MONITORING THE SO_2 AND THE TEMPERATURE AT THE EMISSION OF SELF-IGNITION PHENOMENON IN A LIGNITE DEPOSIT FROM GORJ COUNTY

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ABSTRACT. Lignite self-ignition generated two major problems for the management of mining exploitation, namely: an economical one, as are compromised enormous coal quantities, and the other regarding air quality, in the atmosphere being eliminated important quantities of sulphur oxides, azoth oxides, carbon monoxide and ash. Starting from these aspects, this paper presents the results of monitoring the noxae emission and of the temperature realized at a self-alight coal deposit.

НАБЛЮДЕНИЕ НА ЕМИСИИТЕ ОТ SO_2 И НА ТЕМПЕРАТУРАТА ПРИ САМОЗАПАЛВАНЕ НА НАХОДИЩЕ ОТ ЛИГНИТНИ ВЪГЛИЩА В РАЙОНА ГОРЖ

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РЕЗЮМЕ. Самозапалването на лигнитните въглища създава два основни проблема при управлението на минните работи,а именно икономически проблем, тъй като се компрометират огромни запаси от въглища и проблем, свързан с качеството на въздуха, тъй като в атмосферата се отделят значителни колечества серни окиси, азотни осики, въглероден окис и пепел. Взимайки предвид тези аспекти, в доклада са представени резултатите от наблюдение на азотните емисии и на температурата, получени в резултат на самозапалването на въглищно находище.

Introduction

The coal self-ignition phenomenon is well-known, as a form of manifestation, from day to day practice of mining units. It can be also stated that from the mining experience appanage, is not missing the ability of determining it, sometimes with sufficient exactness. The self-ignition phenomenon can be explained by the property of coal to absorb thermal radiation and important quantities of oxygen and to start a chemical reaction accompanied by the emission of heat and polluting gas. The self-ignition of a clamp of raw coal is initiated when the temperature produced by the process of coal slow oxidation reaches values between 65^0C and 75^0C. [1]

With contact of different bodies with the atmospheric air, among which coal also, these can increase temperature, in conditions favorable to the evolution of the oxidation process. The phenomenon being called self- heating.

Laboratory researches confirmed by practice, showed that below the critical temperature (about 65^0C), self-heating is produced slowly. After exceeding this limit, the process accelerates the rhythm, leading to self-ignition.

The lignite self-ignition in the deposit provokes important negative effects like:

- material damages and disconnection in the functioning of the mining equipments from the deposit;
- emission of polluting gases (CO, SO_2, etc.) and dusts having a significant negative impact on air quality in the deposit area. [2]

Corresponding to the elements necessary to fire production, self-ignition has three factors:

- coal oxidation predisposition;
- air access to fuel;
- conditions in which takes place the head exchange between coal and the environment.

2. Material and methods

The monitoring of sulphur oxides emissions by electrochemical methods, using combustion gases analyzer, pattern Multilyzer N.G, presented in figure 1, and for the measurement of the temperature, has been used the thermal vision method, using the thermal-vision camera, type Flir, presented in figure 2.

The measurement principle of the Multilyzer N.G combustion gases analyzer is the following: gas absorbed by probe is introduced in the reaction cells when the gas pump is started automatically. But, before, gas is analyzed and

suddenly cooled at the temperature of 4 - 8^{0}C, taking place the precipitation of the condensation with low absorption of NO_2 and SO_2. [3]

Fig. 1. The measurement kit of the combustion gases analyzer, Multilyzer N.G. 1 – central unit, 2 – sampling probe, 3, 4 – temperature sensors, 5 – tension adaptor, 6 – portable printer with infrared data transmission, 7 – hose for clean air calibration of the apparatus, 8 – transportation bag

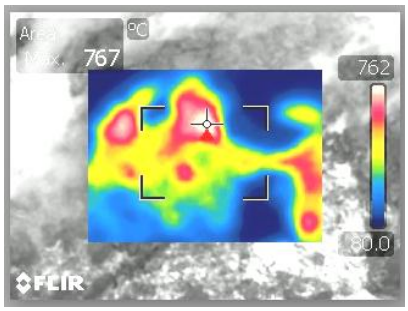
Fig. 2. Thermal vision camera, Flir type

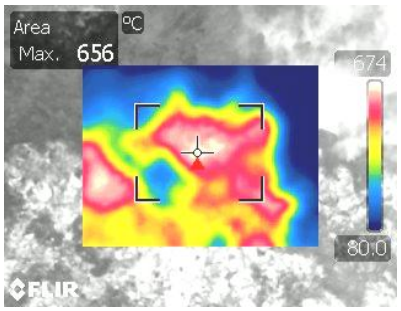
Dry gas passes afterwards through a special filter, to retain solid particles. This filter functions as a water trap. As a result of the Peltier reaction it is issued an electrical signal assumed and processed in the control unit, being presented values of the concentration for the analyzed gases emissions, and the gas excess being continuously released.[4]

3. Results and discussion

Monitoring the emission of SO_2 and temperature has been realised during October 2010, after about one day from the apparition of the lignite self-ignition phenomenon in the coal deposit, taken to study, period in which a third from the lignite quantity stored in piles have been completely burnt out. (fig. 3, fig. 4).

Fig. 3. Pile with self-alight lignite





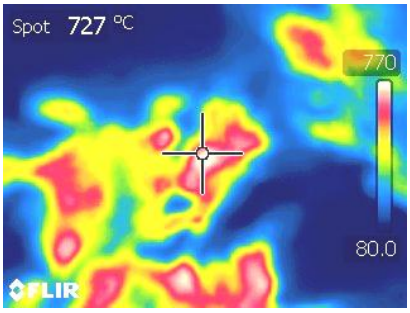
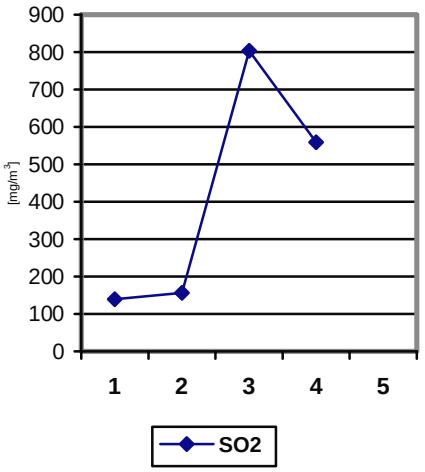


Fig. 4. Maximum temperature registered at the surface of the self-alight coal pile

For the measurement of the sulphur dioxide and azoth monoxide emission have been realised four measurements at a period of 2 hours, whose results are presented in the graphic from figure 5, and for the monitoring of the surface temperature of the pile, have been realized 16 measurements at an interval of 30 minutes (fig. 6).



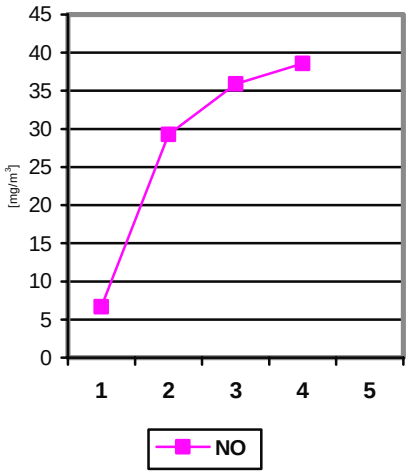


Fig. 5. Measured concentration of the azoth monoxide and sulphur dioxide

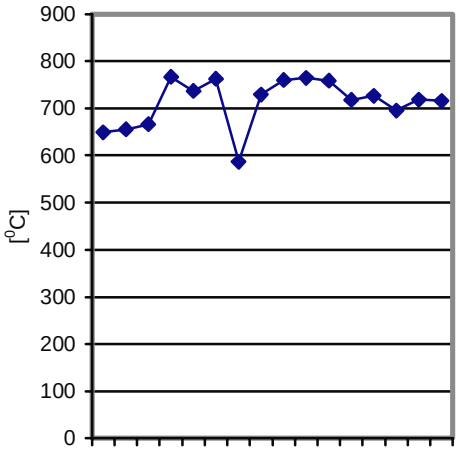


Fig. 6. Measured temperature at the surface of the coal pile

4 Conclusion

- analysing graphics from figures 5 and 6 it can be observed that the self-ignition in coal deposits represent important sources of air contamination and a high degree of fire generating;
- the maximum concentration of SO_2 has been of 803,7 mg/Nm^3, and that of NO of 35,91 mg/Nm^3,
- the temperature at the surface of the coal pile has been between 567^{0}C and 767^{0}C, compromising a third of the lignite quantity stored in the coal pile.

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