IMPROVING THE SAFETY OF FLUIDIZED BED UNITS

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Abstract. The aim of this article is to discuss the peculiarities of working with fluidized bed devices and opportunities for their application in the modern world.

Keywords: fluidized bed, danger, equipment, complex process, corrosion, thermal drying.

Анотація. У цій статті розглядаються особливості роботи з апаратами з псевдозрідженим шаром та можливості їх застосування в сучасному світі.

Ключові слова: киплячий шар, небезпека, обладнання, складний процес, корозія, термічна сушка.

Introduction. The most important problems that arise in the design and operation of chemical equipment are the safe operation of the equipment. Security is an integral part of the reliability issue. Security means the state of protection of man, the society of the environment from excessive danger; property of real processes and systems, including sources of threat and their possible victims, to preserve the state with acceptable possibility of losses caused by adventures; the state of objects and systems in conditions of acceptable risk; occurrence of losses of human, natural and material resources.

Analysis of the question. The creation of large engineering systems, as well as the increase of capacity concentrated in the unit of equipment, makes the problem of aggregate safety more urgent [1].

Improving the reliability and safety of any equipment in the chemical industry involves examining the relevance of the problem to the equipment and reviewing existing methods for solving the problem. A 3D model of the dryer was developed for this purpose [2, 3].

Development of 3D model includes calculation of technological and durable indices (height of fluidized bed, material and thermal balances), compilation of calculated reliability indicators (compilation of the Tree of Responses and calculation of coefficients of significance) [4], representation in a systematic form (present the unit in the form of elements and all external internal connections), the calculation of the gamma-percent residual life of the dryer ammonium sulfate in the fluidized bed (wear rate and residual life).

There are also some operational issues, such as the corrosion of assemblies and parts; wear of connecting surfaces, etc [5].

Wearing of parts, knots and conjugates is one of the main causes of resource depletion. The wear in the units and parts of the dryer ammonium sulfate can be divided into two directions: under the influence of the working environment; wear in friction pairs.

Wearing of friction surfaces is a complex process that involves both purely mechanical (plastic cutting, fatigue damage, etc.) and physicochemical phenomena (molecular entrapment of the oxidation of exposed areas, etc.). The process of wear, in addition to the physical and mechanical properties of materials, is significantly affected by the condition of the surfaces, the pressure, the relative velocities of the rubbing bodies, etc. Wear mechanisms depend on the presence of additional inclusions in the area of contact on the temperature and environmental properties. At this time there is only a qualitative description and explanation of all these phenomena, as well as some attempts at theoretical description of simple mechanisms [6].

Corrosion. There is a kind of gas corrosion (depends on the time and rate of oxidation). Corrosion is observed on all surfaces of parts and components due to the aggressiveness of the environment.

Gas corrosion is the process of destruction of metals and alloys as a result of chemical interaction with gases at high temperatures.

Drying plants of the enrichment factories consist of two parts - a combustion device with blasting units, which is used to produce a gaseous coolant, and in fact dryers with loading and unloading devices, dust collection systems and smoke extractors.

On drying installations, the flue gases used in the furnaces are used as the drying agent, which is obtained in the furnaces when burning solid, liquid or gaseous fuels. The simplest to operate are fireboxes with gaseous or liquid fuels. However, their use is limited by the shortage of such fuel. In concentrating factories, ball-burning solid fuel burners are often used, which are more difficult to operate and automate.

Objective. The process of thermal drying is most often carried out in tube-dryers or drum-drying installations, and in some cases in fluid-bed dryers.

Materials and results. In fluidized bed dryers, a considerable intensity of drying is achieved and the possibility of regulating the residence time of the material on the lattice is created. The drying time is longer than in the drying tubes, which enables a deeper and equable drying of the material. The disadvantage is the significant consumption of electricity required to create a high pressure drying agent (2000-6000 Pa). Significant use of the fluidized bed dryer was obtained in the United States, where instead of drum dryers, especially for coal drying, this method of drying is used.

When drying in a fluidized bed of coal, it is necessary to pay attention to the sanitary standards released into the atmosphere of dust and to improve dust collection schemes. Explosion-proof gas blowers should be used for the installation of operating gas to maintain the required and stable pressure of the fuel gas.

Conclusion. In the modern world, fluidized bed machines have found widespread use in a wide variety of areas. Therefore, their relevance is quite high at the moment and will only grow in the future.

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