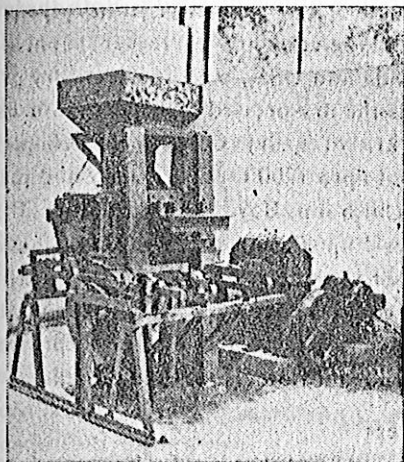


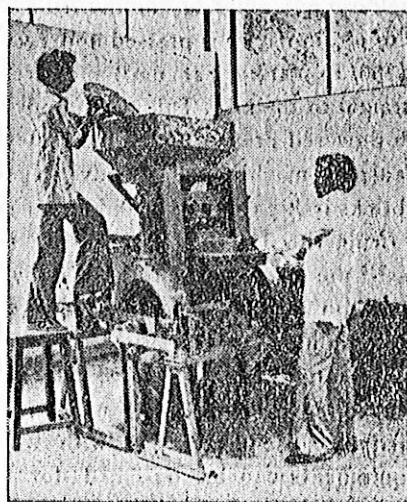
BPPP/61  
1981  
1148  
11

# A Mechanical Press For The Production Of Semi-Dry Clay Bricks

By  
J. P. Kaushish  
D. S. Bhatnagar



A mechanical press for producing semi-dry clay bricks.



A mechanical press for producing semi-dry clay bricks.

## “A Mechanical Press for The Production Of Semi-dry Clay Bricks”

Clay brick continues to be the most versatile and useful building material for its lower cost, remarkable heat and sound insulating properties and high mechanical strength to withstand loads of multi-storey construction. The Brick industry is one of the oldest known, but, most of the modern methods of manufacturing bricks are of recent growth. The process of brick making has now passed from skill craft into a highly mechanised industrially advanced countries where the production of hand made bricks has almost been forgotten, for shortage and high cost of manpower. Extrusion is regarded as a common and widely adopted technique for manufacturing bricks from plastic clays. In Canada and USA, about eighty percent of the total

production of bricks is by extrusion and the remaining is made either by repressing the extruded bricks or by the semidry pressing (or dry pressing) technique<sup>1</sup>. In India, hand moulding is still very much in vogue, although at some places brick extrusion machines have been installed and used with advantage of increased output and improved quality of bricks. Semi-dry pressing has, however, not been used at any level in the country so far.

Manufacturing bricks by semi-dry pressing technique holds great promise. Because of accurate shape, size and clear edges, pressed bricks are found very suitable for facing purposes in a building. The semi-dry pressing process is also highly adaptable for making bricks from coarse grained and poor plastic clays<sup>2</sup>. These bricks find good use for load bearing construc-

\*\* Scientist, Central Building Research Institute, Roorkee 247 672, (U.P.), India.

\* Mechanical Engineer, Central Building Research Institute, Roorkee 247 672, (U.P.), India.

tion also, because of the higher strength possessed by them due to pressing<sup>3</sup>. The rich burned-in beauty of these bricks lend distinctive charm to any building. A lasting visual appearance is provided to the building from outside without the need for any subsequent finish thereby affecting economy in cement.

#### Techniques Of Making Pressed Brick

The manufacture of clay bricks by pressing may be done in a number of ways. In 'Plastic repressing', extruded brick is repressed in a mechanical press to ensure trueness of shape and size. In another method called 'dry or dust pressing', clay in the form of dry powder with 4 to 6% moisture is pressed under very heavy pressures (200/ to 300 kg per cm<sup>2</sup>) and are subsequently sent straight to the kiln. This technology calls for costly high powered presses and other clay preparation and transport machinery. The advantage claimed with these bricks is high strength and elimination of drying before firing the bricks. Dry pressing is mostly used for tiles<sup>2,6</sup> the manufacture of bricks by it is difficult sometimes on account of lamination or cracking, non-uniformity in hardness and defective binding power. As an alternative to dry pressing, there is another technique called 'Semi-dry pressing' which is now gaining popularity because of the ease with which the plant and equipments can be designed for operation at a much reduced price. The technique consists of pressing a powdered clay containing about 12% moisture under moderate pressures<sup>1</sup> (about 50 kg per cm<sup>2</sup>). It is considered to be most suitable for soils which are coarse grained and have poor plasticity. The soil selected should, however, start vitrifying fairly easily at about 1000°C<sup>4</sup>. In order to be suitable for this process, raw-material should be sufficiently dry to enable it to be ground to a free-flowing powder. The latter is then screened and suitable amount of water added to it. The clay is then churned in a mixer while water from atomizers in the form of fine mist is applied to the clay powder. After mixing, the material is left to rest for about 48 hours in a bin to ensure homogenous distribution of moisture<sup>2</sup>.

#### Mechanical Presses In International Market

A mechanical press employed for shaping the moist clay powder into a brick comprises of an arrangement for feeding powdered clay into a mould wherein, by the movement of a plunger within the mould, the charge of clay is pressed into a brick. Subsequently, the brick is ejected out of the mould and pushed away from the press for onward transmission to a delivery conveyor or for being lifted away manually. The main operations involved in a press are executed

mechanically and the press may be operated by crank, eccentric, cam or toggle.

Among the semi-dry presses of different varieties, more commonly used in U. K. are manufactured by a number of companies. The one press called 'Emperor' is manufactured by M/S Sutcliffe Speaksman and Co. Ltd. It is of 200 ton capacity and is known for working on all kinds of nonplastic or slightly plastic materials including sand, iron and steel slags, puzzolana and cement mixtures. Another one 'Hercules Press' manufactured by M/s H. Alexander and Co. Ltd., is of 300 ton capacity and has long been in use for making bricks of materials of low plasticity. Both these presses are rotary table type and are of rather sophisticated design<sup>2</sup> In Canada and USA, both the semi-dry pressed bricks as well as the dry-pressed bricks are in use. The presses used are of heavy duty type. Examples are: 'Boyd Presses' of upto 1200 tons capacity and manufactured by M/s Chisholm, Boyd and white Co., Illinois<sup>7</sup> and 'HPF Presses' upto 2500 ton capacity manufactured by M/s Laeiswerke Ag. West Germany<sup>81</sup>. In India, only a few firms manufacture brick presses which are of low capacity and are suitable only for repressing of the already extruded or otherwise made bricks.

#### CBRI brick Press

Virtually no attempt has so far been made in the country for mass production of bricks by semi-dry pressing technique. Some studies carried out in CBRI indicated that good bricks from clays which are low in plasticity and which are not amenable to hand-moulding or extrusion, can be made by dry-pressing technique. Such clays are available in certain parts of U. P., Andhra, Mysore, and Rajasthan<sup>4</sup>. In early fifties, an attempt was made to put forward a hand-operated brick of making press which made use of a clay charge with moisture content upto 15%<sup>5</sup>. Due to growing cost of manual labour and an increasing trend towards mechanisation, need was felt to develop a mechanical brick press which should be simple in design and cheaper in cost. It should also give adequate pressure to form good bricks. A prototype model of the press was developed.

The press (Fig.1) is a duplex type giving two bricks in one stroke and employs a combined feature of eccentric driven top plunger and cam driven bottom plunger of the mould. An important factor for design is that the charge of clay in the mould should be pressed from both top and bottom to make a dense and homogeneous brick but these pressures should not be applied simultaneously and too suddenly. In the prototype machine, the brick is first pressed from top to allow



the air to escape out and subsequently it is pressed from the bottom. This has resulted in uniform pressing with no separation line along the centre of the brick. Further, the application of the pressure is gradual which besides giving opportunity for the entrapped air to escape out also results in uniform pressing. Air escape slits have been provided in the mould.

In its simplest form, the Prototype press comprises of a base which carries two vertical side columns as its integral part, the side columns have a slot milled in the centre of each for the support and vertical up and down movement of a yoke carrying two top plungers, each one to help pressing of one brick from top. The yoke is driven with the help of two eccentric rods mounted on main shaft passing across the two side columns. There are two mould boxes supported in a frame which is rigidly connected with the side columns. A pair of cam and roller follower device is employed to operate separately but simultaneously two bottom plungers that help pressing of the brick from bottom upwards. A hopper drops the charge of clay into a feed trolley. The latter while moving forward feeds the clay into the moulds and during its return stroke, levels the clay charge filled in the moulds. The power operation of the feed trolley is accomplished with the help of a pair of cams (one for forward and another for return stroke) and an assembly of lever linkages. The salient features of the press are; : Preasing capacity=40 tonnes

Output per hour -720 bricks of size  
22.5 × 11.25 × 7.5 cm.

Floor space occupied - 2.5 sq. metres.

The press components have been so designed that their production and operation is fairly easy. Extensive trials of brick making have been successfully completed on the prototype press, Clays containing sand upto 30% by weight have been tried. Bitumen stabilised bricks were also made successfully. The press was further used for making brick from laterite soil with water content of about 19%.

#### References:

1. Srivastava, L.K., Report of deputation of Mr. L. K. Srivastava to Canada under WAITRO TRAINING SCHEME', 1979, CBRI, Roorkee.
2. Searle, Alfred B. 'Modern Brick Making', pp 372-397 4th Edition, Ernst Benn Limited, London, 1956.
3. Clews, F. J. & Noble, W. "Some Clay-water Relationships" A. T. Green Book, pp 209-32, Brt. Cer. Res. Asscn, 1959.
4. Majumdar, N. C., Hiralal, E. S. and Wadhwa, S. S. 'Manufacture of building bricks by semi-dry pressing', Civil Engineer-

#### Concluding Remarks

The semi-dry brick presses have great potential for their use in India. In places where non-plastic clays are abundantly available and other methods of brick making do not yield good bricks, pressed brick technology could be adopted for manufacturing bricks both for load bearing walls as also for giving attractive facing to the buildings. The mechanical press developed at CBIR should provide an effective way of producing these bricks with speed and economy.

There is scope for helping to solve the problem of low-cost housing in developing countries by using stabilised soil bricks. These bricks can be used in construction straight after drying thereby affecting saving in firing and handling costs. A bricks manufacturing set-up comprising of brick press and other clay preparation equipments, all rigged up and arranged on a portable trolley will effect further saving in transportation and handling costs. Both low investments and full mobility of the plant should overcome difficulties of the infrastructure and finance which are often an unavoidable part of centrally installed sophisticated and costly brick plant. A decentralised brick making for low cost housing all over the country could thus be realised.

#### Acknowledgement

The authors wish to thank Prof. Dinesh Mohan for his valuable guidance and encouragement provided during the development of the press. The help rendered respectively by Shri S.K. Kela and Shri N.C. Mazumdar in the early stages of development and trials of the press is gratefully acknowledged. S/Sri D. K. Gautam, S. K. Handa, S.P. Arora, Dharamveer and G.M. Mukerji have helped in the fabrication and assembly of the press. The paper is published with the kind permission of the Director, Central Building Research Institute, Roorkee.

ing, Construction and Public works, Journal, July-August 1969.

5. 'Hand operated brick and block making machine', Special Technical Note, Silver Jubilee Congress, Central Building Research Institute, Roorkee.
6. Cordson, F. J. 'Clay preparation and shaping', Brick Dev. Assn, 1962.
7. Bulletin 72, Y-max Press, Boyd Power Press, M/S Chisholm, Boyd and White Co., Illinois.
8. Advertisement leaflets on HPF Double Pressure Robot presses LAEIS, M/s Laeis-Werke A G, Ostallee 3-5, D 5500 Trier West Germany.