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DEVELOPMENT OF A MATHEMATICAL MODEL TO SUBSTANTIATE THE VALUE OF PRESSURE DROP IN THE NET-TYPE FILTER ELEMENT, AT WHICH THE FILTER MUST BE CLEANED FROM MECHANICAL IMPURITIES

Background

Currently, gas control stations use the gas cleaning systems based on filter net, which is the most cost effective for cleaning purposes.

Aims and Objectives

Development of a mathematical model to substantiate the value of pressure drop in the mesh-type filter element, at which the filter must be cleaned from mechanical impurities

Results

In this paper it is proved that the value of the pressure drop at the gas net-type filter element inversely impact on the capital investment into the filter, on the one hand, and on the operating costs associated with the removal of solid particles, on the other hand. On this basis a mathematical model was developed to substantiate the maximum allowed pressure drop in the filter element, caused by gradual clogging of the filter net. The model includes a block diagram, the efficiency function of the integral costs, equations of the balance of expenditure, and limitations of the control parameter. Minimal integral cost of the filter is the taken as a criterion to determine optimum of the efficiency function of the mathematical model. The adopted efficiency function is featured by fractional powers, which makes necessary to solve a complex transcendental equation, and this is a rather time-consuming process of successive iterations. Therefore, to determine the optimal pressure drop across the filter element the numerical method of solving the problem was used, that is, a set of values of the pressure drop with known geometric filter parameters being given, we determine the integral costs. The optimal pressure drop on filter element corresponds to the option with minimal costs. The proposed mathematical model determines the optimal value of the maximum allowable pressure drop on the gas filter.

Key words: natural gas, solid particles, maximum allowed pressure drop, gas filter, a net-type gas filter, mathematical model, substantiation

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