

UDC 165.133

## EMISSIONS OF ASH SOLID PARTICLES FROM THERMAL POWER PLANTS WHEN SOLID FUEL IS COMBUSTED

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**Abstract.** *Scientific and technological progress is spreading at a rapid pace. Technologies are gradually being improved, the mechanisms of various apparatuses and devices are being modernized. Working conditions are improving at enterprises that largely depend on the state of the energy industry, which is highly valued in the promising countries of the world. After analyzing the results of the calculation of the emission index of solid ash particles and the dependence of the emission on various particles of fly ash, it was established that obtaining a low concentration of ash waste depends on the quality of the ash-capturing plant and its cleaning capabilities.*

**Key words:** *fine ash dust, benzopyrene, dioxin, fly ash, bottom ash.*

### **Introduction.**

Scientific and technological progress is spreading at a rapid pace. Technologies are gradually being improved, the mechanisms of various apparatuses and devices are being modernized. Working conditions are improving at enterprises that largely depend on the state of the energy industry, which is highly valued in the promising countries of the world. At the current stage of energy development, the question of its interaction with the environment has become very relevant.

The influence of man on the environment in the modern era in many components is close to the gross natural influence, however, from the point of view of the concentration of negative factors, it exceeds the effect of natural effects by orders of magnitude. All this led to the increased interest of humanity in studying the

sources of negative impact on the environment and creating methods for its complete or partial elimination.[1]

Environmental problems of the thermal power industry, which are related to the wear and tear of the main technological equipment, can be solved not so much by the development and wide use of dust and gas cleaning equipment, but also by increasing the efficiency of combustion of organic fuel in combined steam-gas power plants. Such installations are characterized by a wide range of maneuverability, high mobility[2], which makes them indispensable in the event of the need to cover peak loads in the consumption of electrical and thermal energy.

The current ecological situation in Ukraine can be characterized as a crisis, which was formed over a long period of time due to neglect of the objective laws of development and reproduction of the natural resource complex of Ukraine.

Therefore, today the problem of the ecological background of our country has already grown into a problem of global proportions, which must be dealt with comprehensively.

### **Main text.**

Solid particles are fine ash dust, consisting of the smallest particles of solid and liquid substances, divided into groups according to their fractions. Large amounts of particulate matter are released into the atmosphere when coal is burned, including unburned carbon and heavy metal oxides, as well as carbon monoxide and toxic organic compounds such as benzopyrene and dioxin, which are carcinogenic to humans. [3] Also, solid particles are waste in the form of ash particles from the products of fuel combustion in thermal energy installations of the vast majority of TPPs. Therefore, the research is devoted to the calculation of the percentage of solid particles in solid fuel, as well as the calculation of the emission index of the substance of suspended solid particles.

On the basis of the obtained research results, it is possible to develop more effective ways of reducing emissions of harmful substances into the biosphere and contribute to the amortization of the negative impact on the environment and people.

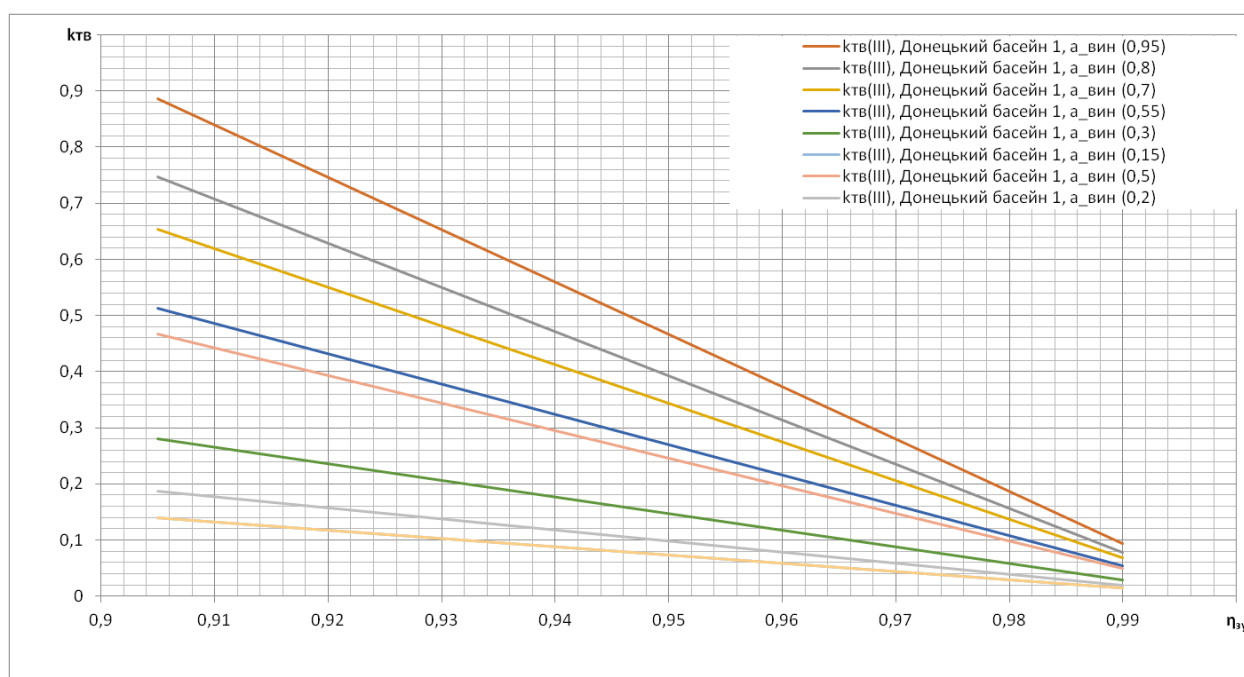
The combustion process is an unconditional factor that contributes to the production of heat and energy. Access to oxygen is a prerequisite for the process of burning substances. As a result of the combustion process, combustion products burn, and slag waste remains. Fuel ash comes out of the power plant in the form of fly ash and or bottom ash (slag). The share of ash that is removed from the power plant in the form of fly ash depends on the fuel combustion technology. Indicator of emission of a

substance in the form of suspended solid particles is defined as specific and is calculated by the formula:

$$k_s = \frac{10^6}{Q_i^r} a \frac{A^r}{100 - \Gamma} (1 - \eta) + k_{ss}, \quad (1)$$

де  $k_s$  solid particle emission index, g/GJ;  $Q_i^r$  lower working heat of fuel combustion, MJ/kg;  $A^r$  mass content of ash in fuel per working mass, %;  $a$  the share of ash that comes out of the boiler in the form of fly ash;  $Q_C$  heat of combustion of carbon to CO<sub>2</sub>, which is equal to 32.68 MJ/kg;  $q_4$  heat losses associated with mechanical fuel underburning, %; efficiency of cleaning flue gases from solid particles; mass content of combustible substances in emissions of solid particles, %;  $k_{ss}$  indicator of the emission of solid products of the interaction of the sorbent and oxides of sulfur and solid particles of the sorbent, g/GJ. [5]

The results of the calculations are summarized in the graph presented below in Figure 1.



**Figure 1. Dependence of the emission of solid particles during the combustion of Donetsk hard coal with different fractions of fly ash**

### Summary and conclusions.

After analyzing the results of the calculation of the emission index of solid ash particles and the dependence of the emission on various particles of fly ash, it was established that obtaining a low concentration of ash waste depends on the quality of the ash-capturing plant and its cleaning capabilities.

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Article sent: 19.09.2023

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