

Bioenergy Production In Rural Areas

Creation Of A Biomass Market
In Mediterranean Areas
And Regions With Declining Water Resources

Quality & Standardization of biomass

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What's ARGEM?

- ARGEM (the Regional Energy Agency) is a Public Foundation owned by the Regional Administration of Murcia.
- It takes part of a vast regional energy agencies network in Europe, promoted by the European Commission.
- We act in the Energy sector in all its forms, that is, the rational use of energy, energy efficiency and, of course, renewable energy.
- ARGEM provides services to the community, acting on behalf of the regional and local administration, or helping the citizens directly.
- Among these services, it contributes to the improvement the regional energy efficiency by offering training, grants and even undertaking development projects.
- We have developed several projects using biomass for heating, and we are promoting a 16 MW Power Plant using wood chips.

Introduction

Why do we need quality in biomass?

Two main fuels coming from biomass: pellets and wood chips

Main problems detected in use of biomass boilers:

- Ashes fusibility. Caused by the dust content in raw materials



Introduction

Main problems detected in use of biomass boilers:

- Particle size (mainly when using wood chips): Cause jamming of the feeding systems

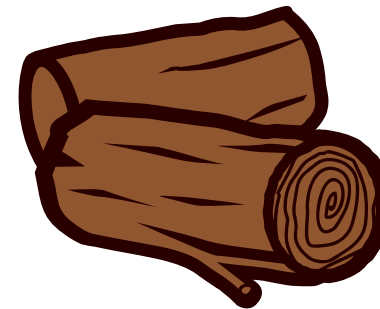


What is happening in EU?

Austria

3 pellets regulations:

- ÖNORM M 7135: Specifications of the pellets and wood briquettes with or without bark
- ÖNORM M 7136: Quality requirements for logistics and transportation of wood pellets
- ÖNORM M 7137: Storage quality requirement of the final consumer of wood pellet



What is happening in EU?

Austria

ÖNORM M 7135		Wood pellets	Bark pellets
Diameter	mm	4-10	4-10
Length	mm	<5*Diameter	<5*Diameter
Density	kg/m ³	<1,12	<1,12
Humidity	%w	<10	<18
Durability	Lignotest	2,3	2,3
Ash	%w	<0,5	<6
Heat Power	MJ/kg	>18	>18
Heat Power	kWh/kg	>5	>5
S	%w	<0,04	<0,08
N	%w	<0,3	<0,6
Cl	%w	<0,02	<0,04
Additives	%w	<2	<2

What is happening in EU?

Sweden

- Standard SS 18 71 20: specifies three types of pellets in relation to the size and amount of ash generated

Italy

- Standard CTI R04/05: sets the parameters of quality of biomass pellets for energy purposes. It establishes 4 categories depending on the source.

Germany

- DIN 51731: standard specifications for pellets and briquettes
- DIN PLUS: specifications for high quality pellets for boilers only working with pellets



What is happening in EU?

Germany



		DIN 51731	DIN PLUS
Diameter	mm	4-10	To be declared
Length	mm	<5*Diameter	<5*Diameter
Density	kg/m ³	1 – 1,4	> 1,12
Humidity	%w	< 12	< 10
Ash	%w	< 1,5	< 0,5
Heat Power	MJ/kg	17,5 – 19,5	> 18
Heat Power	kWh/kg	4,8-5,4	> 5
S	%w	< 0,08	< 0,04
N	%w	< 0,3	< 0,3
Cl	%w	< 0,03	< 0,02
As	mg/kg	< 0,8	< 0,8
Cd	mg/kg	< 0,5	< 0,5
Cr	mg/kg	< 8	< 8
Cu	mg/kg	< 5	< 5
Hg	mg/kg	< 0,05	< 0,05
Pb	mg/kg	< 10	< 10
Zn	mg/kg	< 100	< 100
Durability			< 2,3
Additives	%w		< 2

What is happening in Spain?

- Germany, Austria and Spain are the first three countries to implement the quality seal ENPlus®.
- AVEBIOM is a founding member of the pellet of the European Council (European Pellet Council - EPC) and is the entity designated to develop the brand ENPlus® pellet quality home in Spain.
- AVEBIOM in Spain with PROPELLETS (Austria) and DEPI (Germany) were the first three entities accepted by the EPC to develop the brand in their respective countries.
- The multiple brand market quality and the experience of boiler manufacturers and users with different types of pellets, have led to the pellet industry in Europe to launch a brand of unique quality, simple and efficient, the ENPlus®.
- Based on the new European standard for the pellet (EN 14961-2).
- ENPlus® certification will standardize the quality of pellets in Europe, so that this unique quality mark will assurance the end user.

European pre-standard prEN 14961-2

Three classes of biomass

- **Class A1** represents virgin wood pellets and waste chemically untreated wood, low ash content, nitrogen and chlorine.
- **Class A2**, fuels with a slightly higher content of ash, nitrogen and/or chlorine
- **Class B** is also allowed chemically treated wood, industrial waste and wood used, but there are very strict limit values for heavy metals.

	Property class, Analysis method	Unit	A1	A2	B
	Origin and source		1.1.3 Stemwood 1.2.1 Chemically untreated wood residues	1.1.1 Whole trees without roots 1.1.3 Stemwood 1.1.4 Logging residues 1.1.6 Bark 1.2.1 Chemically untreated wood residues	1.1 Forest, plantation and other virgin wood 1.2 By-products and residues from wood processing industry 1.3 Used wood
	Diameter, D ^a and Length L ^b ENXXXX According Figure 1	mm	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1; 3,15 ≤ L ≤ 40	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1; 3,15 ≤ L ≤ 40	D06, 6 ± 1; 3,15 ≤ L ≤ 40 D08, 8 ± 1; 3,15 ≤ L ≤ 40
	Moisture, M EN 14774-1, EN 14774-2	as received, w-% wet basis	M10 ≤ 10	M10 ≤ 10	M10 ≤ 10
	Ash, A EN14775	w-% dry	A0.7 ≤ 0,7	A1.5 ≤ 1,5	A3.5 ≤ 3,5
	Mechanical durability, DU, EN 15210-1	as received, w-%	DU97.5 ≥ 97,5	DU97.5 ≥ 97,5	DU96.5 ≥ 96,5
Normative	Fines at factory gate in bulk transport (at the time of loading) and in small (up to 20 kg) and large sacks (at time of packing or when delivering to end-user), F, EN 15149-1	w-% as received	F1.0 ≤ 1,0	F1.0 ≤ 1,0	F1.0 ≤ 1,0
	Additives ^c	w-% dry	≤ 2 w-% Type and amount to be stated	≤ 2 w-% Type and amount to be stated	≤ 2 w-% Type and amount to be stated
	Net calorific value, Q, EN 14918	as received, MJ/kg or kWh/kg	Q16.5, 16,5 ≤ Q ≤ 19 or Q4.6, 4,6 ≤ Q ≤ 5,3	Q16.3, 16,3 ≤ Q ≤ 19 or Q4.5, 4,5 ≤ Q ≤ 5,3	Q16.0, 16,0 ≤ Q ≤ 19 or Q4.4, 4,4 ≤ Q ≤ 5,3
	Net calorific value, Q, EN 14918	as received, MJ/kg or kWh/kg	Q16.5, 16,5 ≤ Q ≤ 19 or Q4.6, 4,6 ≤ Q ≤ 5,3	Q16.3, 16,3 ≤ Q ≤ 19 or Q4.5, 4,5 ≤ Q ≤ 5,3	Q16.0, 16,0 ≤ Q ≤ 19 or Q4.4, 4,4 ≤ Q ≤ 5,3
	Bulk density, BD, EN 15103	kg/m ³	BD600 ≥ 600	BD600 ≥ 600	BD600 ≥ 600
	Nitrogen, N, prEN 15104	w-% dry	N0.3 ≤ 0,3	N0.5 ≤ 0,5	N1.0 ≤ 1,0
Sulphur, S, prEN 15289	w-% dry	S0.03 ≤ 0,03	S0.03 ≤ 0,03	S0.04 ≤ 0,04	
Chlorine, Cl, prEN 15289	w-% dry	Cl0.02 ≤ 0,02	Cl0.02 ≤ 0,02	Cl0.03 ≤ 0,03	
Arsenic, As, prEN 15297	mg/kg dry	≤ 1	≤ 1	≤ 1	
Cadmium, Cd, prEN 15297	mg/kg dry	≤ 0,5	≤ 0,5	≤ 0,5	
Chromium, Cr, prEN 15297	mg/kg dry	≤ 10	≤ 10	≤ 10	
Copper, Cu, prEN 15297	mg/kg dry	≤ 10	≤ 10	≤ 10	
Lead, Pb, prEN 15297	mg/kg dry	≤ 10	≤ 10	≤ 10	
Mercury, Hg, prEN 15297	mg/kg dry	≤ 0,1	≤ 0,1	≤ 0,1	
Nickel, Ni, prEN 15297	mg/kg dry	≤ 10	≤ 10	≤ 10	
Zinc, Zn, prEN 15297	mg/kg dry	≤ 100	≤ 100	≤ 100	
Informative	Ash melting behaviour, ^d prEN15370	°C	should be stated	should be stated	should be stated

^a Selected size of pellets to be stated.
^b Amount of pellets longer than 40 mm can be 1 w-%. Maximum length shall be < 45 mm.
^c Type (e.g. starch, corn flour, potato flour, vegetable oil)
^d All characteristic temperatures (shrinkage starting temperature (SST), deformation temperature (DT), hemisphere temperature (HT) and flow temperature (FT) in oxidizing conditions should be stated.

European pre-standard prEN 14961-2

Biomass Traded Forms

- ◆ Briquettes (Table 3)
- ◆ **Pellets (Table 4)**
- ◆ Wood chips (Table 5)
- ◆ Hog fuel (Table 6)
- ◆ Wood logs (Table 7)
- ◆ Sawdust (Table 8)
- ◆ Shavings (Table 9)
- ◆ Bark (Table 10)
- ◆ Straw bales, reed canary grass bales and Miscanthus bales (Table 11)
- ◆ Energy grain (Table 12)
- ◆ Olive residues (Table 13)
- ◆ Fruit seed (Table 14)
- ◆ General master table for others (Table 15)

European pre-standard prEN 14961-2

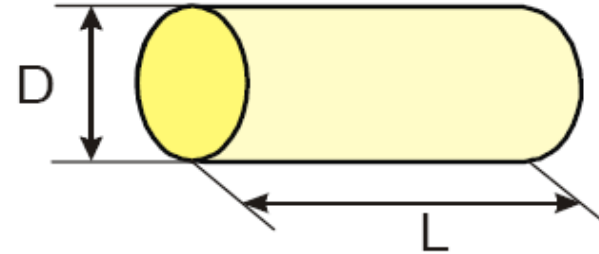
Origin of the biomass

- ◆ Woody biomass 1
- ◆ Herbaceous biomass 2
- ◆ Fruit biomass 3
- ◆ Blends and mixtures 4

1.2.1 Chemically untreated wood residues	1.2.1.1 Without bark (broadleaf)
	1.2.1.2 Without bark (coniferous)
	1.2.1.3 With bark (broadleaf)
	1.2.1.4 With bark (coniferous)
	1.2.1.5 Bark from industry operations (broadleaf)
	1.2.1.6 Bark from industry operations (coniferous)
	1.2.1.7 Blends and mixtures
1.2.2 Chemically treated wood residues, fibres and wood constituents	1.2.2.1 Without bark (broadleaf)
	1.2.2.2 Without bark (coniferous)
	1.2.2.3 With bark (broadleaf)
	1.2.2.4 With bark (coniferous)
	1.2.2.5 Bark from industry operations (broadleaf)
	1.2.2.6 Bark from industry operations (coniferous)
	1.2.2.7 Fibres and wood constituents
	1.2.2.8 Blends and mixtures

European pre-standard prEN 14961-2

Dimensions



Class	Diameter (D)	Length (L)
◆ D06	$\leq 6 \pm 1,0$ mm	$3,15 \leq L \leq 40$ mm (95 w-%)
◆ D08	$\leq 8 \pm 1,0$ mm	$3,15 \leq L \leq 40$ mm (95 w-%)
◆ D10	$\leq 10 \pm 1,0$ mm	$3,15 \leq L \leq 40$ mm (95 w-%)
◆ D12	$\leq 12 \pm 1,0$ mm	$3,15 \leq L \leq 50$ mm (95 w-%)
◆ D25	$\leq 25 \pm 1,0$ mm	$10 \leq L \leq 50$ mm (95 w-%)
◆	Maximum length of pellets: 45 mm in classes D06, D08 and D10 (< 5 w-%)	

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Moisture

- ◆ M10 ≤ 10 % as received
- ◆ M15 ≤ 15 % as received

Ash Content

- ◆ A0.5 ≤ 0.5 % dry basis
- ◆ A0.7 ≤ 0.7 % dry basis
- ◆ A1.0 ≤ 1.0 % dry basis
- ◆ A1.5 ≤ 1.5 % dry basis
- ◆ A3.0 ≤ 3.0 % dry basis
- ◆ A5.0 ≤ 5.0 % dry basis
- ◆ A7.0 ≤ 7.0 % dry basis
- ◆ A10.0 ≤ 10.0 % dry basis
- ◆ A10.0+ > 10.0 % dry basis,
minimum value to be stated

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Bulk Density

- ◆ To be stated in the following classes BD550, BD600, BD650, BD700 and BD700+ (minimum value to be stated)

Amount of Fines

When loaded or packaged

Fines < 3,15 mm

- ◆ F1.0 $\leq 1,0$ w-%
- ◆ F2.0 $\leq 2,0$ w-%
- ◆ F3.0 $\leq 3,0$ w-%
- ◆ F5.0 $\leq 5,0$ w-%
- ◆ F5.0+ $> 5,0$ w-%, maximum value to be stated

Additives

- ◆ Type and amount of pressing aids, slagging inhibitors or any other additives to be stated
- ◆ The amount of additives should not be more than 20 w-% of pressing mass. If the amount of additive is more than 20 w-% of the pressing mass then these are blended pellets

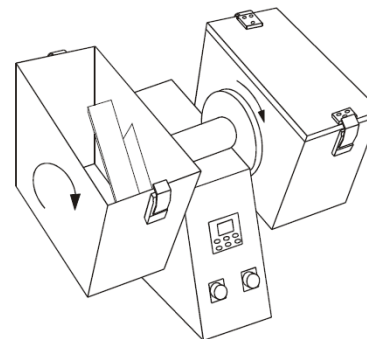
European pre-standard prEN 14961-2

Net Caloric Value as Received

- ◆ **Minimum value to be stated** (calculation by taking into account the selected moisture category and the typical variation of the net calorific value of dry matter at constant pressure)

Mechanical Durability

- ◆ DU97.5 \geq 97.5 % pellets after testing
- ◆ DU96.5 \geq 96.5 % pellets after testing
- ◆ DU95.0 \geq 95.0 % pellets after testing
- ◆ DU95.0- $<$ 95.0 % pellets after testing, minimum value to be stated



Testing apparatus for mechanical durability according prEN 15210-1

European pre-standard prEN 14961-2



**Wood pellets
(prEN 14961-1)**


Amount of fines (< 3,15mm)
 ≤ 1 w-%

Pellet length, 3,15– 40 mm
 ≥ 95 w-%

Maximum length, 45 mm
 < 5 w-%

Photo: VTT

European pre-standard prEN 14961-2

 Wood pellets	Producer	EAA Biofuels P.O. Box 1603, FI-40101 Jyväskylä Tel. +358 20722 2550
	Origin:	1.2.1.2 Coniferous wood without bark
	Traded Form:	Pellets – Class A1 (A0.5)
	Country of origin	Jyväskylä, Finland
	Normative (EN 14961- 2)	
	Dimensions	
	Diameter (D), length (L)	D08 (D= 8±1 mm, and 3,15 ≤ L ≤ 40 (95%) Maximum 45 mm
	Moisture	
	(w-% as received)	M10 (≤ 10 %)
	Ash	
(w-% of dry basis)	A0.5 ≤ 0,5%	
Mechanical durability		
(w-% of pellets after testing)	DU97.5 ≤ 97,5%	
Amount of fines		
(w-%, < 3.15 mm)	F1.0 ≤ 1%	
Net calorific value, Q		
	Q ≥ 4,7 kWh/kg	
Additives		
(w-% of pressing mass)	Starch < 1 w-%	
Bulk density as received (kg/m³)		
	DB600 ≥ 600 kg/m ³	
Chemical composition (w-% dry basis)		
	N0,3, S0,05, Cl0,02	
Ash melting behaviour, (DT °C)		
	≥ 1200	
Minor elements (mg/kg dry basis)		
	As 1, Cd 0,5, Cr 10, Cu 10, Pb 10, Hg 0.05, Ni 10, Zn 100	

What is happening in Spain?

	PCI (kJ/kg)	PCI (kWh/kg)	Humedad b.h. (%)
Pélets	17.000 – 19.000	4,7 – 5,3	< 15
Astillas	10.000 – 16.000	2,8 – 4,4	< 40
Hueso de aceituna	18.000 – 19.000	5,0 – 5,3	7 - 12
Cáscara de frutos secos	16.000 – 19.000	4,4 – 5,3	8 - 15
Leña	14.400 – 16.200	4,0 – 4,5	< 20
Briquetas	17.000 – 19.000	4,7 – 5,3	< 20

b.h.: base húmeda.

Tabla 1: Propiedades de los biocombustibles sólidos

Fuente: Norma UNE-CEN/TS 14961 EX y elaboración propia

What is happening in Spain?

	Pélet baja calidad	Pélet estándar	Pélet alta calidad
Poder Calorífico Inferior			
(kcal/kg)	> 3.000	> 4.000	> 4.300
(kJ/kg)	> 12.500	> 16.700	> 18.000
Humedad b.h. (% en masa)	< 12	< 12	< 10
Densidad (kg/m ³)	> 1.000	1.000-1.400	> 1.120
Contenido en cenizas (% en peso)	< 6	< 1,5	< 0,5
Longitud (mm)	< 7 x diámetro	< 50	< 5 x diámetro
Diámetro (mm)	< 12	4-10	< 8

Tabla 2: Características de los pélets

Fuente: elaboración propia, basada en normas DIN Y ÖNORM 7135 para pélets

What is happening in Spain?

Propiedad*	A	B	C	Análisis
Origen	Biomasa leñosa sin corteza			Documentación
Diámetro (D) y Longitud (L)	D 6 ± 1 mm ó D 8 ± 1 mm			Muestreo en el almacén
	L 5 - 40 mm			
Humedad b.h. (M)	M $10 \leq 10\%$			UNE-CEN/TS 14774-2
Cenizas (A)	A _{0,5} $\leq 0,5\%$		A _{1,0} $\leq 1,0\%$	UNE-CEN/TS 14775
Durabilidad (DU)	DU _{96,5} $\geq 96,5\%$	DU _{97,5} $\geq 97,5\%$	DU _{95,0} $\geq 95\%$	UNE-CEN/TS 15210-1
Finos (F)	F _{1,0} $\leq 1\%$	F _{2,0} $\leq 2\%$	F _{3,0} $\leq 3\%$	UNE-CEN/TS 15149-2
Aditivos	Especificar tipo y cantidad			
Poder calorífico (Q)	16,5 (MJ/kg) ó 4,6 (MJ/kg)			UNE-CEN/TS 14918 ó UNE-CEN/TS 15234
Densidad aparente (BD)	≥ 625 kg/m ³ suelto		≥ 600	UNE-CEN/TS 15103

* Las abreviaturas de las propiedades de acuerdo con la versión en inglés

Tabla 3: Propiedades normativas del proyecto de la norma europea prEN 14961-2

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Many Thanks...

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