A.S. Mnych, associate professor, c.t.s.

RESEARCH OF FACTORS INFLUENCING ON FORMING OF LAYER FOR POLYDISPERSE IRON-ORE MATERIALS

Zaporozhe state engineering academy

There are carried out laboratory researches with the determination of values co-efficients for friction of woobling and sliding on steel and charge. The use of the indicated coefficients, in composition equations of characterizing distribution particles on the height of the formed layer, allows to analyse influence on layer of polydisperse materials of such parameters, as physical-mechanical properties of charge, angle of slope and length of loading tray.

Keywords: sintering process, charge, segregation, polydisperse material, loading tray, vibrofeeder

An agglomeration is the thermal process of preparation for iron-ore raw material to the metallurgical redivision in which combines the using of expensive hard and gaseous fuel. At the metallurgical plants of Ukraine a sintering process is carried out on the agglomerating machines of band type, loading of charge on palletes of machines last produced by means of application of vibrational or drum feeders jointly with a loading tray.

Forming of charge layer on palletes is the very important stage which influences on the segregation of basic components on the height of charge layer, gas-permeability of material, intensity of passing for thermal and physical and chemical processes and renders substantial influence on quality of the got agglomerate, volume of return, quantity of the used fuel and electric power.

Consequently, receipt of presentation abour distribution of factious composition of polydisperse dry material on the height of palletes, determination of factors influencing on forming of charge layer are an actual scientific task.

At this time by the workers of the Zaporozhe state engineering academy are carried out extensive researches of sintering process in the conditions for combines of OAJ «Metallurgical combine «Zaporozhstal», PAJ «Alchevcky metallurgical combine», OAJ «Metallurgical combine by name of Ilich» and basic regularity to law of forming of polydisperse layer of dry materials are set [1].

It is necessary additionally to study influence of basic factors, in particular co-efficient of friction, on the process of segregation of charge and to get dependence of size of its from grain-size distribution dry material.

At productive conditions on conveyor machines mass of dry material moves on the surface of loading tray and slope of the formed layer. Rolling of particles, near on the form to spherical, takes place under the action of gravity forces, as a result of their stratification on factions is happens.

Taking into account that a charge has a high degree of making light, a process can be examined as an aggregate separately locomotive particles of spherical form, freely rolled and sliding off on the surface of loading tray and slope of layer for mate-

rial. At moving of spherical particle on a difficult surface consisting of two inelined planes with the different angles of slope, a few regimes of it motion are possible.

Taking into account indicated higher the features of motion of charge in work [2] two equations characterizing distribution of particles on the height of the formed layer are got.

$$h_i = \frac{l_1 \cdot (sin\,\alpha_1 - f'_{1i} \cdot cos\,\alpha_1) \cdot sin\,\alpha_2}{f'_{2i} \cdot cos\,\alpha_2 - sin\,\alpha_2} \; ; \tag{1}$$

$$h_i = \frac{l_1 \cdot (sin\,\alpha_1 - f_{1i}\,cos\,\alpha_1) \cdot sin\,\alpha_2}{\upsilon \cdot (f'_{2i} \cdot cos\,\alpha_2 - sin\,\alpha_2)} \; , \tag{2}$$

where h_i is position of i particle in a layer in relation to it surface, m; α_1 α_2 are angles of slope of loading tray and surface of slope for layer, hail; f'_{1i}, f_{1i} - are coefficients of friction for woobling and sliding of particle on the surface of loading tray;; f'_{2i} is a coefficient of friction for woobling of particle on the surface of slope of layer, υ is a coefficient of form of particle, for a ball $\upsilon = 5/7$.

Equation (1) corresponds to the regime of the clean woobling, equation (2) characterizes distribution of particles at its woobling with sliding and clean woobling on the surface of slope of the formed layer. Coefficients f'_{1i} and f_{1i}, using in these equations, was determined experimentally, according to methods [3].

It is known that particle of spherical form, being on a flat sloping surface begins motion, if a condition will be executed:

$$\alpha_1 > arctgf'. \tag{3}$$

Thus, coming from equalization (3), angle at which a particle begins motion, is the angle of it friction of woobling.

Drawing on the results of experiments, in the environment of «DataFit» got dependence describing the change of coefficient of friction of woobling f'_{1i} from the diameter of particle was got:

$$f'_{1i} = 0{,}283 - 0{,}0028\,d_i + \frac{0{,}785}{d_i} \; . \tag{4}$$

Rejection of calculation data. got on dependence (4) from experimental values does not exceed 0,014.

Influence of humidity (*W*, %) of sintering chasrge on the size of sliding friction coefficient is characterized by equation:

$$f_{1i} = 0{,}021 \cdot (W + 33{,}1) \; . \tag{5}$$

For determination of coefficient of friction for woobling of granules on the surface of mass for sintering mixture used methods, described at work [4].

Dependence of coefficient of friction for woobling of particle on the surface of monodispersible material from it diameter is characterized by equation:

$$f'_{2i} = 0{,}49 - 0{,}00048 \cdot d_i + \frac{1{,}09}{d_i}. \tag{6}$$

The change of size of coefficient for friction of sliding of charge on the slope of charge was determined according to work [3]. As a result the dependence f_{2i} on humidity is got. At base of experimental data is got equation of kind

$$f_{2i} = 0{,}137 \cdot (W + 10{,}8) \ . \tag{7}$$

The error of calculations on the base of the presented equation does not exceed 0,015.

Conclusions.

As a result of implementation of laboratory researches the values of coefficients for friction of woobling on steel and charge and sliding are certain. Application of its coefficients in composition equations (1) and (2) allows to analyse influence on forming of layer for polydisperse materials of physics and mechanical properties of charge, angle of slope and length of loading tray.

LIST OF LITERATURE

1. *Пазюк, М. Ю.* Теоретические основы движения и взаимодействия дисперсных железорудных масс в процессе формирования их объемных макроструктур [Текст] : дис. … доктора техн. наук / М. Ю. Пазюк. – Запорожье, 1993. – 365 с.
2. *Пазюк, М. Ю.* Особенности формирования слоя полидисперсных сыпучих материалов [Текст] / М. Ю. Пазюк, В. И. Гранковский, Г. М. Туровцев // Известия вузов. Черная металлургия. – 1983. – № 10. – С. 13-16.
3. *Зенков, Р. Л.* Бункерные устройства [Текст] / Р. Л. Зенков, Г. П. Гринкевич, В. С. Исаев. – М. : Машиностроение. – 1977. – 219 с. – Библиогр. : с. 214-216.
4. *Гранковский, В. И.* Исследование физико-механических свойств агломерационной шихты [Текст] / В. И. Гранковский, М. Ю. Пазюк, А. Н. Николаенко // Известия вузов. Черная металлургия. – 1980. – № 10. – С. 15-17.