



UMBERA

Umweltorientierte Betriebsberatungs-,
Forschungs- und Entsorgungsgesellschaft m.b.H.
Schießstattring 25/4
A-3100 St. Pölten
AUSTRIA

Tel. ++43 (0) 2742 79269

Fax ++43 (0) 2742 79459

DVR: 0627585

E-mail: umbera@umbera.at

www: umbera.at

Existing Guidelines and Quality Assurance for Fuel Pellets

PELLETS FOR EUROPE

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Brigitte Hahn

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1 INTRODUCTION

1.1 General remarks about the development of pellets standards

In Europe the wood pellet production started in Sweden in the last 1980s. Other countries such as Finland, Denmark and Austria followed in the early 1990s.

To have a common understanding between the manufacturers and the users, codes of good practice, quality guidelines and later national standards have been developed. In Europe the first national standard on pellet quality has been developed in Sweden in 1998 - other countries followed. With the need for a very high quality of pellets for the dominating household usage, especially Austria also developed its national standard rather early. For the pellet standards, usually, existing national standards for densified biofuels (briquettes) have been further developed and adopted.

In general, quality standards

- guarantee a common, official, national quality of fuel pellets, heating equipment, transport and storage
- ensure legal compliance and security for all involved market actors by defining responsibilities and duties
- help to overcome and harmonize friction points along the supply chain by defining special quality indicators and limit values
- inform the final consumers about quality characteristics

and therefore ensure customer satisfaction and encourage market dissemination of the new biomass fuel.

The development of quality guidelines culminated in the preparation of the European standard for solid biomass fuels by the Technical Committee 335 of European Committee for Standardization (CEN). Meanwhile the technical standards prCEN/TS 14588:2003 E – Solid biofuels – Terminology, definitions and description , as well as prCENT/TS 14961:2004 (E), Solid biofuels – Fuel Specifications and Classes, which also include pellets, are available. With this efforts, the national approaches get harmonised, whereas special national or regional requirements are still respected.

Additionally, in the last years several countries developed national standard for pellets logistics and storage. It was important, to define quality parameters also for logistics and storage, because it was needed for the small scaled pellet market, based on pellet boilers for single family houses, as well as because of the many involved market actors (boiler and pellet manufactures, pellet traders).

Concerning pellet combustion systems and emissions there do not exist special standards for pellets. Pellet firing systems have to fulfil the various national laws and regulations in the field of house building and heating, as well as emission standards. Therefore the combustion side is not considered in this project.

1.2 General characteristics for biofuel quality

There are two basic criteria for judging biofuel quality: chemical and compositional characteristics as well as physical characteristics.

The following table gives an overview of commonly used parameters, as well as of the effects they have on combustion, conveying, transport or logistics.

Parameter	Effects
<i>Chemical and compositional characteristics</i>	
Water content	storability, calorific value, losses, self-ignition
Calorific value	fuel utilisation, plant design
Element content	
Cl	HCl, dioxin/furane emissions, corrosion in superheaters
N	NO _x , HCN and N ₂ O emissions
S	SO _x emissions
K	corrosion in superheaters, reduction of ash melting point
Mg, Ca, P	raising of ash melting point, effect on pollutant retention in ashes and use of ashes
Heavy metals	pollutant emissions, use or disposal of ashes
Ash content	particle emissions, costs for use or disposal of ashes
Ash softening behaviour	operational safety, level of pollutant emissions
Fungi spores	health risks during fuel handling
<i>Physical characteristics</i>	
Storage or bulk density	transport and storage expenditures, logistical planning
Unit density	combustion properties (specific heat conductivity, rate of gasification)
Particle size distribution	pourability, bridge-building tendency, operational safety during fuel conveying, drying properties, dust formation
Share of fines	bulk density, transportation losses, dust formation
Durability (for pellets, briquettes)	quality changes during transshipment, disintegration, fuel losses

During pelletisation it is mainly the physical characteristics of the fuel that are affected. Additionally, both the mean water content and the uniformity of the moisture distribution are drastically improved. Further changes in the chemical composition are unlikely, since the use of chemical or natural additives in relevant amounts is usually prohibited during the production of wood pellets.

The pellet quality cannot be defined without reference to heating technology, since different heating systems require different fuel qualities. For large heating plants durability of pellets and amount of fines is less important, whereas for use in pellet stoves the pellets must be extremely durable so that they do not produce too much dust in the storage bunker and do not cause technical problems in the feeding and combustion unit.

2 NATIONAL STANDARDS

2.1 European countries with no national pellet standards

In most European countries there do not exist national quality standards for wood pellets either because

- there is no or only a small domestic pellet market established, the market is too young and the amounts of domestic consumption too unimportant

or

- some countries with a vital pellet market have stopped or even not started national standardisation activities, as they decided to wait for the European standard.

In many European Countries (17), such as Estonia, Latvia, Lithuania, Greece, Cyprus, Poland, Portugal, Spain, Malta, Netherlands, Luxemburg, Belgium, Ireland, Hungary, Czech Republic, Slovakia, Slovenia or Bulgaria, national standards do not exist, as there is no pellet market established. In these countries for the time being there are neither activities for the development of national standards nor special good practice guidelines. Some of these countries are at the very beginning of developing a pellet market and some general biomass activities are going on, such as in Spain, where the National Technical Standardisation Committee on Solid Biofuels (AEN/CTN 164) with several working groups are developing standards for solid biofuels.,

The reasons for the importance of pellets in the domestic markets in these countries are different: few raw material available, competition of natural gas or other fossil fuels. Although in some of these countries huge raw material potentials do exist, pellet productions not yet have been installed, and the few existing ones mainly are producing for the export market.

Countries such as Finland and Denmark , both big producers of pellets, have decided to wait for the European pellets standard (included in the Standard for solid biomass fuel, CEN/TC 335).

In Finland there have been activities to define good practice guidelines and internal factory instructions for quality control, and these are still used by the market actors in their daily work. A public instruction for pellets quality was developed in 2001-2002 by FINBIO – The Bioenergy Association of Finland. Instruction includes several similar rules as internal instruction of some pellet producers. The quality of pellets was divided into two categories and border values were close to the Swedish Standard for pellets. In 2002 the development work for the national standard was stopped, and involved actors concentrated on the standardisation activities on the European level.

Although Denmark is a huge consumer of pellets, there have never been developed national standards or rules for characterising wood pellets in order to sell them to the consumers. The only legislation in this area is the Biomass regulation [BEK nr 638 af 03/07/1997], of which it appears that wood pellets must be produced from clean wood without any kind of contamination. A maximum of 1% remains of glue (e.g. from fibre boards) is allowed, but there are no rules or demands for e.g. water or ash content which are important for the combustion characteristics. This implies that the wood pellet suppliers currently are not required to perform analysis of the wood pellets before they are sold to the consumers and

thereby the consumers have not necessarily any guarantee for the quality of the delivered products.

As pellets have mainly been fired in large scale heat or power plants, pellet quality has not been so important. The number of small consumers is, however, rapidly growing, and the demand for a common standard guaranteeing the quality of the pellets is getting stronger. One of the reasons for the lack of a common Danish standard is that, as the European standardisation process started, Danish market actors and testing institutes decided to wait for the European standard.

2.2 European countries with national pellet standards

2.2.1 Austria

There exist three standards referring to pellets product quality, logistic quality and storage quality:

- ÖNORM M 7135 - Compressed wood in natural state or bark in natural state – pellets and briquettes – requirements and test specifications
- ÖNORM M 7136 - Compressed wood in natural state – Wood pellets quality assurance in the field of logistics of transport and storage
- ÖNORM M 7137 - Compressed wood in natural state – Wood pellets - Requirements on pellets storage at the end-consumer

ÖNORM M 7135

There is a uniform product standard for pellets and briquettes (ÖNORM 7135). Pellets or briquettes must be made only of pure wood, only natural binding agents up to 2 % are allowed. Limit values of chemical and physical parameters are shown in the table below

Length	<5 x diameter (6mm)
Unit density	> 1,12 kg/dm ³
Water content	< 10%
Ash content	<0,5 %
Calorific value	> 18MJ/kg
Sulfur	<0,04%
Nitrogen	<0,30%
Chlorine	<0,02%
Diameter	4mm<D<10mm (6 mm)
Abrasion/Durability	<2,3% (in Lignotester)
Binding agents	< 2% (only natural)

The process of quality assurance consist of internal and external inspections. Manufacturers have to do internal quality assurance continuously, at least once a week by testing abrasion, water content, unit density, pressing aids. External inspections include an initial inspection with a general check of the production plant and the sampling for laboratory tests, the control of the internal quality assurance system as well as the control of the labelling. Periodical, not announced supervision is to be done once a year.

ÖNORM M 7136

In order to assure the quality of wood pellets produced according to ÖNORM M 7135 during transport and storage certain requirements are specified under the ÖNORM M 7136. Specifications are regarding transport and temporary storage. These specifications are intended to assist pellet manufacturers, haulers and traders in avoiding mistakes to ensure customer satisfaction along the logistic chain.

General Requirements

- Documentation

On all delivery documents including delivery note and invoice, the label of the fuel in accordance with ÖNORM M 7135 must be stated. The dealer/haulage company must furnish proof that only HP1 “ÖNORM M 7135 tested” wood pellets have been delivered.

- Product conformity

HP1 “ÖNORM M 7135 tested” wood pellets must be stored and transported separately from pellets that are not in conformance with HP1 “ÖNORM M 7135 tested” wood pellets and from other substances. A mixture of pellets with different diameters is not permitted.

The transport vehicle must be thoroughly cleared from previously delivered substances. Any ancillary equipment (e.g. hoods) must be clean.

- Protection against humidity and wetness

Wood pellets must be kept dry during storage and transport.

Requirements for temporary storage

- Delivery

Areas where wood pellets are handled (e.g. gutters in silos) must be covered.

- Storage

Wood pellets must be stored in sheds that are covered on all sides. The ground must be equipped with a layer to protect against dirtying (e.g. concrete, asphalt). They can also be stored dry in closed silos .

Wood pellets must at all times be protected from wetness, especially from direct rain, snow and damp walls or condensation. The requirements regarding water content, abrasion and density according to ÖNORM M 7135 must be adhered to.

Areas where wood pellets are handled and storage areas must be clean of foreign bodies (e.g. grit, soil, sand). Silos and transport equipment must be completely cleaned or emptied before being filled with wood pellets, if other materials have been transported or stored there before.

- Loading of transport vehicles – Separation of fines

When loading the transport vehicles before delivery to the end consumer, the fine particles must be separated. After separation fine particles of at the most 1 % is admissible.

This process of separation is not required, if the load has been reloaded from a Big Bag, for example, or has been pumped from a silo container that has undergone the procedure of separation before loading according to the above requirements.

Requirements regarding transport vehicles for delivery to end consumers

- General requirements

- Protection from wetness

The wood pellets must be delivered in transport vehicles that ensure protection against wetness throughout the transport as well as during loading and unloading.

Mechanical stress of wood pellets caused by loading installations of the lorry.

The fine particles can increase by a maximum of 1% during loading and unloading.

- On-board scales

From a maximum permitted load of more than 8000 kg, a delivery vehicle must be equipped with calibrated on-board weighing system .

- Lorry with bin container

- Suction mechanism

A mechanism for the suction of blast in air from the storage room must be in place. The output of the suction mechanism must be bigger than the output of the compressor of the vehicle. In the storage room, no excess pressure must develop.

- Minimum length of hose

A minimum length of 30 m for the injection hose is required as standard equipment of the lorry. Reducing and connecting couplings must also be carried on the lorry during transport.

- Other vehicles

Equivalent transport vehicles can be used.

Requirements regarding training of delivery staff

- Job instructions

The dealer/ hauling contractor delivering wood pellets in accordance with this ÖNORM, has to draw up job instructions for the training of the delivery staff.

These job instructions must include at least the following points:

- transport from temporary storage to temporary storage
- customer relations (notification of date, including notice to switch off firing, among others)-
- Filling in of checklist
- Preparation of filling of fuel depot
- Advice on the best way to protect the quality of the fuel during unloading
- Technical procedure of loading
- correct use of suction mechanism (switching on of suction mechanism before loading; using dry and cleaned exhaust air filter only)
- Avoiding excess pressure in storage room
- Closing of inject and exhaust nozzle after use

- Checklist

The checklist has to be filled in by the delivery staff at each delivery and must include at least the following information:

- Heating switched off YES/NO
- Storage room closed YES/NO
- Nature and estimated amount of remaining stock of fuel
- Length of hose used (in meters)
- Any other comment (e.g. no 'bounce' protection in place, accumulation of dust)

The checklist must be included in the delivery documents and may be included in the delivery note.

Test procedures

Many topics /items are ensured by visual controls on premises (such as product uniformity, protection against humidity and wetness, visual checks to establish that the technical equipment is in working order, on-board weighing system including calibration check, minimum length of hose, job instructions, proof of internal training courses

ÖNORM M 7137

This standard refers to different types of storage facilities such as

- Celler rooms
- Silos
- Containers, underfloor
- Containers, free standing

Standardisation criteria refer to

- Size
- Protection against wetness (condensation, walls)
- Dust
- No installations (water, electricity,..)

- Fire protection regulations

Couplings

- Filling coupling Storz A/110, 4 inches
- Exhausting coupling Storz A/110, 4 inches or StorzF/150 6 inches
- After filling couplings have to be closed

Special criteria for different types of storages are defined such as placing of couplings in cellar rooms, filling pipes, door, stable walls, connection to the ground and ceiling and bound protection (pellets not to strike against the wall). Additional some examples and pictures are given.

2.2.2 Sweden

SS 18 71 20

The Swedish Standard SS 18 71 20 defines quality parameters for fuel pellets.

Fuel pellets are usually produced by milling and pressing slurry (logging residues, clear-cutting residues), by-products from forestry and timber industries, straw, paper etc. Fuel pellets consist of pressed finely-textured dry material and have a maximum diameter of 25 mm.

The standard SS 18 71 20 describes three classes of fuel pellets. These differ primarily in size and ash content.

Regarding determination and quality assessment methods references to following standards are given:

- SS 18 71 70 Biofuels and Peat - Determination of Total Moisture Content (Issue 3)
- SS 18 71 71 Biofuels - Determination of Ash Content (Issue 1)
- SS-ISO 540 Solid Fuels - Mineral Fuels - Determination of Ash Dissolution - Tube Furnace Method (Issue 1)
- SS 18 71 77 Solid Fuels - Determination of Total Sulphur Using a High Temperature Tube Furnace Combustion Method
- SS 18 71 78 Biofuels and Peat - Determination of Green Bulk Density and Calculation of Basic Bulk Density (as in Glossary)
- SS 18 71 80 Biofuels and Peat - Determination of Mechanical Strength of Pellets (Issue 1)
- SS-ISO 1928 Solid Fuels - Determination of Gross Calorific Value by Bomb Calorimeter and Calculation of Net Calorific Value (Issue 1)
- SS 18 71 85 Solid Fuels - Determination of Total Chlorine in Solid Fuel and in Solid Waste Products using a Bomb Method (Issue 1)

Specifications

Limit values of quality properties and test methods for classification of pellets are given in Appendix A. All values given in the Appendix are normative.

Classification of Fuel Pellets according SS 18 71 20

Property	Test Method	Unit	Group 1	Group 2	Group 3
Dimensions: diameter and length in producer's store	By measuring at least 10 randomly selected fuel pellets	mm	To be stated as max 4 times Ø	To be stated as max 5 times Ø	To be stated as max 5 times Ø
Bulk density	SS 18 71 78	kg/m ³	≥ 600	≥ 500	≥ 500
Durability in producer's store	SS 18 71 80	Weight of fines < 3 mm, %	≤ 0.8	≤ 1.5	> 1.5
Net calorific value (as delivered)	SS-ISO 1928	MJ/kg	≥ 16.9	≥ 16.9	≥ 15.1
		kWh/kg	≥ 4.7	≥ 4.7	≥ 4.2
Ash content	SS 18 71 71	% w/w of DM	≤ 0.7	≤ 1.5	> 1.5
Total moisture content (as delivered)	SS 18 71 70	% w/w	≤ 10	≤ 10	≤ 12
Total sulphur content	SS 18 71 77	% w/w of DM	≤ 0.08	≤ 0.08	To be stated.
Content of additives		% w/w of DM	Content and type to be stated.		
Chlorides	SS 18 71 85	% w/w of DM	≤ 0.03	≤ 0.03	To be stated.
Ash dissolution	SS 18 71 65 / ISO 540	°C	Initial temperature (IT) to be stated.		

Standards for logistics

There are no national standards for pellets logistics existing, and for the time being there are no activities at the National Standardisation Institute (SIS) to prepare such standards.

2.2.3 Germany

DIN 51731

The certification of pellets in Germany is based on standard DIN 51731. The certification is based on an initial assessment and conformity assessments as well as periodical surveillance. Monitoring is limited to an annual repetition of product testing in a testing laboratory that is acknowledged by DIN CERTO. (DIN CERTO is the certification institute of DIN (Deutsches Institute für Normung - German standardisation institute).

The limit values and conditions for wood fuel pellets or briquettes are shown in the table (DIN 51731). Apart from the pellet or briquette shape the unit density and the chemical composition are defined.

The today given standards for wood pellets are defined in a German DIN-Standard. In the following the boundary values and conditions for wood fuel pellets or briquettes are compiled:

Allowable unit sizes:

Fuel class	Length	Cross section or width and length
HP 1	> 30 cm	> 10 cm
HP 2	15-30 cm	6-10 cm
HP 3	10-16 cm	3-7 cm
HP 4	< 10 cm	1-4 cm
HP 5	< 5 cm	0,4-1 cm

Apart from the pellet or briquette shape the unit density and the chemical compositional properties are defined as:

Unit density: 1-1,4 g/cm³

Water content: < 12 %

Ash content in dry matter < 1,5 %

Lower calorific value

(water- and ash-free) 17,5-19,5 MJ/kg

Element content in dry matter

Sulphur:	< 0,08 %
Chlorine:	< 0,03 %
Nitrogen:	< 0,3 %
Arsenium:	< 0,8 mg/kg
Cadmium:	< 0,5 mg/kg
Chromium:	< 8 mg/kg
Copper:	< 5 mg/kg
Mercury:	< 0,05 mg/kg
Lead:	< 10 mg/kg
Zinc:	< 100 mg/kg
EOX:	< 3 mg/kg (extractable org. halogenes)

DIN plus

However, experience has shown that using wood pellets for pellet boilers with automatic feed-in may cause a variety of problems and additional quality parameters are needed to define high pellet quality. So since 2002 DIN CERTCO offers the certification of wood pellets for burning in pellet boilers. The new certification scheme is called “Wood pellets used in small heating systems” and combines the requirements of the German standard DIN 51731 and the Austrian standard ÖNORM M 7135. As, in addition to the requirements of the German standard, the Austrian standard establishes complementary quality criteria (abrasive properties) for the use of wood pellets in automated burning systems. Furthermore, the requirements in relation to the maximum values of some product features vary in comparison with the certification of wood pellets according to the scheme “DIN-Geprüft” (tested).

The certification of *DINplus* wood pellets consists of two steps:

- Product testing by a testing laboratory in accordance with the requirements laid down in the certification scheme “Wood pellets used in small heating systems” including DIN 51731 and ÖNORM M 7135. The following properties are tested: Diameter, length, apparent density, water content, heating value, sulphur content, nitrogen

content, chlorine content, abrasion, pressing devices, impurity – foreign matter, labelling

- The monitoring body (testing laboratory) visits the manufacturing enterprise at least one a year without announcement. During this visit the internal quality assurance system is inspected and a product sample for random testing is taken.

Certification of pellet logistic

To monitor the entire process chain the certification scheme “DIN-Geprüfter Fachbetrieb – Pelletlogistik (DIN tested qualified enterprise – pellet logistic) has been introduced and makes sure that the fuel feed-in fully satisfies the end-customer.

The requirements for dealers and forwarders include testing criteria relate to the assessment of the interim warehouse and the transport from both a technical point of view and regarding qualification of the employed staff, including topics such as self-monitoring, third-party monitoring, adequate storage conditions, qualified staff and transport vehicles. The requirements are very similar to the Austrian standard ÖNORM M 7136.

Requirements for pellet storage

At the end of the transport chain comes the storage at the consumer’s location. In addition to the question of proper storage, some important safety aspects are to be considered. In addition to the legal regulations, standard requirements also exist for this type of storage. DIN CERTCO is currently developing a new certification scheme for industrially made pellet deposits based on the Austrian standard ÖNORM M7137.

2.2.4 Italy

CTI – R 04/5

In March 2004 the Italian Standard for solid biofuel was published and gives quality parameters for biopellets for energetic purposes. This standard already relates to the technical specification defined by CEN/TC335.

This standard classifies 4 categories of pellets and includes the origin of the raw material. Categories A (with / without additives) include “woody biomass” such as forest and plantation wood (no stumps), by-products from wood processing industry and chemically untreated used wood. Categories B and C include herbaceous and fruity biomass as well as blends and mixtures.

Limit values are given for diameter, length, moisture, ash content, durability and fines, additives, nitrogen, sulfur, chlorine and heating value. Details are shown in table ... at the end of chapter 2

2.2.5 Comparison of national pellet quality standards

Details are shown in the table on the next page.

Table1: General survey of limit values in existing national standards for fuel pellets (A, S, G, I), as well as national codes of good practice (UK)

Specification	Austria ÖNORM M7135		Sweden SS 18 71 20			Germany DIN 51731 / DIN plus		Italy CTI - R 04/5				Britisch BioGen / UK Code of good practice	
	Holzpresslinge	Rindenpresslinge	Gruppe 1	Gruppe 2	Gruppe 3	5 Längenklassen [cm]	sonst gleich Ø	4 categories according origin and with or without pressing aids A. no additives A. with additives B C				premium fuel pellets	recovered fuel pellets
Size	- Pellets : 4 - 20 mm Ø max.100 mm lg.	-Briketts: 20 -120 mm Ø max. 400 mm lg.	max. 4 mm Ø**)	max. 5 mm Ø	max. 6 mm Ø	HP1 HP2 HP3 HP4 HP5	Länge Ø >30 >10 15-30 6-10 10-15 3-7 <10 1-4 <5 0,4-1	6 mm, 8 mm	6 mm, 8 mm	6 mm, 8 mm	10 -25 mm	<4mm- 20 mm	> 10mm-<20mm
Bulk density			≥ 600 kg/m³**)	≥ 500 kg/m³	≥ 500 kg/m³			620 - 720 kg/m³	620 - 720 kg/m³	620 - 720 kg/m³	≥ 550 kg/m³	>600 kg/m³**)	>500 kg/m³**)
Fines in % <3mm			≤ 0,8	≤ 1,5	≤ 1,5							<0,5 %	<0,5 %
Unit density	≥ 1,0 kg/dm³	≥ 1,0 kg/dm³					1-1,4 g/cm³						>40 pounds/cubic ft. ±) 0,527 kg/dm³
Moisture content	≤ 12 %	≤ 18 %	≤ 10 %	≤ 10 %	≤ 12 %	<12 %		≤ 10 %	≤ 10 %	≤ 10 %	≤ 15 %	≤ 10 %	≤ 10 %
Ash content	≤ 0,5 % *)	≤ 6,0%*)	≤ 0,7 %	≤ 1,5 %	>1,5 %	< 1,5 %		≤ 0,7 %	≤ 0,7 %	≤ 1,5 %	to be stated	< 1 %, < 3 % or 6	< 1 %, < 3 % or 6
Calorific value	≥ 18,0 MJ/kg*)	≥ 18,0 MJ/kg*)	≥ 16,9MJ/kg ≥ 4,7 kWh/kg	≥ 16,9MJ/kg 4,7 kWh/kg	≥ 16,9MJ/kg 4,7 kWh/kg	17,5 - 19,5 MJ/kg ***)		≥ 16,9MJ/kg	≥ 16,9MJ/kg	≥ 16,2MJ/kg	to be stated	>4,7 kWh/kg	>4,2 kWh/kg
Sulphur	≤ 0,04 %*)	≤ 0,08 %*)	≤ 0,08 %	≤ 0,08 %	anges	< 0,08		≤ 0,05 %	≤ 0,05 %	≤ 0,05 %	to be stated	< 300 ppm	< 300 ppm
Nitrogen	≤ 0,3 %*)	≤ 0,6%*)				< 0,3		≤ 0,3 %	≤ 0,3 %	≤ 0,3 %	to be stated		
Chlorine	≤ 0,02%*)	≤ 0,04%*)	≤ 0,03%	≤ 0,03%	anges	< 0,03		≤ 0,03%	≤ 0,03%	to be stated	to be stated	< 800 ppm	< 800 ppm
Arsenic						<0,8 mg/kg							
Cadmium						<0,5 mg/kg							
Chromium						<8 mg/kg							
Copper						<5 mg/kg							
Mercury						<0,05 mg/kg							
Lead						<10 mg/kg							
Zinc						<100 mg/kg							
EOX, extractabl.org, halogens						<3 mg/kg		≤ 1.0 %	≤ 1.0 %	≤ 1.0 %	to be stated		
Fines. bevor delivery to costumer	max. 1 %					max. 1 %							
Additives	max.2 % only natural		to be stated					none	to be stated	to be stated	to be stated		
Ash melting point			temperatur to be stated										
Durability								≥ 97.7 %	≥ 97.7 %	≥ 95.0 %	≥ 90.0 %		

*) of dry basis **) at factory ***) without ash and water

3 THE EUROPEAN STANDARD FOR SOLID BIOFUELS

The European Committee for Standardisation (CEN / TC 335) has prepared technical specifications for solid biofuels as well as testing methods, within this standard also pellets are treated.

3.1 Classification based on origin

prCEN/TS 14961

Classification based on origin

The classification of solid biofuels is based on their origin. The production chain of fuels shall be unambiguously traceable back over the whole chain.

For classification the biofuels are divided in the sub-categories:

- wood biomass,
- herbaceous biomass,
- fruit biomass,
- blends and mixtures.

The classification is flexible, and hence the producer or the consumer may select from each property class. The next table shows the classification of origin and sources of woody biomass:

Table 2: classification of origin and sources of woody biomass according European Standard.

1.1. Forest and plantation wood	1.1.1 Whole trees	1.1.1.1 Deciduous wood
		1.1.1.2 Coniferous wood
		1.1.1.3 Short rotation coppice
		1.1.1.4 Bushes
		1.1.1.5 Blends and mixtures
	1.1.2 Stemwood	1.1.2.1 Deciduous
		1.1.2.2 Coniferous
		1.1.2.3 Blends and mixtures
	1.1.3 Logging residues	1.1.3.1 Fresh/Green (including leaves/needles)
		1.1.3.2 Dry
		1.1.3.3 Blends and mixtures
	1.1.4 Stumps	1.1.4.1 Deciduous wood
		1.1.4.2 Coniferous wood
		1.1.4.3 Short rotation coppice
		1.1.4.4 Bushes
		1.1.4.5 Blends and mixtures
1.1.5 Bark (from forestry operations)*		
1.1.6 Landscape management woody biomass		
1.2. Wood processing industry, by-products and residues	1.2.1 Chemically untreated wood residues	1.2.1.1 Wood without bark
		1.2.1.2 Wood with bark *
		1.2.1.3 Bark (from industry operations)*
		1.2.1.4 Blends and mixtures
	1.2.2 Chemically treated wood residues	1.2.2.1 Wood without bark
		1.2.2.2 Wood with bark *
		1.2.2.3 Bark (from industry operations)*
		1.2.2.4 Blends and mixtures
	1.2.3 Fibrous waste from the pulp and paper industry	1.2.3.1 Chemically untreated fibrous waste
		1.2.3.2 Chemically treated fibrous waste
1.3. Used wood	1.3.1 Chemically untreated wood	1.3.1.1 Wood without bark
		1.3.1.2 Bark*
		1.3.1.3 Blends and mixtures
	1.3.2 Chemically treated wood	1.3.2.1 Wood without bark
		1.3.2.2 Bark*
		1.3.2.3 Blends and mixtures
1.4. Blends and mixtures		

3.2 Technical specifications

For the important commercial biofuels (e.g. briquettes, pellets, wood chips,...) technical specifications as quality classification in table form were prepared. For pellets different property classes (high quality, low quality) are defined. An advantage of this classification is that producer and consumer may agree upon characteristics case-by-case. The most significant characteristics are decisive, normative, and shall be given in the product specification.

Details about specification of pellets according to the European Standard [prCEN/TS 14961:2004 – Solid Biofuels – Fuel specification and classes. CEN/TC 335, Final draft. European Standardisation Committee] are shown in the table 3.

Table 3: Technical specifications for pellets according the European Standard

	Origin: according table 1 in prCEN/TS 14961:2004	Woody Biomass (1) Herbaceous Biomass (2) Fruit biomass (3) Blends and mixtures (4)
	Traded Form	Pellets
Normative specifications		
	Dimensions (mm)	
	Diameter (D) uand Length (L)	
	D06 ≤ 6mm ± 0,5 mm and L ≤ 5 x Diameter D08 ≤ 8 mm ± 0,5 mm and L ≤ 4 x Diameter D10 ≤ 10 mm ± 0,5 mm and L ≤ 4 x Diameter D12 ≤ 12 mm ± 1 mm and L ≤ 4 x Diameter D25 ≤ 25 mm ± 1 mm and L ≤ 4 x Diameter	
	Moisture (w-% as received)	
	M10 ≤ 10 % M15 ≤ 15 % M20 ≤ 20 %	
	Ash (w-% of dry basis)	
	A0.7 ≤ 0,7 % A1.5 ≤ 1,5 % A3.0 ≤ 3,0 % A6.0 ≤ 6,0 % A6.0+ > 6,0 %, (actual value to be stated)	
	Sulphur (w-% of dry basis)	
	S0.05 ≤ 0,05 % S0.08 ≤ 0,08 % S0.10 ≤ 0,10 % S0.20+ > 0,20 % (actual value to be stated)	Sulphur is normatice only for chemically treated biomass and if sulphur containing additives have been used.
	Mechanical durability (w-% of pellets after testing)	
	DU97.5 ≥ 97,5 DU95.0 ≥ 95,0 DU90.0 ≥ 90,0	
	Amount of fines (w-% < 3,15 mm) after production at factory gate*)	
	F1.0 ≤ 1,0 % F2.0 ≤ 2,0 % F2.0+ > 2,0 % (actual value to be stated)	*) at last possible place in the production site
	Additives (w-% of pressing mass)	
	Type and content of pressing aids, slagging inhibitors or any other additives have to be stated	
	Nitrogen (w-% of dry basis)	
	N0.3 ≤ 0,3 % N0.5 ≤ 0,5 % N1.0 ≤ 1,0 % N3.0 ≤ 3,0 % N3.0+ > 3,0 % (actual value to be stated)	
Informative Specification		
	Net calorific value (MJ/kg as received) or energy density (kWh/m ³ loose)	Recommended to be informed by retailer
	Bulk denisty as received (kg/m ³ loose)	Recommended to be stated if traded by volume basis
	Chlorine, Cl (weight of dry basis w-%	Recommended to be stated in categoriy Cl 0.03, Cl 0.07, Cl 0.10, und Cl 0.10+ (if Cl >0.10% the actual value to be stated)

[E. Alakangas, VTT Processes, Secretary of CEN TC 335].

4 ADDITIONAL ENVIRONMENTAL OR QUALITY LABELS FOR PELLETS

4.1 Austria

The Austrian Federal Ministry for the Environment has devised a special environment label for biomass fuels – briquettes and pellets (Umweltzeichen, UZ 38). Only raw material from natural wood is allowed (sawdust, shavings, etc.). Use of materials such as packaging, coatings, glues, chipboard or fibreboard residues is forbidden. Chemical parameters, testing methods and limit values are similar to those in ÖNORM 7135. At present no Austrian pellet manufacturer has applied for this label.

The Austrian Pellet Association has developed a special label (quality seal) for association members (pellet and furnace manufacturer, retailers). The label is a sign of high pellet, stove and boiler, and maintenance and delivery quality. Currently it is uncertain what the future of this seal will be.

4.2 Sweden

Pellsam, the Swedish wood pellet trade body, was set up by manufacturers and suppliers of pellet heating equipment. Pellsam offers its member companies a competitive advantage because of a unique insurance scheme. The insurance gives customers a 6 year full cover for unexpected break-down or damage to the pellet equipment. The insurance is packaged as part of the pellet heating cost and a commission goes to Pellsam to fund their marketing activity

4.3 United Kingdom

The UK pellet market started with a project to introduce wood pellets to UK with the Department of Trade and Industry (DTI). In the framework of this project British BioGen have produced Codes of Good Practice for “Biofuel Pellets” and Pellet Burning Roomheaters <15 kW. These codes of good practice are adopted by British BioGen members as a standard for products and services that are supplied to customers. The codes of good practice are an interim measure, whilst no other standards exist in the UK, and will be superseded by the European Standards for Solid Biofuels, once they are published. [Nicolas Karapanagiotis, CRES,2004] Details see table 3.

4.4 France

The French-based Association for Bioenergy Professionals, ITEBE, has created a Pellet Club. Its aim is to promote the quality of fuels and has established a quality label. The ITEBE quality charter for pellet manufacturers (BIG, French Pellet Club, Charte Qualité) does more than simply outline the various wood pellet standards that exist in Europe, it faces specific advice on determining a quality pellet for various uses – stoves, boilers, large scale heat or power plants.

4.5 Denmark

In Denmark some general environment labels, such as “Svanenmärket (the skandinavien “Blue Angel”) or “Die Blumme” , may also be used for pellets.

5 CONCLUSIONS

Generally, in Europe the standardisation of fuel pellet quality is far developed. With the European Standard an appropriate tool for definition of quality is available, which very well provides the possibility to define the specific quality needed. The standard allows the manufacturer and the consumer to agree upon the quality needed from case to case.

The earlier produced and existing national quality standards for fuel pellets fit well into this concept on the European level. There are no contradictions or mention worth differences in the limit values. The various national pellet standards do not very much differ in the limit values, but some differences exist in the number of chemicals and specifications to be tested. (Details are summarised in table 1)

Countries with no existing national standards can refer to the European standard, which covers a wide range of different raw materials and quality groups for pellets, so that it should be possible to define every sort of pellet with this quality standardisation scheme.

For definition of quality of pellets logistics at the moment there only exist the Austrian ÖNORM M7135 and the German DIN plus. In small scale consumer markets good practice guidelines and standardised quality of the logistic chain are very important to guarantee the final quality of the product at the stage of delivery to the end consumer. For the time being there are no activities on the European level to define pellet logistic guidelines. Countries willing to also define good practice guidelines of standards for the logistic chain can refer to the national standards existing and adopt them to their special needs.

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