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## A Press for Sand Lime Bricks

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Sand lime bricks, also known as calcium silicate bricks, have been popular in the Western countries. There are over 200 factories in West Germany producing 6500 million sand lime bricks, while India has only one factory in operation producing about 3 million such bricks annually. Progress of this industry in India is held up mainly due to the non-availability of a suitable press. Different types of presses used in this industry are discussed. A prototype rotary table press designed for the production of sand lime bricks is described.

**B**RICK is the most common building material in India. The production of bricks falls much below the market demand and this shortage is becoming more acute day by day due to the increased building activity in both urban and rural areas. It has been realized that traditional clay bricks alone cannot meet the heavy demand for building bricks and hence the potential for sand lime brick industry has been recognized. These bricks are common in many foreign countries, specially West Germany, Russia and Netherlands. West Germany has more than 200 factories producing these bricks, whereas India has got only one factory set up in Kerala on the basis of imported knowhow and machinery.

The process for the production of these bricks, depicted in Fig. 1, consists of three main operations: mixing, pressing and curing. Sand and lime are thoroughly mixed in a mixer or blender with a little quantity of water added during mixing and a semi-dry mixture is obtained. This mixture filled in the moulds is then pressed at a pressure of 200-300 kg/cm<sup>2</sup> provided in a suitable press. The green bricks are taken off the press table and loaded on trolleys for onward transmission to the steam curing chambers (autoclaves). The bricks are cured for 4-6 hr in these chambers in an atmosphere of saturated steam having a pressure of about 14 kg/cm<sup>2</sup>. The cured bricks are then taken out of the autoclaves and are sent to the store or building construction sites for use. These types of bricks normally possess the following characteristics: Compressive strength, 105-560 kg/cm<sup>2</sup>; thermal conductivity, 10.3-13.6 g cal/cm hr °C; and density, 1.60-2.1 g/cc.

### Types of presses

The main equipment for the production of sand lime bricks is a press which apart from exerting the required pressure for the compaction of bricks, gives a reasonably high production rate. There are two main types of these presses: (i) rotary table type, and (ii) reciprocating table type.

### Principle of operation of the presses

*Rotary table type press*—This type of press consists of a horizontal, rotating table containing 4-8 pairs of moulds. The table is rotated in such a manner that while the first pair of moulds is being charged with the sand-lime mixture, the next pair of moulds is under the pressure head, while the third pair is under ejection. The fourth pair of moulds is under the cleaning operation (Fig. 2A). Both the pressing and ejection of the bricks are achieved simultaneously by using two different rams. The output of this type of presses ranges from 1000 to 4500 bricks per hour.

*Reciprocating table type press*—This type of press has a horizontal, reciprocating table containing two pairs of moulds. Fig. 2B shows the principle of operation of this press. At position 1, the filling of the exact amount of sand-lime mixture takes place; at position 2, the required pressure is applied and at position 3, the ejection of bricks occurs. The output of this type of press is about 3600 bricks per hour.

Generally the rotary table type presses are

# PRESS FOR SAND LIME BRICKS

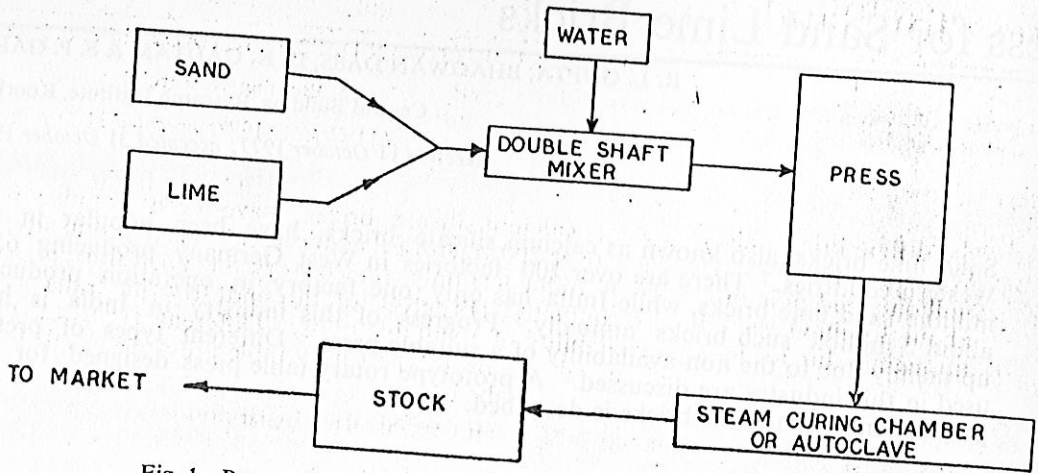
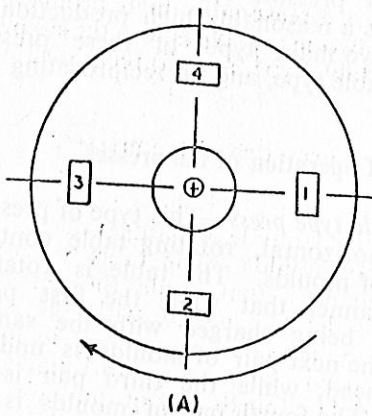
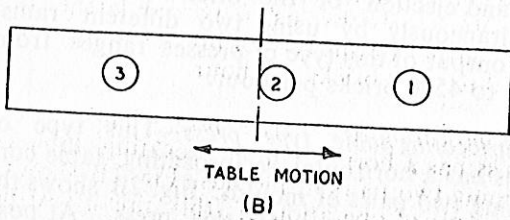


Fig. 1—Process for the production of sand lime bricks : Schematic diagram



(A)



(B)

Fig. 2 (A)—Principle of operation of the rotary table press [(1) filling of the mix into the first mould; (2) pressing of the bricks into the second mould; (3) ejection of the green bricks from the third mould; and (4) cleaning of the fourth mould].

(B) Principle of operation of the reciprocating table press [(1) filling of the mould; (2) pressing operation; and (3) ejection of bricks]

preferred for the reason that the table of these presses can accommodate larger number of moulds (and hence the higher rate of production); yet the presses are available in compact models.

## Design considerations

Because of the wide acceptability of rotary table presses for the production of sand lime bricks and the non-availability of indigenous design for such presses, a rotary table press with a capacity of about 1000 bricks/hour has been designed in this institute.

A rotary table press can be operated mechanically or hydraulically. In mechanically operated presses, the pressure on the rams is obtained by toggle levers, eccentric and connecting rods, whereas in hydraulically operated presses, the pressure is applied with a motorized oil pumping unit. Hydraulically operated presses are compact, smooth in operation and have the advantage of greater flexibility in the control of pressure. Their maintenance cost is low due to less number of moving parts. They have wider adaptability for different pressing operations. The pressure exerted in hydraulic presses is more uniform.

Keeping in view the above facts, a prototype rotary table hydraulically operated press has been designed in this institute. Fig. 3 shows the



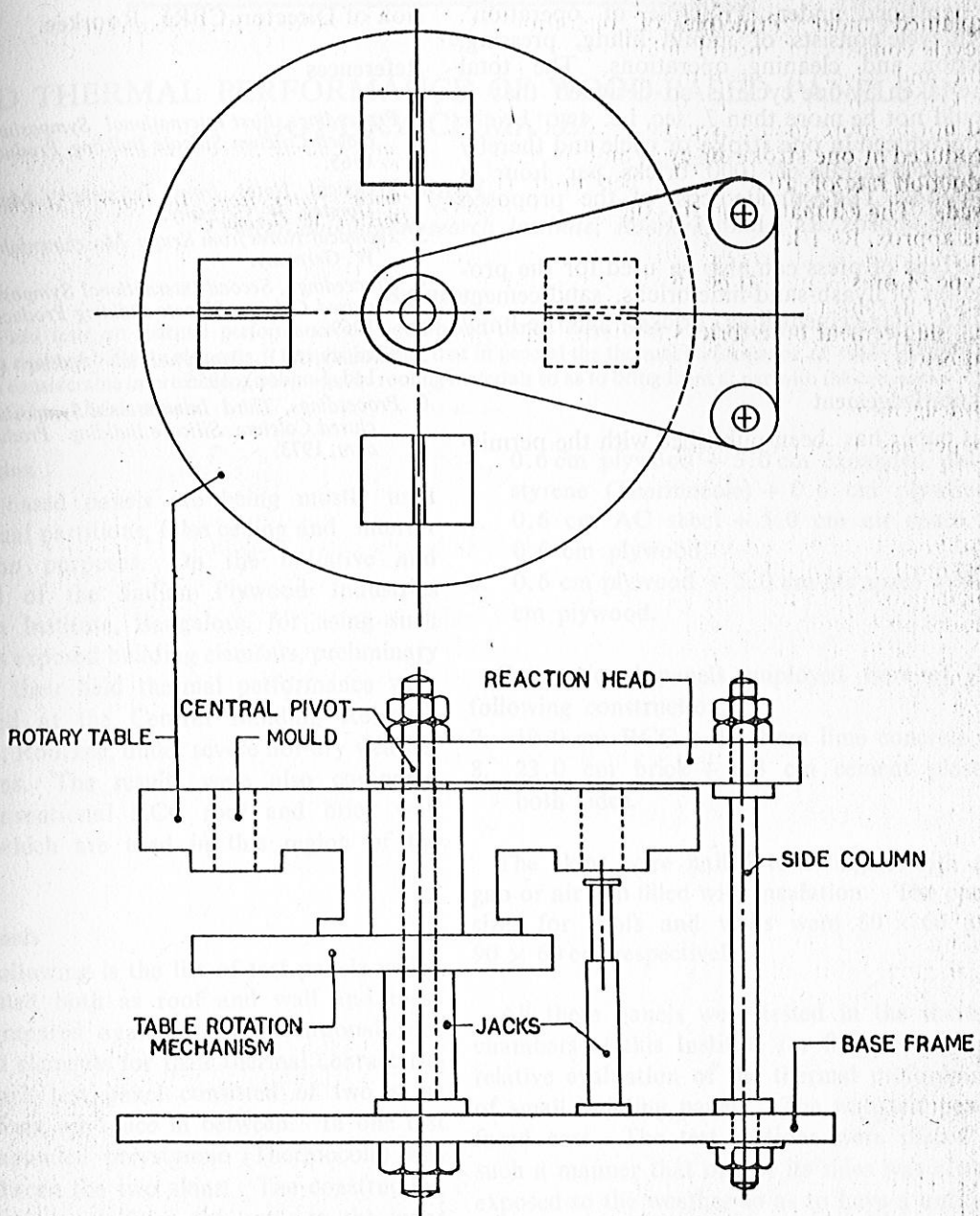


Fig. 3—Press for sand lime bricks

block diagram of the press. The press consists of a rotary table with four pairs of moulds. Each mould can accommodate bricks of the conventional size ( $9 \times 3 \times 4.5$  in) and modular size ( $190 \times 90 \times 90$  mm). The table is rotated by a gear drive mechanism (named the table rotation mechanism) and is stopped automatically after every  $90^\circ$  rotation by a system incor-

porating an electromagnetic brake, an electromagnetic clutch and a shear pin. After about 5 sec, during which the pressing and ejection operations take place, the table is automatically set to further rotation through  $90^\circ$  and is again stopped, as described above.

The cycle of working of the press is the same

as explained under 'Principle of operation'. Each cycle consists of mould filling, pressing, ejection and cleaning operations. The total time taken by one cycle is so designed that it should not be more than 7 sec, i.e. two bricks are produced in one stroke or cycle and thereby a production rate of 1000 bricks per hour is achieved. The estimated cost of the proposed press is approx. Rs 1 lakh.

This type of press can also be used for the production of flyash-sand-lime bricks, sand-cement bricks, slag-cement/lime bricks, laterite-lime/cement bricks.

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