DEVELOPING A ROTARY MILL-MIXER AT THE KHARKOV TILE FACTORY

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Increasing the output of facing and metlakh tiles demands the development and implementation of new progressive technical processes and highly efficient equipment.

In recent years a great deal of attention has been paid to improving and developing rotary type mills for blunging clays by cutting, abrasion, and also impact from the materials being ground. The blunging of clays occurs during the period of one cycle as a result of the intensive mechanical action of a rotating rotor. The output of the mill reaches 20 tons/h or more.

In 1969 members of the Kharkov Tile Factory under the guidance of director of technical sciences, A. S. Sladkov, developed a multichamber mill-mixer of the continuous rotary type [1]. The principle of the equipment design was the principle of multistaged milling, that is, blunging materials having a low strength, clays, chalk, etc.

The mill-mixer was built by the Voskresensk Machine-Building Factory, and in 1972 was installed at the Kharkov Tile Factory in a new production line for making metlakh tiles by the slip method.

Fig. 1

The industrial testing of the mill* was carried out in collaboration with NIIStroikeramika, and in June 1973 it was introduced into production.

Compared with the single chamber blunger of the semi-industrial type with rigid self-balancing rotor [2], and other similar designs, the latter is distinguished by the fact that the processes of crushing and grinding the viscous, water-retentive materials are separated, and are accomplished sequentially in different sections (chambers).

The mill-mixer (see Fig. 1) consists of a cylindrical frame with depressions (subbases) in the lower part, changing into a trapezoidal form designed for extracting the uncrushed objects, and an eccentrically located rotor with hinged suspension on horizontal axes of the beater hammers in the loading—crushing section, and freely suspended beater-rings in the grinding—blunging sections. The beater-ring and beater-hammer established in this manner positively influence the dynamic stability of the mill, and make it reliable in operation even when large uncrushable objects fall into it.

The frame 1 is lined internally with smooth and corrugated reinforced plating. It is designed in the split form which is convenient for repair, and consists of upper and lower sections connected with bolts 2. In the lateral section of the frame there are two rectangular sections for installing the removable screens 3 with round or slitlike apertures designed for discharging the finished clay suspension, which is collected in the reception hoppers 4 fitted around the screens. Subsequently the suspension is gravity fed through connecting pipes 5 down a sloping gutter, and advances to the vibrating screen and to the settling tanks.

The mill is built on supports 6. The charging funnel 7 measuring 630 × 460 mm is located in the central part of the frame, somewhat displaced relative to the vertical axis toward the rotation of the rotor so as to prevent ejection of the material being ground. The funnel internally has a hollow steel lining 8 with a slitlike aperture system 9, and externally pipes 10, and a collector 11 through which a water solution of electrolytes is continuously fed into the crushing section B, and where technologically necessary into the grinding section C through the pipes 12.

The delivery of the water solution of electrolytes directly into the loading—crushing section through the slitlike apertures 9 located around the perimeter of the funnels, during grinding of viscous, water-retaining raw materials, contributes to good blunging and grinding of the material, and also its homogenization. This tends to reduce the segregation of the clay in the roof and walls of the mill.

The rotor of the mill consists of a shaft 13 fitted onto the roller bearings 14, a round shaped beater 15, and beater-hammers 16. The round beaters of diameter 200 mm are freely established on the axles 17 which are firmly secured on the load-bearing discs 18. The beater-hammers with a width on the front side of 70 mm are suspended on the axles 19 fitted on the fork 20. The discs 18 are welded to the forks 21 which are located on the studs of the shaft and extended in the axial direction of the rotor with nuts. The rotor measuring 900 × 2000 mm is driven by an electric motor 22 through a V-belt drive 23.

* Engineer V. A. Vdovichenko took part in this work.