CEMENT RESEARCH INSTITUTE OF INDIA

# CRI TECHNOLOGY DIGEST

## CRI PRECALCINATOR TECHNOLOGY FOR 600-1200 TPD KILNS

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## INTRODUCTION

CRI had developed the design of a precalcinator for 300 tpd kiln in the mid seventies. The precalcinator fabricated accordingly and installed on one of the kilns of M/s Mysore Cements Ltd, Ammasandra, has been operating continuously since September 1979 and consistently giving an increase in production of about 30%.

Encouraged by the success of this unit, CRI set out to extend the technology to kilns up to 1200 tpd capacity and higher increases in output. This technology digest outlines the features of the systems so developed and is third in the series on precalcinators. The first one had dealt with precalcinators in general starting from the definition of precalcinator and the background to their development, and outlined the salient features of the different precalcining systems available. The second one described CRI precalcinator from system design to operational experience with the unit installed at Ammasandra cement plant, with special emphasis on the factors that favoured CRI precalcinator under Indian conditions.

## FACTORS INFLUENCING DESIGN OF CRI PRECAL FOR KILN CAPACITIES UP TO 1200 TPD AND FOR HIGHER INCREASE IN PRODUCTION IN EXISTING PLANTS

**For higher capacity of kilns up to 1200 tpd:** While extending CRI precalcinator technology to existing kilns of higher capacity, both process and design aspects ought to receive due consideration depending on what percentage increase in production is possible in a given situation. As in the case of any other precalcinator technology, up to 30% increase in production is possible without any major modification in the existing suspension preheater system and the clinker cooler. For an increase beyond 30% and up to 50%, major modification of preheater ducts and clinker

cooler will become necessary. However, it is to be understood that in both the cases the required inputs of raw meal will have to be supplemented, if not already available. It may be said on the basis of available data and information of a few dry process units in our country that, barring exceptional cases where raw materials are of such nature as to make it difficult to produce even the rated yields from the raw grinding units, generally 10 to 15% more production can be achieved, other parameters like fineness and chemical composition of the ground meal remaining the same. However, with kiln systems having planetary cooler, it is not possible to go beyond 25-30% increase in production because of the limitation on the quantity of excess air that can be carried through the kiln, a limitation imposed by the absolute need to maintain a certain minimum flame temperature in the sintering zone. Even in the case of grate cooler and rotary coolers, the same considerations hold good in respect of excess air through the kiln and thereby the increase in production that is possible to achieve with the available technology. But with the incorporation of a tertiary duct to supply the combustion air for the precalcinator fuel from the clinker cooler, a 50% increase may be economically feasible. This has been very well established from theoretical considerations as well as by the practical experience of others. Of course the temperatures of the combustion air and thereby the location of tertiary air off-take from the clinker cooler as well as the dimensioning of the tertiary air duct itself ought to be given careful consideration with a view to balancing the draughts through the kiln and the tertiary duct. Towards this end the excess-air factor in the kiln and thereby the temperature of the secondary air, the temperature and quantity of tertiary air are the vital factors that are to be taken into account. Similarly the oxygen content to be maintained at the kiln inlet and the inlet to the IV stage cyclone play a vital role in determining the size of the combustion chamber and the precalcining duct.

In the case where more than 30% increase is found to be feasible from other considerations, the preheater ducts of the upper stages also need to be modified to keep the heat transfer requirements and the pressure drop in balance.

Similarly the type of suspension preheater, its thermal efficiency, the degree of calcination normally achieved in practice are important parameters to be taken into account owing to their bearing on other parameters considered in the designing of the CRI Precal.

## LOCATION OF CRI PRECAL AND STRENGTHENING OF PREHEATER TOWER

The precalcinator can be located within or outside the existing preheater tower according as the floor area of the suspension preheater and layout of the cyclone and ducts permit it or not. The two factors permitting, it should be possible to install CRI Precal within the existing preheater tower irrespective of the kiln capacity, up to 1200 tpd. Otherwise the precalcinator duct may have to be installed outside the existing preheater tower with the necessary supporting structure. Obviously in such cases the total duct length will be more than in the former case for the same capacity.

Consequent on installation of CRI Precal, the combustion chamber and precalcining duct together will impose additional load on the preheater structures. While the total load will be of the order of 100 to 125 tonnes in the case of a 300 tpd kiln, it will increase with larger capacity kilns. The load will get distributed over different floors of the preheater tower depending on the total duct length. Accordingly the existing preheater tower has to be strengthened. However, where a 50% increase in output is envisaged, that is, the precalcinator is designed for a 50% increase in output, a separate structure for supporting the precalcinator may have to be installed outside the preheater tower in cases where the space available for the purpose inside the preheater tower is insufficient after allowing for the modifications needed in the cyclone stages.

## APPLICATION OF CRI PRECALCINATOR TECHNOLOGY

Schematic diagrams for CRI Precal systems for representative cases of cooler types and ranges of increase in output are given in Fig 1 to 3 as below:

i) Fig 1 — For 25-30% increse in output in a kiln equipped with grate cooler

ii) Fig 2 — For 25-30% increase in output in a kiln equipped with planetary cooler

iii) Fig 3 — For 50% increase in output in a kiln equipped with grate cooler

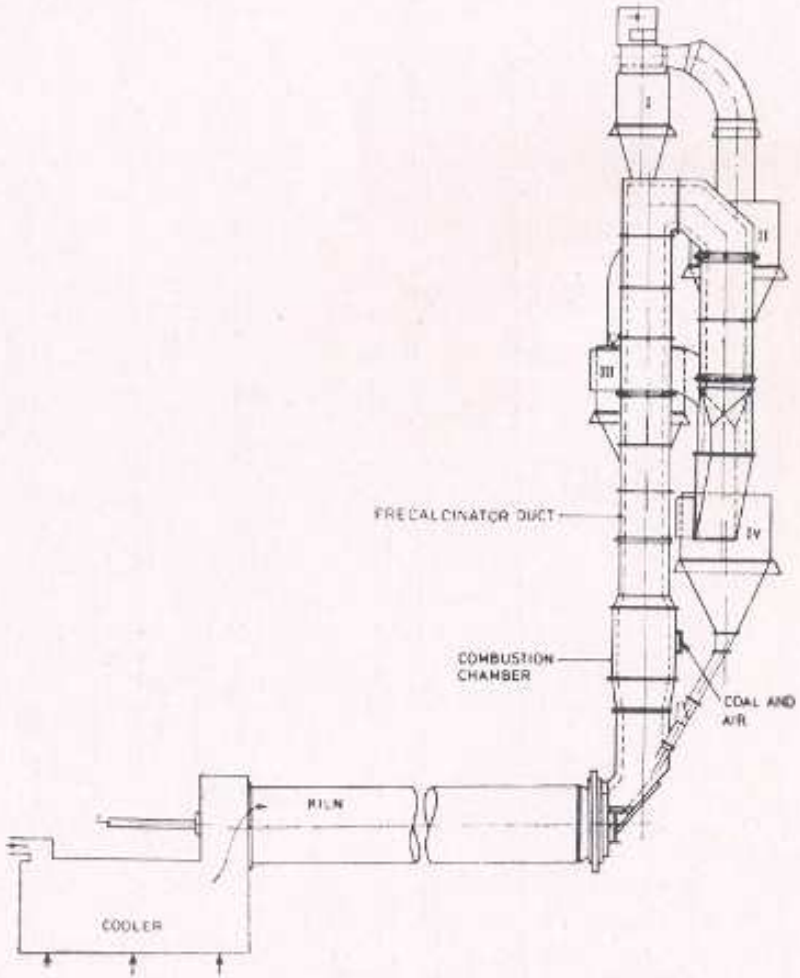


*Fig 1 CRI Precal for up to 30% increase in output—System with grate cooler*

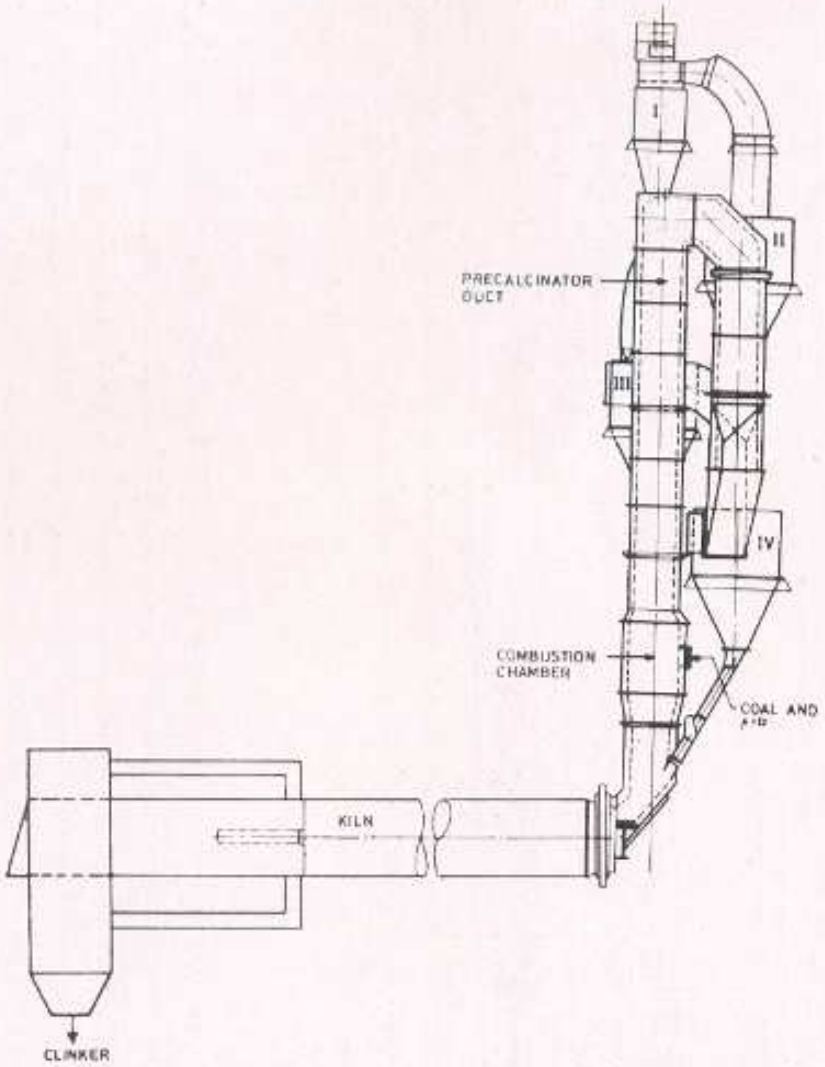


*Fig 2 CRI Precal for up to 30% increase in output—System with planetary cooler*

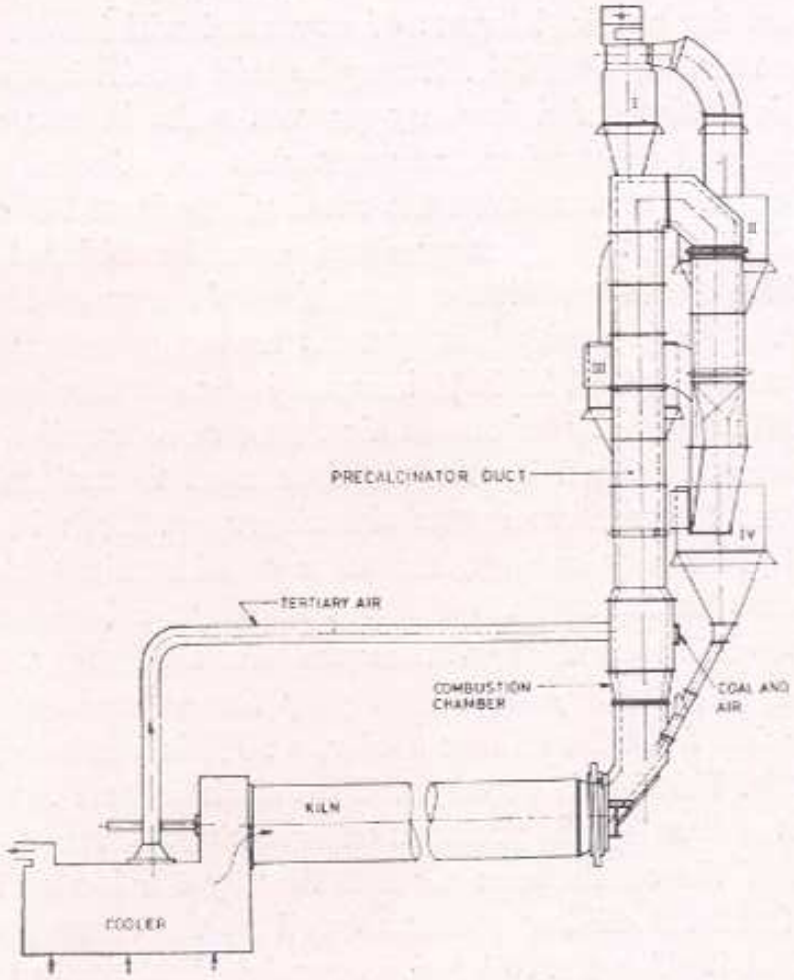


*Fig 3 CRI Precal for up to 50% increase in output—System with tertiary air duct*

The first two are applicable irrespective of the existing kiln capacity while the last one is limited to kilns of capacity 1200 tpd.

The designs for the first precalcinator for an existing 600 tpd kiln have already been supplied and it is currently under fabrication for Mysore Cements Ltd.

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