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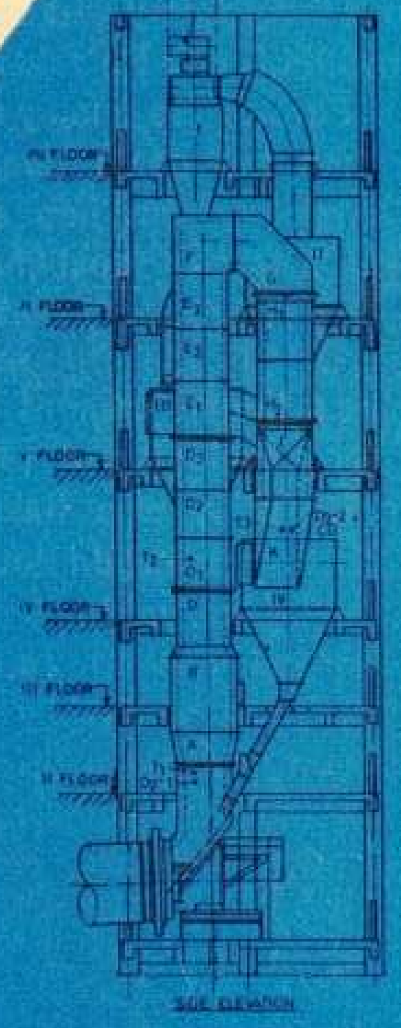
CRI TECHNOLOGY DIGEST



CEMENT RESEARCH INSTITUTE OF INDIA

PRECALCINATOR TECHNOLOGY AN OUTSTANDING DEVELOPMENT OF SEVENTIES—Part II

PRECALCINATOR TECHNOLOGY
AN OUTSTANDING DEVELOPMENT OF SEVENTIES

1. CRI PRECALCINATOR

Cement Research Institute of India started work on the development of an indigenous precalcinator appropriate to Indian cement industry in 1974.

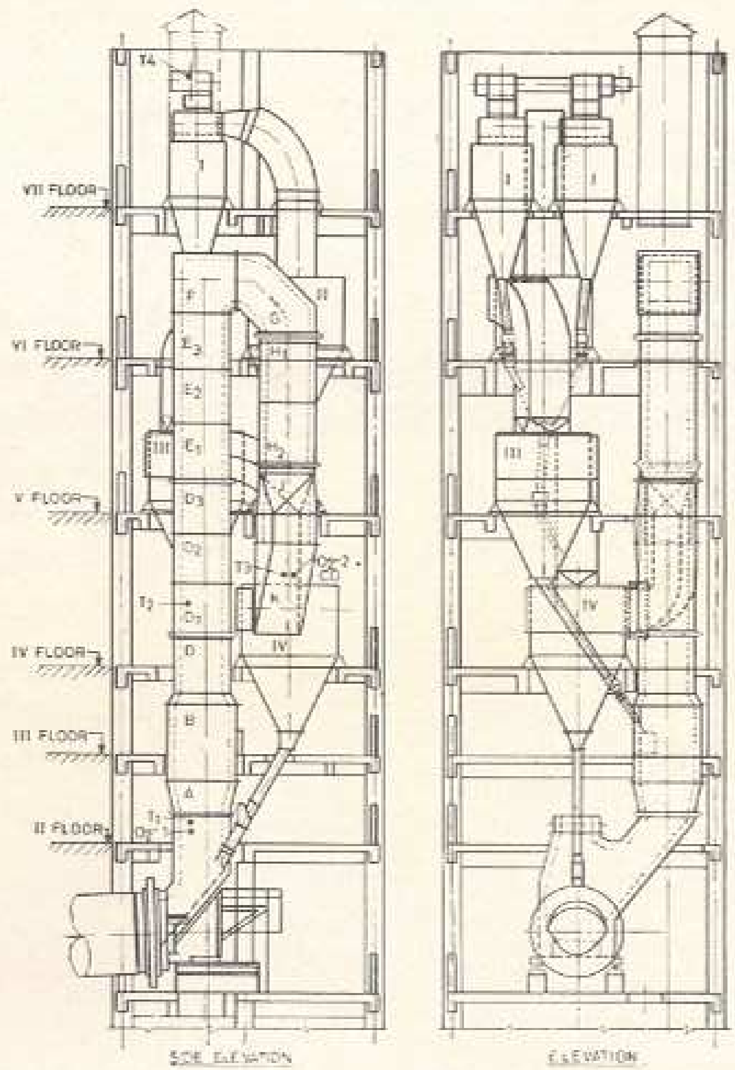
The need for investigations and development of a precalcinator arose mainly from two considerations. Firstly, the precalcining systems developed elsewhere in the world use oil for both the primary and secondary firing. Although some systems like MFC, FLS and Polysius tried coal, it was only for secondary firing. Further the quality of coal used in the trial runs was much better than the coals used in Indian cement plants. Secondly, not a single system has so far been developed where coal, or even high grade coal has been used for both primary and secondary firing.

Since Indian cement plants mainly use coal as the fuel, the need for developing a precalcinator appropriate to the Indian cement industry was thus more than justified. As a first step, the different precalcinator systems developed elsewhere were examined critically. In the second stage, laboratory experiments were carried out to establish certain design parameters for different systems. Finally the design for CRI precalcinator was evolved on the basis of simplicity in fabrication, flexibility in achieving the desired degree of calcination, ease of operation and above all the investment cost.

1.1 System Design

CRI precalcinator is a simple system in which the meal is calcined further in the extended 4th stage duct of the suspension preheater. It comprises a combustion chamber and a calcinator duct arranged in series. Secondary fuel and the meal from the

3rd stage of the preheater are fed into the combustion chamber in such a manner that the meal is entrained in the swirling mass of combustion air and fuel and get thoroughly blended with the fuel. The air for combustion of the secondary fuel (precalcinator fuel) comprises partly the air drawn through the kiln and partly the ambient air fed with the fuel.



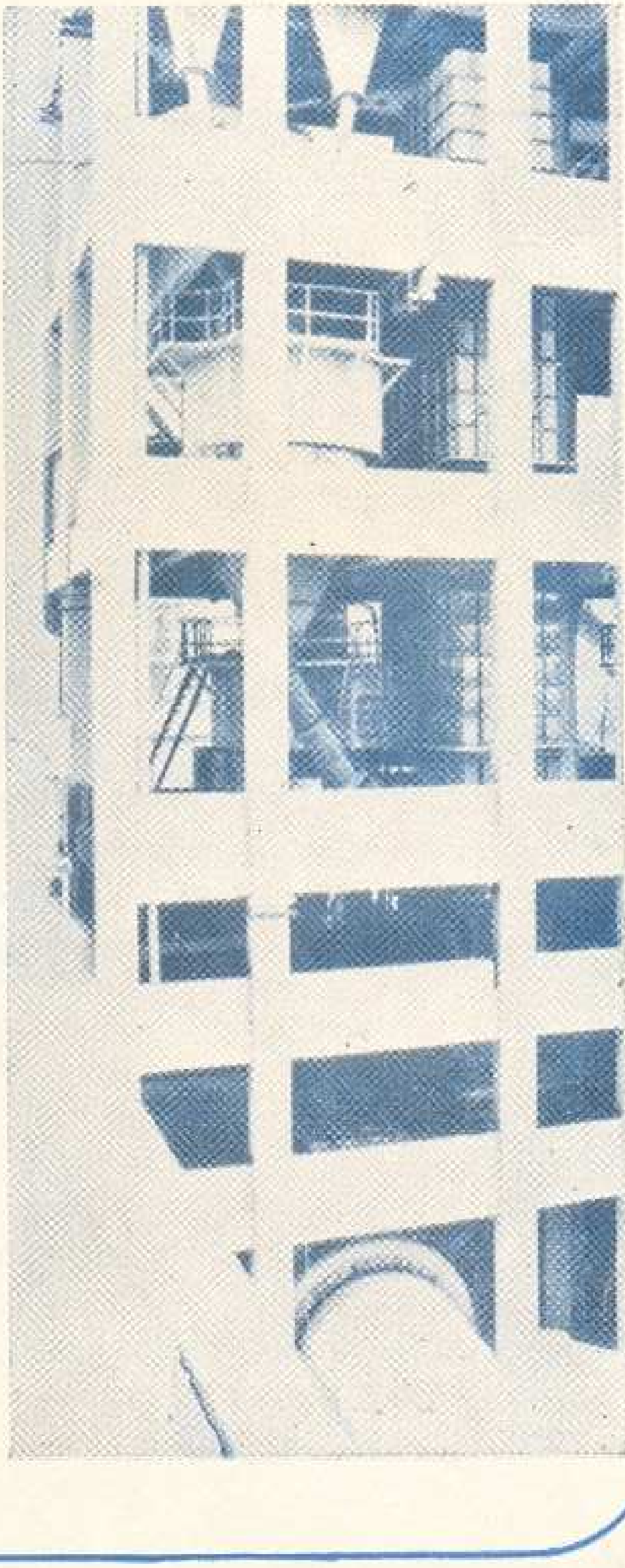
The dimensions of the precalcinator depend on the nature and type of fuel as well as the time required for attaining the desired degree of calcination of the meal. Any type and grade of coal can be used and desired degree of calcination attained.

2. CRI PRECALCINATOR AT MYSORE CEMENTS LTD

The precalcinator put up by CRI at Mysore Cements Ltd, Ammasandra in September 1979 has been designed for an increase in output of 30 percent with pulverised coal as the fuel. The combustion chamber is of cyclonic type to the extent that the fuel and part of the combustion air at ambient temperature are fed into it tangentially. The swirling motion produced under such conditions ensures mixing of the meal and fuel, and creates near isothermal burning conditions.

2.1 Control System

The instrumentation scheme for the precalcinator is simple and effective. The fuel feed rate is controlled by the temperature of the gas at the discharge end of the calcining duct. The raw meal feed rate is controlled through a weigh-feeder by the differential temperature of gases at kiln inlet and the 1st stage cyclone exit. An O_2 analyser at the kiln inlet is used to monitor the oxygen content. An O_2 and CO analyser located at the entry to the 4th stage cyclone, ie, the end of the precalcining duct, monitors the O_2 content and gives a signal whenever the CO content exceeds the set limit.



2.2 Operating Experience

i) There is no significant change in the exit gas temperature although systems abroad have reported an increase of 15 to 20°C.

ii) With 2 to 2·5 percent O_2 in the gas at entry to 4th stage cyclone, the CO content is between 0·1 and 0·15 percent.

iii) There is improvement in clinker litre weight.

iv) With about 15 percent fuel fired into the precalcinator the degree of calcination achieved has been, on the average, about 60 percent.

v) The fuel consumption of the system remains practically the same.

vi) The coating problems experienced by the kiln earlier have practically disappeared after the installation of the precalcinator.

vii) Power consumption is practically unchanged.

viii) The output of the kiln is increased by 30 percent.

ix) The life of the refractory lining has already increased to 3 times the normal life.

3. SCOPE FOR APPLICATION OF PRECALCINATOR TECHNOLOGY IN INDIA

As indicated earlier, the precalcinator systems so far developed are applicable to dry suspension preheater kilns. In India today there are about 30 dry SP kiln units with capacities ranging from 300 to 1200 tpd. On a conservative estimate it should be possible to increase the total capacity of these units by about 30 percent through installation of precalcinators thus raising the production from these units by about 1·5 million tonnes.

About 12 new dry SP kiln units having a total installed capacity of 3·7 million tonnes per annum are either already commissioned or are likely to be installed/commissioned in the near future. Further it is reported that some of these units have provision for incorporating precalcinator at a later stage through surplus capacities in the other unit operation equipment. It is, therefore, reasonable to assume that the production of these new units can be raised on an average by about 40 percent, ie by 1·5 million tonne annually, by installing precalcinators.

4. CHOICE OF PRECALCINATOR

While all known precalcinator systems are reported to be capable of giving up to 95 percent calcination of the meal at kiln inlet, there could be some constraints in adopting such designs in the existing plants owing to the limited capacities of the suspension preheater and clinker cooler, on the one hand, and the other unit operational equipment like the raw and finish grinding mills, on the other. As indicated already, it may be possible to increase the capacities of these units generally by 30 to 40 percent and stretched to even 50 to 60 percent in some favourable cases. But whatever be the feasibility, the ultimate economies depend on the precalcinator system chosen. In this respect the CRI precalcinator system has an edge over others because of its simple design and lower investment cost. Therefore, it would be logical to expect that for the same increase in production in any given unit, CRI Precalcinator could prove to be more economical.

In the case of new plants too providing for a precalcinator, CRI precalcinator is expected to fare better, investment wise.

This development has been possible with the collaboration of M/s Mysore Cements Ltd, Ammasandra, where the R & D work was carried out on one of their kilns.

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