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Key properties on solid recovered fuels to be used for establishing a classification system

Propriétés clés des combustibles solides de récupération à utiliser pour établir un système de classification

Haupteigenschaften von festen Sekundärbrennstoffen als Grundlage zur Erstellung eines Klassifizierungssystems

This Technical Report was approved by CEN on 7 August 2006. It has been drawn up by the Technical Committee CEN/TC 343.

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Foreword

This document (CEN/TR 15508:2006) has been prepared by Technical Committee CEN/TC 343 “Solid recovered fuels”, the secretariat of which is held by SFS.

This document has been drafted on request of CEN/TC 343 Working Group 2 “Fuel Specifications and Classes”. The WG wanted to establish a classification system using practical data on Solid Recovered Fuel (SRF) composition and use. Therefore some delegates involved in the production and use of SRF offered to draft this document.

The WG decided on a classification system based on a limited number of properties. Originally the WG asked for a document covering 7 key properties of SRF: NCV, moisture, ash, Cl, Hg, Cd + Tl and sum of heavy metals. The first draft of the document was discussed at the WG meeting in Lyon on 15 and 16 September 2003. The properties of SRF and the experience with the different technologies were accounted for in the proposed classification system. The emission limit values of the Waste Incineration Directive played a decisive role in establishing the maximum possible content of heavy metals in SRF used as substitute fuel in different technologies.

The WG decided at the meeting in Lyon to reduce the number of key properties from 7 to 3: NCV, Cl and Hg content.

Topics were added covering the questions that had been raised at the Lyon meeting:

— justification of units chosen (Annex C);

— justification of the use of 50th/80th percentile values (Annex E);

— evaluation of data and influence on boundaries of classes (Annex E);

— justification of the boundaries of classes (Annex H).

The main adjustments were made in Clause 5. Annex E and Tables 18 and 20 of Clause 5 have been written with support of Ms Sabine Flamme of INFA.

Concerning the questions raised at the Brussels meeting on 9 and 10 February 2004 and the meeting in Obourg on 24 September 2004, the following modifications have been made:

— the classification of Cd and Tl has been evaluated using practical data. A classification system for Cd has been added if it comes to a need for that;

— additional evaluation of proposed classes of Cl and NCV with practical data has been included.

In making acknowledgements, we would like to express appreciation to the members of CEN/TC 343/WG 2, the members of ERFO and particularly to those companies for making available data and information from their experience with the production and use of Solid Recovered Fuel.

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Introduction

Energy intensive industries are looking for alternative fuels in order to save primary fuels, and by doing so, enforce the development of sustainable development.

The waste management sector industry has developed, for many years, ways to produce secondary fuels e.g. SRFs with reliable qualities, which are used successfully regarding economic and environmental aspects.

However, this way of recovery is not optimized because of some practical uncertainties like:

— obtaining permits to use SRF as an energy source;

— transborder shipment regulation and problems in creating a European market for SRF;

— unclear classification of the SRF in the EC waste list;

— doubt about reliable qualities of some SRF;

— doubt about effect on the processes and installations.

Therefore CEN has received the mandate to establish a set of standards for solid recovered fuel (SRF) prepared from non hazardous waste. CEN/TC 343 has decided to separate the task in five different working groups (WG 1 to 5).

WG 2 has received the task to prepare a proposition of classification system, classes and specifications.

The following Technical Report gives a technical approach based on the processes of final users that have been identified as being (potentially) interested and qualified for the use of SRF on the one hand, and the practical and actual experience of SRF produced in Europe on the other hand.

SRF may only be used by installations complying with the emission limit values set by the Waste Incineration Directive (WID). This Technical Report is based on the characteristics that the SRF should present, in order to fulfil the criteria of the WID and the technical request of the installations. That does not alter the fact that other properties are also of interest considering the specific requirements for different users.

The classification system, the classes and the specifications that are proposed in this Technical Report should help the authorities in writing the permits, be a help for the final user to understand easily what has to be taken into account when dealing with SRF and should increase the positive perception of the public on the use of SRF by saving of natural resources. For example about 50 % of the primary fuel consumption of cement kilns and a substantial share of hard coal and lignite for power production could be substituted by waste. The potential for European Solid Recovered Fuels in 2005 is estimated at more than 10 Mt/a [1], which corresponds to a CO_2-reduction of more than 10 Million tpa. (In this figure only the biogenic fraction and C/H ratio were considered. The reduction due to less emission of methane from landfills would be a factor ~3 of this).

It is of importance to mention that the standardization concerns big SRF streams. It surely does not exclude the possibility to use alternative fuels with other limits or specifications than those presented in this Technical Report. In that case, the waste fuel will not be standardized.

Selection of properties for classes and specifications: a classification system is a system of classes with limit values and valid for all kind of users. Specifications concern specific information related to potential risks for different technologies and plants. Implementing such a system should facilitate trans-boundary shipments, permitting and control for the user of standardized recovered fuels (SRF).

CEN/TC 343/WG 2 has agreed that key properties mentioned below will be used to establish the classification and the specification system for SRF. These properties are significant for one or more of the following aspects: economics (NCV), technology (Cl) and emission (Hg + Cd). Cl has to be mentioned because of the great importance in corrosion, slagging and fouling of boilers. It has been suggested to consider both Cd and Tl. However, the concentration of Tl in SRF is practically nil (see also Annex I), applying this element as part of an environmental parameter would be meaningless.

Table 1 — Key combinations of properties and aspects

Properties	*Key aspect*
NCV Cl [a] Hg + Cd	Economics Technology Emission
[a] Cl may influence emissions of HCl and some heavy metals as chlorides. However, the effect is estimated to be negligible. An influence on the formation of PCDD and PCDF is unlikely under the process conditions in a coal fired power plant and a cement kiln.	

1 Scope

This Technical Report gives background information on key properties to be used for establishing a classification system for solid recovered fuels (SRFs), and a proposal for the classification system and classes for SRF.

2 Overview of practical data

2.1 Specification of users

2.1.1 General

At present the main end-user is the cement industry. But also in lime kilns, SRF has successfully been used for many years. As the technology of cement kilns and lime kilns is very similar in this Technical Report, cement kiln also stands for lime kiln except for heavy metals. However, the market opportunities in the potential bigger market of the power generation sector are increasing. The fourth sector that may become a substantial outlet for SRF is cogeneration CHP (district heating) [1]. Main technologies involved are cement kilns, pulverized coal fired power plants and FBC (fluidized bed combustion) plants. See also Annex A.

2.1.2 Cement industry

The cement industry has a broad experience in the use of waste derived fuels. Hazardous and non hazardous wastes are processed and used as secondary fuel or a mixture of secondary fuel and raw material. Originally the substitution of primary fuels was practised by wet processes, which have higher specific energy consumption than the dominant dry process for the production of clinker. But the use of waste derived fuels, including SRF, is also increasing in the dry process. Cl may cause substantial problems in the dry process in blocking the pre-heater with condensed volatile chlorides. Using a so-called salt bypass increases the tolerance for Cl in the input. Table 2 shows the requirements for SRF. Figures are based on specifications from the end-users from e.g. Belgium, Germany and France.

Table 2 — Specifications [2]

	Unit	*CK*
NCV	MJ/kg ar	5/10 to 12/22 [a] (mean values)
Cl [b]	% ar	0,5 to 1,0 (mean)
		1 to 3,0 (max.)

CK = cement kiln or clinker kiln

[a] There is no maximum value for NCV. The combination of material and energy recovery together in clinker kiln allows the use of poor calorific values, because the ash content in the SRF does not contribute to the energy input.

[b] Cl specification depends on the composition of the input. At high substitution rates, the limits are in the range of 3 % for a cement kiln with a by-pass (depending on the K, Na content) and for a kiln without this system 0,5 % to 1,0 %. For a cement kiln with a wet process, the maximum for Cl is 6 %.