

T.M. KADILNIKOVA, Dr.t.S.,

V.A. KRIVORUCHKO

(Ukraine, Dnepropetrovsk, National Metallurgical Academy of Ukraine)

CHOICE AND GROUND OF SIFTING SURFACES QUANTITY AT CASCADE CLASSIFICATION

In this paper, a method of cascading gravity separation small fraction of materials, which is based on the principle of multiple repetition of the process of separation of the flow of particulate matter on the stage successively established the separation of elements that allows full use of the effect of gravitational separation in the classification of bulk materials on a range of physical and mechanical properties of the particles. Implemented choice of parameters for the separation of the material. As well as an analysis of the required number of screening sites. The proposed method allows to increase the separation efficiency of the material and expand the functionality of the equipment.

Division and classification process of the fine fraction materials is widely used in various industries, from preparation of raw materials up to receiving a qualitative ready product.

The basic data influencing on a choice of a sifting surface and the arrangement scheme are:

- the characteristic of a sorting material (the maximum size of a piece);
- material hit speed on sifting unit, v ;
- sifting unit height, H ;
- sifting grate width, B .

As a rule, elements forming a material stream are included in a sifting unit design. These elements are the deflector, a bumper shield and a grate. The deflector provides change of the traffic movement direction and its speed reduction. The grate provides material sliding and sifting by gravity. The bumper shield carries out material division into smaller fractions. The various design analysis of motionless sifting units showed that these variety can be reduced to 28 standard schemes.

The structural synthesis problem of sifting units is solved by search of 28 schemes, i.e. on initial data one or several schemes are got out, which are satisfying best of all for service conditions.

If sifting unit height lies in the range of $0,7 < H \leq 1,0$, m, then considering high initial speed ($1,2 < v \leq 2$, m/s), a choice of the scheme of sifting is the scheme 28 with a cascade arrangement of sifting surfaces.

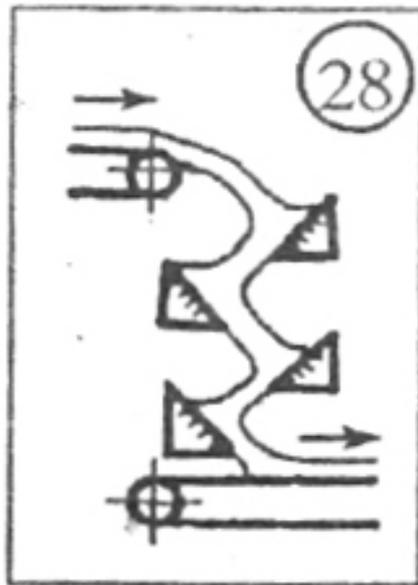


Fig. 1. The sifting scheme with the cascade arrangement of the sifting surfaces

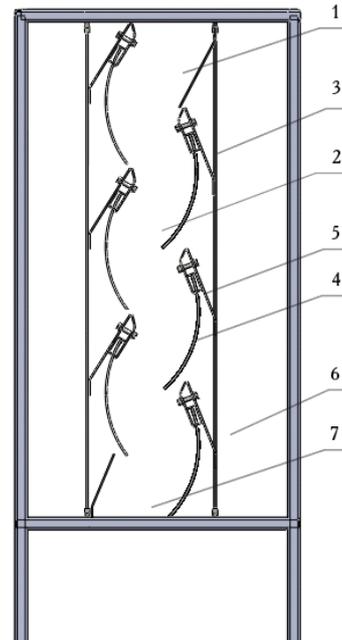


Fig. 2. Longitudinal section of a trammel box with a cascade arrangement of the sifting surfaces

On the basis of the chosen scheme of a fine fraction material division, the trammel with a cascade arrangement sifting surfaces was designed and produced.

At the specified arrangement of sifting units process of a material division is following. The material which needs to be sifted, moves in the cargo receiver 1 where under the influence of its weight and gravity it moves on the vertical channel 2 which is created by two vertical removable sections 3, each of them consists of two springs fixed at the edges in the lower part, connected with each other by inclined deflectors 5. On deflectors there are fire-grates 4, one under another with a certain step in the vertical plane. Sections 3 in a middle part are connected with sources of the compelled fluctuations 9. Regulation of the cargo receiver sizes is carried out by means of stabilizers 8. Material particles which there are less than gaps of a sifting surface, pass in channels 6, and those, which are bigger than gaps or can't sifted under their weight, move on cascade located grates, in passing dissipating, up to an exit of the distributed fractions 7.

Besides crack expansion between gratings deflector installation in the material moving direction is provided. Sifting units are established in such a way that in the material moving direction inclined sites promoting a layer loosening are formed.

According to this loose medium movement scheme, the dynamics particles distribution equation of a target component in the cascade gravitational qualifier is formulated proceeding from a condition that components distribution in a gravitational stream of the non-uniform loose medium happens thereof various physical effects appearance.

The method of cascade gravitational separation of the fine fraction material is

Preparation enrichment process

based on the principle of frequent process repetition of a loose material stream division on the cascade of consistently established dividing elements. The method of cascade division allows effectively dividing of the material particles, differing on one or several physics-mechanical properties (size, density, roughness, elasticity, form, etc.).

This method of division differs increased reliability and allows allocating several fractions for the particles which are different, for example, by the size and density, without cardinal equipment change while initial material properties is changed greatly.

The offered scheme of a material division is based on the principle of frequent repetition division process that leads to multistage movement of particles. In this case it is possible to reach enough good results of division efficiency of a fine fraction material stream at a right choice of sifting unit numbers.

Because of redistribution of the segregated parts of a material stream on separation cells after each of cascade steps, concentration particles of a target component on an each step entrance of separation will be change within each cell depending on the size of the segregation effect reached on the next cells of the previous cascade step.

The offered way purpose is efficiency classification increase of bulks on a complex of particle physics-mechanical properties as at a rapid gravitational current of a fine fraction material stream because of non-uniform particle interaction there is an effect of a segregation that allows claiming that there appeared a stratification of a material stream depending on physics-mechanical particle properties.

Generally division process can consist of "n" sifting units. In this case the division block diagram has the form presented in fig. 3

The probability of allocated fraction transition in the enriched product is described by the dividing characteristic $P(a)$. As considered material division process can be referred to binary, i.e during the division we receive a concentrate of the set fractional structure and elimination, so the probability of receiving elimination can be written down in the form of $P^1(a) = 1 - P(a)$ [1].

Using the balance equations it is possible to define of division efficiency dependences of a material on number of sifting units. Calculation results are given in the table.

Preparation enrichment process

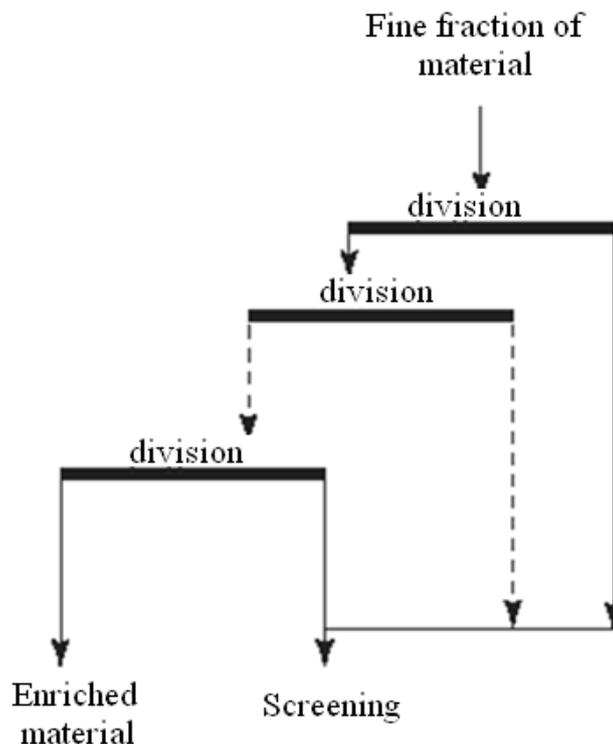


Fig. 3. The block diagram of a material extraction on the cascade located sifting surfaces

Dependence of efficiency (E) gratings on the sifting unit number

n	1	2	3	4	5	6	10	100
	64,4	68,8	70,3	71,0	71,4	71,7	72,2	72,9

From the table follows that division efficiency grows with increase of "n". Use of 6-8 sifting units is optimum, the bigger quantity is inexpedient to use.

The offered way allows using fully effect of gravitational division at classification of loose materials by a complex of physics - mechanical particle properties on the cascade of divided elements, and also allows increasing efficiency of material division and expanding of the equipment functionality.

References

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*Надійшла до редколегії 17.09.2013 р.
Рекомендовано до публікації д.т.н. П.І. Піловим*