

Audit and Test Report:
BEA2015015

Date: 2015-03-24

Inspection according ENplus

Client: STAR JELA D.O.O.
Attn.: Mr. Zoran Starčić
Bjelopoljski Put BB
31300 Prijepolje
Serbia

Subject: Wood pellets production Prijepolje, Serbia

Content: Site Audit and pellet testing according to ENplus

Order: According inspection contract

**Date of audit
and sampling:** 2015-02-12 by Dr. Martin Englisch

Receipt of samples: 2015-03-06

Ref: Eng

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 EN*plus* requirements. A sample of the production is to be taken and tested according EN 14961-2 / 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 EN*plus* regulations which will be assured when quality assurance measures according EN*plus* regulations are continuously applied.

3 INSPECTION AUDIT

The inspection audit was carried out according EN*plus* Handbook for the Certification of Wood Pellets for Heating Purposes (in the currently version) on 2015-02-12 by Dr. Martin Englisch attended by Mr. Zoran Starčić (duration of audit approximately 3 hours).

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

The responsibility in the company is divided as follows:

Contact person:	Mr. Zoran Starčić
Director in charge:	Mr. Zoran Starčić
Responsible for the production of pellets:	Mr. Zoran Starčić
Responsible for quality assurance:	Mr. Zoran Starčić

3.1 Products

Certified products	wood pellets EN 14961 – 2 / ISO 17225-2, class A2
ENplus ID-Number	RS002
Certification Body	OFI Cert, Austria
Dimensions	6 mm
Delivery to end customer	Pellets are only sold in 15 kg bags.
Produced amount	2014: 12.045 t
Brand names	1. BIOSTAR 2. THERMOHOLZ
Storage capacity	bagged pellets on pallets, in halls with an approximate area of 10.000 m ² : > 4.000 t in bags/big bags

3.2 Raw material

Origin of wood	mainly purchase of trees from forest owners, own harvesting and chipping (= own production) little residues from sawmills (external suppliers)
Source raw material	> 90 % stemwood (round wood, 1.1.3 acc. ISO 17225-1, mainly in form of trees; own harvesting and chipping (Chips is existing business); rest chemically untreated wood residues (1.2.1 acc. ISO 17225-1)
Raw material species	~ 50 % hardwood (beech), ~ 50% softwood (spruce)
Form of raw material	Mainly round wood
Raw material storage	The raw material is stored in outside locations, working amount of chips inside production hall
Control and documentation of raw material	Raw material (chips) is produced by own staff in forest or at factory from logs with own equipment (different mobile chippers). Educated foresters select quality for pellet production.
Suppliers	~ 75 % Serbian Sume (Serbian National Forest), Rest from private local suppliers and forest owners.
Sustainability of raw material	~ 75 % FSC certified

Other raw materials used (e.g. pressing aids)	No additives or binders are used.
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3.3 Production process

Raw material preparation	hammer mill
Drying	Raw material is dried by a band drier and a drum drier (new), heated by biomass furnaces.
Separation of contaminants and impurities	Oversized particles and impurities are removed by sieves, metal separators are used.
Pellet production	The dried raw material is pelletized by 3 ring die press and cooled by counter current cooler.
Removal of fines	Fines are removed by 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, they are packed in big-bags.
Documentation of failures, breakdowns and maintenance	A shift book exists containing all relevant information.
Storage of pellets	Pellets are mainly directly packed in 15 kg bags. For storage before bagging, pellets are filled in big bags. Bags on pallets are stored in halls. Pellets are protected against contamination. Storage capacity (in halls): > 4.000 t
Form of dispatch	100% in 15 kg bags
Carbon footprint of production	Carbon footprint of production was calculated by using the Excel-sheet form EPC. Emissions are 77,4 g CO _{2-eq} /kg 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	once a shift	Humimeter
bulk density	once a shift	Stainless steel container
Mechanical durability	once a shift	Tumbler 1000
Length	once a shift	Visual, calliper rule
Fines	once a day, full bag	3,15mm sieve

Instruments for quality control maintained properly, calibration and/or performance tests are done.

Comparison of analysis results:

parameter	Unit	STAR JELA	BEA
moisture	%	6,0	6,8
bulk density	kg/m ³	650	660
durability	%	97,9	98,3
fines	%	0,22	0,26

Analysis results show acceptable agreement. Note that durability increases with storage time after production.

3.5 Quality assurance

Quality management system	<p>Quality management consists of individual documents for most important quality related topics; SOP's are available covering:</p> <ul style="list-style-type: none"> • Receipt of raw materials • Requirements for measuring and test equipment • Instruction of self inspection • Responsibilities
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Documentation raw material	<p>A list of suppliers exists.</p> <p>A declaration of raw material purity is not necessary since only round wood is processed, mainly directly from local forests; majority is FSC certified.</p> <p>Since additives are not used, there is no documentation.</p>
Customer complaints	<p>Customer complaints are documented. Documentation contains date, reason and action to achieve customer satisfaction.</p> <p>2014: 6 complaints documented.</p>
Documentation of outgoing goods	<p>Documentation of outgoing goods is done according to the requirements.</p>

3.6 Retain samples

Retain samples pellets	<p>Sampling frequency: each day</p> <p>Sample amount: ~ 1,5 kg</p> <p>Retention period: 12 month (oldest sample from May 2014 = start of implementation)</p>
Retain sample labelling	<p>Retain samples are labelled accordingly.</p>
Storage for retain samples	<p>The storage of retain samples corresponds with the requirements.</p>

3.7 Labelling

Labelling of bags for all brands is according requirements.

4 SAMPLING

Samples were taken following the principles of EN 14778.

Three 15 kg bag were taken from the storage. They were signed by the auditor and were sent to the auditor's lab.

5 TESTS

Testing took place in March 2015. The tests were carried out in cooperation with a sub-contractor (metals).

6 PELLETT LAB ANALYSIS RESULTS

Sample 2015015	Standard	unit	Pellets	Limit values according ENplus	
				Class A1	Class A2
mechanical durability	EN15210-1	[%]	98,3	≥ 97,5	≥ 97,5
bulk density	EN 15103	[kg/m ³]	660	≥ 600	≥ 600
moisture content	EN 14774-2	[%]	6,8	≤ 10	≤ 10
ash content 550°C(db)	EN 14775	[%]	1,1	≤ 0,7	≤ 1,5
net calorific value (ar)	EN 14918	[MJ/kg]	17,1	16,5≤Hu≤19	16,3≤Hu≤19
Sulphur content (db)	EN 15289	[%]	<0,01	≤ 0,03	≤ 0,03
Chlorine content (db)	EN 15289	[%]	<0,01	≤ 0,02	≤ 0,02
Nitrogen content (db)	EN 15104	[%]	0,09	≤ 0,30	≤ 0,50
pressing aid / additives	-	[%]	none	≤ 2	≤ 2
dimensions					
finest (< 3,15 mm)	EN 15149	[%]	0,26	≤ 1	≤ 1
length (3,15 ≤ L ≤ 40 mm)	EN 16127	[%]	99,7	> 98	> 98
length (40 ≤ L ≤ 45 mm)	EN 16127	[%]	0,0	≤ 1	≤ 1
length (> 45 mm)	EN 16127	[amount]	0	0	0
diameter	EN 16127	[mm]	6,1	8 ± 1	8 ± 1
heavy metals					
Chromium (db)	EN 15297	[mg/kg]	<1	≤ 10	≤ 10
Copper (db)	EN 15297	[mg/kg]	1,5	≤ 10	≤ 10
Zinc (db)	EN 15297	[mg/kg]	<10	≤ 100	≤ 100
Lead (db)	EN 15297	[mg/kg]	<2	≤ 10	≤ 10
Mercury (db)	EN 15297	[mg/kg]	<0,1	≤ 0,1	≤ 0,1
Cadmium (db)	EN 15297	[mg/kg]	<0,2	≤ 0,5	≤ 0,5
Arsenic (db)	EN 15297	[mg/kg]	<1	≤ 1	≤ 1
Nickel (db)	EN 15297	[mg/kg]	<1	≤ 10	≤ 10
ash melting behaviour					
shrinking temperature SST	CEN/TS 15370-1	[°C]	1090	-	-
deformation temperature DT	CEN/TS 15370-1	[°C]	1280	≥ 1200	≥ 1100
hemisphere temperature HT	CEN/TS 15370-1	[°C]	1470	-	-
flow temperature FT	CEN/TS 15370-1	[°C]	1480	-	-

7 SUMMARY

The pellet production of **STAR JELA** in Prijepolje, Serbia is complying with all requirements of ENplus, quality A2.

Required improvements till next Audit:

- Customer complaint management to be organized in a database

This inspection report no. **BEA2015015** comprises 8 pages and 0 appendix(es).

EPC-listed Auditor in charge



Dipl.-Ing. Dr. Martin Englisch