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Mariya Shepelenko
O.V. Zamytskyi, B.M. Litovko, research supervisors
N.O.Holiver, language adviser
Kryvyi Rih National University, Kryvyi Rih (Ukraine)

Simulation modeling of heterogeneous mixture separation in a centrifugal field

As it is known, in the preparation of compressed air and distribution between pneumatic receivers of production, there is a problem of its constant contamination. When transporting compressed air in an air-line and supplying air into air collectors, it is cooled, that causes oil and moisture condensation. As for primary air, characterized by contamination with mechanical impurities, there is a need for additional training.

The process of cooling and cleaning compressed air in devices such as "Venturi tube - centrifugal drip trap" is directly based on the contact of particles of dust and droplets of spray water, with its subsequent separation.

In the study and design of separation processes in the gas-liquid mixture, the common means of computing are widely used. Typically, mathematical modeling is transformed into a complex task that requires a considerable amount of time and effort, especially if it is necessary to investigate the separation processes in a real industrial facility, which usually has a complex design and significant dimensions.

The use of Venturi tubes in wet gas cleaning has been widespread. This is due to a number of advantages: dust cleaning is both fast and efficient, with a fairly simple design of the machine. The process of dusting is directly based on the contact of dust particles and droplets of spray water, with its further separation. [1].

As an object of modeling, a 20-fold reduced model of the separator was selected [2]. The principle of operation is based on the tangential feed of a heterogeneous mixture into a cylindrical body. This geometry of equipment provokes the appearance of centrifugal force of the stream, which leads to the initial separation of moisture.

According to the results of modeling and research by its means of automated design, a sample model that can be used at a laboratory stand to test the adequacy of mathematical modeling data is developed. On conclusion, let us stress upon on that the research is devoted to substantiation of expediency of use of simulation modeling

as a basis for research of separation objects, which allows to significantly reducing time and resources for the manufacture of research objects.

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Ilanit Stashevsk
V.E. Olishavska, research supervisors
M.L. Isakova, language adviser
Dnipro University of Technology, Dnipro, Ukraine

Evaluation of modern methods for determining the hardness of materials

In the twentieth century, a large number of ferrous and non-ferrous metals and alloys, rubber and plastic materials, and composites were developed and introduced into manufacturing. The creation of modern high-quality car parts requires the development and application of new materials and technologies. In recent decades, nanomaterials characterized by a nanoscale level of structural components and higher mechanical properties have received intensive development. Production of car parts from nanomaterials allows reducing weight, linear dimensions and volume, energy consumption, vibration and noise, and increasing the reliability of products. However, the introduction of nanomaterials in production is impossible without new reliable methods of quality control. The work on evaluation of methods for nanohardness measuring and analysis of the possibility and feasibility of their application as a quality control for modern automotive parts has been done in accordance with the curriculum for the preparation of bachelors in the specialty 274 Automobile transport.

Hardness is a property of the surface layer of a material to resist elastic and plastic deformation or destruction under local contact effects from another one, more solid and not receiving permanent deformation of the body (indenter). Modern quality control in the production and repair of automotive parts includes various methods for measuring the hardness of materials. Among the methods for measuring macrohardness (when the load on the indenter is up to 30 kN), the most widely used methods are the determination of Brinell and Rockwell hardness. Microhardness regulates the load on the indenter up to 2 N and the depth of insertion of the indenter from 0.2 μm . Measurement of nanohardness regulates the depth of the indenter (less