LIFE Project Number

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Deliverable 3.2
RDF/SRF sampling protocol

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LIFE+ PROJECT NAME or Acronym

ENERGY WASTE

Data Project

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Data Beneficiary

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1. Summary

The present deliverable describes the sampling procedure followed during the RDF/ SRF sampling campaign at the Recycling plant of EPANA. The sampling period started on May 2011 and will last 12 months. During this period 12-13 samples will be prepared and analyzed according to the available European Standards. Each final sample is formed by after the mixing of 24 subsamples, taken in a period of four weeks.

2. Sampling procedure

A sampling methodology is defined for the characterization and analysis of the produced RDF according to EN 15442:2011. The sampling time will cover the operation of the plant during a whole year, in order to include and analyse the seasonal variation of quality

According to the standard EN 15442:2011 certain parameters have to be specified before the beginning of the sampling procedure. These parameters presented below, are included in a standardised document called “sampling plan”.

- Overall objectives
- Lot and lot size
- The sampling procedure
- The minimum number of increments
- The minimum sample size
- The minimum increment size
- The effective increment and sample size

In the following figure the steps that shall be followed for the development of the sampling plan are presented :

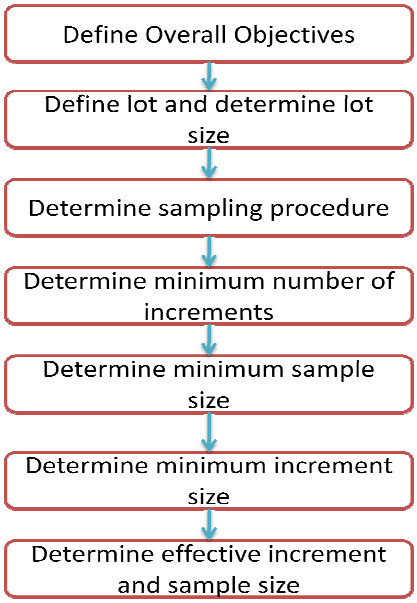

Figure 1: Necessary elements for the development of a sampling plan

2.1 Overall objectives

As mentioned before, the sampling procedure will last 12 months. During this period the main objective is to gather 13 samples that will be prepared and analyzed. Along with the sample analysis, another aim is to use a sampling procedure that will give the opportunity to certify the Residue Derived Fuel as a Solid Recovered Fuel.

2.2 Lot definition and determination of lot size

The annual production of the EPANAs' Material recovery facility comprises about 15.000 tones RDF per year. It was decided that 1 lot would be gathered in 4 weeks (5 days per week) and that it would weight 1.250 tones. This is in accordance with the European Norm (EN 15442), according to which the maximum lot size should not exceed 1500t.

2.3 Determination of sampling procedure

Since there is no sustainable RDF market in Greece, the RDF produced by the EPANA's plant is not thermally utilized in any combustion plant, but it is used as filling material in the existing landfill. For this reason the produced RDF is not shredded in small factions below 5cm, and the raw materials to be used as RDF are compacted in bales. Hence the dedicated RDF shredder at the EPANAs' plant is not in continuous operation. In order to assure representativeness in the sampling procedure, there is a diversion of the conveyor belt to the shredder at a random time each day for 3-5 minutes.

The increment is daily collected from the temporary store that is created, according to the following procedure.

The created static lot is flattened and divided in four regions. Small amounts are then taken from each region randomly, and put together in order to form the increment. The increment is checked by volume to be more than the minimum increment size. The 24 increments are then put together, in order to form the sample. From the gathered sample, the same procedure of sample reduction is followed, in order to divide and finally separate the final sample mass to be taken for analysis. A standardized document with the record details of day and time that each increment was taken is also filled in. The particular document template is given in the Annex.

2.4 Determination of minimum number of increments

The number of increments that was chosen to constitute the sample is 24 which is the minimum number of increments proposed by the standard. Thus, in the 4 weeks of sampling, 1 increment every Monday, Tuesday, Thursday and Friday is taken, while 2 increments on Wednesdays.

2.5 Determination of minimum sample size

According to the standard, two different ways of minimum sample size determination are given. The first one is by using mathematical calculations and the second one is by a quick determination method. The quick determination method involves the use of a table, which gives the minimum sample size as a function of d_{95} and the bulk density by using default values for certain factors that are used. The mesh of EPANAs' shredder is 40x40 mm so d_{95} will be less than 40 mm. According to table D.2. of the standard EN 15442:2011 that gives the minimum sample size in kg in function with d_{95}, it's found that the minimum sample size is determined to be 0,8 kg.

2.6 Determination of minimum increment size

It's calculated that the mass of each increment should be at least 0,8kg/24 = 34g. So each increment is collected so as to fill a plastic bag, with a volume of 2,5lt that is believed to be sufficient for a material with a bulk density of 0,172 kg/lt. Finally the increment weight that is received is 430g.

2.7 Determination of effective increment and sample size

According to standard EN 15442:2011 the effective increment size is defined as the greatest between the minimum increment size and the mass that occurs from dividing the minimum sample size to the number of increments.

Similarly, the effective sample size shall be equal with the minimum sample size, unless the minimum increment size times the number of increments exceeds the minimum

sample size. In this case the effective sample size shall be equal to the minimum sample size divided by the number of increments.
The minimum increment size is determined to 0.43kg and the effective sample size, which is calculated as the effective increment size times the number of increments, is equal with 10.32 kg. This sample amount is dried and then by constant divisions a total sample of 0.8kg is sent for analysis.

Summarizing, the complete sampling plan is presented in the Figure 2 bellow, along with the calculated sizes.

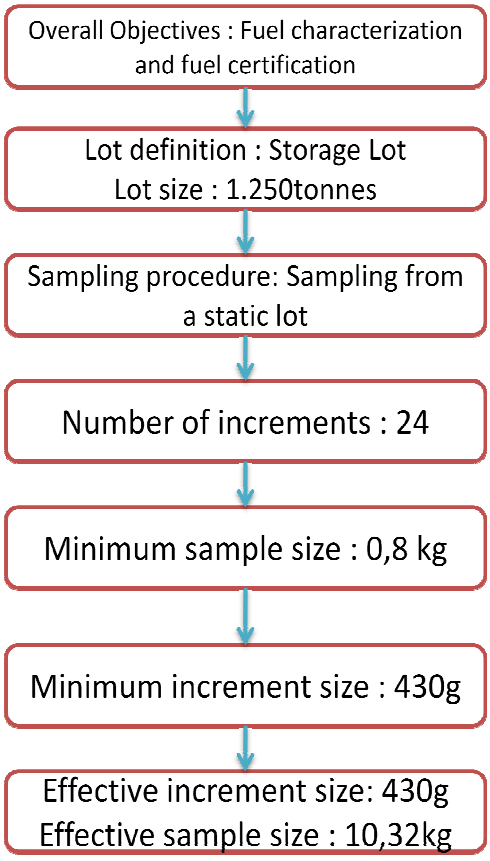

Figure 2: Flow chart on the steps for the development of the sampling plan

Annex

B. 2 Form for the sampling plan

1. General Information		
Project (number)		
Name of Project Leader		
Telephone		
Name of sampler and company		
Telephone		
Sampling date		
Sampling location		
Street		
Town/city		
Description of material for sampling		
Sampling objective		
2. Definition of lot and lot size		
Form taken by solid recovered fuel		(pellets, δέμα, πούδρα, fluff)
Origin of solid recovered fuel		
Lot dimensions		kg
		m^3
3. Information on sampling location and possible sampling procedure		
Which ideal sampling procedure is possible?	□ *mechanical sampling from the drop flow*	
	□ *mechanical sampling from the conveyor belt*	
	□ *sampling from one or more vehicles*	
	□ *sampling from a static lot*	
4. Information on solid recovered fuel		
Bulk components		
Nominal top size		mm
Dominant shape of particles with nominal top size		
Bulk density		kg/m^3
Particle density		g/cm^3
5. Information on increment and sample sizes		
What is the minimum increment size?		kg
		l

What is the minimum sample size?		kg
		l
What is the ultimate increment size?		kg
		l
What is the ultimate sample size?		kg
		l

6. Number of increments to be taken, and the times or locations of the increments					
Increments	**Times**		Coordinates		
			X	Y	Z
Increment number 1	h	min			
Increment number 2	h	min			
Increment number 3	h	min			
Increment number t 4	h	min			
Increment number 5	h	min			
Increment number t 6	h	min			
Increment number 7	h	min			
Increment number 8	h	min			
Increment number 9	h	min			
Increment number 10	h	min			
Increment number 11	h	min			
Increment number 12	h	min			
Increment number 13	h	min			
Increment number 14	h	min			
Increment number 15	h	min			
Increment number 16	h	min			
Increment number 17	h	min			
Increment number 18	h	min			
Increment number 19	h	min			
Increment number 20	h	min			
Increment number 21	h	min			
Increment number 22	h	min			
Increment number 23	h	min			
Increment number 24	h	min			

7. Storage

Nominal top size>>30 mm	No	If possible, decrease the dimensions of each sample to the minimum sample size for the d_{95} concerned
	Yes	If possible, reduce the particles of the sample to a d_{95} of approximately 30 mm or less, and decrease the dimensions of the sample to the minimum sample size for the d_{95} concerned

8. Deviations detected

9. Approval of sampling plan and sampling record

	Name	Signature	Date
Project leader			
Sampler			