УДК 681.515

Абдукодиров Н.

ассистент кафедры прикладной механики

Ферганского политехнического института

Окйулов К.

ассистент кафедры прикладной механики

Ферганского политехнического института

УЛУЧШЕНИЕ ДИЗАЙНА БАРАБАНА СУШИЛКИ.

Аннотация: *в статье приведены уравнения для расчета мощности, затрачиваемой на создание слоя материала в барабанных сушилках. При анализе моделей быстро вращающихся роторных контактных сушилок приведено теоретическое уравнение для определения количества энергии, затрачиваемой на формирование слоя в активном режиме в процессе сушки материала*

Ключевые слова: *барабанная сушилка, слой материала, дисперсный материал, расходуемая мощность.*

Abducodirov N.

Assistant Department of Applied Mechanics

Fergana Polytechnic Institute

Okyulov K.

Assistant Department of Applied Mechanics

Fergana Polytechnic Institute

IMPROVEMENT OF DRUM DRYER DESIGN

The article presents equations for calculating the power spent on the creation of a layer of material in drum dryers. In the analysis of models of fast-rotating rotary contact dryers, a theoretical equation is given to determine the *amount of energy spent on the formation of a layer in the active mode during the drying of the material*

Keywords: *drum dryer, material layer, dispersed material, power consumption.*

Today, various types of dryers are used in chemistry, construction materials, oil refining, food, hydrometallurgy, pharmaceuticals and other industries. Dryers differ from each other in different characteristics. Depending on the method of heating the wet material, the apparatus is divided into convective, contact and other types of dryers. Air, gas or steam can be used as the heat carrier. Depending on the value of the pressure in the drying chamber, there will be atmospheric and vacuum dryers. There will be periodic and uninterrupted apparatus to organize the process.

The material to be dried can be granular, powder-like, pasty or liquid. Natural or forced circulation is used to create the pressure of the drying agent. The drying agent is heated in steam, hot water, fire-powered heaters or by electric current.

Dryers are different according to their structural structure. The industry uses a number of dryers, such as cabinet, chamber, corridor (tunnel), shaft, drum, tubular, auger, cylindrical, turbine, carousel, conveyor, pneumatic, sprinkler and so on.

Drum dryers are used to dry various spraying materials continuously with atmospheric pressure. The drum dryer consists of a cylindrical drum, which is placed at a small angle of inclination (1:15 - 1:50) relative to the horizon. The drum is held in place by means of bandages and rollers and rotated by means of an electric motor and a reducer. The number of rotations of the drum usually does not exceed 5 ... 8 min^{-1}. Wet material is fed through the feeder to the screw-receiving nozzle, where the material dries slightly under the influence of mixing. The material then passes to the inside of the drum. Nozzles are placed along the entire length of the drum. The nozzles ensure even distribution and mixing of the material along the cross section of the drum. Under such conditions, the interaction of the drying agent with the material is effective.

In order to reduce the degree of overheating of the material inside the drum, the material and the drying agent (smoke gases) are in the right direction relative to each other, because under such conditions high temperature hot gases come into contact with the material with high humidity. The velocity of the gases sucked from the drum is kept around 2-3 m / s by a fan to reduce the evaporation of fine particles by the gases. Exhaust gases are cleaned of fine dust in a cyclone before being released into the atmosphere. The dried material is removed from the drum by means of a unloading device. Depending on the size and properties of the grains of the material to be dried, different nozzles are used in the apparatus.

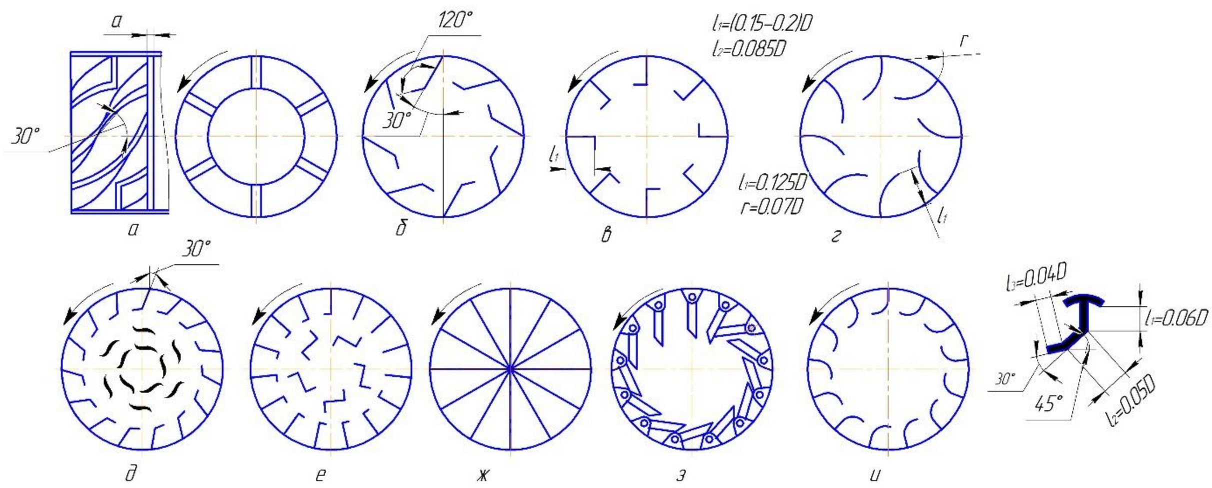

Figure 1. Types of nozzles inside the drum dryer.

The dispersed material accumulated in the gap between the inner surface of the cylindrical drum and the outer end of the rotating paddles is considered to be a quasi-homogeneous medium in which mechanical energy dissipation occurs. In this case, it was considered that the equation of viscosity of a homogenized medium can be described analogously to μ's equation of dispersed materials [2]:

$$\mu = \mu_0 \exp(x\varphi), \qquad (1)$$

where: μ_0 is the viscosity of the dispersed medium in our example: of steam or air; - volumetric concentration of solid particles in the layer; x is the coefficient depending on the shape of the dispersed phase particles.

In this case, the force acting on the shovel:

$$F = 2\pi RL\mu \frac{\omega r_л}{\delta}, \qquad (2)$$

Where r, is the outer radius of the paddles; - the thickness of the gap between the paddles and the drum.

Visual observations and experiments show that the concentration of particles in the field is constant, which allows us to write the following equation:

$$M = F \cdot r_л = 2\pi\omega\mu RL \frac{r_л^{\ 2}}{\delta}$$

In this case, the force required to create and maintain a layer of dispersed material is determined by the following ratio:

$$P = A\omega^m RL \frac{r^2{}_л}{\delta} \mu_0 \exp(x\varphi), \qquad (3)$$

Where: m - 2 for laminar motion mode, and m = 2-3 - for turbulent motion mode; in general, the value of m can be determined experimentally. The value of A is also determined in experiments conducted to determine power consumption.

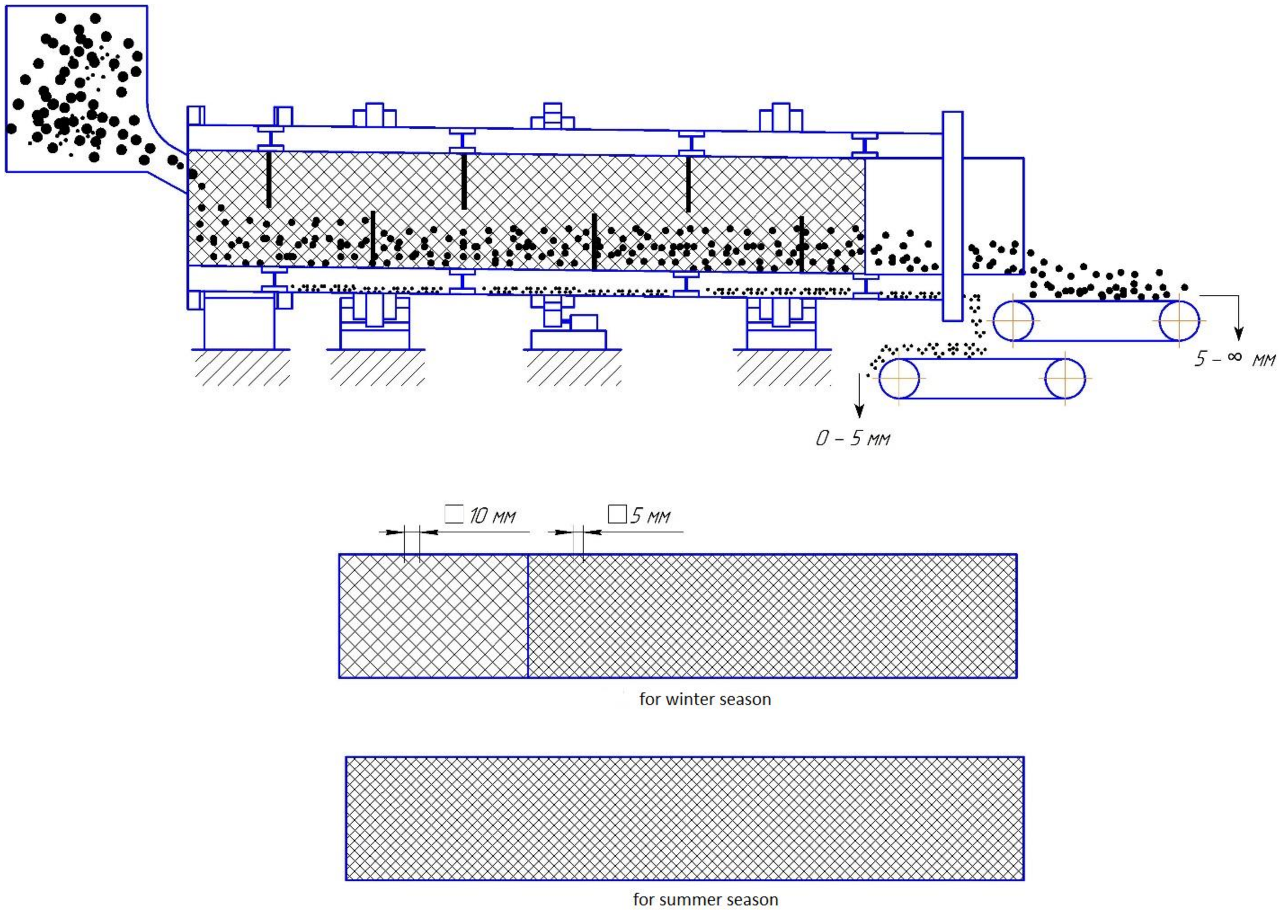

Figure 2. Kinematic scheme of the drying drum

The above kinematic diagram shows a new economical design of a 2.2x14 m dispersed material drying drum. It is mounted on a grid made of St40 steel with a diameter d = 1 m and a thickness of 2 mm along the length of the drum. The centers of the drum and mesh diameter are lowered on top of each other at point O and fastened to the drum body on all four sides at equal intervals. The dried raw material is fed directly to the grid through the feeder. The grid that is installed on the device is made in two different ways. For the summer season (quartz sand humidity 5-8% May-October) the mesh holes are 5 mm, for the winter season (quartz sand humidity 12-18% November-April) the first four meters are larger 10 mm and the rest are smaller 5 mm is prepared as follows. The grids are replaced periodically. The advantage of the installed grid is that it simultaneously sorts and dries the raw material, preventing the breakage of the paddles (nozzles). The contact surface with the raw material and the heating agent increases. As a result, the drying process is accelerated and time and energy consumption are reduced.

References.

1. Ivanov V.E. Drying of dispersed materials in sushilke kipyashchego sloya neprerыvnogo deystviya. Diss… kand. techn. science. - Ivanovo, 2010, - 181 p.
2. Tojiev R.J., Sadullaev X.M., Axunbaev A.A. Mirsharipov R.X. Study of the main parameters of the process of ammonium nitrate granulation // International scientific conference "Global science and innovations 2019: central asia" - Astana, Kazakhstan, 2019.
3. Axunbaev A.A. Mirsharipov R.X. Abdullaeva M.A. Issledovanie gidrodynamiki rotornoy sushilki s bystrovrashchayushchimsya rotorom // Nauchno-tehnicheskiy zhurnal TADI, - Tashkent, 2018. - № 2. - p. 79-82.
4. Tojiev R.J., Axunbaev A.A. Mirsharipov R.X. Optimization konstruktsii sushilnogo barabana na osnove sistemnogo analiza protsessa // Universum: tehnicheskie nauki. - 2020. - №. 11-1 (80).
5. Tojiev, R J.; Axunboev, A. A.; Mirsharipov, R. X.; and Abdukadirov, N. (2019) "Drying glass feed stock in drum drier for manufacturing glass products," Scientific-technical journal: Vol. 23 : Iss. 3 , Article 3. Available at: https://uzjournals.edu.uz/ferpi/vol23/iss3/3