

Audit and Test Report:
BEA 2020248

Date: 2020-11-06

Inspection according ENplus®

Client: **Crown forest doo**
Prilike bb
32252 Ivanjica
Serbia

Subject: Wood pellets production **Crown forest doo** plant in Ivanjica,
Serbia

Content: Site Audit and pellet testing according to ENplus®

Order: according inspection contract

**Date of audit
and sampling:** 2020-09-23 by Dr. Martin Englisch

Receipt of samples: 2020-09-23

Ref: Eng



BEA Institut für Bioenergie GmbH
Avedikstrasse 21, 1150 Vienna, AUSTRIA
P: +43 1 89093 91 | F: +43 1 89093 92

office@bioenergy.co.at
www.bioenergy.institute



Bank: Bank Austria AG
IBAN: AT47 1200 0529 4901 1803
BIC: BKAUATWW

Accredited inspection body



VAT-No.: ATU 65124117
EORI: ATEOS1000004531
Comm. reg. No.: FN 331066m
Jurisdiction: Vienna

1 SCOPE OF WORK

Inspection of the wood pellet production plant especially of quality measures, evaluation of quality related documents and internal testing of product quality of wood pellets production according ENplus® requirements. A sample of the production is to be taken and tested according ISO 17225-2 for verification of pellet quality.

2 SCOPE OF APPLICATION

The test results given in this report have been obtained under the specific conditions of the individual tests. They shall serve as proof for the conformity of the sample(s) tested. The client is responsible for the conformity of products with ENplus® regulations which will be assured when quality assurance measures according ENplus® regulations are continuously applied.

3 INSPECTION AUDIT

The inspection audit was carried out according ENplus® Handbook for the Certification of Wood Pellets for Heating Purposes (Version 3.0 from August 2015) by Dr. Martin Englisch attended by Mr. Jovan Kostić. Duration of audit was approximately 2 hours.

Responsibilities in the factory are assigned clearly, a company organogram exists.

The responsibility in the company is divided as follows:

Contact person:	Mr. Jovan Kostić (also general manager)
Quality manager:	Mr. Brane Pesic info@pelet.org
Responsible for quality assurance:	Mr. Brane Pesic

3.1 Products

Certified products	wood pellets EN ISO 17225-2, class A2	
Dimensions	6 mm	
ENplus® ID	RS 011	
Certification body	HFA	
Subcontracted service providers	none	
Affiliated Companies	none	
Business activities (except activities of service providers)	Production	Yes
	Full load deliveries of bulk pellets to end-users including unsealed big-bags	No
	Part load deliveries of bulk pellets to end-users	No
	Bagging of pellets including sealed big-bags	Yes
	Sourcing pellets from another certified company	No
Produced amount*	2018: total production ~ 19.000 t ~ 17.700 t in 15 kg bags ~ 1.300 t bulk 2019: total production 16.000 t - all in 15 kg bags (50% export to Italy, Macedonia, Greece) 2020: expected 20.000 t current production about 1.800 per month stable	
Brand name ¹	Crown forest (as displayed on EPC hp)	
Storage capacity	~ 3000 t on site, all for bagged pellets on pallets / big-bags	

3.2 Raw material

Origin of wood	~ 40% own production (attached sawmill); fraction increased since a new saw mill was purchased ~ 60 % external purchase
Source raw material	~ 50% stem wood (1.1.3 acc. EN ISO 17225-1) ~ 50 % chemically untreated wood residues (1.2.1 acc. EN ISO 17225-1)
Raw material species	~ 20% conifers, mainly spruce ~ 80% hardwood, mainly beech
Form of raw material	Roundwood, sawdust, chips, offcuts/slabs

Raw material storage	Sawdust and chips are stored in halls. Logs are stored outdoors on paved woodyard.
Control and documentation of raw material	100% of raw material intake is recorded with supplier, origin, truck, truck driver and is checked visually, trucks are weighted
Suppliers	There is only one supplier for wood (also for saw mill), Srbi-jašume), the contract was provided.
Sustainability of raw material	100 % certified FSC SGS - COC 009763
Other raw materials used (e.g. pressing aids)	No additives are used

3.3 Production process

Changes in production process since last Audit	• new and bigger burner and • a new palletizer and complete bagging line (Robotika Kogler)
Raw material preparation	Chipper, hammer mill
Drying	drum drier
Separation of contaminants and impurities	metal separators, sieve for oversizes
Pellet production	The dry raw material is pelletized with 3 ring die presses and cooled by a counter-current cooler (Munch); problems with spare parts due to lower quality provided by Munch
Removal of fines	Fines are removed by two vibrating sieves with suitable size and sieve aperture, dust is removed by air separators.
Non-complying pellets	A possibility for separation of low quality batches exists (manual).
Documentation of failures, breakdowns and maintenance	A shift book exists containing all relevant information including maintenance plans.
Carbon footprint of production	GHG emissions of production were calculated using the EPC XLS-sheet: • 300 g CO₂-eq/kg bagged pellets

3.4 Quality control measures

The factory production control is carried out in accordance with the requirements of the regulations. Tests are done regular and are documented properly.

Parameter	Test frequency	Test equipment
Moisture	Once per shift	Humimeter BP1 / BEA 110
Bulk density	Once per shift	5l bulk density cylinder

Mechanical durability	Once per shift	BEA tumbler 1000
Length	Once per shift	Caliper rule
Fines	Full bag per shift	3,15mm sieve
Ash content	Planned later 2018	ISO18122

Instruments are brand new.

Comparison of analysis results

parameter	unit	Crown forest	BEA
moisture	%	6,1	7,3
bulk density	kg/m ³	615	620
durability	%	(98,9)	98,1
fines	%	0,11	0,20

Results for fines and bulk density are within expected variation. Moisture should be evaluated 2021. Mechanical durability can not be compared because it was done in the plant on a different sample.

3.5 Quality assurance

Quality management system	Crown forest uses an operating procedures and a number of dedicated forms which include: • Responsibilities • Self-inspection • Breakdown report production • Service and maintenance • Customer complaint management • Product control
Documentation raw material	All incoming raw materials are documented and are checked by staff.
Customer complaints	Customer complaint management is implemented.

Number and reason of complaints	2018 till Audit: 2 complaint were recorded, both accepted Reasons: 1 foreign object (metal part) => new magnet was installed 1 transport problem one freight to Rome 2019: 2 complaints on pallets which were broken during transport (accepted); none on pellet quality; some information from customers that pallets were twisted during transport but no complaint
Documentation of outgoing goods	Documentation of outgoing goods is done according to the requirements, labelling to be completed after Certification
Check of temperature of outgoing goods	Not necessary, no part load delivery.
Calibration of scales	There is a valid external calibration, made on 23.1.2020
External training of staff	Mr. Boris Todorović attended training in Podgoriza, 2018
Internal training of staff	Is implemented.

3.6 Retain samples

Retain samples pellets	Not necessary, no part load delivery
Retain sample labelling	-
Storage for retain samples	-

3.7 Labelling

Requirements concerning labelling are implemented.

4 SAMPLING

Samples were taken following the principles of ISO 18135. One samples (15 kg bag) was taken from the running production.

5 TESTS

Testing took place in September/October 2020.

6 PELLET LAB ANALYSIS RESULTS

BEA2020248	Standard	unit	Pellets A2	Limit values according ENplus®	
				Class A1	Class A2
mechanical durability	ISO 17831-1	[%]	98,1	≥ 98,0	≥ 97,5
bulk density (ar)	ISO 17828	[kg/m³]	620	750≥BD≥600	750≥BD≥600
moisture content	ISO 18134-2	[%]	7,3	≤ 10	≤ 10
ash content 550°C (db)***	ISO 18122	[%]	1,16	≤ 0,7	≤ 1,2
net calorific value (ar)	ISO 18125	[MJ/kg]	16,7	≥ 16,5	≥ 16,5
net calorific value (ar)	ISO 18125	[kWh/kg]	4,6	≥ 4,6	≥ 4,6
net calorific value (db)	ISO 18125	[MJ/kg]	18,2	-	-
net calorific value (db)	ISO 18125	[kWh/kg]	5,1	-	-
gross calorific value (ar)	ISO 18125	[MJ/kg]	18,2	-	-
gross calorific value (ar)	ISO 18125	[kWh/kg]	5,1	-	-
Sulphur content (db)	ISO 16994	[%]	0,012	≤ 0,04	≤ 0,05
Chlorine content (db)	ISO 16994	[%]	0,007	≤ 0,02	≤ 0,02
Nitrogen content (db)	ISO 16948	[%]	0,13	≤ 0,30	≤ 0,50
pressing aid / additives**	-	[%]	none	≤ 1,8	≤ 1,8
dimensions					
finer (< 3,15 mm)	ISO 18846	[%]	0,2	≤ 0,5* / ≤ 1	≤ 0,5* / ≤ 1
length (3,15 ≤ L ≤ 40 mm)	ISO 17829	[%]	99,7	> 98,5* / > 98	> 98,5* / > 98
length (40 ≤ L ≤ 45 mm)	ISO 17829	[%]	0,1	≤ 1	≤ 1
length (> 45 mm)	ISO 17829	[Amount]	none	0	0
diameter	ISO 17829	[mm]	6	6 or 8 ± 1	6 or 8 ± 1
heavy metals					
Chromium (db)	ISO 16968	[mg/kg]	<1,0	≤ 10	≤ 10
Copper (db)	ISO 16968	[mg/kg]	7,4	≤ 10	≤ 10
Zinc (db)	ISO 16968	[mg/kg]	11	≤ 100	≤ 100
Lead (db)	ISO 16968	[mg/kg]	<0,50	≤ 10	≤ 10
Mercury (db)	ISO 16968	[mg/kg]	<0,075	≤ 0,1	≤ 0,1
Cadmium (db)	ISO 16968	[mg/kg]	<0,10	≤ 0,5	≤ 0,5
Arsenic (db)	ISO 16968	[mg/kg]	<0,50	≤ 1	≤ 1
Nickel (db)	ISO 16968	[mg/kg]	1,3	≤ 10	≤ 10
ash melting behaviour (ash preparation at 815°C, measurement at oxidizing atmosphere)					
shrinking temperature SST	CEN/TS 15370-1	[°C]	910	-	-
deformation temperature DT	CEN/TS 15370-1	[°C]	1350	≥ 1200	≥ 1100
hemisphere temperature HT	CEN/TS 15370-1	[°C]	>1550	-	-
flow temperature FT	CEN/TS 15370-1	[°C]	>1550	-	-

db... dry basis; ar... as received

*1% at factory gate or when loading truck for delivery to end-users, 0,5% when filling pellets bags/sealed big bags

**according ENplus 1,8% production additives and 0,2% post production additives are allowed

*** performed with proximate analyzer

7 SUMMARY

The pellet production of **Crown forest doo** plant in Ivanjica, Serbia, is complying with all requirements of

ENplus® , quality



Deviations from 2019:

- ♦ Training of employees and suppliers of raw material was done to reduce litter in saw dust delivered (saw mill residues are valuable raw material not waste bin) – quality improved! (2 persons hired for quality control)
- ♦ EPC approved Quality manager training was attended

Type A and type B non-conformities:

- ♦ B-non conformity: few oversized pellets were found in production which were assigned to the new die. The company resolved the problem by adding additional knives on pellet press no 2, where the problem was located.

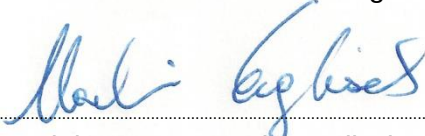
Type C non-conformities and recommendations:

- ♦ Recommendation still the same as last year: use internal lab tests more for process control optimization

This inspection report no. BEA 2020248 comprises 8 pages and 0 appendix(es).



EPC-listed Auditor in charge



Dipl.-Ing. Dr. Martin Englisch