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ICS 13.040.40

75.160.10

**BIOMASS GASIFICATION - TAR AND
PARTICLES IN PRODUCT GASES - SAMPLING
AND ANALYSIS**

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CEN/TS 15439

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English Version

**Biomass gasification - Tar and particles in product gases -
Sampling and analysis**

Gazéification de biomasse - Goudron et particules dans les
gaz produits - Échantillonnage et analyse

Biomassevergasung - Teer und Staub in Produktgasen -
Probenahme und analytische Bestimmung

This Technical Specification (CEN/TS) was approved by CEN on 21 February 2006 for provisional application.

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Contents

	Page
Foreword	3
Introduction	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 Symbols and abbreviations	8
5 Principle of the measurement method	8
5.1 Introduction	8
5.2 Sampling	8
5.3 Analysis	8
6 Reagents	9
6.1 Solvent for tar collection and Soxhlet extraction	9
6.2 Carrier gas in gas chromatography	9
6.3 Calibration standards	9
7 Equipment	9
7.1 Equipment for sampling	9
7.2 Equipment for sample pretreatment and analysis	13
8 Preparation of sampling equipment	13
8.1 Preconditioning of filter thimbles	13
8.2 Cleaning of equipment	14
8.3 Preparation of impinger bottles or Petersen column	14
8.4 Sampling train leak test	14
9 Procedure for sampling	15
9.1 Introduction	15
9.2 Duration of sampling	15
9.3 Sampling procedure	16
10 Storage of samples	16
11 Preparation for analysis	17
11.1 Introduction	17
11.2 Requirements for GC calibration standards and internal standards (ISTD)	17
12 Analysis procedures	18
12.1 Soxhlet extraction procedure	18
12.2 Combination of solvents	19
12.3 Determination of particle mass	19
12.4 Determination of gravimetric tar mass	19
12.5 Determination of individual tar compounds by GC–MS or GC-FID	20
13 Calculation of GC results	21
14 Performance characteristics	21
14.1 Introduction	21
14.2 Performance of the analysis methods (Round Robin tests)	22
14.3 Performance of the whole Technical Specification (parallel tests)	23
15 Test report	24
Annex A (informative) List of most abundant individual organic compounds in biomass gasification product gases	25
Annex B (normative) List of organic compounds for which precision data have been collected	26
Annex C (normative) Dimensions of the Petersen column	27
Annex D (informative) Additional information on Round Robin analysis	28
Annex E (informative) Additional information on parallel tests	34
Bibliography	41

Foreword

This Technical Specification (CEN/TS 15439:2006) has been prepared by Working Group CEN/BT/TF 143 “Measurement of organic contaminants (tar) in biomass producer gases”, the secretariat of which is held by NEN.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this CEN Technical Specification: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

The main contaminants in the product gases of biomass gasification are dust and soot particles, tars, alkali metals, acid gases and alkaline gases. Measuring techniques for these contaminants allow determination of the functioning of the gasifier itself, of the efficiency of the gas cleaning process and of the quality of the cleaned gas to be used in, for instance, a gas engine or gas turbine.

The development of this Technical Specification started out of the need for a reliable method for the measurement of tars. For most contaminants in product gases of biomass gasification, well-developed measurement techniques exist that are similar to techniques used for related technologies, such as coal combustion and coal gasification. For tars, however, no well-developed and widely used measurement techniques existed in these related technology fields. As some of the tars were (and are) seen as the major problem causing contaminants in biomass gasification, manufacturers and other workers in this field used a number of different sampling and analysis methods to determine the level of tars. As a result, comparison of data and definition of clear maximum allowable concentrations for tars was problematic. This formed an obstacle for market introduction of biomass gasification systems, as tars can cause damage or require an unacceptable level of maintenance.

This Technical Specification gives methods for sampling and analysis of tars and particles in product gases from biomass gasifiers operating under atmospheric or pressurised conditions. The sampling and analysis methods in this Technical Specification differ from most of the methods used for sampling organic compounds present in the gaseous emissions from various industrial processes such as flue gases or automobile exhaust gases. The differences are related to the fact that the levels of the organic compounds present in the gasification product gases exceed the levels found in flue gases generally by more than three orders of magnitude. Hence the methods described in this Technical Specification are not intended to be applicable for sampling organic compounds in trace concentrations (sub-ppm range).

The tar-containing biomass gasification product gas is formed by thermal decomposition of biomass at sub stoichiometric conditions (pyrolysis, gasification) and is typically used to produce electricity, heat, or gaseous or liquid biofuels. As tars from pyrolysis or gasification of coal are similar in nature compared to (high temperature) biomass gasification tars, coal tars can also be sampled and analysed with this Technical Specification.

Biomass in this Technical Specification is defined as material of biological origin excluding material embedded in geological formations and transformed to fossil¹⁾. The Technical Specification is developed for uncontaminated biomass, a term being defined in Clause 3 "Terms and definitions". Tests on accuracy and repeatability of the Technical Specification have been performed with uncontaminated biomass. The Technical Specification may also be used for tars produced from gasification of contaminated biomass and for tars produced from gasification of fossil fuels, however, in this case it is up to the user to assess to what extent the concentration and composition of the tars differ from gasification of uncontaminated biomass. Biomass gasifiers, as referred to in this Technical Specification, can be updraft fixed bed gasifiers, downdraft fixed bed gasifiers, stage divided gasifiers, fluidised bed gasifiers, entrained flow gasifiers and other types of gasifiers. Updraft and downdraft fixed bed, fluidised bed and entrained flow gasifiers are described in more detail in a background Technical Report [1].

¹⁾ This definition is the same as the definition of biomass in CEN TC 335 Solid Biofuels

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