An approach to formulation of a process for tangential filtration of dust-gas flows is described. Schematic diagrams of structural solutions developed for the filters are discussed. Results are presented for aerodynamic characteristics of the filter for different positions of an adjustable baffle. Basic operational problems are analyzed. The efficiency of the regeneration process is evaluated.

There are two methods of cleaning dust-gas flows by passage through a filter baffle plate. Dead-end (blind-pass) filtration, during which a cake of suspended material that accumulates in proportion to the volume of cleaned gas and dust concentration, is formed on a filter baffle plate (FBP) is one of the simplest and most widespread methods [1]. The increase in cake on the FBP is continuous; this involves an increase in pressure gradient, or reduction in gas flow, as a result of which it is necessary to remove this cake from the FBP.

Cross-flow filtration, which is widely used in membrane technology and attaches increasing significance in gas cleaning, is another method of cleaning dust-gas flows [2]. Note that the term cross-flow is not entirely correct, since it does not fully correspond to the process in which a dust-contaminated gas flows parallel (and not at a right angle) to the FBP. The terms parallel filtration or tangential filtration would be more accurate. Absence of cake or negligible formation of trapped dust on the FBP is characteristic of cross-flow filtration. Particles deposited on the FBP are carried-off (withdrawn) by the flow of dust-contaminated gas. The cleaning efficiency of the gas flow increases with its increasing velocity.

Tangential filters with a small motive force of a self-cleaning FBP are the filters that are most familiar and simplest in terms of design. A filter with flow-through pipes or chambers may serve as an example of the structural shape of these filters (Fig. 1).

The filter functions in the following manner. A dust-contaminated gas is fed under a pressure gradient through pipe 1 into a dust-containing-gas chamber. On passing through FBP 8, the dispersion medium is cleaned of contaminants, delivered to a cleaned-gas chamber, and is then discharged from the vessel via pipe 7. As trapped dust is deposited on the external surface of the FBP, the resistance of the filter increases, and the latter must be cleaned – regenerated. At the moment of regeneration, adjustable baffle plate 3 is dropped to a lower position by means of transverse 5 and flexible inserts 2. Owing to an increase in the velocity of the flow, moreover, a tangential motive force, which contributes to removal of sediment from the surface of the FBP, develops.

During the testing of such a filter, its aerodynamic characteristics were determined as a function of various positions of the adjustable baffle plate. A perforated metallic foil with 75-μm pores was used as the filter material. A dust-gas flow with a dust concentration of 3–5 g/m³ was simulated in a fluidized-bed pulverized-coal feeder. Quartz dust with a lognormal par-
Fig. 1. Diagram showing flow-through filter with adjustable baffle [3]: 1) inlet pipe for contaminated medium; 2) flexible inserts; 3) adjustable baffle; 4) housing; 5) transverses; 6) discharge pipe for concentrate; 7) discharge pipe for cleaned medium; 8) filter baffle plate.

Fig. 2. Distribution of static pressure (a) and velocity field (b) in filter with raised baffle plate when $q = 0.3 \text{ m}^3/\text{(m}^2 \cdot \text{min})$. 

149