Coupled Problems of localization of dust and gas

Konstantin I. Logachev*, Ivan N. Logachev* and Olga A. Averkova*

* Belgorod State Technological University named after V.G. Shukhov
(BSTU named after V.G. Shukhov), 308012 Belgorod, Russia
e-mail: kilogachev@mail.ru, web page: http://www.bstu.ru

ABSTRACT

The problem of localization of dust and gas discharges has a complex multidisciplinary character. [1]

It contains problems of aerodynamics, heat and mass transfer, the theory of machines and mechanisms, mathematical modeling and numerical methods.

In addition, effective devices for localization dust emissions should ensure proper sanitary and hygienic conditions of work at the workplace with minimum power consumption, i. e. directly related to the problems of medicine (the prevention of occupational diseases) and energy efficiency.

The paper outlines the developed mathematical models, computational algorithms for calculation of dust and gas streams in the spectrum of action of local ventilation device of the closed type (aspiration shelter) from nodes overload of granular materials.

Here was used combination of methods of boundary integral equations and discrete vortices, theory of functions of complex variables, theory of jets of perfect incompressible fluid and heterogeneous environments.

In order to reduce energy consumption for the operation of the aspiration shelter is proposed to use of properties of separated [2], swirled and recirculated flows [3].

Separation of flow from sharp edges of thin profiles is used to reduce consumption of air entering, through leaks and unauthorized openings.

An auto-whirling cylindrical exhaust is proposed for reducing the ablation of dust in the aspiration network.

The use of recirculated flows in the ejection of air by the flow of granular materials will allow reducing consumption of ejected air.

Data and developed computer programs can be used for designing efficient devices for dust and gas emissions, being obtained as a result of computational experiments of geometric and kinematic parameters.

REFERENCES

[1] I.N. Logachev and K.I. Logachev, *Industrial Air Quality And Ventilation: Controlling Dust Emissions*, 1th Edition, CRC Press, 2014.

[2] O.A. Averkova, I.N. Logachev, K.I. Logachev and A.K. Logachev. "The principles of separated flow at the inlet of the protruding duct with screens",*TsAGI Science Journal*, Issue 2, pp: 219-243, (2013).

[3] I.N. Logachev, K. I. Logachev, O.A. Averkova and I. V. Kryukov. "Methods of Reducing the Power Requirements of Ventilation Systems. Part 1. Derivation of Hydrodynamic Equations of Air Ejection by a Stream of Free-Flowing Material in a Perforated Trough with Bypass Chamber", *Refractories and Industrial Ceramics*, Vol.55(1), pp:70-75, (2014).