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Research of Dust – Collecting Characteristics of the Granular Filter with a Dynamic Layer

In titan-magnesium branch ore-thermal furnaces are applied for titanite slags melting. 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.

Various devices are applied to 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.

General view of the granular filter, which is intended for catching a dust from under-roof gases of the closed type ore-thermal furnace, can be presented on the slide. Basic elements of the filter are a bunker, a shell with inlet and outlet pipes with jalousie grates located inside them, and a unloading device.

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. But it is not the theme of our investigation.