# BUILDING RESEARCH NOTE 3

CENTRAL BUILDING RESEARCH INSTITUTE, INDIA

## USE OF RICE HUSK AS FUEL IN BULL'S TRENCH KILN

At the beginning of 1984, the shortage of housing in India, was of the order of 24 million dwelling units—18 million in the rural areas and 6 million in urban areas. The annual demand for such a massive construction is roundabout 4,000 crore bricks. This needs nearly 5 million tonnes of coal for firing every year. Transportation of this amount of coal is not fully met by railways and a major portion is carried by road through long distances to kiln site. By the time it reaches destination its cost rises by 80-100% of its original cost. As a result the cost of bricks becomes exorbitant.

India is an agricultural country and about 20 million tonnes of rice husk is available as waste material every year. This finds no significant use at present. As rice husk has got poor nourishing value and is not easily digestible by cattle. It is not used as fodder. It can not be used as manure either as it does not easily decay when disposed off in cultivated fields where it helps in harbouring insects which are very injurious to crops. Hence it creats dis posal problem to rice mills whcre it is found in heaps every year.

This waste material can be utillised as a renewable source of energy if some technique is developed for burning it in Bull's Trench or small scale inrermittent kiln which is conventionally employed for brick firing. The calorific value of rice husk is about half of coal. Hence it can compensate the demand for coal energy wise. Attempts have been made to develop a technique for burning rice husk in brick kilns as fuel. Three field trials have been conducted in this respect, as shown in the photograph.

Photo—Feedlng of Rice Husk in Commercial Bull's Trenca Kiln.

**Rice Husk can bs used in three ways as below :**

1. As fuel for small scale firing of bricks in intermittent kiln.
2. In mixed feed firing of brick along with coal to save coal upto 25-30%.
3. Exclusively rice husk and firewood to eliminate coal completely.

**Setting Pattern of Bricks in the Kiln**

In all the above cases setting pattern of bricks is the same as in a conventional Bull's Trench Kiln. The only difference is to

provide a firewood feeding line after every two feeding lines of rice husk. The setting is kept simple and can be easily adopted by an average brick setter. Thls type of setting helps in proper combustion of rice husk and movementof flame in forward direction. A layer of ash 15 cm. thick is put on top of the brick setting to check convectional and radiation losses of heating space. The setting is enclosed from all sides to check entrance of cold air or leakage of hot gases from firing space. Supply of air is channelised through openings in cooling zone and in optimum quantity.

### Initiaton of Fire and Burning of Bricks

Firewood is burnt in the very first line to get a temperature roundabout 900°C in next forward line. This temperature is required for instant burning of rice husk and to avoid formation of charcoal. Sometimes wooden chips or saw dust is also fed in the kiln after alternate 2 or 3 feeding of rice husk.

### Firing Details

Firewood is fed in wood feeding line, which has been provided after every two rice husk feeding lines. The usual firing temperature roundabout $1000 \pm 20$°C is achieved in firing zone of the kiln. This temperature is maintained for 3-4 hours. In mixed feed coal is fed in one fire line made for rice husk. In all the three fire lines the first is used for firewood; next for coal burning and the third, for rice husk. This sequence is followed for alround firing of the Bull's Trench kiln.

### Quality of Bricks

The quality of bricks by using rice husk as fuel in Bull's Trench kiln has been found at par with that of bricks fired exclusively by coal. Keeping other factors similar like quality of soil used, workmahship of moulders and firemen, use of rice husk and firewood as fuel has no deteriorating effect on the quality of bricks.

### Fuel Consumption and Cost of Firing

Though the cost of firing is subject to rates of materials available in the locality following data would give an idea of fuel consumption and saving in cost by use of rice husk as fuel substitute. The data are based on three field trials conducted in 1980–81 in the rice growing areas of Uttar Pradesh.

#### 1. Bricks Fired with Coal Exclusively

Basis : Per Lakh Bricks

Fuel Consumed :

| | |
|---|---|
| (i) Coal 18 Tonnes/Lakh Brick @ Rs. 1000/Tonne | = Rs. 18000.00 |
| (ii) Labour Cost | = Rs. 350.00 |
| Total | = Rs. 18350.00 |

i.e, Rs. 183'50/Thousand Bricks.

#### 2. Brick fired with Coal Firewood & Rice Husk in mixed-Feed Firing

Basis : Per Lakh Bricks

| | |
|---|---|
| (i) Coal 7 Tonnes @ Rs. 1000/Tonne. | = Rs. 7000.00 |
| (ii) Firewood 12 Tonnes @ 450/Tonne | = Rs. 5400.00 |
| (iii) Rice Husk 12 Tonnes @ Rs. 100/Tonne | = Rs. 1200.00 |
| (iv) Labour Cost | = Rs. 600.00 |
| Total | = Rs. 14200.00 |

i.e.Rs 142/Thousand Bricks.

#### 3. Bricks Fired by Rice Husk and Fire-Wood Only

Basis :—Per Lakh Bricks.

| | |
|---|---|
| (i) Firewood 12 Tonnes @ Rs. 450/Tonne | = Rs, 5400.00 |
| (ii) Rice Ausk 25/Tonnes @ Rs. 100/Tonne | = Rs. 2500.00 |
| (iii) Labour Cost | = Rs. 600.00 |
| Total | = Rs. 8500.00 |

i.e., Rs. 85/Thousand Bricks

## Conclusions Drawn

1. Conservation of energy in Bull's Trench Kilnt hrough utilisation of renewable sources like rice husk, groundnut husk, bagasse and saw dust, etc., can be achicved.
2. One firewood feeding line is invariably given after two rice husk feeding lines.
3. Simple and versatile technique which can be tried in running kiln.
4. Technique can be adopted for small scale production of bricks for individual requirement.
5. Solves disposal problem in rice mills.
6. Technique helps utilisation of a waste material thus adding to economy and saving of fossil fuel-reserve of the country.

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