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SOLID BIOFUELS TESTING SECTION



AB 088

Poznań, 24th April 2023



TEST REPORT No. BDB-23-A-1289

Subject of the order	Fuel properties testing of wood pellets
Order No.	A/DBD/BDB/1289/2023
Name and address of the customer/ producer	Frame Pack Kamil Szalast, Remigiusz Paprocki S.K.A Kaleńsko 27 74-406 Namyślin
Performance date	23.03 – 24.04.2023
Operators	Jacek Pawłowski, M.Sc. Dariusz Radoński, B.Eng. Małgorzata Walkowiak, M.Sc. (Eng.) Magdalena Witczak, PhD. (Eng.)

Compiled by

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1. IDENTIFICATION (DESCRIPTION OF TEST SAMPLE)

The object of the assessment was a sample of pellets, which was collected and described by the customer as wood pellets made of coniferous wood.

Identification number: A-1289-BDB/2023.

2. DELIVERY DATE OF TESTED SUBJECTS

The sample was taken by the customer and delivered to the laboratory on 23rd March 2023.

3. TEST METHODS

- EN ISO 14780:2017 Solid biofuels – Sample preparation (Method 16M)
- EN ISO 18134-2:2017 Solid biofuels – Determination of moisture content – Oven dry method – Part 2: Total moisture – Simplified method (Method 1M)
- EN ISO 18134-3:2015 Solid biofuels – Determination of moisture content – Oven dry method – Part 3: Moisture in general analysis sample (Method 1M)
- EN ISO 18122:2015 Solid biofuels – Determination of ash content (Method 2M)
- EN ISO 17828:2015 Solid biofuels – Determination of bulk density (Method 4M)
- EN ISO 18125:2017 Solid biofuels – Determination of calorific value (Method 6M)
- EN ISO 16948:2015 Solid biofuels – Determination of total content of carbon, hydrogen and nitrogen (Method 7M)
- EN ISO 16994:2016 Solid biofuels – Determination of total content of sulfur and chlorine (Method 8M)
- EN ISO 18846:2016 Solid biofuels – Determination of fines content in quantities of pellets (Method 9M)
- EN ISO 17831-1:2015 Solid biofuels – Determination of mechanical durability of pellets and briquettes – Part 1: Pellets (Method 10M)
- EN ISO 17829:2015 Solid biofuels – Determination of length and diameter of pellets (Method 11M)
- EN ISO 16968:2015 Solid biofuels – Determination of minor elements (Method 13M)
- EN ISO 21404:2020 Solid biofuels – Determination of ash melting behaviour (Method 14M)

4. EQUIPMENT OF THE TEST STANDS (elementary)

No.	Name	Type	Producer	Lab.No.
1.	Analytical balance	LE26P-0CE	SARTORIUS	M7/2
2.	Analytical balance	CPA225D-0CE	SARTORIUS	M8/57
3.	Laboratory drier	Redline RF115	BINDER	M1/47
4.	Calorimeter	C6000	IKA	M6/83
5.	Elemental analyzer	Flash EA 1112	THERMO ELECTRON CORPORATION	M7/8
6.	Furnace	FCF 7SM/pl	CZYLOK	M2/4
7.	Ionic chromatograph	ICS-1100	THERMO SCIENTIFIC	M8/54
8.	Laboratory balance	PS 6000/C/2	RADWAG	M3/50
9.	Laboratory balance	WLC 6/F1/R	RADWAG	M9/46
10.	Pellets durability tester	TUMBLER 3000	BIOENERGY ANLAGENPLANUNG	M10/42
11.	Sieve 3.15 mm	-	RETSCH	M9/34
12.	Caliper	SD-10	BAKER	M3/14
13.	Microwave oven	MARS 6	CEM CORPORATION	M13/80
14.	Atomic Absorption Spectrometer	280FS AA	AGILENT TECHNOLOGIES	M13/66
15.	Atomic Absorption Spectrometer	280Ze AA	AGILENT TECHNOLOGIES	M13/67
16.	Mercury analyzer	DMA80	Milestone	M13/117
17.	System for determination of characteristic temperatures of ash melting behaviour	PR-37/1600	Radio Research Institute	M14/88
18.	Sieve 0.075 mm	-	ATEST	M14/91

5. TESTS RESULTS

Tests results are presented in Record No. 1/1289/2023.

6. DECLARATION

Test results presented in this Report refer to the tested samples only.

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Record No. 1/1289/2023

Sample name: Wood pellets made of coniferous wood
Name of the customer/ producer: Frame Pack Kamil Szalast, Remigiusz Paprocki S.K.A
 Kaleńsko 27 74-406 Namyślin

Parameter	Unit	Value	Uncertainty [±] ¹	Requirements EN ISO 17225-2:2021		
				A1	A2	B
Diameter	mm	5,9	0,1	6 ± 1 / 8 ± 1		
Length	mm	24,5	13,7	3,15 < L ≤ 40		
Moisture	w-% _{ar}	7,5	0,3	≤ 10		
Ash	w-% _d	0,42	0,03	≤ 0,7	≤ 1,2	≤ 2,0
Mechanical durability	w-% _{ar}	98,1	0,1	≥ 98,0	≥ 97,5	≥ 96,5
Fines (< 3.15 mm)	w-% _{ar}	0,10	0,01	≤ 1,0		
Gross calorific value	MJ/kg _d	20,33	0,05	-		
Net calorific value	MJ/kg _{ar} kWh/kg _{ar}	17,34 4,82	0,10 0,03	≥ 16,5 ≥ 4,6		
Bulk density	kg/m ³ _{ar}	655	9	600 ≤ BD ≤ 750		
Carbon	w-% _d	49,40	0,47	-		
Hydrogen	w-% _d	6,37	0,14	-		
Nitrogen	w-% _d	< 0,08	-	≤ 0,3	≤ 0,5	≤ 1,0
Sulfur	w-% _d	0,007	0,001	≤ 0,04		≤ 0,05
Chlorine	w-% _d	0,011	0,002	≤ 0,02		≤ 0,03
Ash shrinkage temperature SST ^{2,3}	°C	1330	25	Should be stated		
Ash deformation temperature DT ^{2,3}	°C	1440	51	≥ 1200	≥ 1100	
Ash hemisphere temperature HT ^{2,3}	°C	1460	20	Should be stated		
Ash flow temperature FT ^{2,3}	°C	1460	12	Should be stated		
Arsenic	mg/kg _d	< 0,1	-	≤ 1		
Cadmium	mg/kg _d	0,135	0,004	≤ 0,5		
Chromium	mg/kg _d	0,65	0,04	≤ 10		
Copper	mg/kg _d	0,55	0,02	≤ 10		
Lead	mg/kg _d	< 0,5	-	≤ 10		
Mercury	mg/kg _d	0,0016	0,0001	≤ 0,1		
Nickel	mg/kg _d	< 0,5	-	≤ 10		
Zinc	mg/kg _d	9,05	0,02	≤ 100		

_d dry _{ar} as received

1. the expanded uncertainty was determined for coverage factor k = 2 and 95% confidence level

2. characteristic ash melting temperature determined in an oxidizing atmosphere

3. ash received at 815°C

End of report