

MARKETS FOR SOLID RECOVERED FUEL

Data and assessments on markets for SRF

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Background

In the early nineties industry, and cement industry in particular, began to take an interest in using fuels derived from waste in view of reducing energy costs. When it was not possible to identify these fuels as a monostream (such as tyres, wood) they were generally referred to as 'Refuse Derived Fuel' (RDF). Further to the growing interest in waste derived fuels, waste management companies started to generate some types of "fuel" or RDF. Nevertheless, given that the market was very diffuse, collecting statistics proved a challenge.

When waste derived fuels are produced according to the requirements of the CEN/TC 343 standards (namely EN15359), they are referred to as "Solid Recovered Fuel" (SRF). Today, only a small part of waste derived fuels are produced in accordance with EN15359. Nevertheless, the two terms SRF and RDF are often confused and misused. The fact that a large number of waste management companies are generating RDF, but that the term SRF is incorrectly applied, makes it hard to obtain an accurate overview of the current markets.

For the purpose of this document, three methods are used in order to get a picture of the SRF market:

- Assessment of the potential production of SRF based on EU waste volumes
- Assessment of the current generation of RDF and production of SRF
- Assessment of the potential demand in the EU

All amounts referred to in this document are in million tonnes (Mt).

Production of SRF based on waste volumes

SRF is produced from a wide range of non-hazardous wastes. Important sources include Municipal Solid Waste (MSW), Commercial & Industrial Waste (C&IW) and Construction & Demolition Waste (C&DW). In order to roughly estimate the potential production of SRF (and RDF) from these waste streams, the following is assumed:

- MSW is treated in a sorting plant or in a mechanical biological (pre)treatment (MBT) plant. MBT plants are designed to process mixed household waste as well as commercial and industrial wastes. The output of SRF/RDF is assumed to be 35%.
- In several Member States, MSW is incinerated and thus not available for SRF production. Furthermore, the waste management infrastructure of many Member States still needs to be developed. Based on [EEA, 2013], in 2010 more than 100 Mt of MSW were landfilled in Europe (EU-28 + 5 non-EU countries). Based on these figures, an assumed 50 Mt could become available for the production of SRF/RDF. This figure comes on top of the current production of SRF/RDF from MSW.
- Both C&IW and C&DW are treated in sorting plants. These plants are designed to recover plastics, paper, metals, wood and other inert materials. The SRF output is 15%.
- C&IW includes a variety of waste streams. In most Member States, these waste streams are not monitored separately. In the Netherlands, for example, estimation is possible based on figures related to incineration, amounting to approximately 50% of all MSW. In 2012, according to data from the European Environment Agency, 270 Mt of manufacturing waste were generated in the EU compared to 213 Mt of household waste. Manufacturing waste covers both process-specific waste and mixed waste from offices, shops etc. Estimates would suggest that 50% of all manufacturing waste is a (dry) mixed waste.
- According to [DG Environment] C&DW accounts for 25-30% of all waste generated. The total volume of all waste generated across the EU amounts to 2,515 Mt, according to [EEA]. Therefore, it can be assumed that 630 Mt of C&DW is generated.
- Only mixed C&DW is sorted, accounting for approximately 20% of all C&DW.

Approximately 13.5 Mt of SRF/RDF are used every year (see below). Assuming that 50% of this comes from C&DW and C&IW (although the figure is thought to be lower), some 6.5 Mt of SRF are produced from these wastes. When combined with the data in table 1, a conservative estimate would suggest that 63 Mt of SRF/RDF could be produced each year.

Table 1 - Theoretical volumes of SRF/RDF based on waste volumes

Waste	Arising EU (Mt/year)	Assumption	Potential volume SRF (Mt/year)
MSW	213	<ul style="list-style-type: none"> • 50 Mt additionally available for SRF • Output MBT 35% SRF 	17.5 (in addition to current production)
C&IW	270	<ul style="list-style-type: none"> • 50% available for SRF • Output 15% SRF 	20
C&DW	630	<ul style="list-style-type: none"> • 20% available for sorting • Output 15% SRF 	19

Current use of SRF/RDF

In 2003, a report commissioned by the European Commission estimated that around 3 Mt of SRF/RDF were produced each year in Europe [WRc, 2003]. In 2008, ERFO estimated the production of SRF to be 4-5 Mt/year. This figure was based on data collected from 11 Member States.

A more recent ERFO study (2015) has investigated the use of SRF in the EU per application. This study concludes that the best and most reliable data available comes from cement kilns and dedicated SRF/RDF waste-to-energy plants. These two are currently the biggest markets for SRF/RDF. SRF/RDF are also used in power plants, gasification/pyrolysis, industrial plants, blast furnaces and others, such as lime kilns. Data regarding these other uses are considered as less reliable.

The use of SRF/RDF in the EU is summarised under table 2. In the EU, 12 Mt of SRF/RDF are used in cement kilns and dedicated waste-to-energy plants. The SRF/RDF used in cement kilns makes up 40% of this total.

Table 2 - Current use of SRF/RDF

Use	SRF/RDF (Mt/year)
Cement industry	5
Dedicated SRF/RDF incinerators	7
Others	1.5

Potential markets for SRF

Potential markets for SRF include district heating, industry, power generation and co-combustion with biomass whereby SRF can be used to partially substitute fossil fuels. Dedicated plants which run only SRF can be found, for instance, in the food industry, where SRF is used at substitution rates usually lower than 10%. In biomass power plants SRF provides for much faster combustion compared to wood, therefore enabling rapid process adjustments.

Table 3 summarizes potential markets in the European Union, based on the following assumptions:

- Realistic potential for substitution in the cement industry: 40%
- Realistic potential for substitution in industry: 5%
- Realistic potential for substitution in power plants: 2%
- Realistic potential for substitution in biomass power plants: 2%
- Realistic potential for substitution in district heating: 3%
- The average net calorific value of SRF is assumed to be 14 MJ/kg

Table 3 - Potential demand for SRF

Market	Volume	Source	Potential SRF volume(Mt/year)
Industry	3497 PJ ¹⁾	[Pardo, 2012]	12
Cement industry	522 PJ/year	[CEMBUREAU, 2013, 2015]	12
Power generation	3,13 million GWh	[Eurostat]	16
Biomass power generation	100 Mtoe	[Eurelectric, 2011]	6
District heating	815088 TJ	[Pardo, 2012]	2

¹⁾ Excluding the cement industry

²⁾ Supply of biomass and biogas in the EU in 2010 amounted to 82 Mtoe and is estimated to be 120 Mtoe in 2020. We assume a potential 100 Mtoe (toe = tonnes of oil equivalent).

Conclusions

Currently available data indicate that approximately 13.5 Mt SRF/RDF are used in the EU. 12 Mt are used in cement plants and dedicated waste-to-energy plants. Estimates suggest a further 1.5 Mt are used in other applications. In total, more than 5,000 million m³ of Russian gas is replaced with SRF/RDF.

At this stage, it is only possible to provide a rough estimation regarding potential demand for SRF/RDF. A first attempt assuming very moderate substitution rates shows that the market for SRF could amount to at least some 53 Mt.

A conservative estimate also shows that, today, some 63 Mt of SRF could be produced from mixed wastes such as MSW, C&IW and C&DW.

The cement industry remains an important market for SRF. Fuels derived from waste have been used in the EU cement kilns for over 30 years. The cement industry thereby replaces coal and petcoke for a more sustainable fuel. At the same time the mineral content of waste is recycled as raw material. In the cement industry this combination of energy recovery and material recycling is referred to as “co-processing”. A potential increase in substitution is foreseen from current 5 Mt SRF/RDF to a growing demand of 12 Mt/year in the coming years.

But there is also a huge unused potential in many other industries like paper industry, chemical industry etc. Appropriate measures are needed to boost recycling and, in conjunction, allow for an increase in the production of SRF. If this were to be the case, then at least 50 Mt of SRF could be used in the EU. This would replace almost 20,000 million m³ of Russian gas.

Literature

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