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СИСТЕМИ РОЗРОБЛЕННЯ ТА ПОСТАВЛЕННЯ ПРОДУКЦІЇ НА ВИРОБНИЦТВО

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SAVE ENERGY OPTIMIZATION UNDER COOLING OF GRANULATED FERTILIZER

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In many industrial processes, there is a need of bringing granular solids into the contact with cooling medium. One way to do it is to apply a fluid bed. In this process, an upward directed gas stream causes a bed of granular solids to be fluidized. Fluid beds offer advantages in performing processes such as heating, drying, roasting, or cooling.

The mode of operation with positive conveying action is the good technological solution. The material is directed through the rectangular inlet into the process zone. The cooling air is fed through the individual pipe across the entire process area thanks to a special screen bottom. The cooling air flow fluidizes the material. A special conveying chain with flights forming a chamber system conveys the material within a closely controlled resident time through the process zone to the outlet. This positive conveying action at a continuously variable speed allows accurate control of the resident time.

The advanced ability of the fluid-bed heat exchanger is based on the specific characteristics of the granulated material to be processed. In many applications, these are known only to a limited extent. A comprehensive material test giving consideration to physical and chemical aspects is therefore necessary. The chemical laboratory conducts such tests and verifies the results

Heat-exchange equipment with fluidized bed devices is known to play a very important role in fertilizers industry. Two processes are used to produce phosphate fertilizers: run-of-pile and granular. The granular process uses lower-strength phosphoric acid (40%, compared to 50% for run-of-pile). The reaction mixture, a slurry, is sprayed onto recycled fertilizer fines in a granulator. Granules grow and are then discharged to the screens, crushers, cooler and are sent to storage. Thus, the multistage fluidized bed can be used for granular solids cooling. But the solid particles do not reach the thermal equilibrium due to relatively short residence time in cooler.

So, first of all a rational perforated plate construction and optimal regime is needed to establish. Second, we have to propose some method for energy saving

The improvement of the heat-exchange efficiency of cooling equipment can be regarded as one of the most significant tasks of this investigation. One of the ways to solve this problem is the design and practical application of new high-

performance fluidized bed coolers that is based on effective interactions between granules and air stream. The fluidized-bed devices with perforated plates are mainly used for intensive treatment of granulated materials as well as classification under required dispersion factors. Their efficiency was proved on the basis of the results of modern technology analysis and experimental investigation with new approach. In the proposed apparatus a fluidized bed has an perforated plate which is inclined to the horizontal so that excessively sized or dense particles migrate to a collection point from which they may be removed, such as by a gate in the side of the bed

The course and behavior of particles that formed a dense and stable fluidized bed are discussed. Both the experimental and simulation results of this study show that the process of forming a suspension bed can be categorized into an induced stage, a growing stage, and a stable stage. The velocity of air through the orifice directly controls the formation of the bed while the solid flow rate over a considerable range maintains a balanced hold-up in the suspension bed system without downcomers.

The existence of a multiplicity of steady states corresponding to different gas flow rates, for the same feed rate and perforated plate type and slope, was observed. Results show that the design of the plate, the particle feed rate and the gas velocity distribution through the holes affect the stability of the fluidized bed. The simulated results agree qualitatively well with experimental observations.

The research of the combined cooling-classification systems and the development of column apparatus with the perforated inclined plates represented by new coolers is the urgent matter of R&D on this scope. But there are several shortcomings of the granulation process typical design. With the theoretical models developed and tested in this work the different aerodynamic parameters and technical economic factors can be taken into account. Even in the case of single-phase turbulent flows, which have been extensively studied over the last century, the theory has remained at the level of semi-empirical generalizations. The same can be said of two-phase flows, which are physically more complex. Hence the importance of any regularities or laws discovered by experimentation for the future development of a theory of fluidized bed appearance and particles classification is indisputable.

The first part of the investigation deals with the problem of supporting granules into fluidized bed by the minimum air rate. When there is an excess flow of air, it is reasonable to take into consideration its usage and regime optimization. One of the most workable decisions is to use the special devices (perforated plates) to support fluidized bed and increase the average resident time.