

Aspects of laboratory tests for the determination of the minimum ignition energy of the fuel / dust mixture

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Abstract. During the technological processes of processing, production, handling and storage of combustible dusts, complex explosive mixtures may occur, the characteristics of which, in most cases, cannot be assimilated with the existing data in the specialized literature. If these combustible dusts are mixed with air in appropriate proportions and are initiated by an efficient source of ignition, they can burn rapidly and with considerable explosive force. One of the most common sources of ignition of potentially explosive atmospheres generated by the dust / air mixture is static electricity, materialized by electrostatic discharges. In order to assess the risk of ignition of an explosive mixture of air / dust, it is necessary to know the sensitivity of the explosive atmosphere to ignition, ie the value of the minimum ignition energy of the explosive mixture, which is then compared with the energy resulting from an electrostatic discharge. The paper presents a comparative analysis regarding the methods of determining the minimum ignition energy for air / fuel dust mixtures, using different devices, on the same type of dust.

1 Introduction

The continuous evolution of human society in recent decades has led to an increase in the need for various products, the realization of which requires the widespread use of chemical compounds in the form of dusts and combustible powders. In technological installations through which these combustible dusts and powders are produced, processed, handled and stored, complex explosive mixtures can frequently occur, which, in most cases, cannot be assimilated with the existing data in the literature specialty.

If these combustible dusts are ignited, they can burn rapidly, and if mixed with air in appropriate proportions, they can lead to explosions with considerable force [1].

Therefore, in order to be able to use technical equipment in conditions of maximum safety, in areas endangered by the presence of explosive air / dust mixtures, it is necessary

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the principle of the method, and should be used to establish protection measures to prevent the initiation of explosive dust / air mixtures and to ensure their repeatability in different test laboratories.

The estimation method can be used as a method of interpreting the minimum energy, but still the standardized (quantitative) method is currently the reference method in determining the minimum ignition energy.

References

1. A. Jurca, F. Păun, M. Părăian, D. Gabor, L. Lupu, *Proceedings of the 18th International Multidisciplinary Scientific Geoconference SGEM 2018* **18**, 819-826, (2018)
2. Directive **2014/34/EU** (2014)
3. A. Jurca, D. Gabor, F. Păun, N. Vătavu, M. Părăian, *Comparative study having in view the methods of determination the minimum ignition energy of the air/combustible dust mixtures*, 19th International Multidisciplinary Scientific Geoconference (2019)
4. A. Jurca, C. Lupu, M. Părăian, N. Vătavu, F.T. Iacob-Ridzi, *The importance of determining explosivity parameters of combustible dusts*, *Environmental Engineering and Management Journal* **13**, 1535-1545, (2014)
5. M. Popa., S. M. Nan, M. Părăian, A. Jurca, F. Păun, L. Lupu, N. Vătavu, D. Gabor, *Study of explosive characteristics of combustible powders*, *8th International Multidisciplinary Scientific Symposium „UNIVERSITARIA SIMPRO”* ISSN–L 1842 – 4449, ISSN 2344 – 4754 (2018)
6. A. Jurca, E. Ghicioi, M. Părăian, S. Burian, M. Darie, S. Sicoi, F. Păun, *Implementation and carrying out of laboratory test stands required for conformity assessment of equipment intended for use in potentially explosive atmospheres generated by combustible dusts - IRECEEX, INSEMEX Petroșani, (Romanian) C 43/2005*, (2005)
7. *** EN ISO/IEC **80079-20-2** (2016)