Statement of Verification

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EU Environmental Technology Verification Pilot Programme

Technology Type:	**System for producing briquettes from biomass**	
Technology Name:	**BIOMASSER® briquetting machines**	
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Verification Body and Proposer details:

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1. Technology description

The BIOMASSER® technology has been developed for converting non-wood wet biomass without its drying to produce renewable biofuel in the form of briquettes using a briquetting machine called BIOMASSER® BSX14. The main part of the machine is a processing screw with a forming head coupled with a driving unit. Depending on the number of the briquettes forming heads the briquetting machine BIOMASSER® BSX14 may occur in different versions.
The number of the briquettes forming heads may vary from 1 to 4, depending on the required production output. Letter "X" in the machine name indicates the number of the forming heads. Machine with one forming head is marked as BS114, with two heads as BS214, with three heads as BS314 and with four heads as BS414. Additionally, machine with one head is called SOLO, with two heads DUO, with three heads TRIO and with four heads QUATTRO.

For the purpose of technology verification, BIOMASSER® BS114 SOLO machine was tested. Additionally, for some tests BIOMASSER® BS214 DUO machine was used.

Fig. 1 Briquetting machine BIOMASSER® BS114 SOLO

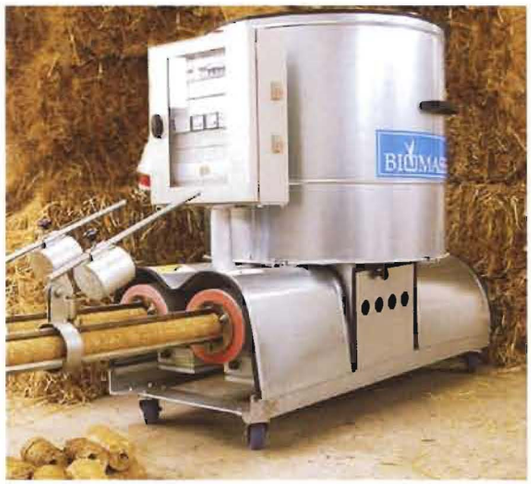

Fig. 2 Briquetting machine BIOMASSER® BS214 DUO

2. Application

The BIOMASSER® technology is used to convert non-wood wet biomass without its drying to produce renewable biofuel in the form of briquettes.

2.1. Matrices

The verification of the BIOMASSER® technology was performed for 4 types of input materials: rye, grass, corn and reed straw.

2.2. Purpose

BIOMASSER® BSX14 briquetting machine integrates the input material into the form of briquettes by volumetric compression of the shredded biomass material in an elevated temperature without any additional filler or binder.

2.3. Conditions of operation and use

BIOMASSER® BSX114 briquetting machine can be used to briquette the input material shredded into sections of 2 to 5 cm long. Moisture content of the input material should be in the range of 10 to 30%. Ambient temperature should be in the range of 5 to 30°C.

2.4. Verification parameters definition summary

Table 1 presents the BIOMASSER® technology operation parameters declared by the Proposer.

Tab.1 Declared operation parameters of the BIOMASSER® BSX114 machine

Type of parameter	Declared values
Moisture content in input material	From 10% to 30%
Ambient temperature	From 5°C to 30°C
Mechanical durability of briquettes	Minimum 80%
Specific energy consumption	Between 60 kWh Mg^{-1} and 80 kWh Mg^{-1}
Output (for BS114 SOLO)	Between 60 kg h^{-1} and 90 kg h^{-1}

3. Test and analysis design

3.1. Existing and new data

Based on the analysis and assessment of the documents from the testing of the operational parameters of the briquetting machine submitted by the Proposer, it was concluded that the tests were not carried out in compliance with the standardised procedures for testing technical parameters of machineries and with the requirements of the Specific Verification Protocol. Moreover, the data were produced for machines with a different design. The existing data could thus not be used for the verification purpose.

3.2. Laboratory / field conditions

The testing conditions were determined taking into account the operational performance parameters of the technology declared by the Proposer.
Figure 1 presents a summary of the declared operational conditions and real conditions in which the tests were performed.

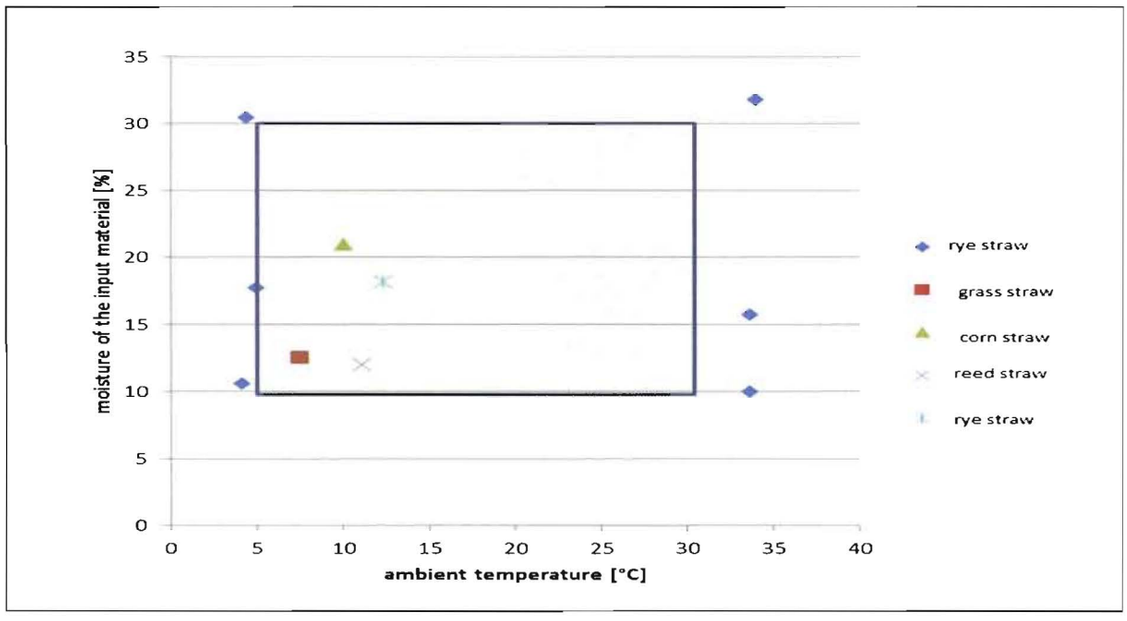

Fig.1 Declared operational parameters (inside the blue frame) and the real testing parameters (figures)

3.3. Matrix compositions

Table 2 presents a summary of the composition of matrices used for the verification of the Biomasser BSX114 performance parameters.

Tab.2 Materials tested in the BIOMASSER® technology (length 2-5cm)

Matrix no.	Material composition
1	Rye staw, with moisture content in the range below or equal 10% and above or equal 30%
2	Grass staw, with moisture content in the range between 10% and 30%
3	Corn staw, with moisture content in the range between 10% and 30%
4	Reed staw, with moisture content in the range between 10% and 30%
5	Rye staw, with moisture content in the range between 10% and 30%

3.4 Test and analysis parameters

Table 3 presents a summary of the methods and standards applied the for verification of the BIOMASSER® technology performance parameters declared by the Proposer.

Tab 3. Methods and standards applied the for verification of the BIOMASSER® technology performance parameters

Parameter	Parameter value	Method and standards applicable to declared parameters
Moisture of the input material	10%-30%	Standard EN-14774-1:2010E - Moisture Measurement* Test procedure PB-00-22* PN-EN 14778:2011 p. 12.3.3.3* PN-EN 14780:2011* PN-EN 14774:2009 p.6 – Collection of Test Samples*
Ambient temperature	From 5°C to 30 °C	Instruction for determining test conditions*
Specific energy consumption	60 kWh Mg^{-1} – 80 kWh Mg^{-1}	Time and weight measurement* Sample collection**
Mechanical durability of briquettes	Minimum 80%	PN-EN 15210:2011** PB-00-22**
Output	60 kg h^{-1} – 90 kg h^{-1}	Time and weight measurement* Sample collection**

* Included the accreditation scope of the testing body No AB190
** Not included in the accreditation scope of the testing body

4. Verification results

4.1. Performance parameters

Table 4 presents the verification results of the performance parameters of the BIOMASSER® technology.

Tab.4 Results of the performance parameters verification of the BIOMASSER® technology

Matrix	Measurements					
		Operational parameters	Environmental conditions	Values of parameters measures and values proved by tests		
	BIOMASSER® BS114 SOLO					
	Test no.	Material moisture [%]	Ambient temperature [°C]	Briquettes durability [%]	Specific energy consumption [kWh Mg^{-1}]	Output [kg h^{-1}]
1 (rye straw)	1	10,6	4,1	90,83	63,38	85,98
	2	17,7	4,9	97,87	76,88	68,02
	3	30,4	4,4	95,36	76,40	69,74
	4	10,0	33,6	96,92	71,66	75,33
	5	15,7	33,6	95,54	72,25	68,02
	6	31,8	33,9	95,89	71,82	74,31
2 (grass straw)	7	12,5	7,5	84,96	67,44	74,40
3 (corn straw)	8	21,0	10,0	93,83	61,83	88,06
4 (reed straw)	9	12,0	11,1	90,53	64,18	75,79
5 (rye straw)	BIOMASSER® BS214 DUO					
	10	18,2	12,3	97,70	73,88	125,85

4.2. Operational parameters

Based on the achieved verification results summarised in Tab. 4 the following can be concluded:

1. The BIOMASSER® BS114 SOLO briquetting machine produces briquettes from rye, corn, reed and grass straw with the moisture content ranging from 10% to 30% at the ambient temperature ranging from 5°C to 30 °C. The average durability of briquettes made of rye, corn and reed straws exceeds 89% with confidence level above 95%. The average durability of briquettes made of grass straw exceeds 82% with confidence level above 95%.

2. The durability of the briquettes made of rye straw formed by BIOMASSER® BS214 DUO machine does not differ significantly from the briquettes formed by BIOMASSER® BS114 SOLO machine.

3. In more than 95% cases, the average consumption of energy during the production of briquettes made of rye, grass, corn and reed straws with moisture content in the range from 10 to 31,8% is in the range

from 57 to 81 kWh Mg^{-1}.

4. The efficiency of the briquettes output of the BIOMASSER® BS114 SOLO machine is in the range from 71 kg h^{-1} to 92 kg h^{-1}. Its varies depending on the type of the input material.

The above mentioned conclusions confirm the performance parameters declared by the Proposer for the BIOMASSER® technology.

4.3. Environmental parameters

The humidity of ambient air measured during the testing may be considered as an environmental aspect. Environment humidity was below 90%. No effect of the ambient air humidity on the obtained results was observed.

4.4. Additional parameters

A performance parameter that has not been intended for verification yet is important as an environmental parameter is the noise level at the operator's working places. The noise levels for BIOMASSER® BS114 SOLO and BIOMASSER® BS114 DUO machines at the operator's working place were 72.0 dB(A) and 77.5 dB(A) respectively. These results do not exceed the acceptable limit value which is 85 dB(A).

4.5. Additional information

Details concerning the performed verification activities including testing of the BIOMASSER® technology are presented in the final Verification Report No 1/JWTS/2014.

5. Quality assurance and deviations

The personnel of Verification Body undertook all relevant efforts throughout the verification process to ensure the reliability and correctness of the decisions made. The undertook quality assurance measures are specified in the Specific Verification Protocol.

The personnel of the Verification Body reviewed all documents drawn up in the verification process and enforced additional control activities to ensure quality with respect to the applied test methods.