EN 1948:2006		
Gas volume flow	measurement conditions		m <sup>3</sup> /h	100575	1723	X	
	normal conditions		m <sup>3</sup> N/h	87284	1552		
	standard conditions		m <sup>3</sup> U/h	81980	5730		
	reference conditions O <sub>2</sub> ref. 11%		m <sup>3</sup> U/h	105754	7694		
The emission obtained by measuring	PCDDF*	ng/h	213,15	67,86	PN-EN 1948:2006		
Emission limits	PCDDF*	ng/m <sup>3</sup> U	0,10				
Transgerssion	PCDDF*	ng/m <sup>3</sup> U	-				

\*- the results obtained from the subcontractor ( accredited )

<sup>1)</sup>-information obtained from the client

**Test Report No PW/47/09/21****Notes:**

Normal conditions designate the temperature of 273 K and pressure of 101,3kPa, defining normal cubic meter m<sup>3</sup>N. 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, m<sup>3</sup>U

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/07/09/21, P/08/09/21

Date of delivery to the laboratory: 02.09.2021

Date of analysis: 02.09.2021 - 20.09.2021

**Field blanks:**

ID/ number of sample	Type of substance	The criterion of the blank [ng/m <sup>3</sup> ] 11%O <sub>2</sub>	The value of the blank [ng/m <sup>3</sup> ] 11% O <sub>2</sub>	Result [+/-]
P/08/09/21	PCDD/DF	0,01	0,0016	+

**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: 12:00 – 17:04 (360,3 min)  
 nozzle diameter: 8 mm  
 probe temperature: 120 °C  
 scrubbers temperature 4 °C  
 aspired gas volume 8,8 m<sup>3</sup>  
 average sampling flow 24,2 l/min  
 izokinetic ratio: 109,2 %  
 leak test: + / +  
 gas meter temperature 25,2 °C  
 gas meter pressure 0 bar  
 spiking pattern: filter surface  
 absorption solution: 100 ml H<sub>2</sub>O dest. + 50 ml 2-etoksyetanol  
 recovery: 71 % <sup>13</sup>C<sub>12</sub>-2,3,4,7,8-PECDF, />50%/  
 72 % <sup>13</sup>C<sub>12</sub>-1,2,3,6,7,8-HxCDF, />50%/  
 64 % <sup>13</sup>C<sub>12</sub>-1,2,3,4,6,7,8 HpCDF. />50%/  
 TEQ sample mass: 0,02 ng

**H<sub>2</sub>O (PN-EN 14790:2017)**

Sampling train: 2 measurement axis  
 Sampling equipment: titanium sampling line  
 heated probe 2,0 m  
 sampling pump: PT-02  
 Cartridge No: H<sub>2</sub>O content set No 1  
 Sampling No: 1  
 Sampling time: 39,3 min  
 Sampling speed: ~2,0 l/min  
 H<sub>2</sub>O mass: 6,85 g  
 absorption efficiency: 98,5 %

**Test Report No PW/47/09/21**

**O<sub>2</sub> paramagnetic (PN-EN 14789:2017):**

Range : 0 – 25 % [X]  
 Calibration gas: O<sub>2</sub> – 9,012% [X] R/07/W  
 N<sub>2</sub> – 99,99% [X] R/17/  
 Sampling train: 2 measurement axis  
 Sampling time/ average time: 364 min / 1 min

O <sub>2</sub> concentration measurement (paramagnetic):		HORIBA PG-350E-EU			
check operation		unit	result	criterion	result +/-
„0” after adjustment, without sampling train		%	0,05	± 0,1 [%]*	+
„0” after adjustment, with sampling train	before measurement	%	0,1	± 0,2 [%]**	+
	after measurement	%	0,05	± 0,2 [%]**	+
„Span” after adjustment with sampling train /standard 20,018 % R/12/W analyzer range 25%/	before measurement	%	9,0	± 0,2 [%]**	+
	after measurement	%	9,05	± 0,2 [%]**	+
	before measurement time T90	%	8,15	> 8,12 [%]	-----
		sec.	38	< 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: 110,0 %  
 Sampling time: 39,3 min  
 Sampled volume: 0,114 m<sup>3</sup>  
 Impingers: impingers set No. 1 (absorption efficiency 97,5 %)  
 Absorption solution: No. 1 (manganese (VII) potassium / sulfuric acid (VI))

**Heavy metals (PN-EN 14385:2005)**

Sampling train: 2 measurement axis  
 Sampling: isokinetic [x]  
 nonisokinetic []  
 Isokinetic ratio: 115,0 %  
 Sampling time: 39,3 min  
 Sampled volume: 0,188 m<sup>3</sup>  
 Filter parameters: FT-50: Ø 0,50 mm, efficiency: 99,990 %, quartz (QMA)  
 Impingers: impingers set No. 2 (absorption efficiency 98,5 %)  
 Absorption solution: HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>

**Test Report No PW/47/09/21**Statement 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-02
Certificate	Calibration No	851-2464/19 786-2246/19 R-287/16-186/16 G-373/19-227/19
Issued by		INTROL Sp. z o.o. KATOWICE ZAP BESTWINKA
Date of issue the certificate of calibration		29.08.2019 12.08.2019 08.08.2019
Expiration date of the certificate of calibration		-

**Test Report No PW/47/09/21****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**

Powierza 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 8 grudnia 2019 roku

## Test Report No PW/47/09/21

## 9. DIOXINS AND FURANS ANALYSIS RESULTS



## Attachment no. 1 to the Certificate of Analysis for work order PR2184913

Sample:

P/07/09/21

## Measurement results PCDD/Fs:

Sample:		P/07/09/21		Final extract [µl]:		60	
				Injection volume [µl]:		4	
				Acquisition date [d.m.y h:m]:		11.9.21 17:09	
2,3,7,8-PCDD/Fs	Result [ng/sample]	Limit of Detection [ng/sample]	Limit of Quantification [ng/sample]	<sup>4</sup> I-TEFs	I-TEQ Upperbound [ng/sample]		
2,3,7,8-TCDD	< 0.0045	0.0045	0.009	1	0.0045		
1,2,3,7,8-PeCDD	< 0.0047	0.0047	0.0094	0.5	0.0023		
1,2,3,4,7,8-HxCDD	< 0.0055	0.0055	0.011	0.1	0.00055		
1,2,3,6,7,8-HxCDD	< 0.0055	0.0055	0.011	0.1	0.00055		
1,2,3,7,8,9-HxCDD	< 0.0055	0.0055	0.011	0.1	0.00055		
1,2,3,4,6,7,8-HpCDD	< 0.017	0.017	0.034	0.01	0.00017		
OCDD	< 0.016	0.016	0.032	0.001	0.000016		
2,3,7,8-TCDF	< 0.01	0.01	0.02	0.1	0.001		
1,2,3,7,8-PeCDF	< 0.0067	0.0067	0.013	0.05	0.00033		
2,3,4,7,8-PeCDF	< 0.013	0.0067	0.013	0.5	0.0067		
1,2,3,4,7,8-HxCDF	< 0.0083	0.0083	0.017	0.1	0.00083		
1,2,3,6,7,8-HxCDF	< 0.0083	0.0083	0.017	0.1	0.00083		
1,2,3,7,8,9-HxCDF	< 0.0083	0.0083	0.017	0.1	0.00083		
2,3,4,6,7,8-HxCDF	< 0.0083	0.0083	0.017	0.1	0.00083		
1,2,3,4,6,7,8-HpCDF	< 0.01	0.01	0.021	0.01	0.0001		
1,2,3,4,7,8,9-HpCDF	< 0.01	0.01	0.021	0.01	0.0001		
OCDF	< 0.017	0.017	0.034	0.001	0.000017		
I-TEQ from quantified 2,3,7,8-PCDD/Fs - "Lowerbound"							0
I-TEQ from 2,3,7,8-PCDD/Fs - "Mediumbound"							0.01
Maximum possible I-TEQ - "Upperbound"							0.02
PCDDs	Result [ng/sample]	PCDFs	Result [ng/sample]				
Tetra-CDDs	< 0.44	Tetra-CDFs	< 0.78				
Penta-CDDs	< 0.066	Penta-CDFs	< 0.57				
Hexa-CDDs	< 0.055	Hexa-CDFs	< 0.13				
Hepta-CDDs	< 0.034	Hepta-CDFs	< 0.042				
OCDD	< 0.016	OCDF	< 0.017				

<sup>4</sup>I-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/N<sub>3</sub>.

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 "&lt;" 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.

**Test Report No PW/47/09/21**



**Attachment no. 1 to the Certificate of Analysis for work order PR2184913**

Sample: P/07/09/21

**Standards recovery:**

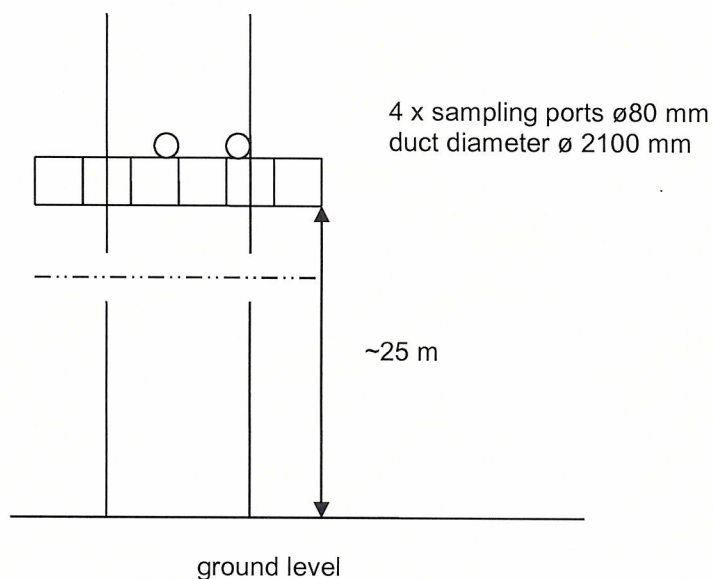
Sample:		P/07/09/21			
		Final extract [µl]:		60	
		Injection volume [µl]:		4	
		Acquisition date [d.m.y h:m]:		11.9.21 17:09	
Extraction standard	Recovery	Acceptable range [%]		Accept. rec. with respect to	
PCDDs	[%]	Basic	Extended	basic range	extended range
13C12 - 2,3,7,8-TCDD	80	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,7,8-PeCDD	99	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,4,7,8-HxCDD	93	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,6,7,8-HxCDD	87	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,4,6,7,8-HpCDD	47	40 - 130	20 - 150	YES	-
13C12 - OCDD	58	40 - 130	20 - 150	YES	-
PCDFs					
13C12 - 2,3,7,8-TCDF	55	50 - 130	30 - 150	YES	-
13C12 - 2,3,4,7,8-PeCDF	95	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,4,7,8-HxCDF	77	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,6,7,8-HxCDF	75	50 - 130	30 - 150	YES	-
13C12 - 2,3,4,6,7,8-HxCDF	74	50 - 130	30 - 150	YES	-
13C12 - 1,2,3,4,6,7,8-HpCDF	54	40 - 130	20 - 150	YES	-
13C12 - OCDF	46	40 - 130	20 - 150	YES	-
Sampling standard	Recovery	Acceptable range		Rec. in range?	
	[%]	[%]			
13C12-1,2,3,7,8-PeCDF	71	> 50		YES	
13C12-1,2,3,7,8,9-HxCDF	72	> 50		YES	
13C12-1,2,3,4,7,8,9-HpCDF	64	> 50		YES	

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**Test Report No PW/47/09/21**

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**10. MEASUREMENT PLANE SCHEME**



Approved by  
DYREKTOR

.....  
Name and Signature inż. Dariusz Guja

END OF REPORT

