DETERMINATION OF SULFUR OXIDES EMISSIONS WITH DIESEL ENGINE EXHAUST GAS FLOW

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As is known from the analysis of studies of scientists who specialize in ensuring the ecological safety of exploitation process of power plants with reciprocating ICE, except for the legislative normalized directly indicators of its level – mass hourly emissions of particulate matter PM, nitrogen oxides NO_x, unburned hydrocarbons C_nH_m, carbon monoxide CO, exist also legislative regulated indirectly, among which the emission of sulfur oxides SO_x deserves special attention [1].

To account of such emissions in the criteria-based assessment using the mathematical apparatus of the complex fuel-ecological criterion K_{fe}, the value of mass hourly emission $G(SO_x)$ and dimensionless index of the relative aggressiveness of this pollutant $A(SO_x)$ should be determined. In [1] analyzed the composition of sulfur oxides in the structure of exhaust gas (EG) of an reciprocating ICE and found that they are on 94 % composed of SO_2, for which $A(SO_x) = 22.0$. It has also been found that the sources of SO_x occurrence in the composition of EG of diesel engine are sulfur in engine fuels and engine oils, both in the free and in the chemical-bound form. Then the value of $G(SO_x)$ can be determined by the formula (1).

$$G(SO_x) = 2 \cdot G_{fuel} \cdot (C_{Sf} + C_{of} \cdot C_{So}) / 100 = G_{fuel} \cdot k_{SO2}, \text{ kg/h.} \quad (1)$$

where k_{SO2} – coefficient that converts the fuel consumption value into the SO_2 emission value; G_{fuel} – mass hourly consumption of motor fuel, kg/h; C_{Sf} – relative sulfur content of the motor fuel, % mass; C_{So} – relative sulfur content of engine oil, % mass; C_{of} – relative consumption of engine oil through burning, % mass.

Distribution of magnitude of $G(SO_x)$ by the regimes of the ESC standardized steady test cycle (UNECE Regulation No. 49) for 2Ch10.5/12 autotractor diesel and by the field of its operating regimes obtained in this study by the proposed method at $k_{SO2} = 0.015$ is illustrated in Fig. 1.

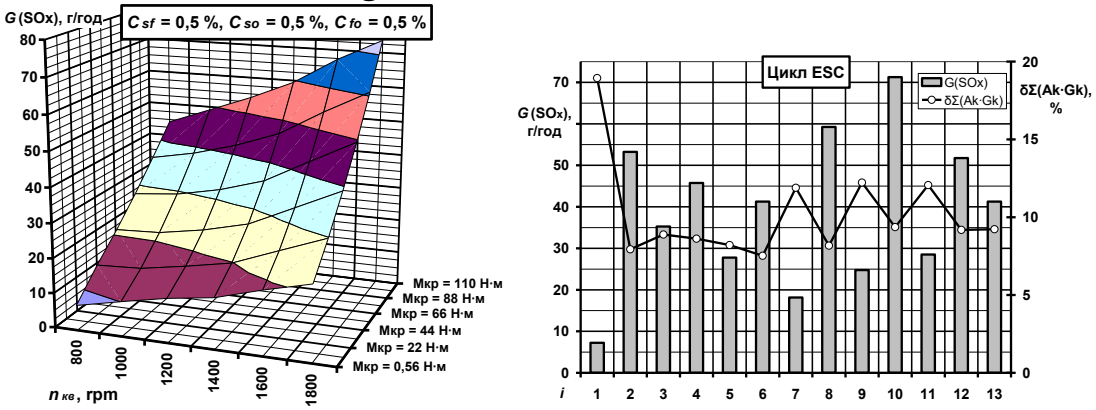

Fig. 1 – Results of the study

References:

1. Кондратенко О.М. Обґрунтування вибору раціональних одиниць вираження вартісних складових комплексного паливно-екологічного критерію / О.М. Кондратенко, С.А. Коваленко // Електронна збірка наукових праць «Е-КОНОМІКА». – 2019. – № 1(3)/2019. – С. 114-118.