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Evaluation and measurement of combustion-induced vibration in gaseous fuel combustion chambers

气体燃料燃烧室的振动等级评价及测量方法

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Table of Contents

Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part

1.Structure and drafting rules for standardization documents" Drafting. Please note that some of the contents of this document may involve patents. The issuing organization of this document does not assume the responsibility for identifying patents. This document was proposed and coordinated by the National Technical Committee for Combustion Energy Saving and Purification Standardization (SAC/TC441). This document was drafted by: Xi'an Thermal Engineering Research Institute Co., Ltd., Hefei Zhigan Technology Co., Ltd., Huazhong University of Science and Technology, Zhejiang University, Jiangsu Sifang Clean Energy Equipment Manufacturing Co., Ltd., Zhejiang Tefu Development Co., Ltd., Zhejiang Xizi New Energy Engineering Technology Co., Ltd. Wuxi Huaguang Environmental Energy Group Co., Ltd., Sichuan Chuanrun Power Equipment Co., Ltd., Sinopec Beijing Yanshan Petrochemical Co., Ltd., University of Science and Technology of China, Xi'an Jiaotong University, Xi'an Fengdong Huaneng Thermal Power Co., Ltd., Huaneng Tongchuan Zhaojin Coal Power Co., Ltd. Shaoxing Weicodo Electric Appliance Co., Ltd., Anhui Fengxing New Material Technology Co., Ltd., Hefei Shunchang Distributed Energy Comprehensive Application Technology Co., Ltd. Co., Ltd., Zhejiang Energy Group Co., Ltd., and Guizhou

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1 Scope

China's national standard for evaluating and measuring the vibration levels caused by gaseous fuel combustion in industrial combustion chambers. Combustion-driven oscillation is the characteristic pathology of gas firing, and it is more than a noise nuisance. It arises when the heat release couples with an acoustic mode of the chamber: a fluctuation in heat release drives a pressure wave, the wave modulates the fuel or air supply, and the loop reinforces itself until the chamber is oscillating at amplitudes that crack liners, break burners and destroy instrumentation in hours. The problem grew with the low-NOx burners that regulation required, because lean premixed combustion is inherently closer to instability than the diffusion flames it replaced. The standard defines the vibration levels produced under typical operating conditions and specifies the requirements and methods for their evaluation and measurement, applying to industrial combustion chambers burning gaseous fuels.

This document defines the vibration levels in the combustion chamber caused by the combustion of gaseous fuels under typical operating conditions and specifies the requirements and methods for evaluation and measurement. This document applies to the evaluation and measurement of vibration levels in industrial combustion chambers burning gaseous fuels.

2 Normative references

The contents of the following documents constitute essential clauses of this document through normative references in this document. For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document.

GB/T 37650 Terms and definitions of combustion methods

GB/T 51306 Engineering vibration terminology and symbols standard JJG676-2019 Vibration Meter Calibration Procedure

3 Terms and definitions

The terms and definitions defined in GB/T 37650 and GB/T 51306 and the following apply to this document.

3.1 Combustion chamber A chamber in which fuel is burned to produce high temperature products.

3.2 A combustion chamber in which the flow direction of combustion products is perpendicular to the ground.

3.3 A combustion chamber in which the flow direction of combustion products is parallel to the ground.

3.4 The operating condition when the vibration amplitude is maximum.

3.5 The root mean square of the vibration velocity at all points within a unit period.

4 Evaluation and requirements of combustion chamber vibration level

4.1 Under typical working conditions, gas fuel burns in the combustion chamber, and the combustion chamber vibrates (hereinafter referred to as vibration) due to turbulent combustion pulsation, etc. The level evaluation is shown in Table 1.