SLOVENSKI STANDARD
SIST-TS CEN ISO/TS 21596:2022

01-januar-2022

Trdna biogoriva - Določanje stopnje mletja - Metoda trdega grozda za toplotno obdelana goriva iz biomase (ISO/TS 21596:2021)

Solid biofuels - Determination of grindability - Hardgrove type method for thermally treated biomass fuels (ISO/TS 21596:2021)

Biogene Festbrennstoffe - Bestimmung der Mahlbarkeit - Hardgrove-Verfahren für thermisch behandelte Brennstoffe aus Biomasse (ISO/PRF TS 21596:2021)

Biocombustibles solides - Détermination de la broyabilité - Méthode de type Hardgrove pour les combustibles de biomasses traitées thermiquement (ISO/TS 21596:2021)

Ta slovenski standard je istoveten z: **CEN ISO/TS 21596:2021**

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75.160.40	Biogoriva	Biofuels

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TECHNICAL SPECIFICATION

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CEN ISO/TS 21596

November 2021

ICS 75.160.40

English Version

Solid biofuels - Determination of grindability - Hardgrove type method for thermally treated biomass fuels (ISO/TS 21596:2021)

Biocombustibles solides - Détermination de la broyabilité - Méthode de type Hardgrove pour les combustibles de biomasses traitées thermiquement (ISO/TS 21596:2021)

Biogene Festbrennstoffe - Bestimmung der Mahlbarkeit - Hardgrove-Verfahren für thermisch behandelte Brennstoffe aus Biomasse (ISO/TS 21596:2021)

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European foreword

This document (CEN ISO/TS 21596:2021) has been prepared by Technical Committee ISO/TC 238 "Solid biofuels" in collaboration with Technical Committee CEN/TC 335 “Solid biofuels” the secretariat of which is held by SIS.

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Endorsement notice

The text of ISO/TS 21596:2021 has been approved by CEN as CEN ISO/TS 21596:2021 without any modification.

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Solid biofuels — Determination of grindability — Hardgrove type method for thermally treated biomass fuels

Biocombustibles solides — Détermination de la broyabilité — Méthode de type Hardgrove pour les combustibles de biomasses traitées thermiquement

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Foreword

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This document was prepared by Technical Committee ISO/TC 238, *Solid biofuels*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 335, *Solid biofuels*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Grindability characteristics are of fundamental importance during solid biofuel preparation for energy conversion processes, requiring a predictable particle size distribution. Particles that are too large or too wide in their distribution may result in feeding problems as well as un-burnt fuel passing through the conversion process. Also, in case of processing of biomass for pre-treatment, consistency in particle size determines the yield of such pre-treatment as well as the quality of the final solid biofuel.

The effectiveness of combustion in a pulverized fuel furnace depends strongly on the reactivity and particle size distribution of the pulverized fuel among other factors. For coal, the Hardgrove Grindability Index (HGI) test was developed to characterize the relative grindability of a particular quality of coal relative to a pre-determined standard quality of coal (ASTM D409). The HGI test is an empirical batch method that simulates the continuous grinding and crushing operation of a ball, table or tube type of industrial coal pulverizer, herein also called coal mill. The HGI value is an indication of the degree of grinding required to reach a particular particle size necessary for effective combustion.

Manufacturers of coal pulverizers for preparation of pulverized coal for combustion in coal burning plants provide curves that show the relationships between the HGI for coal, coal mill capacity in terms of tonne/h and coal mill power in kW. This is done as part of the boiler contract and guarantees. It also serves as a first indication as to how to operate a mill when pulverizing different coals with predetermined standard properties. A HGI of 50, which is standard industry convention, implies that 100 % capacity in tonnes per hour (as indicated) can be reached for the coal at a fineness of 70 % less than 75 microns and 99,5 % less than 300 microns. If a coal has a HGI of less than 50 it implies some level of pulverizer capacity loss while on the other hand, a HGI higher than 50 indicates some level of pulverizer capacity gain. The HGI method is internationally accepted and quoted as part of the specification of coal for international trade.

Grindability may also be applied to thermally pre-treated compressed biomass materials, such as pellets, for pulverization in coal mills. Pre-treatment methods for biomass fuels such as torrefaction, steam treatment or hydro-thermal carbonization (HTC) upgrade the properties of biomass making it more effective as a fuel. With increasing interest in the use of such pre-treated biomass fuels for direct co-firing applications in conventional pulverized coal boilers, this method herein describes a laboratory procedure for determination of the grindability of pre-treated biofuels for powder fuel preparation.

The HGI determination is subject to many limitations, including the fact that measurements can be insensitive to the heterogeneous properties of coal that arise from different mineral contents, maceral constituents and levels of maturity. Three relevant adaptations are applied to the standard HGI method in order to extend its applicability to thermally pre-treated biomass fuels. The adaptations and their justification are as follows:

— Amount of sample used for the test determination.

— Particle size used as basis for defining grindability.

— Reference materials for establishing the calibration curve.

0.1 Amount of the sample used for test determination

Coal pulverizers are volumetric devices but with the densities of coals being fairly similar, the capacity of these devices is expressed in mass units per hour. In contrast different biomass materials have different densities. Therefore, the sample amount was changed to the volume (75 ± 0,5) cm^3 of input material, which approximates the bulk volume of the standard reference coal samples with a particle size between 1,18 mm and 600 µm.

0.2 Particle size used as basis for defining grindability

The standard HGI test for coal uses the mass of particles passing a sieve with an aperture size of 75 µm as criteria for determining the grindability and the resulting HGI value. The furnace volume is designed from the knowledge of coals to be utilized so as to provide an adequate residence time for complete combustion. Combustion efficiency depends in part on fuel particle size especially for pulverized coal