STANDARDISATION OF SRF

Basic information for producers and users of SRF, public authorities and other stakeholders

Introduction

Since the 1980´s the use of waste as a fuel has been an appealing idea to stakeholders involved in waste management. Whereas recovery and recycling of materials in waste has well developed over the years, remaining fractions still contain valuable energetic content. The energetic content is well used in modern mass burning incinerators (waste-to-energy plants). Alternatively, certain wastes can be used as fuel in dedicated plants such as cement kilns, lime plants, steelworks, CHP and other power plants. For such waste derived fuels there is an increasing need for methods that enable a clear and uniform description of the quality of secondary fuels and of environmental aspects of their thermal application. This can be achieved by standardisation. Standardisation is a well proven concept for other secondary materials. Upon standardising the fitness for use of waste derived fuels can be proven and therefore their acceptance will grow.

The past ten years CEN/TC343 has worked on standards for waste derived fuels. Such fuels, when produced according to the requirements of the standards, are called Solid Recovered Fuel (SRF). This document provides for an introduction of the standards for SRF and their beneficial use.

The need to distinguish between SRF and other fuels

Today many wastes and waste fractions are offered for energetic applications. Very often the compositional quality and the environmental parameters are not well described. This poses a risk for producers and users of these fuels as human health and equipment may suffer from certain components in the fuel. As environmental impacts can not be overseen, public acceptance and acceptance by competent authorities is generally low.

Upon using standards for SRF, clear and uniform information can be obtained and communicated. All relevant technical and environmental features are declared by the producer. Upon using quality assurance schemes the producer guarantees the stable and acceptable performance of its fuel. The requirements for declaration of are described in SRF standard EN15359.

SRF is therefore to be distinguished quite clearly from all other fuels derived from waste. In general these other fuels are referred to as "RDF": Refuse Derived Fuel. A main distinction between SRF and RDF is that SRF is intentionally produced with respect of quality criteria, whereas RDF is usually a remaining fraction from waste treatment operations. Producers of SRF control the production process so that their fuels meet the desired specifications. RDF is a non specified waste. Its quality and environmental features are not analysed using acknowledged methods.

==> SRF is a fuel derived from non-hazardous waste produced in accordance with the requirements of the European standards for SRF, specifically in accordance with EN15359.

==> If no declaration of conformity to the requirements of EN15359 can be provided, a waste derived fuel may not be considered to constitute SRF

The sources of SRF are non-hazardous wastes. They can be processed in many ways using different kinds of technologies.

The process of standardisation

The standards for SRF have been developed by CEN/TC343 according to a mandate of the European Commission. The European Commission has considered that standards are necessary to support the trading of waste derived fuels.

The process of standardisation has involved representatives of national standardisation bodies, research institutes, industry and the European Environmental Citizens Organisation for Standardisation (ECOS). The standards have been developed on the basis of scientific research and extensive validation research. The standards were published by CEN and are available at the national standardisation bodies.

Are the standards obligatory?

The CEN/TC343 standards must be implemented by the national standardisation bodies. These bodies are member of CEN. If any national standards for waste derived fuels exist, they must be replaced by the CEN/TC343 standards. All over Europe the same standards for SRF do now apply.

Even if national standards for SRF exist, it is not obligatory for producers of waste derived fuels to apply the standards. In that case however, the waste derived fuels may not be called SRF in conformity with CEN/TC343 standards.

==> All stakeholders involved should take good notice that if the label "SRF" is used the fuel must have been produced according to the standards of CEN/TC343

An overview of the SRF standards

The SRF standards address the following issues:

- quality management systems
- safety
- specifications and classes
- determination of biomass content
- sampling and sample preparation
- chemical testing
- physical testing

In the following the main aspects of the standards are explained.

Quality management systems

The goal of standard EN 15358 is the development of a Quality Management System (QMS) for SRF production and trading that provides for continuous improvement, emphasising the fulfilment of quality requirements. This standard is a base for developing a QMS for a SRF supplier organization which has not earlier established a QMS. It can also be used as a supporting document for a supplier who already has a QMS established. The development of a quality management system for Solid Recovered Fuel based on this standard does not involve a compulsory third party certification, however such certification is recommended.

The emphasis of this standard is on:

- giving wider confidence to the production and trading of SRF;
- defining the documentation to be used for internal procedures and communicating to all parties the specifications needed to ensure the achievement of the quality objectives;
- verifying the origin and demonstrating the properties of the input materials (i.e. non hazardous wastes).

Quality Management Systems according to EN ISO 9001 cover the whole process from the point of waste reception to the point of delivery of SRF to the customer. Standard EN15357 on terminology, definitions and descriptions describes the terms in the standards for solid recovered fuels

Safety

Production, handling, storage, trade, sampling or analysis of SRF can be accompanied with certain health risks. These risks are described in Technical Report CEN/TR 15441.

The safety data sheet (SDS) for chemical products due to ISO 11014 is a means of transferring essential hazard information (including information on transport, handling, storage and emergency actions) from the supplier of a chemical product to the recipient of this product. For non-hazardous

substances or products there is a gap in information duties. Solid Recovered Fuel is derived from non-hazardous types of waste, so prima facie there seems to be no need for preparing an SDS for SRF. In addition, the SDS due to ISO 11014-1 would not cover environmental or health risks in the stage of SRF production.

Standard EN 15590 (not under the mandate of the Commission) specifies the method determining the current rate of aerobic microbial activity of SRF using the real dynamic respirator index (RDRI). The rate of aerobic microbial activity is an indication of the biological stability under the actual chemical and physical properties of the SRF. (Note that the test environment differs considerable from the practical situation e.g. the storage of SRF.)

Specifications and classes
Standard EN15359 forms the core of SRF standardisation. It requires the specification of a set of parameters, including both technical and environmental parameters. The analysis of parameters must follow the subsequent standards for analysis of SRF. Documents concerning sampling, biomass content determination, calorific value, determination of moisture, ash content, etc. are indispensable for its application. Upon applying EN15359 a producer is able to present reliable and standardised information of his fuel. On the basis of the specified quality, a producer can then declare the quality of his fuel using the SRF classification scheme. This scheme has the mere function of providing for an easy and uniform language between producer, client and other stakeholders. The classification scheme uses three major parameters: calorific value (economic information), chlorine (technical information) and mercury (environmental information). Using these three parameters the overall quality and value of a SRF can quickly be assessed.

Classification characteristic	Statistical measure	Unit	Classes				
			1	2	3	4	5
Net calorific value (NCV)	Mean	MJ/kg (ar)	≥ 25	≥ 20	≥ 15	≥ 10	≥ 3

Classification characteristic	Statistical measure	Unit	Classes				
			1	2	3	4	5
Chlorine (Cl)	Mean	% (d)	≤ 0,2	≤ 0,6	≤ 1,0	≤ 1,5	≤ 3

Classification characteristic	Statistical measure	Unit	Classes				
			1	2	3	4	5
Mercury (Hg)	Median 80th percentile	mg/MJ (ar) mg/MJ (ar)	≤ 0,02 ≤ 0,04	≤ 0,03 ≤ 0,06	≤ 0,08 ≤ 0,16	≤ 0,15 ≤ 0,30	≤ 0,50 ≤ 1,00

EN15359 also prescribes compliance rules. It must be noted that specifying and classifying SRF is not a one-time event. Compliancy to the limit values of each characteristic specified in the classification scheme must be established on the basis of a 12 months period. In that period a quality management system must be applied. Measurement of the characteristics must take place per lot, whereas a lot size may not exceed 1,500 tonnes. If the production is less than 15,000 tonnes a lot size is one tenth of the amounts produced. If the input of a plant changes, the production is considered to be interrupted.

Example
If a SRF plant produces 20,000 tonnes annually, at least 13 samples must be taken and analysed. If the input material changes half way of the year, then two times 10 samples must be taken.

Declaring conformity
The ultimate proof that a fuel meets with the requirements of the SRF standards, and therefore may be called a SRF in conformity with the CEN/TC343 standards, is a written declaration of conformity by the producer according to the required template. SRF must comply with the following:

- it is classified according to the classification scheme of EN15359
- it meets the quality requirements described in EN15359
- its properties are specified according to the requirements of EN15359

The producer is recommended to use the template declaration of conformity as provided in EN15359.

Methods for the determination of the biomass content
It is well recognised that SRF pays a contribution to the reduction of greenhouse gas emissions. Whereas SRF is used to substitute coal, gas or oil in many types of combustion units, the emission of fossil fuel related CO_2 is prevented. However, SRF is usually not composed of 100% biomass. For several reasons it is desirable to know the biomass content of SRF and the true contribution to greenhouse gas reduction.

For the determination of biomass content EN15440 describes three methods:

- the selective dissolution method (SDM) based on the property of biomass that it can be dissolved in a sulphuric acid / hydrogen peroxide mixture.
- the manual sorting method (MS) suitable for samples with a particle size > 10 mm
- the 14C method suitable for samples of all types of fuel.

The 14C method has not been validated for SRF. However, the determination of the biomass content using this method is based on the well established analytical procedures for the determination of the age of carbon containing objects. At this moment the amount of skilled 14C laboratories is limited. CEN/TR15591 that describes the C14 method has been used for the development of EN15440. Problems with the reliability of the selective dissolution method and the manual sorting method can occur for biomass concentrations below 5 % and above 95 %. The influence of non-regular substances might modify the results significantly in these regions. Verification with the 14C method will solve these problems.

Methods for sampling
SRF is a unique fuel. Unlike coal, SRF can be rather inhomogeneous, both with respect to particle form and size and to the composition. Sampling of SRF therefore puts other demands than sampling of coal. The methods of sampling prepared by CEN/TC343 give full respect to the typical nature of SRF. Using the prescribed sampling methods (field, laboratory and test) assures that all care has been taken to arrive at reliable samples.

Developed methods are:

- EN15442 Methods for sampling. This standard describes methods for taking samples e.g. from production plants, from deliveries and from stock. The lot size is limited at a maximum of 1500 ton. The minimum number of increments of a sample (combined sample) shall be 24.

- EN15443 Methods for the preparation of a laboratory sample. This standard specifies methods for reducing combined samples to a laboratory sample.

- EN15413 Methods for the preparation of the test sample from the laboratory sample. This standard describes the correct sequence of operations and treatment to obtain a laboratory sample in compliance with the analytical procedure.

Methods for determination of SRF characteristics
A series of standards is provided for that describe the proper methods for the determination of physical and chemical parameters.

How to use SRF standards

The CEN/TC343 standards can be used by each producer of SRF on an individual basis. The standards do not require third party control.

Further information

Further information on the standardisation of SRF can be obtained at:

CEN/TC343 eija.makinen@sfs.fi
ERFO geert.cuperus@erfo.info

SRF Standards

PUBLISHED STANDARDS (EN), TECHNICAL SPECIFICATIONS(TS), TECHNICAL REPORTS (TR)

Quality management systems
EN 15357:2011 Solid recovered fuels - Terminology, definitions and descriptions
EN 15358:2011 Solid recovered fuels – Quality management systems

Safety
CEN/TR 15441:2006 Solid recovered fuels - Guidelines on occupational health aspects
EN 15590:2011 Solid recovered fuels – Determination of potential rate of microbial self heating using the real dynamic respiration index (not under mandate)

Specifications and classes
CEN/TR 15508:2006 Key properties on solid recovered fuels to be used for establishing a classification system
EN 15359:2011 Solid recovered fuels - Specifications and classes

Determination of biomass content
CEN/TR 14980:2004 Solid recovered fuels - Report on relative difference between biodegradable and biogenic fractions of SRF
CEN/TR 15591:2007 Solid recovered fuels - Determination of the biomass content based on the 14C method
EN 15440:2011 Solid recovered fuels - Method for the determination of biomass content

Sampling
EN 15442:2011 Solid recovered fuels - Methods for sampling
EN 15443:2011 Solid recovered fuels - Methods for the preparation of the laboratory sample
EN 15413:2011 Solid recovered fuels - Methods for the preparation of the test sample from the laboratory sample

Physical testing
CEN/TR 15716:2008 Solid recovered fuels - Determination of combustion behaviour (not under mandate)
EN 15400:2011 Solid recovered fuels – Determination of calorific value
CEN/TS 15401:2010 Solid recovered fuels - Determination of bulk density
EN 15402:2011 Solid recovered fuels - Determination of content of volatile matter
EN 15403:2011 Solid recovered fuels - Determination of ash content
CEN/TR 15404:2010 Solid recovered fuels – Methods for the determination of ash melting behaviour by using characteristic temperatures
CEN/TS 15405:2010 Solid recovered fuels - Determination of density of pellets and briquettes
CEN/TS 15406:2010 Solid recovered fuels - Determination of bridging properties of bulk material
CEN/TS 15414-1:2010 Solid recovered fuels - Determination of moisture content using the oven dry method - Part 1: Determination of total moisture by a reference method
CEN/TS 15414--2:2010 Solid recovered fuels Determination of moisture content using the oven dry method - Part 2: Determination of total moisture by a simplified method
EN 15414-3:2011 Solid recovered fuels - Determination of moisture content using the oven dry method - Part 3: Moisture in general analysis sample
EN 15415-1:2011 Solid recovered fuels - Determination of particle size distribution - Part 1: Screen method for small dimension particles
CEN/TS 15639:2010 Solid recovered fuels – Determination of mechanical durability of pellets
CEN/TS 15412:2010 Solid recovered fuels- Methods for the determination of metallic aluminium
FprEN Solid recovered fuels 15415-2:2012 - Determination of particle size distribution - Part 2: Maximum projected length method (manual) for large dimension particles

FprEN Solid recovered fuels 15415-3:2012 - Determination of particle size distribution - Part 3: Method by image analysis for large dimension particles

Chemical testing

EN 15407:2011 Solid recovered fuels - Methods for the determination of carbon (C), hydrogen (H) and nitrogen (N) content

EN 15408:2011 Solid recovered fuels - Methods for the determination of sulphur (S), chlorine (Cl), fluorine (F) and bromine (Br) content

EN 15410:2011 Solid recovered fuels - Method for the determination of the content of major elements (Al, Ca, Fe, K, Mg, Na, P, Si, Ti)

EN 15411:2011 Solid recovered fuels - Methods for the determination of the content of trace elements (As, Ba, Be, Cd, Co, Cr, Cu, Hg,Mo, Mn, Ni, Pb, Sb, Se, Tl, V and Zn)