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01-04: Odd biomass fractions – An introduction

There is nothing like "odd biomass" but there is, according to federal European standard, something called "solid recovered fuels". This fuel fraction – or indeed these fuel fractions – is treated in fourteen standards including three that are mainly devoted to solid biofuels. The latter three standards are excluded from this listing:

General aspects:	EN 15357	Terminology, definitions and descriptions
	EN 15358	Quality management systems
Sampling:	EN 15442	Methods for sampling
	EN 15443	Preparation of laboratory samples
Analysis:	EN15400	Determining the calorific value
	EN 15402	Determining the volatile content
	EN 15403	Determining ash content
	EN 15407	Determining the content of C, H and N
	EN 15408	Determining S, Cl, F and Br
	EN 15414	Determining moisture content (3 separate standards)
	EN 15440	Determining content of biomass

Considering that all these standards have been updated or issued during 2010 and/or 2011 it is clear that "recovered solid fuels" is something considered a relatively new phenomenon.

Beside these standards, relevant legal information concerning recovered solid fuel fractions can be found in several federal directives and the reader is referred to http://europa.eu/legislation_summaries/environment/waste_management/index_en.htm . Decisions and directives later than 2010/2011 are – for natural reasons – not included in this handbook.

The over-all scope and system perspective is this (adapted from EN 15357):

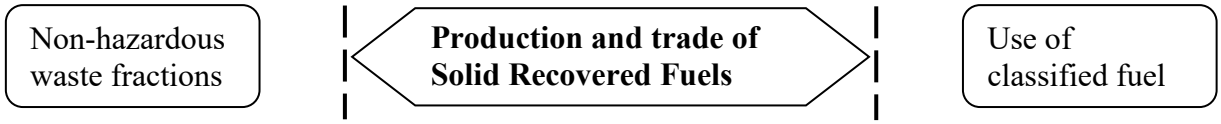

Figure 01-04 1: System limits for solid recovered fuels

The implications of this schematic are:

- The raw material for SRF can be any non-hazardous waste fraction fulfilling the quality criteria set up by a producer/trader.
- The producer/trader upgrades the waste fraction in one or more respects so that it fulfils the quality requirements of a fuel user – an energy plant, for example.
- Then this producer or trader actually handles – per definition – a "solid recovered fuel".

Key words in the schematic are the fact that the raw material must be non-hazardous.

With respect to what is considered hazardous waste, the federal law has generally adopted the definition of the Basel Convention, the full text to be found on the net. However, there are also some further specifications in the federal "List of Wastes" that need to be considered

before a waste resource can be used for energy purposes. In connection with the LoW, one must also consider the special directives valid for waste handling.

The most important parts of the convention text are the annexes where Annex III contains an extensive list of properties, each of which qualifies to render a substance hazardous while Annex I is an extensive list of industrial or societal origins or product classes, each of which renders the waste hazardous. Thus, the Basel convention defines the left-hand side box in figure 01-04 1, namely the raw materials that may be used but it must also be recognized that the individual state may impose their own restrictions following article 3 in the convention.

Though the Basel convention is focused on trans boundary movement of hazardous waste, the annexes in combination with state law will provide the first legal basis to determine what may be used for raw material in the individual state.

Following the above, it becomes clear that the use of recovered fuel is subject to strict constraints and that any fuel production process must be carefully planned. A number of good examples can be found at http://ec.europa.eu/environment/waste/studies/.

It must also be recognized that biomass – in the present context of recovered fuels – is defined as "*the biodegradable fraction of products, waste and residues from agriculture including vegetable and animal substances, forestry and related industries as well as the biodegradable fraction of industrial and municipal waste*".

Hence, the key factors to produce a biofuel from a waste stream will generally consist of the following three steps:
1) Decide that the waste stream is non-hazardous as defined in the Basel convention
2) Determine the actual content of biomass according to EN 15440
3) Decide whether a separation of the biomass is economically and environmentally feasible

In case the outcome from the third step is that the process is feasible, the next stage consists mainly of a choice between three options:
1) Use the separated and clean fraction to produce an upgraded fuel (RDF, refuse-derived fuel or SRF, solid recovered fuel, quality demands for certification being very high) suitable for stand-alone combustion. This option will require a very thorough quality control throughout the fuel production process.
2) Use the separated fraction as a co-combustion fuel in for example cement production kilns or any other industrial processes apt to it. In this case, the demands put on the fuel will be depending on the general demands put on the fuels for the industrial sector in question. In co-combustion applications, the main concern will be the corrosive properties of the fuel fraction, mainly characterized by its content of chlorine and sulphur. Depending on the base fuel composition and the environmental demands set to the plant, also heavy metals may be a major concern.
3) Use the fuel in waste incineration plants designed and aimed for mass burning of municipal solid (household) waste. In this case, the directive on electricity produced from renewable fuels (2001/77/EC) and the waste incineration directive (2000/76/EC) as well as state legislation will apply.

Household waste is, in the Basel convention, in a special category, namely "requiring special consideration". The meaning of this is that household waste may, in some cases, classify as hazardous – sometimes not.

However: In the forthcoming chapters 02-04, 03-04, 04-04 and 05-04, the main focus will be on non-hazardous municipal and household waste.

The major demarcation line between hazardous and non-hazardous fractions is set by the chlorine content and on the content of heavy metals.

The content of chlorine and other halogens is most often connected to plastic qualities and to flame retardants being present in the waste. Hence, the first step to avoid too high chlorine content is to separate plastics into a fraction by itself.

The content of heavy metals and volatile metals such as lead and mercury is most often connected to paint, anti-rotting agents and electrical components being present in the waste. Hence, pressure-impregnated or painted construction or demolition wood as well as any kind of electronics or electrical products must not be present in a waste fraction aimed for combustion.

As will be treated in some detail in chapter 03-04, the separation of waste into different fractions prior to any energetic use is thus absolutely crucial.