The paper describes roller press structure in a cement mill of a cement plant. When provision of press is planned along with mill building, it is possible to provide suitable structural arrangement. This provision is sometimes made in an existing mill or in mill structure already under construction. In such a case, limitations are imposed on planning of supporting structure. Since the introduction of press is a new development, there is still a lack of reliable machine load data and vibration constraints. A case study of such a foundation in recently-constructed cement plant is given with recommendations on proposed structural arrangement.

A roller press is installed in front of grinding installations to cut down energy consumption in the grinding unit. Installation of a roller press before rolling mill or cement mill in cement plants is now becoming a common feature.

In a roller press, clinker material is subjected to extreme pressure between opposing rollers for a short time, Fig 1. One roller is fixed and other roller can move by about 50 mm laterally (perpendicular to rotating axis) to adjust space for size of material to be rolled between the rollers. This movement is achieved by hydraulic/pneumatic supporting system and keeps roller gap or pressure constant. Each roller is driven by an electric motor through a gear reducer. The products discharged from roller press are compacted cakes of irregular size.

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Case study
In a certain cement plant, it was decided to provide a roller press after column and mill foundations of a cement mill were
Fig 2 General arrangement under mill hopper area at +9.8 m level (case study)

constructed. The arrangement under the mill hopper area was revised. The general arrangement is shown in Figs 2 and 3.

Roller press is mounted at +9.8m level floor in front of the mill and below mill hopper. Rollers are mounted on a steel frame bolted to reinforced concrete beam-column frames. Four reinforced concrete columns of size 800mm x 800mm in M-20 mix (28-day characteristic cube strength = 20 MPa) are provided upto +9.8m level only to support roller press floor. Since provision of press was made after a part construction was complete, it was not possible to isolate this area from cement mill structure. It was also not possible to provide columns right under roller framing beams, since free space on ground floor was not available. For designing +9.8m slab, the suppliers gave the following load data:

(i) For rollers mounted on 10 bolts, vertical load on each bolt = 81.5 kN

Total vertical load = 815 kN

(ii) Lateral force along centre line of press (that is along axis perpendicular to rotating axis of press) = 163 kN

The horizontal force of 163 kN is due to horizontal motion of the movable roller, which is prompted by the feed materials when pressed through the roll gap. This force is independent of roller speed. The structure was designed and constructed for these loads. Before the roller erection, suppliers informed that the supporting structure should withstand 2 to 10 Hz fluctuation of horizontal motion of the movable roller.

Since press structure was a part of mill floor at +9.8 m level, lateral stiffness was very large and horizontal natural frequency would be much larger than the specified range. This therefore did not cause any concern. However, the vertical natural frequency of the already-constructed supporting structure was 7.4 Hz. In order to keep this frequency at about 20 percent away from the specified range, vertical deflection of the supporting beam had to be reduced from 0.51 cm to 0.17 cm to increase natural vertical frequency value from 7.4 Hz to 12 Hz. Since it was not possible to increase beam stiffness, the only alternative was to reduce beam span by providing additional column supports. This also was an operational obstruction.

It was explained to suppliers that the hydraulic system, operating roller movement, will partly absorb oscillations and the supporting structure may not be subjected to such wide range of oscillations. The suppliers agreed to accept the struct-

Fig 3 A cross-section of the general arrangement under mill hopper area (case study)
Fig 4 Roller press installed at +9.8 m level in a cement mill. Moveable roller and hydraulic system can be seen to withstand oscillations in 2.5 Hz range.

No modification in structure was made and additional columns were not provided. The press is installed and is in operation. No significant vibrations are so far reported in the structure. Figs 4 and 5 show photographs of the installed press.

**Conclusion**

(i) Due to movement of roller, there is a wide range of oscillations, though suppliers should not specify this on adhoc basis.

(ii) It is advisable to isolate press supporting structure from the main structure of the mill to prevent transfer of vibrations to the main structure. It is also advisable to provide supporting columns directly under the beams on which rollers are mounted. Such arrangement is provided in a plant where roller press was planned along with the mill building, Fig 6.

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