



# Straw briquetting and use of the briquettes for heating

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**24 October 2023**

Barbara Pokrzywa, Sales Director, Asket Poland (Europe)



## Why to briquette

- Storing straw can be troublesome due to the **required large storage area**, logistic possibilities and ensuring **proper storage conditions** so that the straw does not rot.
- Briquetting is low-cost and **allows for a 6-10 times reduction in storage space**.
- Transporting and using straw in a compact form of **briquettes** is much more convenient. **Briquettes are handy and practical.**



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## Can we briquette straw without drying?

- **Biomasser®** is a machine for simple straw briquetting (densification) of moisture content from 10% to 30%
- **100% natural briquettes** are used for:
  - heating insted of coal or wood
  - animals as hygienic bedding, fibrous food or toy

BIOMASSER®



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## What are the briquettes used for?



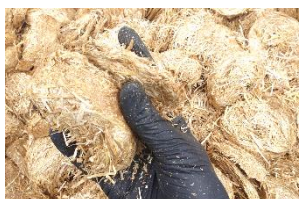
**Hard briquettes** – fuel for fireplaces (replacing wood-logs), cooking or dietary fibre snack for animals e.g. pigs (animal welfare)



**Medium hard** – fuel for boilers, also automated



**Slices** – kindling or for fuel for power plants, (biogas production)



**Soft** – hygienic animal bedding

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What materials can briquettes be made from?

On what machines?

How much does it cost?

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# What material can briquettes be made of?

Non-woody biomass such as:

- rye straw
- wheat straw
- barley straw
- oat straw
- rape straw
- corn (maize) straw
- rice straw
- hay - dry grasses
- Miscanthus
- reed canary grass (*Phalaris arundinacea*)
- Tanzanian grass (*Hypperrhenia rufa*)
- reed
- soya straw
- serradella (*Ornithopus* L.)
- Alfalfa... and others
- digestate – solid fraction from biogas plant



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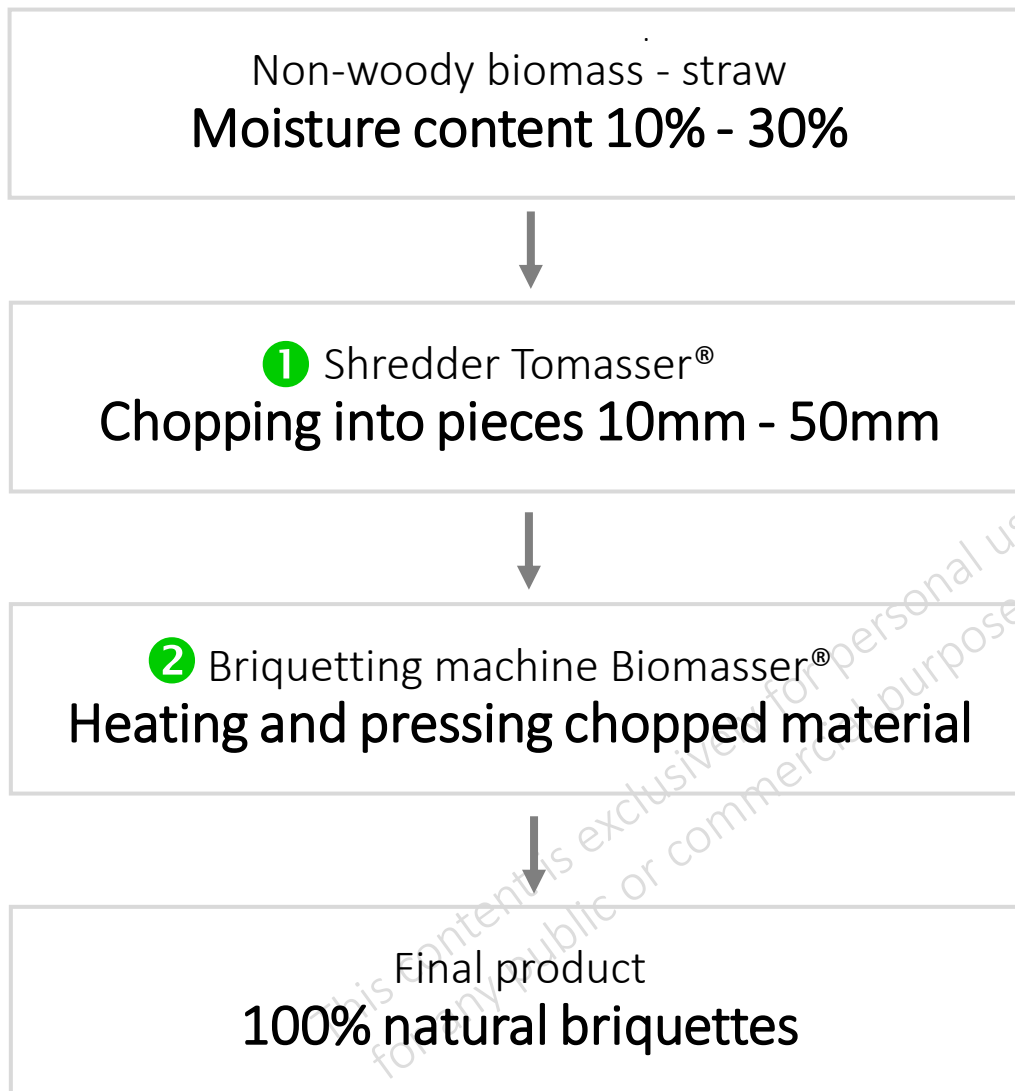
## Take care of the raw material

- Cover in the field
- Store under roof
- Store in a tent hall



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## Simple briquetting process – 2 steps



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# Biomasser® compact and modular briquetting machines



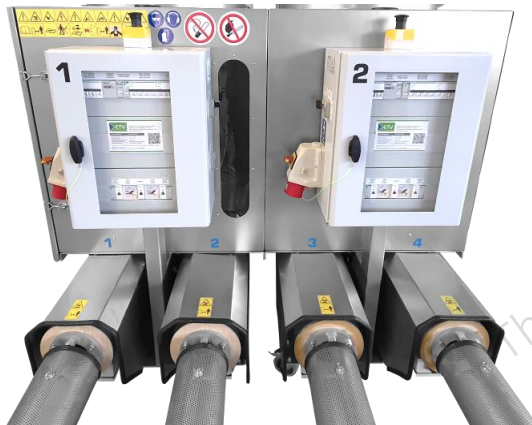
Biomasser® Duo



Machines compliant  
with European safety requirements



Biomasser® 2Duo



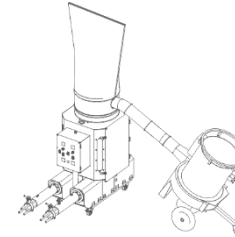
Biomasser® Multi



# Biomasser® Duo-Set

Stationary set for straw briquettes production  
productivity up to 160 kg/h

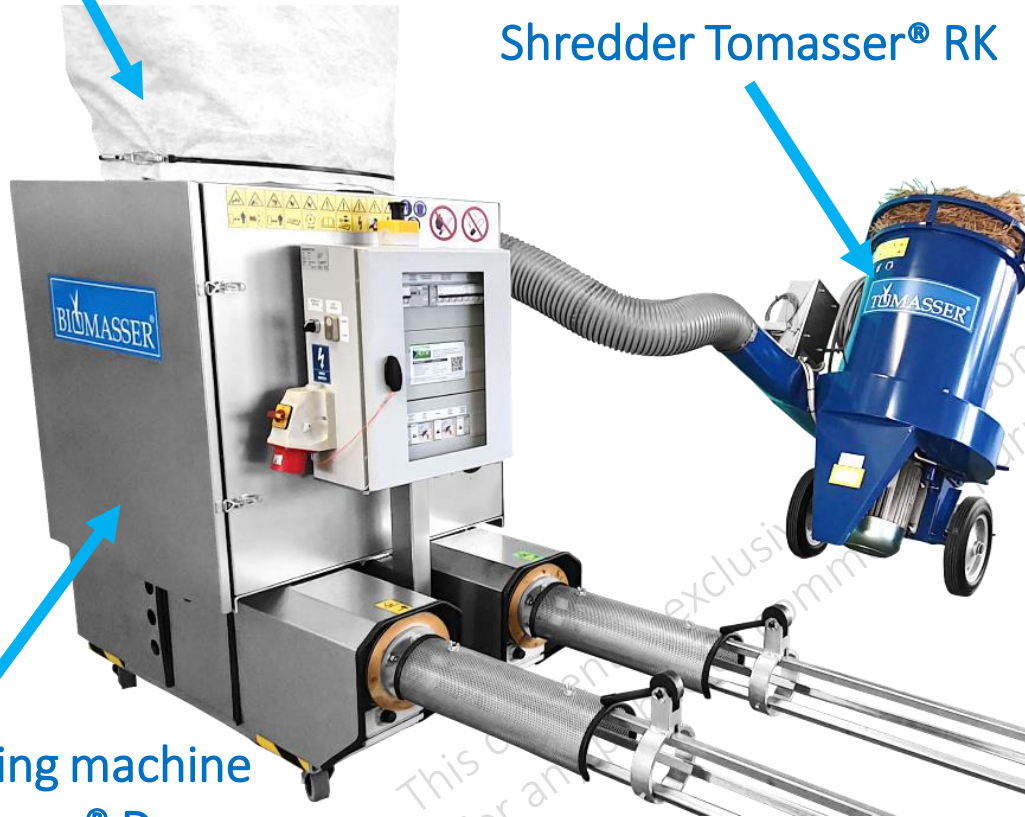
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Filter bag

Shredder Tomasser® RK

Briquetting machine  
Biomasser® Duo



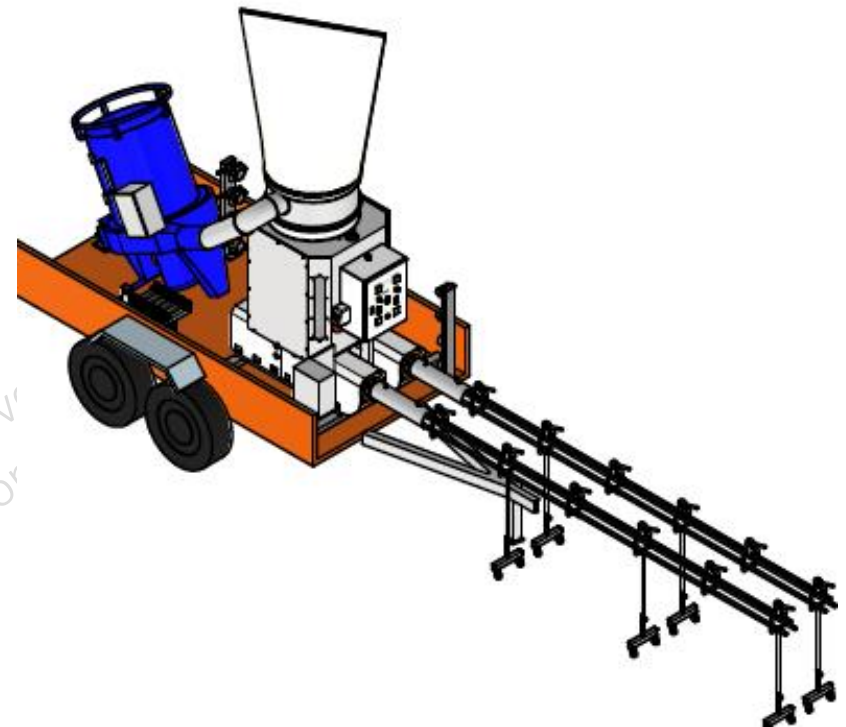
Productivity depends on the type of raw material, its moisture content and the hardness of the produced briquette.

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# Biomasser® Duo-Set mobile

Transportable set for straw briquettes production  
productivity up to 160 kg/h





# Example photos

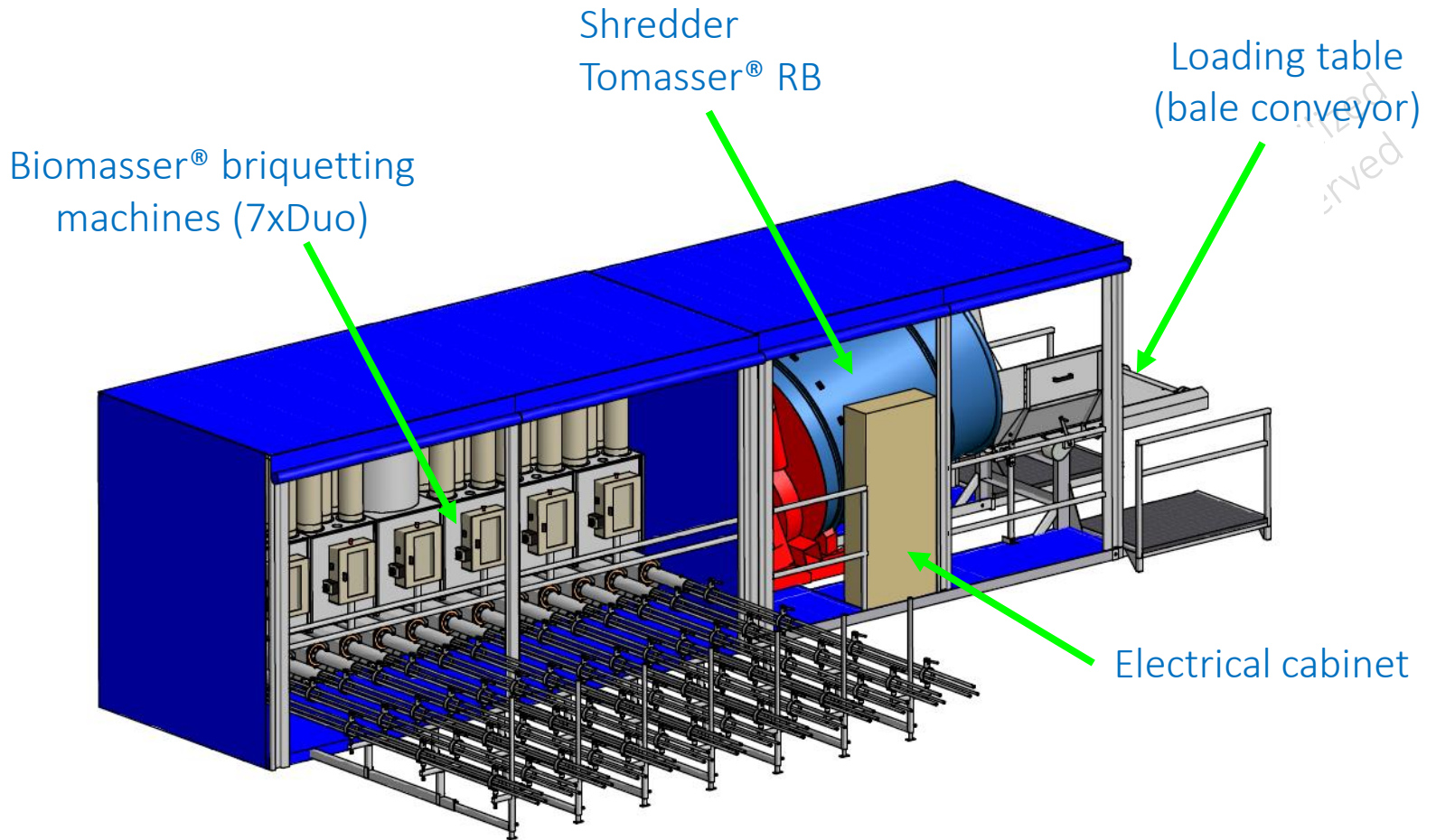


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# Biomasser® BM-7

Stationary professional line for straw briquettes production  
productivity up to 1120 kg/h



# Biomasser® BM-7

Stationary professional line for straw briquettes production  
productivity up to 1120 kg/h



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# Biomasser® BM-7 mobile

Transportable professional line for straw briquettes production  
productivity up to 1120 kg/h





# Biomasser® BM-7

Stationary professional line for straw briquettes production  
productivity up to 1120 kg/h

February 2023





# Example photos



# Biomasser briquetting machines - models

Biomasser Duo Standard  
Model year 2023

Biomasser Duo Semi-Automatic  
Model year 2024



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# Payback time?

## Example payback time of Biomasser Duo-Set about 1 year

at net price of briquettes of 250€/t = ~425 AUD/t | ~450 NZD/t

- Energy consumption 80kWh per 1 ton
- Net cost of spare parts 11€/t = ~19 AUD/t | ~20 NZD/t

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Based on Polish conditions, prices exw valid on 01.09.2023, excl. VAT and other taxes.  
Assumption 24.10.2024: 1EUR = 1,7AUD | 1,8NZD



# Biomasser® verified technology

International Organization for Standardisation  
 ISO 14034:2016  
 Environmental management  
 Environmental Technology Verification (ETV)



BIOMASSER® BSX14 briquetting machines were verified in the framework of the EU Environmental Technology Verification (ETV) pilot programme for:

TYPE OF PARAMETER	VERIFIED 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 <sup>-1</sup> and 80 kWh Mg <sup>-1</sup>
Output (for BS114 SOLO)	between 60 kg h <sup>-1</sup> and 90 kg h <sup>-1</sup>

Verification Body: Environmental Technology Verification Body, Institute of Technology and Life Sciences in Falenty, Poznań Branch (Poland). Date: 12.11.2014

The **Statement of Verification** has been registered under **Number VN20140001** and is accessible at the following address: <http://iet.jrc.ec.europa.eu/etv/biomasser%20140001>

**Statement of Verification**  
 EU Environmental Technology Verification Pilot Programme

Technology Type: **System for producing briquettes from biomass**  
 Technology Name: **BIOMASSER® briquetting machines**  
 Statement Registration Number: **VN20140001** | Date of issue: **12<sup>th</sup> November 2014**

**Verification Body and Proposer details:**

Verification Body	Proposer
Environmental Technology Verification Body Institute of Technology and Life Sciences in Falenty, Poznań Branch	ASKET ROMAN DRUGI
<b>Contact person</b> Mrs Agnieszka Wawrzyńiak - Head of Verification Body	<b>Contact person</b> Mr Roman Drugi - General Director Mrs Marta Gloger - Director's Assistant
<b>Address</b> ul. Rakwilińska 67 60-463 Poznań, Poland tel.: +48 61 820 33 31 fax: +48 61 820 83 61 e-mail: a.wawrynska@itp.edu.pl	<b>Address</b> ul. Forbiczna 12a 61-362 Poznań, Poland tel.: +48 61 879 44 59 fax: +48 61 877 35 06 e-mail: r.drugi@asket.pl biuro@asket.pl
<b>Website</b> www.itp-enz.edu.pl	<b>Website</b> www.asket.pl

**Verification Body:** Prof. Edmund Karcz, Eng, Director of the Institute of Technology and Life Sciences

**Proposer:** Roman Drugi, M.Sc. Eng, General Director

Internal address where the Statement of Verification is available:  
<http://iet.jrc.ec.europa.eu/etv/>



## Straw briquettes – Golden Coal

Local fuel. 100% natural

- ❖ calorific value: ~16 MJ/kg
- ❖ ash: 2% - 4%
- ❖ Bulk density up to 650 kg/m<sup>3</sup>
- ❖ 1 ton of coal = 1,5 ton of straw briquettes



**GOLDEN COAL**®  
heat from the straw briquettes



Tr...  
for all...

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ommercial purposes. As,

# SGS rye straw briquettes raport of 27.09.2022



AB 313

Laboratorium SGS Polska  
Pracownia Paliw Słomych (PPS)  
ul. Cieszyńska 52A  
43-200 Pszczyna, tel. 32 449 25 15

TEST REPORT No: 2022/264		description:	
Number of sample: B - 264	Date of delivery of sample: 16.09.2022	Page 1 from 1	a,ad-as analysed
Kind of sample: biomass	Date of determining of testing: 20/21.09.2022	No. of enclosures : 0	r,an-as received
Customer: ASKET Roman Długi, ul. Forteczna 1 1, 61-362 Poznań	No. of order: 71B/2022	Pszczyna, date: 27.09.2022	d-dry
			daf-dry,ash free

The presented test results apply only to the sample as received, sampled and delivered by the Customer

Method	parameter	unit	result	measurement (±)
PN-EN ISO 18134-3:2015-11 method thermogravimetric, gravimetric	Moisture in the analysis sample ( $M_{ad}$ )	%	5,8	-
PN-EN ISO 18134-1:2015-11	Total moisture ( $M_{tp}$ )	%	7,3	-
	Ash ( $A_{ad}$ )	%	2,5	-
PN-EN ISO 18122:2016-01 method-thermogravimetric, gravimetric	Ash ( $A_{ad}$ )	%	2,5	-
	Ash ( $A_d$ )	%	2,7	-
*PN-EN ISO 18125:2017-07	Gross calorific value ( $q_{gr,ad}$ )	kJ/kg	18163	-
	Gross calorific value ( $q_{gr,asr}$ )	kJ/kg	17874	-
	Gross calorific value ( $q_{gr,daf}$ )	kJ/kg	19281	-
	Gross calorific value ( $q_{gr,ad}$ )	kJ/kg	19807	-
	Net calorific value ( $q_{net,ad}$ )	kJ/kg	-	-
	Net calorific value ( $q_{net,asr}$ )	kJ/kg	16520	-
	Net calorific value ( $q_{net,daf}$ )	kJ/kg	18002	-
	Net calorific value ( $q_{net,ad}$ )	kJ/kg	-	-
PN-EN ISO 16994:2016-10	Total sulfur ( $S_{ad}$ )	%	0,04	-
	Total sulfur ( $S_{asr}$ )	%	0,04	-
	Total sulfur ( $S_d$ )	%	0,04	-
PN-EN ISO 18123:2016-01	Volatile matter ( $V_{ad}$ )	%	75,0	-
	Volatile matter ( $V_{asr}$ )	%	73,8	-
	Volatile matter ( $V_d$ )	%	79,6	-
	Volatile matter ( $V_{ad}$ )	%	81,8	-
PN-EN ISO 16948:2015-07	Total hydrogen ( $H_d$ )	%	6,21	-
PN-EN ISO 16948:2015-07 PN-G-04574:1998	Total nitrogen ( $N_{ad}$ )	%	0,38	-
	Total nitrogen ( $N_{asr}$ )	%	0,37	-
PN-EN ISO 16994: 2016-10 potentiometric titration method, analysis made using: chloride electrode / CRIC analyser	Total nitrogen ( $N_d$ )	%	0,40	-
	Chlorine ( $Cl_{ad}$ )	%	0,029	-
	Chlorine ( $Cl_{asr}$ )	%	0,029	-
	Chlorine ( $Cl_d$ )	%	0,031	-
PN-EN ISO 17828:2016-02	Bulk density ( $BD_{asr}$ )	kg/m <sup>3</sup>	-	-
PN-EN ISO 17831-1:2016-02	Mechanical durability of pellets ( $D_{10}$ )	%	-	-
PN-EN ISO 17831-1:2016-02	Fraction below 3.15mm	%	-	-

\*Sample weight: 0,25-0,4kg.  
Test report shall not be reproduced except in full, without written approval of the laboratory.  
Relative expanded standard uncertainty of measurement for the coverage factor  $k=2$ , determined for a confidence level of 0.95.

#### Additional Information

Description of the sample declared by the customer: Rye straw fuel briquette.  
Information declared by the Client: Method of sampling: not known. Objective performance analysis: not known  
Sample was delivered quantity 10,8 kg in a state useful for analysis.

SGS Polska Sp. z o.o.

27.09.2022

*Malgorzata Figura*  
Data and signature of person in the field  
inż. Malgorzata Figura

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Formularz FPFS-08 wersja 03

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<b>Total moisture (<math>M_{ar}</math>)</b>	%	<b>7,3</b>
Ash ( $A_{ad}$ )	%	2,5
<b>Ash (<math>A_{ar}</math>)</b>	%	<b>2,5</b>
Ash ( $A_d$ )	%	2,7
Gross calorific value ( $q_{gr,v,ad}$ )	kJ/kg	18163
Gross calorific value ( $q_{gr,v,ar}$ )	kJ/kg	17874
Gross calorific value ( $q_{gr,v,d}$ )	kJ/kg	19281
Gross calorific value ( $q_{gr,v,daf}$ )	kJ/kg	19807
Net calorific value ( $q_{net,v,ad}$ )	kJ/kg	-
<b>Net calorific value (<math>q_{net,v,ar}</math>)</b>	<b>kJ/kg</b>	<b>16520</b>
Net calorific value ( $q_{net,v,d}$ )	kJ/kg	18002
Net calorific value ( $q_{net,v,daf}$ )	kJ/kg	-
Total sulfur ( $S_{ad}$ )	%	0,04
<b>Total sulfur (<math>S_{ar}</math>)</b>	%	<b>0,04</b>
Total sulfur ( $S_d$ )	%	0,04
Volatile matter ( $V_{ad}$ )	%	75,0
<b>Volatile matter (<math>V_{ar}</math>)</b>	%	<b>73,8</b>
Volatile matter ( $V_d$ )	%	79,6
Volatile matter ( $V_{daf}$ )	%	81,8
Total hydrogen ( $H_d$ )	%	6,21
Total nitrogen ( $N_{ad}$ )	%	0,38
<b>Total nitrogen (<math>N_{ar}</math>)</b>	%	<b>0,37</b>
Total nitrogen ( $N_d$ )	%	0,40
Chlorine ( $Cl_{ad}$ )	%	0,029
<b>Chlorine (<math>Cl_{ar}</math>)</b>	%	<b>0,029</b>
Chlorine ( $Cl_d$ )	%	0,031

description:  
a,ad- as analysed  
r,ar-as received  
d- dry  
daf-dry,ash free

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# EN ISO 17225-7:2021 Solid biofuels – Fuel specifications and classes

## Part 7: Graded non-woody briquettes

Table 1 – Specification of graded non-woody briquettes.

### Rye straw briquette

Parameter	Rye straw briquette Result	Property class A1 <sup>b</sup>	Units descrip.
Total moisture ( $M_{ar}$ )	7,3 %	$M_{12} \leq 12 \%$	in mass as received, wet basis
Ash ( $A_{ar}$ )	2,5 %	$A_{3,0} \leq 3 \%$	% in mass, dry
Net calorific value ( $q_{net,v,ar}$ )	16,52 MJ/kg	$Q_{14,5} \geq 14,5 \text{ MJ/kg}$	as received
Total sulfur ( $S_{ar}$ )	0,04 %	$S_{0,20} \leq 0,20 \%$	% in mass, dry
Total nitrogen ( $N_{ar}$ )	0,37 %	$N_{1,5} \leq 1,5 \%$	% in mass, dry
Chlorine ( $Cl_{ar}$ )	0,029 %	$Cl_{0,10} \leq 0,10 \%$	% in mass, dry

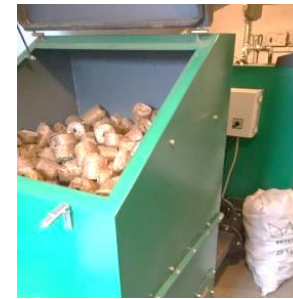
b – It is recommended to blend woody biomass to achieve the limits of Class A1.

**Class A1 is recommended for residential use.**

Other parameters of class A1 were not examined.

# Appliances for combustion

- Fire places
- Tiled stoves
- Top loaded boilers
- Automated boilers



## How to combust properly?

Properly combusted straw **briquettes should glow**. In the initial stage of combustion, the briquettes will increase in volume, so leave them free space in the combustion chamber, so that they can **expand freely**.

Leave the load to burn out completely.

The **hole** in the Biomasser briquettes guarantees its full and correct combustion, because **oxygen** is supplied to the inside of the briquette, the briquette maintains its temperature for a long time, and the furnace does not fill up.





## How to combust the straw briquettes properly?

The combustion temperature of straw briquettes should be **700°C - 800°C** so that the ash does not slag, does not melt.

Glowing briquettes we will get by giving a **small amount of air** during combustion.



Properly combusted  
briquettes glow



Ash keeps the shape  
of the briquettes

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# Straw briquettes - no smog



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## What can ashes be used for?

- thanks to its high pH, it **deacidifies the soil**
- is a **natural fertilizer** - enriches the soil with calcium, potassium, magnesium and phosphorus, helps to bind nitrogen - for vegetables, lawns
- added to the composter speeds up the composting process and **helps to avoid unpleasant odors**
- repels snails - an effective, **natural "weapon" in the fight against snails** - makes it difficult to reach plants.

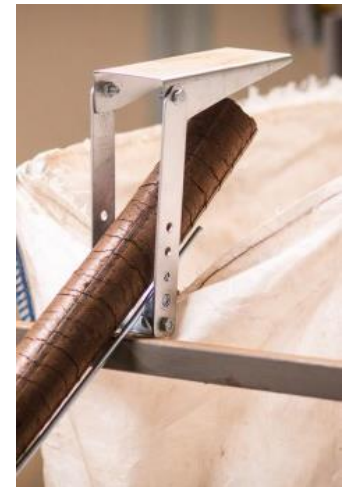


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## Digestate - biogas plant

- solid fraction from biogas plant, made up of a mixture of **corn silage residues and manure**
- Digestate dried in a drying chamber - **moisture content ~25%**
- Biomasser for digestate:
  - almost **400%** higher productivity of 170kg/h comparing to straw briquettes hard 40-50kg/h per one line
  - energy consumption 35 kWh/t, which is ~50% less than the standard 60-80 kWh/h for straw



„BRYKOS” – patent technology of using biomixture based on sewage sludge for energy and agricultural purposes

Ph.D. Małgorzata Makowska, Dr. Eng. Sebastian Kujawiak, Dr. Eng. Maciej Pawlak, MSc. Aleksandra Sowińska

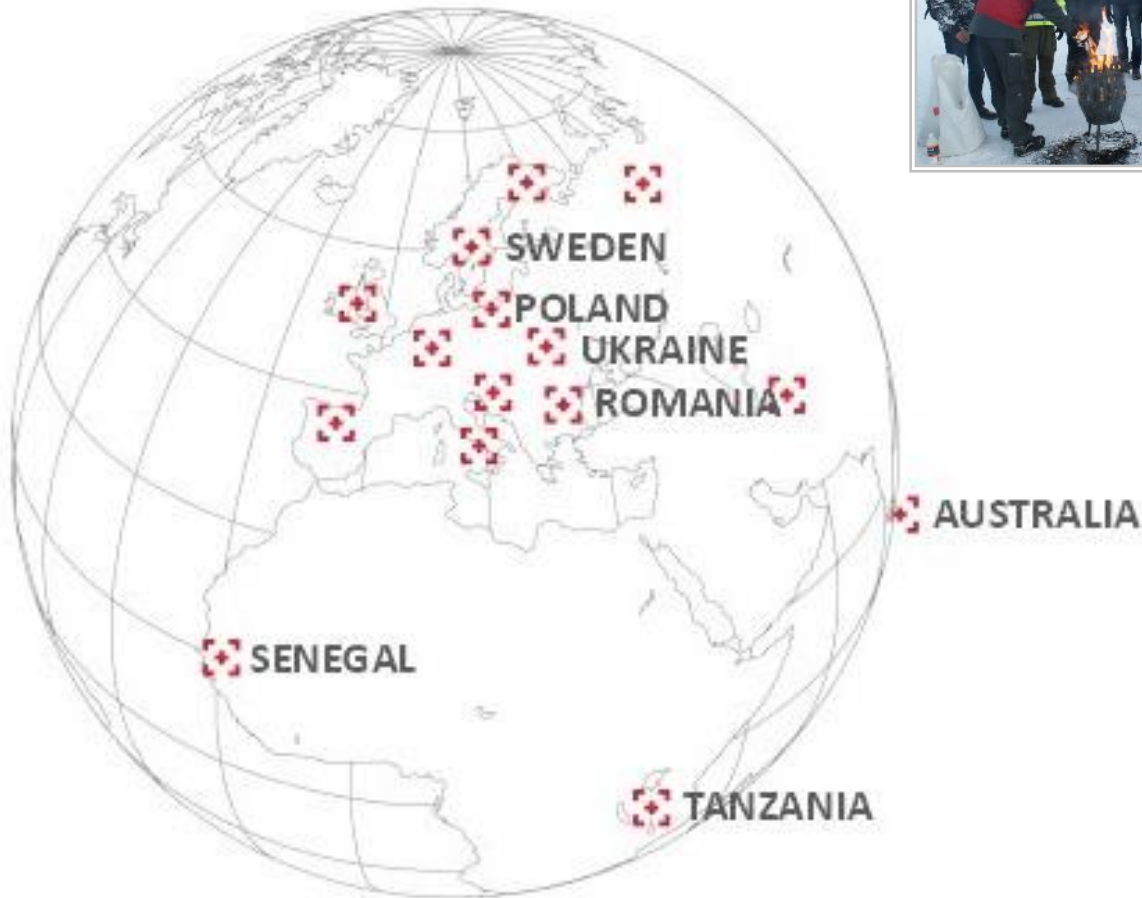
Poznań University of Life Science, Poland | Monographs of the Environmental Engineering Committee

Sewage sludge is usually a problem, especially in small treatment plants due to, for example, disposal costs.

- **sewage sludge** – solid fraction, sediment **dried to 20%-30%**.  
In small and medium-sized sewage treatment plants operating in municipalities, a very good method of preparing sewage sludge is solar drying using solar energy.
- sediment content in the **mixture** with straw was **20% to about 50%**
- **briquettes calorific value 15.5 MJ/kg** – can be used for heating
- high content of nitrogen, phosphorus and potassium - **possibility of natural or agricultural use**, provided the product is prepared with appropriate parameters.
- **mechanical durability 87%** - can be easily transported and stored.







be utilized  
erved



# Biomasser®

## Straw briquetting technology in a pill



- Stationary and mobile lines (easy to transport)
- Compact and scalable machines
- Processing of raw material with a moisture content of 10% - 30%  
briquetting without drying - saving time and money
- Simple production process and low maintenance cost
- Adjustment of the hardness of the produced  
briquettes – for various applications: heating, animals
- tested in various climatic conditions
- verified parameters in EC ETV project

*EC ETV – European Commission Environmental Technology Verification*



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## Straw briquettes in a pill




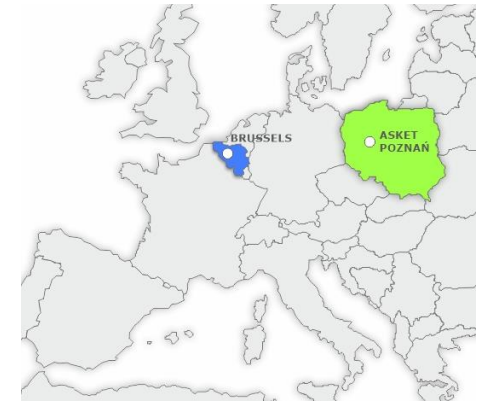
- **100% natural product**
- **produced** from commonly available and annually renewable raw material – sustainable solution
- **convenient use** – compact form, easy to handle
- **easy to storage** – 2-3 years ...
- **replacing coal or wood for heating** – assuring fuel for winter and decreasing energy poverty
- **can be used for animals** – safe product of various applications



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## About company Asket®

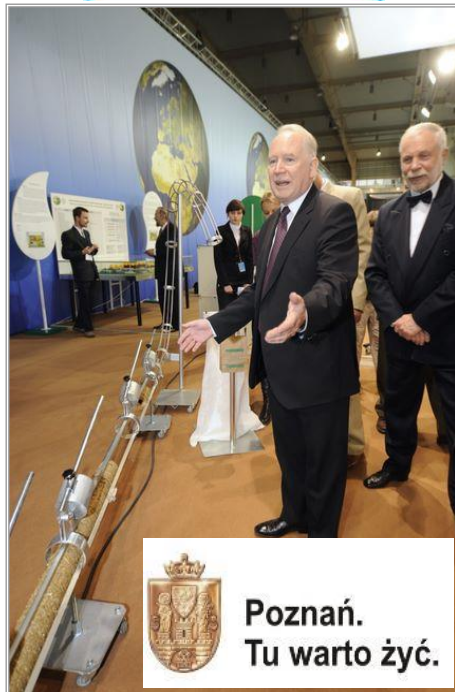
- family company - business activity since 1984
- producer and constructor of straw processing machines:  
**brand Biomasser® - straw briquetting machines** (since 2005)  
**brand Tomasser® - straw shredders** (since 2007)
- manufacturer of straw briquettes
- machines delivered to over 30 countries
- the company's facilities powered by PV panels,  
 heated with straw briquettes and electrically  
 – to minimise the carbon footprint
- member of association 

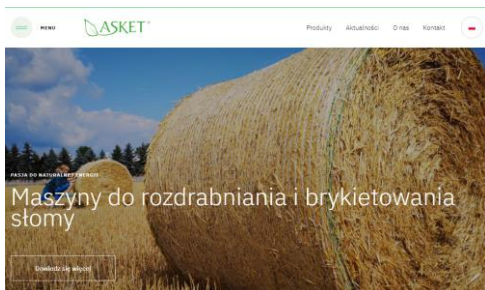


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# Biomasser® on UNFCCC COP, ETV, GreenEvo





[www.asket.pl](http://www.asket.pl)

Asket Group



[www.biomasser.pl](http://www.biomasser.pl)

Briquetting machines for straw



[www.tomasser.pl](http://www.tomasser.pl)

Shredders for straw



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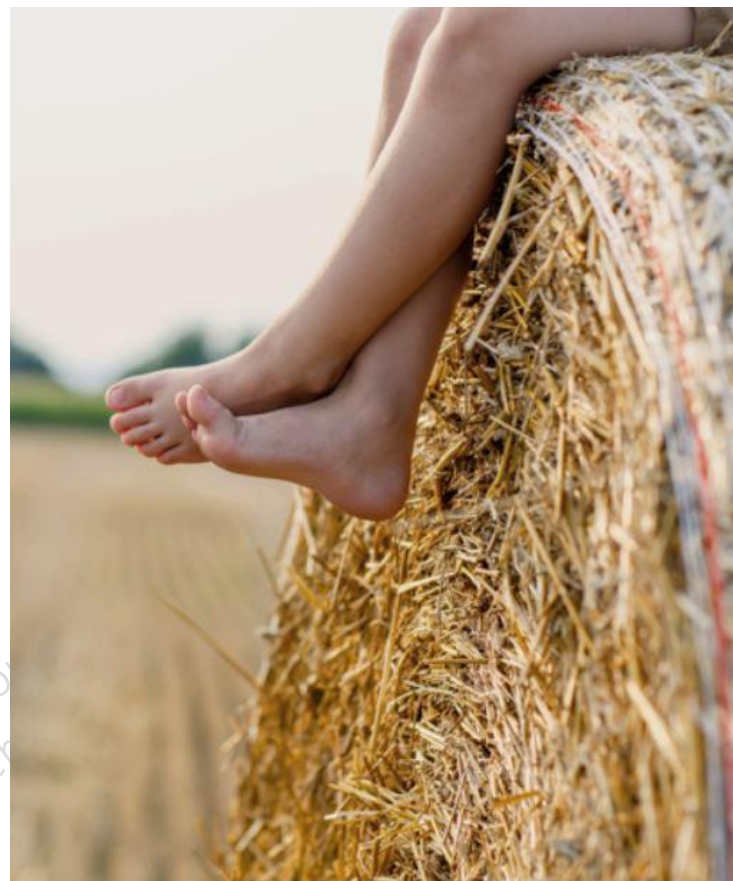


asketpl



AsketCompany

By using straw, hay, reed,  
we give the local sources  
a **second life**,  
**we care for the environment**,  
we create jobs and assure energy  
in the countryside,  
we care for the future  
of our children and grandchildren.



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TECHNICA**®  
THE WORLD'S NO. 1

**2023**

12-18 NOVEMBER | HANOVER, GERMANY  
PREVIEW DAYS 12/13 NOVEMBER



ASKET®

VISIT US IN HALL 26, BOOTH G55

# Thank you very much for your time

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