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CORRIGENDUM
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Corrigendum

The title of document ID/208 should read as above.

Replace pages 18 and 19 by the attached text.

A process for avoiding warping and cracking of tiles made from plastic clay

The warping and cracking of tiles during drying result in poor quality and also cause considerable loss in production. The Central Building Research Institute, Roorkee, India, has developed a process by means of which such losses can be considerably reduced. The process involves the addition of fertilizers in small proportions and uniform drying under controlled conditions. It can be adopted easily by small manufacturers in rural areas as well as in mechanized or semi-mechanized units. No additional machinery is involved.

It is claimed that the process reduces warping and cracking losses by 12 to 15 per cent. It has been satisfactorily tested in a manufacturing unit.

Brick-making machine

While traditional methods of brick making cannot satisfy the heavy demand for bricks in developing countries, fully mechanized imported brick-making plants are much beyond the reach of the small-scale manufacturers, who are interested mainly in plants in which only the shaping of the brick is mechanized and the other operations are carried out manually. Such semi-mechanized plants require far less capital outlay.

Keeping in view the need for developing a machine of modern design, capable of producing about 3,000 wire cut bricks per hour, with an economically low rate of power consumption, the Central Building Research Institute, Roorkee, India, has developed a brick-making machine which has an advanced design and can fully satisfy the requirement of the industry both from the point of view of capital outlay and efficient service. The brick-making machine developed by the Central Building Research Institute is a pug-auger mill incorporating the latest advancement in the design of such machines. It has certain novel features. It is a robust machine of double-deck design. The double-shafted mixer forms the upper deck and the main auger is placed in the lower deck. Provision has been made for a vacuum chamber of large capacity to avoid bridging of clay. An efficient pug-sealer unit has been provided to effect perfect sealing of the vacuum chamber. A straight barrel of 400 mm diameter has been provided for housing the main auger. The auger is of variable pitch design which substantially increases the efficiency of extrusion. The auger works at 25 rpm and it is designed to give an output of 3,000 wire-cut bricks per hour. The bearings of the auger and mixer shafts have been so placed that they do not come in the line of clay flow. All bearings are either roller or ball, requiring very little attention for maintenance. Separate drives have been provided for the mixer and the main auger. The power required to drive the mixer is 30 hp and that for the main auger is 35 hp. A 2 hp motor drives the vacuum pump. All wearing parts, namely blades and augers, have been tipped with hard wearing alloy. Detailing has been done in a manner permitting easy replacement of worn-out parts without requiring dismantling of shafts or other driving gears.

A machine with an output of 3,000 bricks per hour is considered to be the smallest economic unit. This is in conformity with the output of the smallest economic kiln producing about 20,000 bricks per day (24 hours). The main body of the machine comprises various machined castings of cast iron. The castings house the various mild steel carbon steel shafts. The shafts are supported by roller and ball-bearings. The drive to the shaft is arranged by machined mild steel and cast-iron gears. The auger blades have been fabricated from mild steel tipped with hard stellite alloy.

Standard components such as reduction gear, electric motors and vacuum pump have been used. These are controlled by automatic star-delta starters. So far, the manufacturing licences have been issued to five parties. The complete machine including belt conveyor, cutting table, motors and starter is sold for about $7,500.

The licensor is the National Research Development Corporation of India, 61, Ring Road, New Delhi 110024, India.

Continuous brick kiln

The only continuous kiln being used by the building brick industry in India is the Bull's trench kiln. This kiln is well known for its low thermal efficiency and the low quality of the products burnt in it. Moreover, this kiln works only during the dry season.

Keeping these aspects in mind, the Central Building Research Institute (CBRI), Roorkee, India, has designed and developed a high draught continuous kiln with a burning capacity of 15,000 bricks per day. This kiln can be burnt throughout the year, is thermally as efficient as Hoffmann and related kilns commonly used in advanced countries, and costs much less to construct.

The kiln is an archless, coal-fired continuous kiln in which the fire follows a zigzag path. The setting area is divided into a number of chambers by partition walls. The partition walls are built with unfired bricks and are dismantled at the time of unloading the bricks from a chamber. Draught is provided by a fan and the products of combustion are channelled through a system of flues. The flow of gases is controlled by suitable dampers. The kiln has proved to be highly efficient. Fuel consumption is low, 120 kg per 1,000 bricks, compared with 180 to 200 kg per 1,000 bricks normally consumed in Bull's kilns. The quality of the product is also highly satisfactory. This kiln has already been licensed to a number of brick manufacturers.

Common building bricks of good quality are used in all brickwork. No fire brick is required for any part of the construction. Except in the foundations, where

lime concrete is used, the entire brickwork is constructed with mud mortar. The shed over the kiln is supported with tabular trusses and corrugated iron sheets are used as cover. The trusses are supported by steel stanchions. The drawings and estimates for such kilns with capacity of up to 30,000 bricks per day can be supplied. It is considered that a kiln with a burning capacity of 20,000 bricks per day would be the smallest economic unit at an estimated capital outlay of $10,000.

The licensor is the National Research Development Corporation of India, 61, Ring Road, New Delhi 110024, India.

Manufacture of fly ash sand-lime bricks

Sand-lime bricks are generally manufactured by curing, under saturated or atmospheric pressure of steam, a pre-moulded mixture of sand/siliceous material, lime and water. The Central Building Research Institute of India has developed a process substituting part of the sand with fly ash obtained from thermal power stations using pulverized coal.

The mixture of sand, fly ash and lime is thoroughly mixed in semi-dry condition and pressed in a suitable press at the optimum pressure. The pressed bricks are steam-cured in a reservoir and then dried in the sun for a day.

The process is simple and the plant and machinery are easily fabricated. The bricks are light and have a low water absorption. They can be used a day after their manufacture. Since they have a uniform and smooth surface, a saving of about 30 per cent of the mortar and plastering is expected.

The capital investment for a plant manufacturing 3,000 bricks per hour, working in three shifts a day for 300 working days a year is about $55,000.

The process is available for licensing from the National Research Development Corporation of India, 61, Ring Road, New Delhi 110024, India.

Clay fly ash building bricks

The Central Building Research Institute of India has developed a process of using in the brick industry fly ash obtained from thermal power stations using pulverized coal. Addition of fly ash results in economy in firing and lighter and better burnt bricks. It also reduces the drying shrinkage of the bricks and is of particular advantage for black-cotton clays which produce drying cracks in the bricks.

The capital investment for a manual mixing plant with a production of 30,000 bricks per day is estimated to be $60,000.

The process is available for licensing from the National Research Development Corporation of India, 61, Ring Road, New Delhi 110024, India.

Sintered fly ash lightweight aggregate

The Central Building Research Institute of India has developed a process for the use of fly ash (a waste product from thermal power stations using pulverized coal) in combination with clay and coal for producing aggregates required in building construction. These aggregates are light and have a bulk density of about 650 to 700 kg/m^3 which compares favourably with 1,400 kg/m^3 for stone aggregates. They can be used for in-situ concrete work, for the manufacture of load-bearing and non-load-bearing masonry blocks and other pre-cast concrete units such as roof and floor slabs.

Powdered fly ash, clay and pulverized coal are fed in suitable proportions into a pan pelletizer. The pellets are then fed into a sintering machine which is equipped with a variable speed travelling grate, drying and ignition hoods with oil burners, wind-boxes connected to suction blowers and recycling devices for the hot gases. The sintered products are allowed to cool and are then fed to a jaw crusher and sieved into three fractions.

The licensor is the National Research Development Corporation of India, 61, Ring Road, New Delhi 110024, India.

Note: "Ash utilization", *Application of Modern Technologies to International Development*, April 1972, p. 37; Aerospace Corporation, "Technical and economic factors associated with fly ash utilization", *Application of Modern Technologies to International Development*, January 1973, p. 11.

Lime sludge based masonry cements

Large quantities of waste lime sludge in the form of finely precipitated calcium carbonate are available from carbonation process sugar factories, sulphate and soda process paper mills, tanneries and calcium carbide based acetylene industries. The Central Building Research Institute of India has developed a specially formulated masonry cement that can be made by intergrinding waste lime sludge with portland cement.

The masonry cement made of portland cement limestone or slag blend requires the addition of an air entraining agent for better workability and water retention. Otherwise, the mortar remains harsh, non-plastic and non-cohesive. The lime sludge based masonry cement, however, owing to high surface area and porosity of precipitated calcium carbonate sludges, possesses good workability and water retention properties even without an air entraining agent. Also by using lime sludges, the intergrinding costs are substantially lower.

The fixed capital required for setting up a plant of 4,800 tons per annum is estimated to be $30,000. It is estimated that normal portland cement and the mortars made from this cement are expected to be 30 per cent cheaper.

The process is available for licensing from the National Research Development Corporation of India, 61, Ring Road, New Delhi 110024, India.

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