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CLIMA.A.3 - Monitoring, Reporting, Verification

Guidance Document

MRR Guidance on Sampling & Analysis – Example Sampling Plan

MRR Guidance document No. 5a, Version of 14 August 2013

Status of this document:

This document is part of a series of documents provided by the Commission services for supporting the implementation of Commission Regulation (EU) No. 601/2012 of 21 June 2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council[1].

The guidance represents the views of the Commission services at the time of publication. It is not legally binding.

This document takes into account the discussions within meetings of the informal Technical Working Group on the Monitoring and Reporting Regulation under WGIII of the Climate Change Committee (CCC), as well as written comments received from stakeholders and experts from Member States.

All guidance documents and templates can be downloaded from the Commission's website at the following address: **http://ec.europa.eu/clima/policies/ets/monitoring/documentation_en.htm**.

[1] **http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:181:0030:0104:EN:PDF**

1 INTRODUCTION

This document supplements GD 5 “Guidance on Sampling & Analysis” by presenting an example sampling plan. For more details on sampling & analysis in the context of the monitoring and reporting of GHG emissions in the EU ETS, please refer to that guidance document[2].

Chapter 2 presents an example for a simple sampling plan for heavy fuel oil, a fairly homogenous fuel.

Note that the examples presented are quite common cases. Nevertheless operators should not be tempted to copy text from this document, but should always define their monitoring methodology in a very installation-specific way, choosing the most appropriate means of monitoring, with the lowest possible uncertainty and highest robustness against errors.

Important note in section 3.2 of Guidance Document 5 on Sampling & Analysis: *"In some cases sampling itself may be carried out by a third party, e.g. the fuel/material supplier. In such a case it is still the operator's responsibility to demonstrate compliance with the requirements in the MRR for sampling plans. This may be achieved by obtaining information and evidence about the sampling plan by the third party. In any event the operator is responsible for correct sampling defined in an appropriate sampling plan in accordance with Article 33 regardless whether sampling or analysis is carried out by the operator or by third parties"*.

2 EXAMPLE 1: HEAVY FUEL OIL

2.1 Case description

A category B installation is burning heavy fuel oil which is delivered on trucks and stored in tanks on-site. The relevant parameters for heavy fuel oil are:

- Approx. 24,000 t CO_2 per year (= major source stream)
- Corresponding to about 7,700 t of heavy fuel oil and approx. 300 truck deliveries per year

A category B installation has to apply tier 3 (laboratory analyses in accordance with Articles 32 to 35 of the MRR) for major source streams other than commercial standard fuels, which applies to heavy fuel oil. Annex VII of the MRR requires a frequency of analyses of at least six times per year for fuel oils.

Section 2.2 shows a sampling plan for this source stream, applying the template given in the Annex of Guidance Document No. 5.

[2] http://ec.europa.eu/clima/policies/ets/monitoring/docs/gd5_sampling_analysis_en.pdf

2.2 Sampling plan

Sampling objectives

Sampling objectives: *Describe the objective(s) of the sampling, e.g. determination of net calorific value, emission factor, oxidation factor*
The determination of the (weighted average) net calorific value and the (weighted average) emission factor of the total amount of heavy fuel oil over the whole year for the purpose of determining the CO2 emissions stemming from its combustion.
Analysis required: *Describe what the laboratory is testing for, e.g. identify constituents to be tested.*
The net calorific value and the carbon content which is needed for calculating the emission factor[3]

Specifications of source stream or mass stream

Name of material or fuel: *Fill in the name of the source stream or mass stream, as used in the monitoring plan*
Heavy fuel oil
Characteristics of the source stream or mass stream: *Describe the relevant characteristics, such as its phase (gas, liquid or solid), if relevant common or maximum particle size of the fuel or material, density, viscosity, temperature, etc., if those properties are relevant for the sampling procedure*
Heavy fuel oil is a highly viscous fuel delivered by trucks exhibiting a density of about 0.8 t/m³ (at 70°C). Transfer requires heating to 70°C. In general, the amount of heavy fuel oil of one truck delivery is considered as very homogenous (see sampling approach below).
Source and origin of the material or fuel: *Describe the source and origin of the source stream or mass stream, e.g. is the source stream delivered continuously, in batches, produced on site, etc?*
Delivered in trucks in batches of approx. 25 t each
Heterogeneity of the material or fuel and causes of variability (spatial and in time): *Describe the heterogeneity of the material, both spatial and in time, and justify (e.g. origin of source stream, stability of manufacturing process).*
Very homogenous within one batch (truck load) and also between different batches

Sampling methodology

Sampling frequency: *Describe the sampling frequency (e.g. "every Monday morning", "every 3 hours", "once per truck load", "once every 200 tonnes",…)*
Once per truck load
Relevant standards: *Describe the relevant standards for the sampling methodology*
EN ISO 3170:2004 (Petroleum liquids - Manual sampling)
Define place and point of sampling: *Specify the place (e.g. the stockpile) and point of sampling (e.g. after delivery or after completion of a deposit). Please note that the sample should be as representative as possible*
The outlet of the heavy fuel oil tank of the truck (bottom of the tank). Increments are taken before and after transfer into the storage tank of the installation.
Equipment used for sampling:

[3] See equation 11 in section 6.3.1 of GD 1.

Describe the equipment used for sampling

- The outlet of the truck's heavy fuel oil tank (heated to 70 °C)
- Connecting pieces for transfer
- Three sealable metal containers (approx. 5 litre capacity)
- Heating jackets for containers and connecting pieces

Sampling approach:

Describe how the sample is taken, e.g. by probabilistic or judgmental approach

From each truck load two increments are taken, one at the beginning and one at the end of the delivery process. Therefore two sampling containers are needed, plus one for the cleaning process (see alternative approach at the end of this paragraph for a simplified approach).

1. Before the start of transfer into the storage tank the outlet of the truck tank is connected to the first container via the connecting piece and heated to 70 °C.
2. The outlet is opened slightly and approx. 3 litres are collected which will be discarded[4]; then the outlet is closed.
3. The first container is replaced by a clean and dry second container.
4. The outlet is reopened slightly again and approx. 3 litres are collected.
5. The container is sealed.
6. The container is labelled (Internal ID, Name of fuel, date and time, Name of sample collector, name of trade partner, truck license plate number)
7. After transfer of the fuel into the installation's storage tank, steps 3 to 7 are repeated for the second increment using the third container.

Sampling pattern:

Define how the sample is taken, e.g. in the case of random sampling describe how inaccessible parts of the population are dealt with; define how a probabilistic approach is implemented, and/or how decisions are made for a judgmental approach

Judgemental sampling:

The heavy fuel oil tank on the truck is sealed and only accessible through the tank outlet.

Sample composition:

Describe whether each increment (amount of material obtained through one single sample action) is analysed individually, or combined with other increments to form a composite sample

Two increments are taken (before and after transfer). Those increments are mixed to form a single sample (one sample for each truck)

Number of increments to be collected:

Describe the number of increments that make up a sample

See above

Increment and sample size:

Describe the size of one increment (the amount of material that is obtained through one single sampling action). The increment size should accommodate all particle sizes present. Describe the minimum sample size. The minimum sample size must take into account the level of heterogeneity of individual particles, to ensure representativeness of the sample.

Increment size: approx. 3 litres

Sample size: Mixing of the two increments using precisely 50 g each.

Composite sample size: Mixing of samples using precisely 2 g each from approx. 50 trucks. Therefore, composite samples are representative for approx. 2 months, resulting in a minimum of six samples to be analysed.

Retained samples (at least 100 g each) are stored for at least 5 years in the "sample archive room", i.e. a well-vented, dark room in the basement of the laboratory building. Temperature is kept between 18 and 25 °C.

Sample reduction or sub sampling (if applicable):

[4] Discarded samples are collected and transferred to the installation's fuel storage tank.

If the overall sample is too large for transport to a laboratory, a sub-sample should be prepared in such a way that the integrity of the sample is protected. If relevant, describe this procedure and justify the representativeness of the final sample
Composite sample size: Mixing of samples using precisely 2 g each from approx. 50 trucks. Retained samples are stored for at least 5 years
Justification of representativeness: *Give a justification that the chosen approach leads to a representative sample. Take into account the source stream or mass stream information and characteristics of the population (i.e. the amount of fuel or material represented by the sample)*
The amount of heavy fuel oil contained on one truck is considered to be very homogenous due to the permanent heating of the truck tank to 70°C and the resulting convection. Still, to take into account any gradients within the tank increments are taken before and after the transfer into the storage tank. The two increments are combined 1:1(wt) to form a sample which is considered to be representative for this one truck delivery. The composite samples (representative for approx. 50 trucks) are mixed again in equal quantities assuming that each truck delivery is about the same amount of heavy fuel oil.[5]
Access, health and safety: *Identify access problems or restrictions that may affect the sampling programme. Identify health and safety precautions.*
In accordance with MSDS (Material Safety Data Sheet)

Procedures for packaging, preservation, storage and transport

Packaging: *Briefly describe the size, shape and material of the containers used, taking into account the risk of adsorption/absorption/reaction*
Increments/Samples: 5 litres sealable containers Composite samples/Retained samples: 250 mL sealable bottles
Sample coding methodology: *Describe how samples are coded. All sample containers should be marked with a unique identifier that is recognized by sampler and laboratory*
Internal ID (prefixes for types of samples: IS (increment/sample), CS (composite sample), RS (retained sample)), name of fuel, date and time, Name of responsible person
Preservation: *Justify how samples are packed and transported in such a way that the conditions at the time of sampling are preserved*
No special preservation required (see storage conditions)
Storage: *Describe how the sample is stored on site and in the laboratory*
In tightly closed containers/bottles stored in a well-vented, dark room in the basement of the laboratory building. Temperature is kept between 18 and 25°C.
Transport: *Describe relevant conditions during storage; Describe or refer to a chain of custody form that should be completed and sent with each sample*
Labelled bottles are transferred accompanied by material information sheets.
Data storage system: *Briefly describe the location and functioning of the data storage system and the information it contains, such as sample date, sample code, stockpile reference number, product type, specific location, size, etc.*
Excel file “Heavy Fuel Oil S&A.xlsx” stored under “P:\\ETS\S&A\”. Type of information: ID, sampled on, sampled by, delivery ID, stored at (location),..

[5] Note that the error associated with that assumption is negligible because variation of amounts will be very low between the trucks and the fuel properties will be fairly consistent.

Analytical laboratory

Company: *Fill in the name of the laboratory responsible for analyses of the sample*
AccrACME Lab Inc.
EN ISO/IEC 17025 Accreditation: *Justify to what extent the scope of accreditation of the laboratory covers analysis of samples described in this sampling plan. If the laboratory is not accredited, please refer to the provided evidence that it meets the relevant criteria of Article 34(3).*
lab is accredited to EN ISO/IEC 17025
Contact details: *Fill in contact details of the analytical laboratory*
Mr John Doe John.doe@AccrACME.com B-1049 Brussels/Belgium
Analyses carried out: *Describe the properties to be analysed (e.g. net calorific value, emission factor, oxidation factor, carbon content)*
Net calorific value, carbon content for the calculation of the emission factor
Standards used: *Describe the relevant standards used for each parameter analysed*
EN ISO XYZ006 and 007