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## WOOD TECHNOLOGY CENTRE TESTING LABORATORY OF WOOD, WOOD-BASED MATERIALS, PACKAGING, FURNITURE AND CONSTRUCTIONS

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### SOLID BIOFUELS TESTING SECTION



AB 088

Poznań, 22<sup>nd</sup> December 2022



# TEST REPORT No. 4358/2-2/2022/S.M

<b>Subject of the order</b>	Quality testing of wood pellets – For Nature Solutions Sp. z o.o.
<b>Order No</b>	A-4358-BDB/2022
<b>Name and address of the customer</b>	Control Union Poland Sp. z o. o. Al. Wojska Polskiego 45, 65-764 Zielona Góra
<b>Name and address of the producer</b>	For Nature Solutions Sp. z o.o. Pomorska Specjalna Strefa Ekonomiczna Ostaszewo 57L, 87-148 Łysomice
<b>DINplus ID/ Sample No.</b>	7A312; 6mm/For_Nature/2022-2
<b>Performance date</b>	09.12 – 22.12.2022
<b>Operators</b>	Agnieszka Jankowska, M.Sc.Eng. Jacek Pawłowski, M.Sc. Dariusz Radoński, B.Eng. Małgorzata Walkowiak, M.Sc.Eng. Magdalena Witczak, PhD.Eng.

Compiled by

Authorized by

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Małgorzata Walkowiak, M.Sc.Eng.

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*A qualified electronic signature has been affixed to this document, which according to the law is equivalent to written form.*

## 1. IDENTIFICATION (DESCRIPTION OF TEST SAMPLE)

The object of the assessment was the sample of pellets with the diameter of 6mm, described by the customer as pellets made of post-production chemically uncontaminated sawdust.

Sample number: 6mm/For\_Nature/2022-2.

Identification number: A-4358-BDB/2022.

## 2. DELIVERY DATE OF TESTED SUBJECTS

The sample was taken by the customer and delivered to the laboratory on 09<sup>th</sup> December 2022.

## 3. TEST METHODS

- EN ISO 14780:2017-07 Solid biofuels – Sample preparation (Method 16M)
- EN ISO 18134-2:2015-11 Solid biofuels – Determination of moisture content – Oven dry method – Part 2: Total moisture – Simplified method (Method 1M)
- EN ISO 18134-3:2015-11 Solid biofuels – Determination of moisture content – Oven dry method – Part 3: Moisture in general analysis sample (Method 1M)
- EN ISO 18122:2016-01 Solid biofuels – Determination of ash content (Method 2M)
- EN ISO 17828:2016-02 Solid biofuels – Determination of bulk density (Method 4M)
- EN ISO 18125:2017-07 Solid biofuels – Determination of calorific value (Method 6M)
- EN ISO 16948:2015-07 Solid biofuels – Determination of total content of carbon, hydrogen and nitrogen (Method 7M)
- EN ISO 16994:2015-06 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 17831-1:2016-02 Solid biofuels – Determination of mechanical durability of pellets and briquettes – Part 1: Pellets (Method 10M)
- EN ISO 17829:2016-02 Solid biofuels – Determination of length and diameter of pellets (Method 11M)
- EN ISO 16968:2015-07 Solid biofuels – Determination of minor elements (Method 13M)
- EN ISO 21404:2020-8 Solid biofuels – Determination of ash melting behaviour (14M Method)

## 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. 1/4358/2-2/2022.

## 6. DECLARATION

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

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**Record No. 1/4358/2-2/2022**

**Sample name:** Wood pellets  
**Name of Producer:** For Nature Solutions Sp. z o.o.  
 Pomorska Specjalna Strefa Ekonomiczna, Ostaszewo 57L, 87-148 Łysomice  
**DINplus ID /sample No.:** 7A312; 6mm/For\_Nature/2022-2

<b>Origin:</b>		1. Woody biomass		
<b>Traded form:</b>		Wood pellets		
<b>Classification of origin according to EN ISO 17225-1:2021</b>		1.2.1 Chemically untreated by-products and residues from the wood processing industry		
<b>Parameter</b>	<b>Unit</b>	<b>Value</b>	<b>Uncertainty [±] <sup>1</sup></b>	<b>Threshold value acc. to DINplus Certification Scheme Edition: November 2021</b>
Diameter	mm	6.1	0.1	6 ± 1 or 8 ± 1
Length	mm	15.7	8.7	3.15 < L ≤ 40
Moisture	w-% <sub>ar</sub>	6.24	0.22	≤ 10
Ash	w-% <sub>d</sub>	0.33	0.02	≤ 0.6
Mechanical durability	w-% <sub>ar</sub>	99.1	0.1	≥ 98.0
Fines (< 3.15 mm)	w-% <sub>ar</sub>	0.11	0.01	≤ 0.5% / ≤ 1.0 % <sup>2</sup>
Gross calorific value	MJ/kg <sub>d</sub>	20.84	0.11	-
Net calorific value	MJ/kg <sub>ar</sub> kWh/kg <sub>ar</sub>	18.07	0.12	≥ 16.5
		5.02	0.03	≥ 4.6
Bulk density	kg/m <sup>3</sup> <sub>ar</sub>	680	14	600 ≤ BD ≤ 750
Carbon	w-% <sub>d</sub>	50.87	0.36	-
Hydrogen	w-% <sub>d</sub>	6.47	0.12	-
Nitrogen	w-% <sub>d</sub>	< 0.08	-	≤ 0.3
Sulfur	w-% <sub>d</sub>	0.006	0.001	≤ 0.04
Chlorine	w-% <sub>d</sub>	0.005	0.001	≤ 0.02

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Ash shrinkage temperature SST <sup>3,4</sup>	°C	1280		Should be stated
Ash deformation temperature DT <sup>3,4</sup>	°C	> 1500	-	≥ 1200
Ash hemisphere temperature HT <sup>3,4</sup>	°C	> 1500	-	Should be stated
Ash flow temperature FT <sup>3,4</sup>	°C	> 1500	-	Should be stated
Arsenic	mg/kg <sub>d</sub>	< 0.1	-	≤ 1
Cadmium	mg/kg <sub>d</sub>	0.18	0.01	≤ 0.5
Chromium	mg/kg <sub>d</sub>	< 0.5	-	≤ 10
Copper	mg/kg <sub>d</sub>	0.96	0.09	≤ 10
Lead	mg/kg <sub>d</sub>	< 0.5	-	≤ 10
Mercury	mg/kg <sub>d</sub>	< 0.0006	-	≤ 0.1
Nickel	mg/kg <sub>d</sub>	< 0.5	-	≤ 10
Zinc	mg/kg <sub>d</sub>	6.37	0.01	≤ 100

<sub>d</sub> dry <sub>ar</sub> as received

1. the expanded uncertainty was determined for coverage factor  $k = 2$  and 95% confidence level
2. "at the factory gate", last loading before delivering to end-user ( $\leq 0.5\%$  small bags up to 20kg;  $\leq 1\%$  large sacks and bulk ware)
3. characteristic ash melting temperature determined in an oxidizing atmosphere
4. ash received at 815°C

End of report