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Bioenergy 2003–2005

**Action 2: Development of Standards to Achieve Market
Harmonisation in the Bioenergy Field**

REVIEW OF THE PRESENT STATUS AND FUTURE PROSPECTS OF STANDARDS AND REGULATIONS IN THE BIOENERGY FIELD

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Title: Bioenergy 2003–2005. Action 2: Development of Standards to Achieve Market Harmonisation in the Bioenergy Field. Review of the present status and future prospects of standards and regulations in the bioenergy field			
Abstract: <p>The aim of the BASREC standardisation project was to establish contacts between relevant national organisations in the Baltic Sea Region and Technical Committees within CEN to prepare possible contributions to ongoing activities on solid biofuel standards and further to investigate the needs and possibilities for common test methods and rules regarding biofuels and biofuel machinery and systems in the area. The work was concentrated on the analysis of existing standards and their suitability in the trade of solid biofuels. Also information on equipment standards for small-scale boilers and stoves were collected.</p> <p>This review provides an overview on the CEN/TC 335 standardisation on solid biofuels. Altogether 30 CEN/TC 335 technical specifications both published and under preparation are described. Also more than 50 national biofuel norms from Finland, Sweden, Denmark, Germany, Norway, Austria and UK, as well as 15 equipment standards and regulations related to bioenergy field are presented.</p> <p>In addition to present bioenergy norms, the survey also gives a summary of the results of the BASREC standardisation project and presents new proposals, i.e. storage standard, ash classification and peat guideline.</p>			
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Preface

This report relates to the action 2 “Development of Standards to Achieve Market Harmonisation in the Bioenergy Field” of BASREC Bioenergy 2003 – 2005 project. This action is financed by Nordic Ministry Council under Baltic Sea Region Energy Co-operation (BASREC) “Bioenergy 2003 – 2005”. The project is managed via Nordic Innovation Centre. Contact person in Nordic Innovation Centre was Deputy managing director Mads Peter Schreiber. Mr. Max Nitschke from Elsam Engineering has been the project manager from 1 January to 31 December 2004 followed by Mrs. Eija Alakangas from VTT Processes from 1 January to 30 December 2005.

VTT has been responsible for collecting information related to Finnish and international bioenergy standards (e.g. CEN standards) and for drafting this report and also peat guidelines. Mrs. Nina Haglund from NAH Consulting has gathered information on Swedish national standards and information related to CEN standards for physical and mechanical testing of solid biofuels and participated also in meetings of peat guidelines. Mr. Max Nitschke has compiled information on Polish, Latvian and Danish standards and planned a standardisation questionnaire, which is available on the internet at the following address: <http://www.biomasse.teknologisk.dk/survey.htm>. In addition Industry has taken an active part in the project and several meetings have been organised with experts from industry. Peat associations and peat users have participated in drafting of guidelines for fuel peat.

The project has produced three newsletters of the current situation of the standardisation. A list of the key persons of bioenergy standardisation in Baltic Sea Region has been collected. A workshop “Standardisation of biofuels – Tools for Trading” was organised on 12 May 2005 in Tallinn in co-operation with Tallinn Technical University. Ms Inge Roos was responsible for practical arrangements of this workshop. The workshop was attended by 51 participants from Belarus, Denmark, Estonia, Finland, Latvia, Russia and Sweden. A second workshop was organised in co-operation with Riga Technical University with prof. Dagnija Blumberga on 22 August 2005 in Riga, Latvia. 17 Latvian bioenergy experts participated in the half-day workshop. The Riga workshop was organised in the connection to the Fuel Peat Guidelines meeting. Presentations of the workshop and other publications are available at the following address: <http://www.nordicinnovation.net>.

Jyväskylä, October 2005

Eija Alakangas, project manager

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Abbreviations and definitions

CEN	European Committee for Standardisation (www.cenorm.be)
DIN	German Standardisation Institute
DS	Danish Standards Association
ISO	International Organisation for Standardisation
NEN	Netherlands Standardisation Institute
ON	Austrian Standards Institute
SFS	Finnish Standards Association
SIS	Swedish Standards Institute
TC	Technical Committee
TS	Technical specification so called prestandard, which is in force three years after publishing.

1. Introduction

This report gives an overview of standardisation of solid biofuels and of equipment for biofuel utilisation as well as ideas and proposals for development of additional standards related to the bioenergy field.

Existing standards have been analysed for their suitability in biofuel trade and usage. During this analysis and in contacts with numerous biofuel professionals, needs and ideas for further standards were identified and collected, see Chapter 3.

In the Chapter 4 there is a summary of the project.

In the Appendices A – D there are short summaries of both published standards and standards under development in Europe. The European organisation for standardisation, CEN, is in the process of developing a whole series of standards for solid biofuels. There are also CEN equipment standards and guidelines, both published and under development. Beside CEN standards there are national standards in most countries. A short description of each standard is presented including contact information for enquires. These contacts are from the project partners' organisations. In Appendix E a draft guideline for peat is summarised. In the Appendix F the standardisation bodies are listed, where already published standards can be purchased.

Countries considered in the national standards section (Appendix C) are Denmark, Estonia, Latvia, Lithuania, Finland, Germany, Norway, Poland Russia and Sweden as well as Austria and the UK. A Nordic ecolabelling standard for pellets, which is under development, is also included.

2. Current standardisation

This chapter presents CEN standards and national standards on solid biofuel and equipment for their usage. Both published standards and standards under development are summarized. National standards related to the bioenergy field in Denmark, Estonia, Latvia, Lithuania Finland, Germany, Norway, Russia, Sweden as well as Austria and the UK are summarized.

2.1 CEN standards

2.1.1 CEN standards for solid biofuels

One of the most important tools for a strong common biofuel market around the Baltic Sea is the standards for solid biofuels currently under development in CEN. Summaries can be found below. The standards can be used as tools to enable both efficient trading of biofuels and good understanding between seller and buyer, as well as in communication with equipment manufacturers.

The Commission has given the CEN a mandate to develop standards for solid biofuels in order to facilitate the trading of biofuels. The scope has been defined by the Commission and is the same as the exclusions from the Waste Incineration Directive (*Directive 2000/76/EC*).

The CEN technical committee for solid biofuels, TC 335, started in year 2000 and decided to start by making prestandards so called Technical Specifications, TSs, in order to serve the market as fast as possible. The main part of this work is now finished and most TSs will be published no later than in 2006. The upgrading of the TSs to full standards will start in 2006.

A Technical Specification, TS, has to be upgraded (or deleted) after three years. When it is upgraded to a full CEN standard and all conflicting national standards in Europe have to be withdrawn.

For summaries of each CEN Technical Specification see Appendix A.

2.1.2 CEN equipment standards

For summaries of CEN standards on equipment for biofuel usage see Appendix B.

2.2 National standards and guidelines

Both new and old EU member countries are obliged to establish a national standardisation institute seeking to enforce the use of the common European standards developed in CEN. National standards in conflict with CEN standards are not allowed. A national standard can however exist in parallel with a CEN prestandard, CEN/TS. National standards on subjects not covered by the CEN are of course no problem.

In the Appendix C national standards related to the bioenergy field are summarized. The review covers Denmark, Estonia, Latvia, Lithuania, Finland, Germany, Norway, Poland, Russia, Sweden and also Austria and the UK.

A Nordic standard for ecolabelling of biofuel pellets is currently under development. This development is summarized in Appendix C as C.11.

3. Future prospects

3.1 General

During the review of existing standards and in the contacts with numerous biofuel professionals, needs and ideas for further standards were identified and collected. They are listed and explained in this chapter.

The CEN-standards and technical specifications can meet the major requirements of the standardisation needs for solid biofuels and small-scale equipment. The CEN technical specifications for solid biofuels are currently being finalised and more experience from their implementation is needed. The **need for a special information and training project for the Baltic countries and Russia** has been identified. The reason is that the Baltic States have not participated actively in the CEN work and Russia is not even a CEN member.

Many participants in the Tallinn workshop expressed that it is difficult to find a specific standard, because websites include only the title of a standard, and no description of the scope and other content is available. The summaries in this report could be of help in this respect. The Russian experts complained that for them it is difficult to purchase international standards. They should be able to contact national standards organisations listed in Appendix F.

The following **additional standards** were found to be urgently needed:

- Standard for storage and handling of solid biofuels, see 3.2
- Standard for requirements and measurements for field testing of 300 kW – 4 MW biomass boilers, see 3.3
- Standard for classification of ash from biofuels, see 3.4.
- Guidelines for peat classification, sampling and analysis of properties, see 3.5

3.2 Storage and handling standard

The growth in the use of biofuels that Europe has experienced during the past 10 – 15 years has implied a significant increase in the amount of biofuel handled. The size of the storages and transports as well as the number of locations where biofuel is handled and/or stored has risen markedly. The personnel operating these large amounts of biofuels work in a business with a very short history of experience.

This assumption is confirmed by the fact that the market has seen a lot of fires in biofuel storages that could easily have been avoided by following simple rules for handling and storing. For this reason it is argued that a short standard or guideline for correct handling and storing of biofuels, based on existing (although rather limited) research, would prevent accidents and loss of biofuels through fires and can furthermore prevent unnessecary deterioration of biofuel in store.

Health issues are very important and could be either included or handled in a separate standard.

3.3 Field testing of 300 kW – 4 MW biofuel boilers

Equipment standards include currently only small-scale combustion equipments (CEN/TC 295) and the scope of the standards include measurements of heat out, emissions and efficiency and requirements of safety issues.

The works of TC 295 is connected closely to the Construction Products Directive (CPD), Council Directive 89/106/EEC of 21 December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products. All published standards will be modified to hEN-standards, which ensure that the standardised products meeting the requirements of the standard meet also the essential requirements of the CP Directive. This is a way (not the only one) for manufacturers to get CE marks for their products.

It is difficult to make any common standards for larger combustion equipment (few megawatts). Usually boilers and handling equipment are taylorised for each plant based on the locally available biomass fuels.

Currently there are several combustion equipment standards for stoves and boilers up to 300 kW, because boilers of this size can be measured in laboratory conditions.

In the Tallinn workshop it was pointed out the need for a simplified method for field measurements for boilers of few megawatts. The earlier mentioned standards cover quite well the needs of quality assurance of small biomass fuel fired appliances. There is a need for simple standard for larger than 300 kW biomass systems, which has to be tested on field. For large power plants exists a well established standard (DIN 1942). It is originally developed for power plants using fossil fuels. It may need updating so that it is better suited also for biomass fuel fired plants.

3.4 Ash classification and ash melting behaviour

Ash from combustion of biofuels can be used to contribute to sustainable forest management. To facilitate such ash usage a classification system for ash from biofuels is needed, including methods for analysis and limit values for heavy metals (usage in the building industry will not be covered).

During the discussion during the workshop held in Tallinn the need of a standard simplified method for ash melting behaviour was identified. This is especially needed to evaluate the suitability of different biomass raw materials for pellet production. It is uncertain if the CEN method for ash melting behaviour, which is under development could fulfill this need.

In Denmark a method of a rapid slagging analyser has been developed by Danish Technical Institute. In this method 2 kg of biofuel is ignited with gas on a virgin grate under standard conditions and the ash is evaluated visually or by empirical measurements. A slagging analyser described in a standard can be built by any laboratory, and provide information about properties of a biofuel to biofuel purchasers or biofuel producers considering new raw material sources.

Tallinn Technical University has also tested ash melting by so-called “yes or no”-method. In this method biomass is kept in certain temperature (e.g. 1300 °C) for certain time to evaluate if biomass is melt or not.

The different ideas for testing of ash melting behaviour were discussed at the workshop in Tallinn. The conclusion was to gather more experience of the CEN method before proposing any other method for standardisation.

3.5 Peat guidelines

In the Baltic Sea Region peat is commonly used together with biofuels in order to improve the biofuel combustion properties and thereby increase boiler efficiency. There is also a significant international trade with peat in the region. Peat reduces slagging problems, fouling and corrosion. Especially when using wood fuel from logging residues, the use of peat is important to avoid combustion problems and down-time. The percentage of peat is dependant on the type of biofuel. Typically 15–20% peat is used.

When large amounts of particularly difficult biofuels (e.g. logging residues and used wood) are to be combusted, blends with up to 35% peat are used. Guidelines on classification, handling, storage and testing of peat is needed to facilitate optimizing of biofuel combustion. The classification system and test methods for peat should be similar to the CEN standards for solid biofuels.

A guideline for fuel peat has been drafted with the help of users of biofuels and peat producers in Finland, Sweden, Estonia, Latvia and Russia and national peat associations. The role of peat industry and utilities has been crucial in developing these guidelines. They have been actively participating in the meetings and collecting statistical information of peat. The intention is to publish the guideline as a Nordtest report by the end of year 2005. National peat associations in Finland and Russia will translate the guidelines into local languages. For a summary of the draft guideline see Appendix E.

4. Summary

The aim of the project is to establish contacts between relevant national organizations in the Baltic Sea Region and Technical Committees within CEN to prepare possible contributions to ongoing activities on solid biofuel standards and further to investigate the needs and possibilities for common test methods and rules regarding biofuels and biofuel machinery and systems in the area.

The work was concentrated on the analysis of existing standards and their suitability in the trade of solid biofuels. Also information on equipment standards for small-scale boilers and stoves were collected.

European standardisation organisation, CEN, is currently preparing 30 different technical specifications for solid biofuels, which are presented in this report. These technical specifications have been drafted in co-operation with the leading bioenergy experts in Europe. They provide a good basis in the future in production, trading and use of solid biofuels. There are also CEN standards on equipment for the usage of biofuel. From the Baltic Sea Area only Denmark, Finland, Germany and Sweden have participated actively in the CEN work. It is essential that the knowledge of CEN standardisation work is transferred to also to the other Baltic Sea countries. This has been one of the major tasks in this project. Members of the project team have a good knowledge of the CEN standardisation as they are participating in the CEN standardisation work.

There are also national standards related to the bioenergy field in most countries. A survey, supported by interviews, was carried out to find information about existing standards and future needs in the Baltic Sea Region. A web based questionnaire (available at <http://www.biomasse.teknologisk.dk/survey.htm>) was elaborated and has been sent to experts in the countries around the Baltic Sea. Needs of future standards have also been discussed in meetings with experts from industry and in the workshop: *Standardisation of Solid biofuels – Tools for trading* organised in Tallinn on 12 May 2005.

A second, half-day workshop was organised in Riga on 22 August 2005 with 17Latvian participants. Riga workshop was organised together with Riga Technical University.



Participants of the CEN/TC 335 standardisation workshop in Riga on 22 August 2005.

Project results:

The CEN-standards and technical specifications can meet the major requirements of the standardisation needs for solid biofuels and small-scale equipment. The CEN technical specifications for solid biofuels are currently being finalised and more experience from their implementation is needed. The need for a special information and training project for the Baltic countries and Russia has been identified.

The reason is that the Baltic states have not participated actively in the CEN work and Russia is not even a CEN member.

The following additional standards were found to be urgently needed:

- Standard for storage and handling of solid biofuels.
- Standard for requirements and measurements for field testing of 300 kW – 4 MW biomass boilers
- Standard for classification of ash from biofuels for the use in sustainable forestry.
- Guideline for fuel peat classification, sampling and analysis of properties.

Such standards could preferably be developed by the Action 2 project team with the help of experts from industry.

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Appendix A. CEN solid biofuel standards

A.1 Terminology

CEN/TS 14588: Solid Biofuels – Terminology, definitions and description

Status: published

Short description: This TS defines the terms within the scope of CEN/TC 335 “Solid Biofuels”. Beside the international standards, also national standards and manuals have provided the basis of the TS. Some terms important within specific nations have been added to the terminology: e.g. “black liquor” and “animal husbandry residues” are out of the scope of the mandate, yet included in the TS for information only. Numerically 147 terms and definitions are categorised in a logical structure based on the assumptions that there are different types of solid biofuels, which are produced from different sources and the purpose of which is the conversion into bioenergy.

Additional information: Eija Alakangas, VTT Processes (eija.alakangas@vtt.fi)

A.2 Fuel specification and classes, fuel quality assurance

CEN/TS 14961: Solid Biofuels - Fuel specifications and classes

Status: published

Short description: This TS determines the fuel quality classes and specifications for solid biofuels. The classification principle of the solid biofuels is based on origin and source, major traded forms (briquettes, pellets, fuel powder, sawdust, wood chips, hog fuel, logs, whole wood, straw bales, bundles, bark, chopped straw, grain or seed, shells and fruit stones, fibre cakes) and properties of solid biofuels. It enables classification from first to fourth level. Hierarchical classification system includes four types: woody biomass, herbaceous biomass, fruit biomass and biomass blends and mixtures. This TS involves special requirements for chemically treated biomass.

Additional information: Eija Alakangas, VTT Processes (eija.alakangas@vtt.fi)

CEN/TS 15234 Solid Biofuels - Fuel quality assurance

Status: under preparation

Short description: This draft TS defines the procedures to guarantee solid biofuel quality through the whole supply chain from the biofuel origin to the delivery to the end-user, and describes measures to provide adequate confidence that specified quality requirements are fulfilled. It covers the fuel quality assurance of the supply chain and the information to be used in the quality control of the product, which ensures traceability and gives confidence by demonstrating that all processes along the supply chain up to the point of the delivery to the end-user are under control.

Additional information: Eija Alakangas, VTT Processes (eija.alakangas@vtt.fi)

Solid Biofuels – A guide for a Fuel Quality Assurance System

Status: under preparation

Short description: This draft guide is to assist all operators within the solid biofuel supply chains to compose a quality assurance manual according to TS “Solid Biofuels - Fuel quality assurance”. This document can be considered as a bridging element over the gap between the ISO 9001:2000 quality management principles and the specific needs of operators in the solid biofuel market. Methodology of this guideline can be applied without having a full quality management system already in place.

Additional information: Eija Alakangas, VTT Processes (eija.alakangas@vtt.fi)

A.3 Sampling and sample reduction

The TSs for sampling and sample preparation are intended for all user groups, i.e. producers, traders and buyers as well as regulators, controllers and laboratories. There are four TSs related to sampling and sample reduction of solid biofuels:

- CEN/TS 14778-1, Solid biofuels Sampling – Part 1: Methods for sampling;
- CEN/TS 14778-2, Solid Biofuels Sampling – Part 2: Methods for sampling particulate material transported in lorries;
- CEN/TS 14779, Solid biofuels – Sampling – Methods for preparing sampling plans and sampling certificates;
- CEN/TS 14780, Solid biofuels Methods for sample preparation.

These TSs can be used, for example, when the samples are to be tested for mechanical, physical or chemical properties. It should be noted that they are not intended for obtaining very large samples that are required for the testing of bridging properties.

The principle of each sampling method is that every particle in the lot or sub-lot to be represented by the sample should have an equal probability of being included in the sample. The applicability of the TSs related to sampling and sample reduction is based on the categories of solid biofuels given in Table 1.

Table 1. Categories of solid biofuels to be sampled

Number	Definition
1	fine and regularly-shaped particulate materials, particle sizes up to about 10 mm that can be sampled by using a scoop or pipe, e.g. sawdust, olive stones and wood pellets
2	coarse or irregularly-shaped particulate materials with particle sizes up to about 200 mm that can be sampled by using a fork or shovel, e.g. wood chips and nut shells, forest residue chips, and loose straw
3	baled materials that require a special sampling tool to be used if the bales are not to be broken open for sampling, e.g. baled straw or grass
4	large pieces (particles sizes above 200 mm) which are to be picked manually
5	fibrous and vegetable waste dewatered in belt press

CEN/TS 14778-1: Solid Biofuels – Sampling – Part 1: Methods for sampling

Status: under preparation

Short description: This TS is applicable to solid biofuels belonging to categories 1, 2, 3, 4 and 5 presented in Table 1. It describes both manual and mechanical methods for sampling of solid biofuels from both stationary and moving material: the apparatus for sampling is presented and the size and number of the increments needed to provide a representative sample are defined.

Additional information: Antero Moilanen, VTT Processes (antero.moilanen@vtt.fi)

CEN/TS 14778-2: Solid Biofuels – Sampling – Part 2: Methods for sampling particulate material transported in lorries

Status: under preparation

Short description: This TS describes methods for sampling of solid biofuels transported in lorries and is applicable to solid biofuels belonging to categories 1 and 2 presented in Table 1. It defines the minimum of five increments to be taken from every lorry-load and instructs to take into account single lorry loads and continuous delivery of one source in the sampling plan.

Additional information: Antero Moilanen, VTT Processes (antero.moilanen@vtt.fi)

CEN/TS 14779: Solid Biofuels - Methods for preparing sampling plans and sampling certificates

Status: under preparation

Short description: This TS is applicable to solid biofuels belonging to categories 1, 2, 3, 4 and 5 presented in Table 1. It defines the calculation of the volume required for the combined sample and the preparation of both full and brief sampling plans, as well as sampling certificates.

Additional information: Antero Moilanen, VTT Processes (antero.moilanen@vtt.fi)

CEN/TS 14780: Solid Biofuels - Methods for sample preparation

Status: under preparation

Short description: This TS is applicable to solid biofuels belonging to categories 1, 2, and 4 presented in Table 1. It describes methods for reducing combined samples to laboratory samples and further, laboratory samples to sub-samples and general analysis samples by means of following basic sample preparation processes: mass-reduction of the sample by division and particle size-reduction of the sample.

Additional information: Antero Moilanen, VTT Processes (antero.moilanen@vtt.fi)

A.4 Mechanical and physical properties

CEN/TS 14918: Solid Biofuels - Methods for the determination of calorific value

Status: published in May 2005

Short description: This TS defines a method for the determination of the gross calorific value of a solid biofuel at constant volume and at reference temperature of 25 °C in a bomb calorimeter calibrated by combusting certified benzoic acid. It is applicable to all solid biofuels. In the TS, the reagents, apparatus, test sample preparation, calorimetric procedure and calibration related to the determination process, and the calculation of net calorific value are presented.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

CEN/TS 15103: Solid Biofuels - Methods for the determination of bulk density

Status: under preparation

Short description: This draft TS describes a method for determining bulk density of solid biofuels by using a standard measuring container and is applicable to all solid biofuels with a nominal top size of maximum 100 mm. The test portion is filled in a standardised way into a standard container of a given size and shape. Bulk density is calculated from the net weight per standard volume and reported for the measured moisture content. The apparatus, sample preparation, procedure and calculation are described.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

CEN/TS 14774-1: Solid Biofuels – Methods for the determination of moisture content – Oven dry method – Part 1: Total moisture – Reference method

Status: published

Short description: This TS is applicable to all solid biofuels and describes the reference method for determining the total moisture content of a sample by drying in an oven. It should be used when high precision of the determination of moisture content is necessary. A sample with the minimum mass of 300g (preferably more than 500g) is dried at a temperature of $(105 \pm 2^\circ\text{C})$ and in which the air atmosphere changes between 3 and 5 times per hour, until constant mass is achieved. Moisture percentage is calculated from the loss in sample mass. Procedure for the correction of buoyancy effects is included in the method. The dried sample has to be weighed while still hot, which gives a buoyancy effect which has to be compensated for when the highest precision is required. The apparatus, sample preparation, procedure and calculation are described.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

CEN/TS 14774-2: Solid Biofuels – Methods for the determination of moisture content – Oven dry method – Part 2: Total moisture – Simplified method

Status: published

Short description: The principle of this TS is similar to CEN/TS 14774-1, and it may be used when the highest precision is not needed e.g. for routine production control on site i.e. most analysis. The only difference compared to Part 1 is that there is no buoyancy compensation in Part 2. The sample with the minimum mass of 300g (preferably more than 500g) is dried at a temperature of $(105 \pm 2^\circ\text{C})$ in air atmosphere until constant mass is achieved and moisture percentage is calculated from the loss in sample mass. The apparatus, sample preparation, procedure and calculation are described.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

CEN/TS 14774-3: Solid Biofuels – Methods for the determination of moisture content – Oven dry method – Part 3: Moisture in general analysis sample

Status: published

Short description: This TS is applicable to all solid biofuels and it describes the method for determining the moisture in the analysis sample by drying the sample in an oven. It is to be used for general analysis samples described in CEN/TS 14780 Methods for Sample Preparation. General analysis sample is defined as sub-sample of a laboratory sample having a nominal top size of 1 mm or less and used for a number of chemical and physical analysis. The analysis sample is dried either in air atmosphere or in nitrogen atmosphere at a temperature of (105 ± 2) °C and the moisture percentage is calculated from the loss in the test sample mass. The apparatus, sample preparation, procedure and calculation are described.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

CEN/TS 15148: Solid Biofuels – Methods for the determination of the content of volatile matter

Status: under preparation

Short description: This draft TS is applicable to all solid biofuels and defines the method used for the determination of volatile matters of solid biofuels. This means determination of the loss in mass, less that due to moisture, when solid biofuel is heated out of contact with air under standardised conditions. A test portion of the general analysis sample is heated out of contact with air at (900 ± 10) °C for 7 min, and the percentage of volatile matter is calculated from the loss in mass of the test portion after deducting the loss in mass due to moisture. The apparatus, sample preparation, procedure and calculation are described.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

CEN/TS 14775: Solid Biofuels – Method for the determination of ash content

Status: published

Short description: This TS specifies the method for the determination of ash content of all solid biofuels. Ash content is defined as the mass of inorganic residue remaining after ignition of a fuel under specified conditions, expressed as a percentage of the mass of the dry matter in the fuel. The ash content of the sample is calculated from the mass of the residue remaining after the sample is heated in air under rigidly controlled conditions of time, sample weight and equipment specifications to a controlled temperature of (550 ± 10) °C. The apparatus, sample preparation, procedure and calculation are described.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

CEN/TS 15370-1: Solid Biofuels – Method for the determination of ash melting behaviour

Status: under preparation

Short description: This draft TS specifies a method for the determination of the ash melting behaviour of all solid biofuels. Ash from the solid biofuel sample is prepared according to the method specified in CEN TS 14775 Solid Biofuels- method for the determination of ash content. A test piece made from the ash is heated and continuously observed. The temperatures at which characteristic changes of shape occur are recorded. The temperatures to be recorded are the “shrinkage starting temperature”, the “deformation temperature”, the “hemisphere temperature” and the “flow temperature”. The apparatus, sample preparation, procedure and calculation are described.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

CEN/TS 15149-1: Solid Biofuels – Methods for the determination of particle size distribution. Part 1: Oscillating screen method using screen apertures of 3,15 mm and above

Status: under preparation

Short description: This draft TS specifies a method for the determination of the size distribution of particulate biofuels by the oscillating screen method. The method is intended for particulate biofuels only, i.e. materials having been reduced in size (such as most wood fuels) or materials already in a particulate form (such as grains and nut shells) It is applicable also to particular compressed fuels. To determine the particle size distribution a sample is subjected to sieving through horizontally oscillating sieves, sorting the particles in decreasing size classes by either manual or mechanical means. The apparatus, sample preparation, procedure and calculation are described.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

CEN/TS 15149-2: Solid Biofuels – Methods for the determination of particle size distribution. Part 2: Vibrating screen method for small particles using screen apertures of 3,15 mm and below

Status: under preparation

Short description: This draft TS specifies a method for the determination of the size distribution of particulate biofuels by the vibrating screen method. It is applicable to particulate fuels with a nominal top size less than 3,15 mm (e.g. sawdust). A sample is subjected to sieving through horizontal vibrating sieves, sorting the particles in decreasing size classes by mechanical means. Manual sieving is excluded due to the risk of clogging of the sieve holes. The apparatus, sample preparation, procedure and calculation are described.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

CEN/TS 15149-3: Solid Biofuels – Methods for the determination of particle size distribution. Part 3: Rotary screen method

Status: under preparation

Short description: This draft TS specifies a method for the determination of the size distribution of particulate biofuels by the rotary screen method. It is applicable to all particulate uncompressed fuels with a nominal top size of 3,15 mm and over, e.g. wood chips, hog fuel and olive stones. A sample is subjected to sieving through sieves in a rotary sieving machine sorting the particles by increasing size. The apparatus, sample preparation, procedure and calculation are described.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

CEN/TS 15150: Solid Biofuels – Methods for the determination of the particle density (of pellets and briquettes)

Status: under preparation

Short description: This draft TS describes the method for determining the particle density of irregularly shaped pieces of compressed fuels such as pellets or briquettes. Both mass and volume of an individual particle or a group of particles are determined. The volume is determined by measuring the buoyancy in a liquid. Buoyancy of a body is equal to the weight of the displaced volume of a liquid. The apparent loss in weight between a measurement in air and a subsequent measurement in liquid marks its buoyancy. The volume of the sample is calculated via the density of the applied liquid. For regularly shaped briquettes the volume could also be estimated by stereometric means. This is described in an informative Appendix in the TS. The apparatus, sample preparation, procedure and calculation are described.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

CEN/TS 15210-1: Solid Biofuels – Methods for the determination of the mechanical durability for pellets

Status: under preparation

Short description: This draft TS defines the requirements and methods for testing the mechanical durability of pellets. The durability is the measure of the resistance of densified fuels towards shocks and/or abrasion in consequence of transport and handling processes. The test sample is subjected to controlled shocks by collision of fuel particles against each others and against the walls of a defined rotating test chamber. The durability is then calculated from the mass of sample remaining after separation of abraded and fine broken particles. The test chamber according to the TS is a box made of rigid material. The apparatus, sample preparation, procedure and calculation are described.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

CEN/15210-2: Methods for the determination of the mechanical durability of briquettes

Status: under preparation

Short description: This draft TS defines the requirements and methods for testing the mechanical durability of briquettes. The durability is the measure of the resistance of densified fuels towards shocks and/or abrasion in consequence of transport and handling processes. The test sample is subjected to controlled shocks by collision of fuel particles against each others and against the walls of a defined rotating test chamber. The durability is then calculated from the mass of sample remaining after separation of abraded and fine broken particles. The test chamber according to the TS is a cylindrical steel drum. The apparatus, sample preparation, procedure and calculation are described.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

Solid Biofuels – Methods for the determination of bridging properties of particulate fuels

Status: under preparation

Short description: This draft technical report describes a method for determining the bridging properties of particulate biofuels that either have been reduced in size (most wood fuels or cut straw) or are physically in a particulate form (olive stones, nut shells and grain). A sample is subjected to bridging by placing it over an expandable slot opening facilitating the building of a bridge. The opening width of the slot when the bridge collapses is taken as a measure for the bridge building properties of the sample. The apparatus, sample preparation, procedure and calculation are described. It should be recognised that bridging is not an absolute value. It is influenced by fuel related properties (such as moisture content and proportion of long particles) as well as handling related parameters (such as friction against surfaces and angle of repose).

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

Solid biofuels – Method for determination of the particle size distribution of disintegrated particles

Status: under preparation

Short description: This draft TS defines the method for determining the size distribution of particles compressed to pellets. The size distribution is determined after the pellets sample has been disintegrated in deionised water and dried in a drying cabinet in two steps. The dry material is divided into two parts and each part is sieved separately in accordance with TS “Solid Biofuels – Methods for the determination of particle size distribution – Part 2”. The average of the results from the two sievings is reported. The apparatus, sample preparation, procedure and calculation are described.

Additional information: Nina Haglund, NAH Consulting (nina.haglund@telia.com)

A.5 Chemical properties

CEN/TS 15104: Solid Biofuels – Determination of total content of carbon (C), hydrogen (H) and nitrogen (N) content – Instrumental methods

Status: under preparation

Short description: This draft TS describes following method for the determination of total carbon, hydrogen and nitrogen contents in solid biofuels: a known mass of the sample is burnt under such conditions that sample is converted into ash and gaseous combustion products, i.e. carbon dioxide, water vapour, elemental nitrogen and/or oxides of nitrogen, oxides and oxyacids of sulfur and hydrogen halides, which are treated to ensure that any hydrogen associated with sulfur or halides is liberated as water vapour. Oxides of nitrogen are reduced to elemental nitrogen, and combustion products likely to interfere with the subsequent gas-analysis procedures are removed. The carbon dioxide, water vapour and nitrogen mass fractions of the gas stream are then determined quantitatively by appropriate instrumental gas-analysis procedures.

Additional information: Raili Vesterinen, VTT Processes (raili.vesterinen@vtt.fi)

CEN/TS 15289: Solid Biofuels - Determination of total content of sulphur (S) and chlorine (Cl) content

Status: under preparation

Short description: This draft TS describes a method for simultaneous determination of the total sulphur and total chlorine content in solid biofuels: procedures for the digestion and different analytical techniques for the quantification of the elements in the digestion solution are described. The method is applicable for all biofuel samples containing more than 50 mg/kg of chlorine and/or sulphur.

Additional information: Raili Vesterinen, VTT Processes (raili.vesterinen@vtt.fi)

CEN/TS 15105: Solid Biofuels – Methods for the determination of water soluble chloride (Cl) content, sodium (Na) and potassium (K)

Status: under preparation

Short description: This draft TS describes a method for defining the water soluble content of chloride, sodium and potassium in solid biofuels. The method is applicable for all solid biofuels with water soluble contents more than 50 mg/kg for chloride and more than 10 mg/kg for sodium and potassium. The principle of the method is following: the sample is heated with water in a closed container at temperature of 120°C for one hour, then digestion volume is adjusted and the contents of chloride, sodium and potassium are determined via different analytical techniques.

Additional information: Raili Vesterinen, VTT Processes (raili.vesterinen@vtt.fi)

CEN/TS 15290: Solid Biofuels – Determination of major elements (Al, Si, K, Na, Ca, Mg, Fe, P and Ti)

Status: under preparation

Short description: This draft TS describes methods for determining the content of major elements of solid biofuels, i.e. Al, Si, K, Na, Ca, Mg, Fe, P and Ti, also Ba and Mn can be determined through the methods. Part A of the TS describes the direct determination on the fuel, and part B presents the determination on a prepared 550°C ash. The principle of the procedure is following: the digestion of the sample is carried out in a closed vessel and through method presented either in part A or part B. The detection of the elements is done by Inductively Coupled Plasma Optical Emission Spectrometry (ICP/OES), Inductively Coupled Plasma Mass Spectrometry (ICP/MS) or Flame Atomic Absorption Spectrometry (FAAS).

Additional information: Raili Vesterinen, VTT Processes (raili.vesterinen@vtt.fi)

CEN/TS 15297: Solid Biofuels – Determination of minor elements (As, Ba, Be, Cd, Co, Cr, Cu, Hg, Mo, Mn, Ni, Pb, Se, Te, V and Zn)

Status: under preparation

Short description: This draft TS defines the methods for determining the content of the minor elements in all solid biofuels, i.e. As, Cd, Co, Cr, Cu, Hg, Mn, Mo, Ni, Pb, Sb, Se, Sn, V and Zn. The principle of the procedure is following: the analysis sample is prepared according to CEN/TS 14780 and digested in a closed vessel made from fluoro plastic using nitric acid, hydrogen peroxide and in some cases hydrofluoric acid in a thermally heated oven or a microwave oven.

Additional information: Raili Vesterinen, VTT Processes (raili.vesterinen@vtt.fi)

CEN/TS 15296: Solid biofuels – Calculation of different bases

Status: under preparation

Short description: This draft TS gives formulae, which allow analytical data relating to solid biofuels to be expressed on the various different bases in common use. Consideration is given to corrections that may be applied to certain determined values for solid biofuels prior to their calculation to other bases. The principle of the calculation is that in order to convert an analytical result expressed on one basis to another basis, it is multiplied by the appropriate formula after insertion of the requisite numerical values.

Additional information: Raili Vesterinen, VTT Processes (raili.vesterinen@vtt.fi)

Appendix B. CEN equipment standards

B.1 Boiler and burner standards

EN 303-5: Heating boilers – Part 5: Heating boilers for solid fuels, hand and automatically stoked, nominal heat output of up to 300 kW – Terminology, requirements, testing and marketing

Status: published in 1999

Short description: This standard covers the following solid fuels: splitted and chopped wood (billets), chipped wood (chips), wood pellets and briquettes containing natural binding materials only, sawdust, bituminous coal, lignite, coke and anthrasite. The standard determines the flue gas emissions as well as particle content in flue gas, and efficiencies at nominal and maximum output, and classifies the boilers into three classes on the basis of capacity (< 50 kW, 50-150 kW and 150-300 kW).

Available: National standardisation body

Additional information: Heikki Oravainen, VTT Processes (heikki.oravainen@vtt.fi)

EN 12953-12: Shell boilers – Part 12: Requirements for grate firing systems for solid fuels for the boiler

Status: published in 2003

Short description: This part of EN 12953-12 specifies the requirements for internal or external grate firing systems commencing at the fuel bunkers and ending at the ash extraction plant. For combination of various firing systems, the individual requirements of each system also apply. If several fuels are burnt simultaneously or if a fuel quality varies considerably, additional safety measures can be necessary, especially with respect to limitation of the fuel flow into the firing system and ensuring proper air supply to the individual fuels. This standard covers the following solid fuels: all coal qualities, other fossil solid fuels, biomass solid fuels, municipal waste solid fuels and industrial waste solid fuels.

Available National standardisation body

Additional information: Heikki Oravainen, VTT Processes (heikki.oravainen@vtt.fi)

Pellet burners for small heating boilers – Definitions, requirements, testing, marking (CEN/TC 57)

Status: under preparation

Short description: This European standard relates to pellet burners with a nominal rating of not more than 70 kW, intended for fitting with appropriate boilers for hot water according to EN 303-2 and EN 303-5 (*page 1*), and intended for high quality pellets according to CEN/TS 14961 (*page 1*). It covers all external equipment which influences the safety systems. It contains requirements and test methods for safety, combustion quality, operating characteristics and maintenance.

Available when published: National standardisation body

Additional information: Heikki Oravainen, VTT Processes (heikki.oravainen@vtt.fi)

B.2 Space heating standards

EN 13240: Roomheaters fired by solid fuel – Requirements and test methods

Status: published in 2001

Short description: This standard is applicable to non-mechanically fired appliances that burn solid mineral fuels and/or wood, in accordance with the appliance manufacturer's instructions. This standard specifies requirements relating to the design, manufacture, construction, performance (efficiency and emission), safety, instructions and marking, together with associated test methods and test fuels for the type testing of appliances, the main function of which is to produce heat by convection and/or radiation and which may also produce hot water.

Available: National standardisation body

Additional information: Heikki Oravainen, VTT Processes (heikki.oravainen@vtt.fi)

EN 13240/A2: Roomheaters fired by solid fuel – Requirements and test methods

Status: published in 2004, candidate for harmonised

Short description: This amendment is applicable to non-mechanically solid fuel-fired roomheaters, the primary function of which is to provide heat into the space of installation and which are listed under categories 1a and 2a of table 1 of *EN 13240*. Additionally, where fitted with a boiler, roomheaters within this amendment provide also central heating.

Available: National standardisation body

Additional information: Heikki Oravainen, VTT Processes (heikki.oravainen@vtt.fi)

EN 12809: Residential independent boilers fired by solid fuel – Nominal heat output up to 50 kW – Requirements and test methods

Status: published in 2001

Short description: This standard is applicable to hand and automatically fired appliances, the nominal heat output of which range up to 50 kW and which are designed to be used only with open vented systems at a working pressure not exceeding 2 bar. These appliances' function is primarily to provide hot water for central heating and secondary to provide space heating to the place of installation. The standard specifies requirements relating to the design, manufacture, construction, performance (efficiency and emission), safety, instructions and marking together with associated test methods and test fuels for type testing residential independent heating and hot water boilers fired by solid fuel, i.e. naturally occurring or manufactured solid mineral fuels, peat briquettes, natural or manufactured wood logs and biomass based products in an identifiable and consistent form.

Available: National standardisation body

Additional information: Heikki Oravainen, VTT Processes (heikki.oravainen@vtt.fi)

EN 12809/A1: Residential independent boilers fired by solid fuel – Nominal heat output up to 50 kW – Requirements and test methods

Status: published in 2004, candidate for harmonised

Short description: The draft amendment is applicable to hand and automatically fired appliances, the nominal heat output of which range up to 50 kW and which are designed to be used only with open vented systems at a working pressure not exceeding 2 bar.

Available: National standardisation body

Additional information: Heikki Oravainen, VTT Processes (heikki.oravainen@vtt.fi)

EN 12815: Residential cookers fired by solid fuel – Requirements and test methods

Status: published in 2001

Short description: This standard is applicable to appliances, the primary function of which is to cook and the secondary function of which is to provide heat into the space where they are installed. Additionally, where fitted with a boiler, they also provide domestic hot water and/or central heating. The standard specifies requirements relating to the design, manufacture, construction, safety and performance (efficiency and emission), instructions and marking together with associated test methods for type testing, residential cooking appliances fired by solid fuel. These appliances may burn solid mineral fuels, peat briquettes, wood or be multi-fuel in accordance with the appliance manufacturer's instructions.

Available: National standardisation body

Additional information: Heikki Oravainen, VTT Processes (heikki.oravainen@vtt.fi)

EN 12815/A1: Residential cookers fired by solid fuel – Requirements and test methods

Status: published in 2004, candidate for harmonised

Short description: This amendment is applicable to solid fuel-fired residential independent boilers used primarily for cooking and secondary for space heating in residential buildings with supply of hot water. This amendment is not applicable to hopper fed or mechanically fired appliances or appliances having fan assisted combustion air.

Available: National standardisation body

Additional information: Heikki Oravainen, VTT Processes (heikki.oravainen@vtt.fi)

EN 13229: Inset appliances including open fires fired by solid fuels – Requirements and test methods

Status: published in 2001

Short description: This standard is applicable to residential open fires and inset appliances fired by solid fuels, the intended use of which is space heating in residential buildings with possible supply of hot water. It specifies requirements relating to the design, manufacture, construction, safety and performance (efficiency and emission), instructions and marking together with associated test methods for type testing.

Available: National standardisation body

Additional information: Heikki Oravainen, VTT Processes (heikki.oravainen@vtt.fi)

EN 13229/A2: Inset appliances including open fires fired by solid fuels – Requirements and test methods

Status: published in 2004, candidate for harmonised

Short description: This amendment is applicable to solid fuel-fired inset appliances including open fires, the intended use of which is space heating in residential buildings with possible supply of hot water. This amendment covers definitions, requirements and test methods for mechanically fed inset appliances including open fires.

Available: National standardisation body

Additional information: Heikki Oravainen, VTT Processes (heikki.oravainen@vtt.fi)

EN 14785: Residential space heating appliances fired by wood pellets - Requirements and test methods

Status: under preparation

Short description: This standard specifies requirements relating to the design, manufacture, construction, safety and performance (efficiency and emissions), instructions and marking together with associated test methods and test fuels for type-testing residential space heaters fired by pellets, and mechanically fed up to 50 kW nominal heat output. The appliances provide heat into the space of installation and may be operated with either natural draught or fan-assisted combustion air. Additionally, where fitted with a boiler, they also provide domestic hot water and/or central heating.

Additional information: Heikki Oravainen, VTT Processes (heikki.oravainen@vtt.fi)

EN 15250: Slow heat release appliances fired by solid fuel – Requirements and test methods

Status: under preparation

Short description: This European Standard specifies requirements relating to the design, manufacture, construction, safety and performance (efficiency and emission) instructions and marking together with associated test methods and test fuels for type testing residential slow heat release appliances fired by solid fuel. This standard is applicable to hand fuelled intermittent burning slow heat release appliances having thermal storage capacity such that they can provide heat for a period of time after the fire has gone out. These appliances provide heat into the space where they are installed. These slow heat release appliances may be supplied either as assembled appliance or as pre-fabricated sections designed to be built on site in accordance with the manufacturer's specified construction design. One off installations are not included. These appliances may burn either solid mineral fuels, peat briquettes, natural or manufactured wood logs or be multi-fuel in accordance with the appliance manufacturer's instructions. This standard is not applicable to appliances with fan assisted combustion air.

Additional information: Heikki Oravainen, VTT Processes (heikki.oravainen@vtt.fi)

B.3 Agricultural and forestry machinery

EN 609-1:1999: Agricultural and forestry machinery - Safety of log splitters - Part 1:
Wedge splitters

EN 609-2, 2000: Agricultural and forestry machinery - Log splitters - Safety - Part 2:
Screw splitters

Appendix C. National standards for solid biofuel and peat

C.1 Denmark

DK – Wood pellets of “HP” quality
Status: published
Short description: The norm describes requirements for a high quality pellet for the Danish and other markets.
Available: HP briketter, Industrivej 6, 4800 Vildbjerg, Denmark
Additional information: Max Nitschke, Elsam Engineering (man@elsam-eng.com)

DK – Quality classes for fuel wood chips
Status: published
Short description: The norm describes four different types of wood chips that suits different combustion units.
Available: The National Forest and Nature Agency, Denmark (www.sns.dk)
Additional information: Max Nitschke, Elsam Engineering (man@elsam-eng.com)

C.2 Estonia, Latvia and Lithuania

Estonia and Latvia

The survey found no Estonian or Latvian standards for solid biofuels. It is likely that there exist standards for wood chips classification. Estonian and Latvian producers of wood pellets for export use the standards of the import countries.

Lithuania

The survey found no Lithuanian standards for solid biofuels. However, there may exist a Lithuanian standard for wood chip classification.

C. 3 Finland

FI – Quality guidelines for fuel peat 1989

Status: published in 1989

Short description: These quality guidelines have been adopted for milled fuel peat in 1989 and are still in use in milled fuel peat trade. The purpose of this manual is to define the procedure, by which the quality of fuel peat can be given and defined unambiguously and appropriately. It provides recommendations for using terms and definitions, sampling and sample handling and specifying characteristics and quality definitions related to fuel peat.

Available: Association of Finnish Peat Industries (<http://www.turveliitto.fi>)

Additional information: Association of Finnish Peat Industries

FI – Quality guidelines for fuel peat 1991

Status: published in 1991

Short description: These quality guidelines have been adopted for sod peat in 1991. The purpose of this manual is to define the procedure, by which the quality of fuel peat can be given and defined unambiguously and appropriately. It provides recommendations for using terms and definitions, sampling and sample handling and specifying characteristics and quality definitions related to fuel peat. The long-term aim has been to combine and revise the manuals 1989 and 1991 in order to prepare a manual that comprises both milled fuel peat and sod peat.

Available: Association of Finnish Peat Industry (<http://www.turveliitto.fi>)

Additional information: Association of Finnish Peat Industry

FI – Quality guidelines for solid wood fuels in Finland

Status: published in 1998, translated from Impola, R., Puupolttoaineiden laatuohje, FINBIO Julkaisuja/Publications 6. ISSN 1239-4874, ISBN 952-5135-06-3, 29 p.

Short description: This document defines the methods, by which the quality and energy amount of wood fuels - fuel chips, sawdust and bark - can be reported and stated unambiguously and appropriately. It provides directions for definitions, quality classes and determination, sampling and sample treatment and determination of properties related to solid wood fuels. Only clean wood fuels are covered in this manual, not wood that has been chemically treated or coated or painted.

Available: Finnish Bioenergy Association, FINBIO (<http://www.finbio.fi>)

Additional information: Risto Impola (risto.impola@vtt.fi)

SFS 5875: Solid recovered fuel. Quality control system

Status: published in 2000

Short description: This standard defines the procedure and requirements, by which the quality of recovered fuel, produced for the purpose of energy production from source-separated waste, can be controlled and reported unambiguously. The standard covers the whole chain of supply from the source-separation of wastes to the delivery of recovered fuel, but does not concern untreated wood wastes, like bark, sawdust and forestry residues.

Available: Finnish Standards Association, SFS (<http://www.sfs.fi/>)

Additional information: Finnish Standards Association, SFS (sfs@sfs.fi)

C.4 Germany

DIN 51731: Standard of wood pellets

Status: published in 2000

Short description: This standard defines the requirements of the wood pellet quality. Dimensions of pellets are classified in five different classes. Requirements for particle density is 1 000–1 400 kg/m³, moisture content, <12%, ash content <1.5% and net calorific value as received 4,8–5,4 kWh/kg. Standard also gives requirements for heavy metals and some other chemical composition of pellets.

Available: German Standardisation institute (DIN) and national standardisation body

Additional information: German Standardisation institute, DIN (www.din.de)

Analysis of chemical or physical properties:

- **DIN 22022**, Solid fuels – Determination of contents of trace elements
- **DIN 51701**, Testing of solid fuels; sampling and sample preparation
- **DIN 51900**, The net calorific value of solid fuels for dry matter
- **DIN 51 718**; The determination method of moisture content
- **DIN 51705**; Determination of bulk density of solid fuels
- **DIN 51719**; The determination of ash content
- **DIN 51730**; Ash melting behaviour
- **DIN 51724**; Sulphur
- **DIN 51721** Carbon and hydrogen
- **DIN 51722** Nitrogen,
- **DIN 51725** Phosphorus
- **DIN 51727** Chlorine

- **DIN 51720**; Volatiles
- **ISO/DIN 15238** Heavy metals (Cd), ISO/DIN 15237 (Hg), ISO/DIS 8983 (Cr, Cu, Mn, Ni, Pb, V and Zn)
- **DIN 51723**; Other chemical analyses
- **DIN 51729-8**, Determination of soda and potash (Na₂O, K₂O) contents – fuel ash
- **DIN 51729 – 10 and 11**, Determination of chemical composition of fuel ash.

C.5 Norway

Norwegian standards relating to biofuels and firewood:

- **NS 3165, 1999**: Biofuel - Cylindrical pellets of pure wood - Classification and requirements
- **NS 3166, 1999**: Biofuel - Determination of mechanical strength of pellets
- **NS 3167, 1999**: Biofuel - Determination of moisture content in laboratory samples
- **NS 3168, 2000**: Biofuel - Fuelbriquettes - Classification and requirements
- **NS 4414, 1997**: Firewood for domestic use

C.6 Poland

The survey found a Polish standard for classification of wood chips. Beside this the survey found that a coal laboratory working also with biofuels have developed several standards for determination of chemical properties of solid biofuels, as can be seen below.

Size classes for wood chips (only in Polish)

Status: Published

Short description: The norm classifies types of traded wood chips.

Available: Polish Forest Agency

Additional information: Max Nitschke, Elsam Engineering (man@elsam-eng.com)

Sample preparation, Q/ZK/P/15/04/A

Status: published

Short description: The norm describes the right way to prepare a sample for analysis in a laboratory.

Available: Institute for Chemical Processing of Coal, Zabrze, Poland

Additional information: Max Nitschke, Elsam Engineering (man@elsam-eng.com)

Total and analytical moisture, Q/ZK/P/15/05/A

Status: published

Short description: The norm describes suitable methods to determine total and analytical moisture in biomass.

Available: Institute for Chemical Processing of Coal, Zabrze, Poland

Additional information: Max Nitschke, Elsam Engineering (man@elsam-eng.com)

Ash content, Q/ZK/P/15/06/A

Status: published

Short description: The norm describes suitable methods to determine ash content in biomass.

Available: Institute for Chemical Processing of Coal, Zabrze, Poland

Additional information: Max Nitschke, Elsam Engineering (man@elsam-eng.com)

Volatile matter content, Q/ZK/P/15/07/A

Status: Published

Short description: The norm describes suitable methods to determine volatile matter content in biomass.

Available: Institute for Chemical Processing of Coal, Zabrze, Poland

Additional information: Max Nitschke, Elsam Engineering (man@elsam-eng.com)

Total sulphur content, Q/ZK/P/15/08/A

Status: published

Short description: The norm describes suitable methods to determine total sulphur content in biomass.

Available: Institute for Chemical Processing of Coal, Zabrze, Poland

Additional information: Max Nitschke, Elsam Engineering (man@elsam-eng.com)

Ash sulphur content, Q/ZK/P/15/10/A

Status: published

Short description: The norm describes suitable methods to determine ash sulphur content in biomass.

Available: Institute for Chemical Processing of Coal, Zabrze, Poland

Additional information: Max Nitschke, Elsam Engineering (man@elsam-eng.com)

C, H, N content, Q/ZK/P/15/09/A

Status: published

Short description: The norm describes suitable methods to determine C, H and N content in biomass.

Available: Institute for Chemical Processing of Coal, Zabrze, Poland

Additional information: Max Nitschke, Elsam Engineering (man@elsam-eng.com)

Net and gross calorific value, Q/ZK/P/15/03/B

Status: published

Short description: The norm describes suitable methods to determine net and gross calorific value in biomass.

Available: Institute for Chemical Processing of Coal, Zabrze, Poland

Additional information: Max Nitschke, Elsam Engineering (man@elsam-eng.com)

Ash fusion temperatures, Q/ZK/P/15/11/A

Status: published

Short description: The norm describes suitable methods to determine ash fusion temperatures in biomass.

Available: Institute for Chemical Processing of Coal, Zabrze, Poland

Additional information: Max Nitschke, Elsam Engineering (man@elsam-eng.com)

C.7 Russia

The most widely applied system of standards in Russia is the GOST (“gosudarstvennye standarty”), i.e. the State Standards of the Russian Federation. Compared to other standard systems and indeed the European CEN, the GOST standards are much more mandatory.

The Russian producers of solid biofuels for export (mostly wood pellets) use the standards of the import countries. There exist Russian standards for solid fuels including peat and standards for fuel peat only, as well as standards specifying wood chips, crushed wood and firewood. Standards listed in this report can be found from both the GOST-website (<http://www.gost.ru>) and website of the East View Information Services (<http://www.eastview.com>)

Russian wood fuel specification standards:

- **GOST 15815-83:** Technological chips. Specifications (published 1985)
- **GOST 23246-78:** Crushed wood. Terms and definitions (published 1979)
- **GOST 3243-88:** Firewood. Specifications (published 1990)

Russian peat standards:

- **GOST 21123-85:** Peat. Terms and definitions (published 1986)
- **GOST 13674-78:** Peat. Acceptance rules (published 1979)
- **GOST 11303-75:** Peat and products of its processing. Method of preparation of analysis sample (published 1977)
- **GOST 10538-87:** Solid fuel. Methods for determination of chemical composition of ash (published 1988)
- **GOST 18132-72:** Peat briquetts and semibriquetts. Method for determination of mechanical strength (published 1974)
- **GOST 10650-72:** Peat. Determination of the disintegration degree (published 1974)
- **GOST 26801-86:** Peat. Method for determination of ash content in deposit (published 1987)
- **GOST 9963-84:** Peat bricks for heating purposes. Technical requirements (published 1986)
- **GOST 50902-96:** Fuel peat for pulverised burning. Specifications (published 1997)
- **GOST 51062-97:** Sod fuel peat for heating purposes. Specifications (published 1998)

C.8 Sweden

Sweden has taken a very active part in the CEN standardisation of solid biofuels, and the CEN TSs are gradually replacing the Swedish standards in Swedish laboratories.

Unfortunately the CEN TSs for solid biofuels do not cover peat, which is frequently used together with biofuels in Sweden, and so there is a need for guidelines providing information on how to apply the CEN TSs for analysis of peat samples. Current Swedish standards for solid biofuels and peat are all listed below.

Physical and mechanical test methods:

- **SS 18 71 06:** Solid biofuels and peat – Terminology (2000)
- **SS 18 71 13:** Solid biofuels and peat – Sampling (1998)
- **SS 18 71 14:** Solid biofuels and peat – Sample preparation (1992)
- **SS 18 71 20:** Solid biofuels and peat – Pellets – Classification (1998)
- **SS 18 71 23:** Solid biofuels and peat – Briquettes - Classification (1998)-12-02
- **SS 18 71 70:** Solid biofuels and peat – Determination of total moisture (1997)
- **SS 18 71 84:** Biofuel and peat – Determination of moisture in general analysis sample (1990)
- **SS 18 71 71:** Solid biofuels – Determination of ash content (1984)
- **SS 18 71 73:** Solid biofuels – Calculation to different basis (1986)
- **SS 18 71 74:** Solid biofuels and peat – Determination of size distribution (1990)
- **SS 18 71 78:** Biofuels and peat – Determination of bulk density in bushel (1990)
- **SS 18 71 80:** Biofuel and peat – Determination of mechanical durability of pellets and briquettes (1999)
- **SS 18 71 75:** Peat – Determination of durability of sod peat (1990)
- **SS 18 71 79:** Peat – Determination of bulk density (1990)

Chemical test methods:

- **SS 18 71 76:** Solid biofuels – Determination of total sulphur content with eschka and bomb (1991)
- **SS 18 71 77:** Solid biofuels – Determination of total sulphur content at combustion in high temperature oven - IR-detector (1991)
- **SS 18 71 85:** Solid biofuels – Determination of total chlorine content with bomb method (1995)

- **SS 18 71 86:** Solid biofuels – Determination of total sulphur content with high temperature oven and IR.detector (1995)

C.9 Austria

ÖNORM M 7132: Energy-economical utilisation of wood and bark as fuel – Definitions and properties

Status: published in 1998

Short description: This ÖNORM Standard specifies terms assisting the commercial and legal transactions between the producers, dealers and consumers of fuels. It provides a technological assessment of wood and bark as fuel. This ÖNORM Standard deals with the raw material wood, with or without bark content, and with the wooden parts derived from wood working and processing, but it should not be applied to salvaged materials, chemically treated wood or wood derived from timber products containing binding agents and/or coating materials. Specifications with regard to environmental impact are not concerned in this ÖNORM Standard.

Available: Austrian Standards Institute, ON (<http://www.on-norm.at>)

Additional information: Austrian Standards Institute, ON (<http://www.on-norm.at>)

ÖNORM M 7133: Chipped wood for energetic purposes – Requirements and test specifications

Status: published in 1998

Short description: This ÖNORM Standard classifies wood chips with and without bark into different categories, defines testing requirements and methods, and can be used to assess the value of wood chips. It is addressed to persons and organisations manufacturing, selling, erecting or using machinery, equipment, tools and entire plants having a connection with wood chips, and to all persons and organisations involved in purchasing, selling and utilising wood chips.

Available: Austrian Standards Institute, ON (<http://www.on-norm.at>)

Additional information: Austrian Standards Institute, ON (<http://www.on-norm.at>)

ÖNORM M 7135: Compressed wood and compressed bark in natural state – Pellets and briquettes – Requirements and test specifications

Status: published in 2000

Short description: This ÖNORM Standard defines the requirements and methods for the testing of wood/bark pressings. It is addressed to persons and organisations manufacturing, selling, erecting or using machinery, equipment, tools and entire plants having a connection with wood chips, and to all persons and organisations involved in purchasing, selling and utilising pressings.

Available: Austrian Standards Institute, ON (<http://www.on-norm.at>)

Additional information: Austrian Standards Institute, ON (<http://www.on-norm.at>)

ÖNORM M 7136: Compressed wood in natural state – Wood pellets – Quality assurance in the field of logistics of transport and storage

Status: published in 2002

Short description: This ÖNORM standard is applicable only to pellets specified in the standard *ÖNORM M 7135*. It determines the quality assurance of pellets during transportation and storing. It is addressed to persons and organisations manufacturing, selling or keeping (intermediate) storages, and to all persons involved in the transportation of wood pellets.

Available: Austrian Standards Institute, ON (<http://www.on-norm.at>)

Additional information: Austrian Standards Institute, ON (<http://www.on-norm.at>)

ÖNORM M 9466: Emission limits for air contaminants of wood incineration plants of a nominal fuel heat output from 50 kW onwards – ÖNORM M 9466 – Requirements and testing on the site

Status: published in 1998

Short description: This ÖNORM Standard classifies wood chips with and without bark into different categories, defines testing requirements and methods, and can be used to assess the value of wood chips. It is addressed to persons and organisations manufacturing, selling, erecting or using machinery, equipment, tools and entire plants having a connection with wood chips, and to all persons and organisations involved in purchasing, selling and utilising wood chips.

Available: Austrian Standards Institute, ON (<http://www.on-norm.at>)

Additional information: Austrian Standards Institute, ON (<http://www.on-norm.at>)

C.10 The United Kingdom

British Biogen, The Trade Association to the UK Bioenergy Industry, has developed a system of describing wood fuels, which aims to balance the need to have a good enough description to cover the requirements of the user's equipment, whilst recognising the practicalities of producing wood fuels. In addition to system of describing wood fuels, BioGen have also produced codes of good practice for biofuel pellets and pellet burning roomheaters with nominal heating capacity less than 15 kW. (*British Biogen website*).

UK- Describing retail wood fuels

Status: published in 2000

Short description: This fact sheet defines a system of describing wood fuels. It divides wood fuels into three main types: log wood, wood chips and other wood fuels, i.e. pellets, compressed logs, faggots and kindlings, and describes methods for calculating moisture content and determining the size or quality (super, fine or coarse) of the wood fuels.

Available: British Biogen (<http://www.britishbiogen.co.uk>)

Additional information: British Biogen (<http://www.britishbiogen.co.uk>)

UK- The British BioGen code of good practice for biofuel pellets (Version 2.3)

Status: published in 2001

Short description: This code specifies issues related to pellets' raw materials, physical and chemical attributes, and quality assurance and miscellaneous. The code is voluntary but all members of the industry are strongly encouraged to comply with it. The code is an interim measure, whilst no other standards exist in the UK, and will be superseded by the European Standards for solid biofuels, once it is published.

Available: British Biogen (<http://www.britishbiogen.co.uk>)

Additional information: British Biogen (<http://www.britishbiogen.co.uk>)

C.11 Nordic ecolabelling of biofuel pellets

Nordic Ecolabelling: Swan labelling of biofuel pellets

Status: under preparation

Short description: To Swan label biofuel pellets is to take an overall approach to environmental measures. Requirements are set of manufacturing methods, transportation and storage. The aim is to identify the top-grade alternative from an environmental perspective. It is possible to Swan label biofuel pellets intended for private use in small to medium-scale burners. These boilers and stoves are often used in built-up areas. The majority of requirements aim to reduce emissions resulting from combustion due to the likely event of individuals being present in the surroundings and open to exposure from the fumes.

Additional information: Ecolabelling organisations (Finland; www.sfs.fi/ymparist/, Denmark www.ecolabelling.dk, Iceland; www.svanurinn.is, Norway; www.ecolabel.no and Sweden; www.svanen.nu)

Appendix D. National equipment standards

D.1 Norway

Norwegian standards relating to enclosed wood heaters:

- **NS 3058-1, 1994:** Enclosed wood heaters - Smoke emission - Part 1: Test facility and heating pattern
- **NS 3058-2, 1994:** Enclosed wood heaters - Smoke emission - Part 2: Determination of particulate emission
- **NS 3058-3, 1994:** Enclosed wood heaters - Smoke emission - Part 3: Determination of organic micro contaminations (PAH)
- **NS 3058-4, 1994:** Enclosed wood heaters - Smoke emission - Part 4: Determination of the content of carbon monoxide (CO) and carbon dioxide (CO₂) in the flue gas
- **NS 3059, 1994:** Enclosed wood heaters - Smoke emission – Requirements

D.2 The United Kingdom

UK- The British BioGen code of good practice for biofuel pellet burning roomheaters < 15 kW (Version 2.3)
Status: published in 2001
Short description: This code concerns biofuel pellet burning appliances' integrity, safety, emissions, efficiency, noise effect and quality assurance. The code is voluntary but all members of the industry are strongly encouraged to comply with it. It is an interim measure, whilst no other standards exist in the UK, and will be superseded by the European Standards for solid biofuels, once it is published.
Available: British Biogen (http://www.britishbiogen.co.uk)
Additional information: British Biogen (http://www.britishbiogen.co.uk)

Appendix E. Guidelines for fuel peat

Nordtest-method: Guidelines for fuel peat classification, sampling and analysis of properties

Status: under preparation will be published for test use in end of year 2005

Short description: This guideline is applied for fuel peat. In case the fuel is composed of both peat and solid biomass fuel fractions, this guideline and CEN/TS 14961 are to be used together. The purpose of this quality guideline is to define the procedure, according to which the quality of fuel peat can be given and defined unambiguously and appropriately. The guideline provides recommendations for using terms and definitions, sampling and sample handling and specifying characteristics and quality definitions related to fuel peat. The Guideline is based on the existing Finnish guidelines and CEN/TC 335 standards. Quality tables are presented in a similar form as in CEN/TS 14961 and the same symbols are used.

Available when published: Nordtest (<http://www.nordicinnovation.net>)

Additional information: Eija Alakangas, VTT Processes (eija.alakangas@vtt.fi)

Appendix F. National standardisation organisations in Baltic Sea Region

DENMARK	Dansk Standard (DS) Kollegievej 6, DK-2920 Charlottenlund Tel. + 45 39 966 101, fax. + 45 39 966 102 URL: http://www.ds.dk
ESTONIA	Estonian Centre for Standardisation (EVS) Aru Street 10, EE-10317 Tallinn Tel. + 372 60 55 050, fax. + 372 60 55 070 URL: http://www.evs.ee
FINLAND	Suomen standardisoimisliitto r.y. (SFS) PO Box 116, FI-00241 Helsinki Tel. + 358 9 149 93 31, fax. + 358 9 146 49 25 URL: http://www.sfs.fi
GERMANY	Deutsches Institut für Normung e.V. (DIN) Postfach, D-10722 Berlin Tel. + 49 30 26 010, fax. + 49 30 26 01 12 31 URL: http://www.din.de
ICELAND	Icelandic Standards (IST) Laugavegur 178, IS-105 Reykjavik Tel. + 354 52 07 150, fax. + 354 52 07 171 URL: http://www.stadiar.is
LATVIA	Latvian Standards Ltd (LVS) K. Valdemāra Street 157, LV-1013 Riga Tel. + 371 7 371 308, fax. + 371 7 371 324 URL: http://www.lvs.lv
LITHUANIA	Lithuanian Standards Board (LST) T. Kosciuškos g. 30, LT-2600 Vilnius Tel. + 370 5 212 62 52 URL: http://www.lsd.lt
NORWAY	Standard Norge (SN) PO Box 242, NO-1326 Lysaker (visitors: Strandveien 18) Tel. + 47 67 83 86 00, fax. + 47 67 83 86 01 URL: http://www.standard.no
RUSSIA	Federal agency on technical regulating and metrology (GOST) Leninsky prospekt, 9, Moscow, B-49, Russian Federation Tel. + 7 95 236 03 00, fax. + 7 95 236 62 31 URL: http://www.gost.ru
SWEDEN	Swedish Standards Institute (SIS) Sankt Paulsgatan 6, S-11880 Stockholm Tel. + 46 8 555 520 00, fax. + 46 8 555 520 01 URL: http://www.sis.se



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For more information: www.nordicinnovation.net