

Audit and Test Report:
BEA2018252

Date: 2018-08-29

Inspection according ENplus®

Client: Sparrow d.o.o.
Attn.: Mr. Igor Milekić
Marina Marinovića 1
37260 Varvarin
Srbija - Serbia

Subject: Wood pellets production Sparrow d.o.o.
plant in Varvarin, Serbia

Content: Additional Site Audit 2018 including pellet testing according to ENplus® for quality A1; for quality A2 see BEA2018039

Order: According to the inspection contract

Date of audit and sampling: 2018-08-07 by Dr. Martin Englisch

Receipt of samples: 2018-08-14 and 2018-08-27

Ref: Eng



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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.

This inspection was an additional inspection for implementation of quality A1 as new product for Sparrow.

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. Igor Milekić and Mr. Nemanja Aleksić. Duration of the audit was approximately 2 hours.

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

The responsibility in the company is divided as follows:

Contact person:	Mr. Igor Milekić
Quality manager:	Mr. Nemanja Aleksić nemanja.aleksic@sparrow.rs
Responsible for quality assurance:	Mr. Nemanja Aleksić

3.1 Products

Certified products	wood pellets EN ISO 17225 – 2, class A1 and A2	
Dimensions	6 mm	
ENplus® ID-number	RS 007	
Certification Body ENplus	HFA Holzforschung Austria	
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 (97%)
	Sourcing pellets from another certified company	No
Brand names*	Sparrow; ID: RS 007 A2: EPC approval from 2018-08-17; A1: pre-approval by EPC Email on 2018-08-24)	
Produced amount*	2017: 46.420 t From which: ~ 1.000 t in big bags, rest in 15 kg bags	
Storage capacity	up to 4.000 t bagged pellets on pallets in halls; additional intermediate outdoor storage on site is possible	
Relevant storage sites	none	

* according statement of client

3.2 Raw material

Origin of wood	100 % external suppliers
Source raw material	100 % stem-wood (1.1.3 acc. EN ISO 17225-1)
Raw material species	70% hardwood (beech), 30% coniferous (spruce, pine)
Form of raw material	100% logs (stem-wood)
Raw material storage	Outdoor storage on paved wood-yard; there are additional 4 external intermediate stores for logs
Control and documentation of raw material	All deliveries are checked visually; there is a sorting of logs before chipping; low quality round-wood (e.g. with mould) is

	chipped and used for boiler. The bark from the debarker is sold to external customers.
Suppliers	90 % Serbian National Forest (Srbijašume), 10 % from Serbian forests, private owners; 2018 it will be 100% Srbijašume (contract 100.000 cm; contract for 10 years)
Sustainability of raw material	No certification
Other raw materials used (e.g. pressing aids)	none

3.3 Production process

Changes in process	<ol style="list-style-type: none"> Changes in raw material handling to differentiate in A1 and A 2 quality: Raw material (logs) are manually sorted in 3 quality classes. Lowest class is used as fuel for the boiler. Straight and mould-free beech is stored on a separate location, same for high quality spruce. All these high quality logs are debarked and stored again. When a batch of 1500 m³ is obtained, production of standard A2 quality is stopped, plant is cleaned including change of filter bags and debarked and washed logs are chipped and A1 pellets are produced. Ash target: 0,60-0,70% For A2 quality, conifers are debarked and all logs are now washed. For A1 dryer temperature is reduced to get brighter colour. An additional set of instruments was bought for ash determination. Aspiration in whole plant is currently changed to reduce dust emissions in the plant.
Raw material preparation	Raw material is manually cleaned, majority of logs is debarked and chipped
Drying	Drum drier
Separation of contaminants and impurities	Oversized particles and impurities are removed by sieves and stone traps. Metal separators are used.
Pellet production	Raw material is conditioned using water and is pelletized by 3 ring die presses. Pellets are cooled in a counter current cooler.
Removal of fines	Fines are removed by 2 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. Non-conforming pellets are filled in big-bags and are sold to local customers at factory gate.

Documentation of failures, breakdowns and maintenance	A shift book exists containing all relevant information.
Storage of pellets	Pellets are stored in bags on pallets only.
Carbon footprint of production	Carbon footprint of production was calculated by using the Excel-sheet form EPC. Emissions are: <ul style="list-style-type: none"> • 121,9 g CO_{2-eq.}/kg for bulk pellets • 129,9 g CO_{2-eq.}/kg for pellets in bags.

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	Every shift	IR-dryer
bulk density	Every shift	Bulk density container acc. EN 15103
durability	Every shift	BEA Tumbler 1000
length	Every shift	Visual, occ. with ruler
finer	Every shift	3,15 mm sieve
Ash content	once per day	2 systems, one according ISO 18122

A second muffle furnaces and analytical scales were bought to be able to measure ash every shift if A1 is produced.

Instruments for quality control maintained properly, calibration and/or performance tests are done. External calibration stickers are applied on e.g. scales, they are up-to-date.

Comparison of analysis results for ash content (new instrument):

parameter	Unit	Sparrow	BEA
Ash content (db)	%	0,64	0,61

Results comply very well within expected variation.

3.5 Quality assurance

Quality management system / Factory Production Control	Quality management is in place and based on SOP's which cover: <ul style="list-style-type: none"> • Responsibilities • Inspection procedure incoming logs • Customer complaint management • Procedure for self-inspection • Requirements for lab equipment calibration and maintenance
Documentation raw material	Is done accordingly
Customer complaints	Customer complaint management system exists. All complaints are kept electronically. In 2017 there were 6 complaints handled. Remark: the customer complaints reported in Audit 2017 were from January-October 2017, after October no pellets were sold and there were no additional complaints the rest of the year: <ul style="list-style-type: none"> • 2 slagging/ash content • 1 pellets are not burning • 2 packaging (weld seams, stretch foil) • 1 oversizes
Documentation of outgoing goods	Documentation of outgoing goods is done according to the requirements
External training of employees	Quality manager and additional shift manager attended EPC approved training.
Internal training of employees	Internal trainings are hold regularly, is included in quality management system

3.6 Retain samples

Retain samples	Not necessary, only bagged pellets.
Retain sample labelling	-
Storage for retain samples	-

3.7 Labelling

Labelling (delivery notes including dispatch form and bags) includes information required in ENplus® handbook.

There was an issue by using non-complying bad designs and wrong logos etc. for homepage, see extensive Email conversation Sparrow-EPC 6th August 2018 – 28th August 2018. Main issues were wrong fonts, colours etc. There was no misleading information!

However, new bag designs are approved now.

4 SAMPLING

Samples were taken following the principles of ISO 18135.

The Audit was scheduled right after a test production of approximately 300 t (batches 369/18-374/18, in the production log). During this relatively short test run, the quality improved and just reached A1 quality (no precleaning of the plant). Internal procedure was changed and optimized which was the main discussion and focus of the Audit. Test on this first batch showed an ash content exactly on the limit. It was agreed to produce a larger batch with the optimized procedure 3 weeks later. From this production, 3 samples were sent by the customer, arrived 2018-08-27 at BEA.

5 TESTS

Testing took place in August 2018.

6 PELLET LAB ANALYSIS RESULTS

Sample 2018252	Standard	unit	Pellets 2018252-1	Limit values according ENplus®	
				Class A1	Class A2
mechanical durability	ISO 17831-1	[%]	99,2	≥ 98,0	≥ 97,5
bulk density (ar)	ISO 17828	[kg/m³]	669	750≥BD≥600	750≥BD≥600
moisture content	ISO 18134-2	[%]	6,1	≤ 10	≤ 10
ash content 550°C(db)****	ISO 18122	[%]	0,61	≤ 0,7	≤ 1,2
net calorific value (ar)	ISO 18125	[MJ/kg]	17,1	≥ 16,5	≥ 16,5
net calorific value (ar)	ISO 18125	[kWh/kg]	4,7	≥ 4,6	≥ 4,6
net calorific value (db)	ISO 18125	[MJ/kg]	18,4	-	-
net calorific value (db)	ISO 18125	[kWh/kg]	5,1	-	-
gross calorific value (ar)	ISO 18125	[MJ/kg]	18,6	-	-
gross calorific value (ar)	ISO 18125	[kWh/kg]	5,2	-	-
Sulphur content (db)	ISO 16994	[%]	0,007	≤ 0,04	≤ 0,05
Chlorine content (db)	ISO 16994	[%]	< 0,005	≤ 0,02	≤ 0,02
Nitrogen content (db)	ISO 16948	[%]	0,149	≤ 0,30	≤ 0,50
pressing aid / additives	-	[%]	none	≤ 1,8	≤ 1,8
dimensions					
finer (< 3,15 mm)	ISO 18846	[%]	0,18	≤ 0,5* / ≤ 1	≤ 0,5* / ≤ 1
length (3,15 ≤ L ≤ 40 mm)	ISO 17829	[%]	99,8	> 98,5* / >98	> 98,5* / >98
length (40 ≤ L ≤ 45 mm)	ISO 17829	[%]	0	≤ 1	≤ 1
length (> 45 mm)	ISO 17829	[Amount]	0	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]	0,96	≤ 10	≤ 10
Zinc (db)	ISO 16968	[mg/kg]	< 5,0	≤ 100	≤ 100
Lead (db)	ISO 16968	[mg/kg]	< 0,50	≤ 10	≤ 10
Mercury (db)	ISO 16968	[mg/kg]	< 0,05	≤ 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]	< 1,0	≤ 10	≤ 10
ash melting behaviour (ash preparation at 815°C)					
shrinking temperature SST	CEN/TS 15370-1	[°C]	910	-	-
deformation temperature DT	CEN/TS 15370-1	[°C]	1270	≥ 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

** were performed with accredited sub contractor

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

**** sample from 2018-08-27

7 SUMMARY

The pellet production of **Sparrow**, plant in **Varvarin, Serbia** is complying with all requirements of:

ENplus[®], quality A1



Deviations and suggested improvements from 1st Audit 2018:

- Installation of the log-washing station before chipper was implemented, in optimization phase
- There were no oversized pellets visible during inspection, pellet length is improved, see attached pellet size distribution evaluation BEA2018252-1_pV

Type A and type B non-conformities:

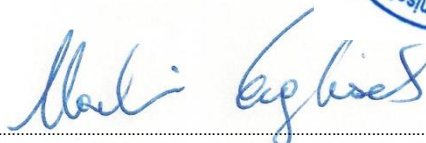
- ◆ none

Type C non-conformities and recommendations:

- ◆ none

This inspection report no. BEA2018252 comprises 9 pages and 0 appendix(es).

EPC-listed Auditor in charge

A handwritten signature in blue ink, which appears to read 'Martin Englisch'.

Dipl.-Ing. Dr. Martin Englisch