

Anastasiia Losikhina
Y.V. Shishko, research supervisor
I.P. Nikitina, language adviser
National Metallurgical Academy of Ukraine, Dnipropetrovsk

Ore -Thermal Furnaces Flue Gases Dedusting

In titan-magnesium branch ore-thermal furnaces are applied for titanite slags melting. It is furnaces of periodic action with the melting period of 4.5-5 hours, period between heats 0.5-1.0 hour. During work of ore-thermal furnaces smoke gases with such parameters are allocated: expense of gas – 1400 м³/hour, a dust content of gas – 70 г/м³, temperature – 950°C, a content of CO – 80 %. These parameters were measured on several fusions at automatic regulation of pressure under the roof. This furnaces operate in closed mode.

Dust of ore-thermal furnace is a sublimates, combined in conglomerates of particles size 5-10 мкм. To trapping such dust apply various devices of thin clearing of gases. One of such devices is the granular filter. Each specific case of the granular filter application, established behind any technological unit, requires its research. Objective of such researches is definition of dust collection and aerodynamic characteristics. In a general these parameters (the degree of gas cleaning of and its resistance) depend on set of factors. It is possible to present a degree of dust collection and layer resistance by functional dependence:

$$\eta = f(w, Z, d_D, d_B, \mu, H, \rho_D, \rho_G, D, F_{AD}, F_{AUT}, w_S, \tau);$$
$$P = f(w, Z, d_D, d_B, \mu, H, \rho_D, \rho_G, D, F_{AD}, F_{AUT}, w_S, \tau),$$

where w – speed of a gas stream; Z – fundamental concentration; d_D – diameter of dust particles; d_B – diameter of charge particles; μ – coefficient of dynamic viscosity; H – thickness of charge layer; ρ_D – density of dust particles; ρ_G – density of a gas stream; D – coefficient of diffusion; F_{AD} – force of adhesion (interaction of dust particles with a nozzle surface); F_{AUT} – force autohesion (interaction of dust particles with each other); w_C – speed of layer movement; τ – time of dust collection of a.

We suggest using the granular filter with a dynamic layer for its installation behind the ore-thermal furnace for specific conditions. The dynamic layer is characterized by rather stable sizes of aerodynamic resistance and dust collection characteristics.

As a charging material it is offered to use anthracite. Its expense on the filter depends on gas load and speed of layer movement, and these parameters depend on dust collection and aerodynamic characteristics. This will prevent the regeneration of the filter and backfill collected dusts with backfilling to return directly to the furnace.

Flue gases of ore-thermal furnaces contain combustible components, such as carbon monoxide (CO), hydrogen (H₂), methane (CH₄) and others, which are mixed with air and form combustible and explosive mixtures. We offer to use granular filter with afterburner to avoid explosions in the production of titanium slag.