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MODELLING OF CONTROL SYSTEM BY DISTRIBUTION FOR CHARGE BETWEEN RECEIVING BUNKERS OF SINTERING MACHINES

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Based on the balance method in «Mat Lab» environment modeling are simulated processes of loading and unloading of receiving storage bunkers agglomeration machines for sintered manufactory of sinter plant and also motion control systems dispenser. Conclusions about the influence of operating modes automatic self-unloading trolley to fluctuations of the quantity charge in the reception bunkers sintering machines are made. On the basis of elaborate models it is can carry out researches to choosing of boot modes of technological capacities at dependence from the technological characteristics of the equipment and technological features of sinter.

Key words: agglomeration, storage bunker, charge, automatic self-unloading trolley, performance, modeling.

One of basic workshops of metallurgical plants is sintering tasks of which: preparation of charge, her sintering on sintering machines and treatment of the hot sintered material. Continuity of sintering production needs clear and concerted work of knots and aggregates, which provide a dosage, transporting, overload and averaging of raw materials. In connection with complication of maintenance of clear synchronization and permanent productivity each of areas of workshop use buffer capacities which allow to arrange oscillation between transporting of materials. So, for providing of continuous presentation of charge at every sintering machine the area of receiving bunkers, which carries out maintenance of the set level of charge, providing of supply of material and his additional averaging before further presentation to drum-palletize, serves in the sintered separation of sintered manufactory.

Complication of maintenance of the set quantity of material in bunkers is related to the productivity of loading device, with treason of the productivity of separation of charge and sintering machines, and also complication of measuring of current level of charge. Therefore the area of receiving bunkers of sintered separation of sintered manufactory is considered the basic source of indignations which violate stable work of highways of loading of charge on the ribbon of sintering machines. The conditions of loading of extreme bunkers are considered most critical, that contingently their location on an area.

For diminishing of violations of the normal regime for operations of sintered separation, and thus and increase of the general productivity of sintered manufactory, considerable attention is spared to the questions of research for control system by charge distribution after the receiving bunkers of sintering machines.

Basic complications during automation of charge distribution between the receiving bunkers of sintering machines are related to the type of loading devices in quality of which the movable apply and stationary to the plough of tippers and

automatic self-emitting light carts (autostela), and also choice of the set level of charge, that it is necessary to support in a capacity. So, in the conditions of OJS the «Metallurgical combine «Zaporozhstal» is used distributive device of type autostela, and control after the level of material in receiving bunkers is conducted by means of enunciators, which are located on levels which answer 25 and 75 % filling of capacity. The analysis of the existent regime of autostela operations showed that in the conditions of sintered separation level of material in extreme bunkers below than set, and the necessary supply of charge is not provided. It results to violation of a withstand regime of operations of corresponding sintering machines. Therefore an actual task is determination of the rational regime of motion of distributive device for the terms of concrete production.

For the validation of choice and introduction on the production of distributive devices, and also with the purpose of search of ways of modernization of operating control system by the process of distribution of charge between receiving bunkers, necessary facilities which would allow adequately to estimate by means of numerical experiments made decision and to do corresponding conclusions.

For the decision of the assigned task mathematical description of processes of overload of friable materials was executed by means of the most widespread approach - balance method.

Development of mathematical model of work of area of receiving bunkers was executed for terms by the sintered separations of OJS the «Metallurgical combine «Zaporozhstal». It is known that at implementation of condition of equality of the productivity charge and sintered separations maintenance of necessary quantity of charge is provided in bunkers:

$$\Delta Q = \int_0^{t_y} q_{uu} dt - \sum_{i=1}^n \int_0^{t_y} q_{ag.m.i} dt ,$$

where q_{ch} is the productivity of separation for charge of sintered manufactory, m^3/s ; $q_{ag.m.i}$ is the productivity of sintering machine i , m^3/s ; n is an amount of sintering machines.

Quantity of material, which is in a bunker after his loading consists of quantity of material which stopped behind after unloading to the bunker and quantity of material, that it is high-usage to him for period (t_y) which equals the complete cycle of motion for autoatela.

For realization of numerical experiments the flow diagram of mathematical model is worked out at additions of «Simulink» and «Stateflow» of software environment of «Mat Lab».

Detains for a model are: the productivity of every sintering machine, productivity of autostela, metallurgical characteristics of sintering mixture, volume of bunkers, rate of movement for autostela, distance between bunkers and initial value of quantity of charge in every bunker.

Basic part of model consists of blocks, which are responsible for description of loading and unloading of every bunker and blocks which will realize the algorithms of traffic of distributive device control. A model works off a before starting period,

when loading of all bunkers is carried out to the set initial level of charge, farther later starting and steady periods of work for area of receiving bunkers.

On the developed model research of work for control system by distribution of charge after the receiving bunkers of sintering machines at the successive, cyclic regime and regime «after a call» are executed.

Got results of modeling of work for area of receiving bunkers for the terms of OJS the «Metallurgical combine «Zaporozhstal» was shown, that after the cyclic regime of motion for autostela in a steady period was supported quantity of charge in the volume of from 110 to 131 m³, that answers 25 % of general volume to the bunker, but oscillation of quantity of charge at a later starting bunker 6 at a later starting period presents 72 m³, and in a steady period – 35 m³.

After the successive regime of loading of receiving bunkers at entrance preset parameter the system allows to support the level for supply of charge of from 110 to 130 m³. Thus the vibrations of material quantity in bunkers for period of modeling laid down from 68 to 20 m³. For a later starting period the most vibrations of amount of material looked after in a bunker 6.

In the regime of autostela operations for «after a call» in a steady period maintenance of level for supplies of materials is provided in the bunkers from 100 to 130 m³. Oscillation of charge quantity folds to 53 m³ in a later starting period and to 30 m³ in steady.

Conclusions. Thus, analysis of work all three regimes of loading of bunkers testifies that after the successive and cyclic regimes of autostela operations in a later starting period look the considerable vibrations of charge quantity of in bunkers 6 and 5. The least vibrations of quantity material in a later starting period are fixed during application of the regime «after a call», but in a steady period of this regime of oscillation for charge quantity fold from 20 to 30 m³. Thus application of the considered regimes of autostela operations does not allow to get necessary stable indexes in relation to providing of the set supply of materials in each of bunkers. Therefore additional researches are needed for development of the rational regime of autostela operations.