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A cement factory in India has a problem with reaching its desired capacity. The problem does not lay with the actual production, but with the transport of the cement across the plant. It is transported with a pipe conveyor that is constructed at a small angle. When a certain filling ratio is reached the cement start flowing back down the pipe to the bending point and causes spillage. The main problem is thought to be that the density of the cement on the belt is too low. A possible solution could be increasing the density before the cement reaches the belt.

A common way of increasing the density of cement is to store it in a hopper where it is compressed. An external party has investigated the fluidization behavior of the cement and determined that it should rest for at least ninety seconds to let the cement reach an acceptable density. After determining the characteristics of the cement and acquiring all the requirements and limitations that the hopper is subjected to, two designs have been made.

The first design is a standard conical shaped hopper of two meters in diameter and roughly four meters high. In order to fit it above the belt the existing system of a screw conveyor and air slides must be altered. The screw conveyor is no longer needed and can be removed completely. It is likely that the air slides must be repositioned or removed.

The second design is an experimental one which doesn't require altering the current system to great extends. The hopper is shaped like a ring or turban cake that rotates. This way the height can be limited but the capacity is limitless and the desired duration time can be met. This design has never been tested and it is unknown if it will function at all. Even if is works some preliminary difficulties can be expected.

Both designs have some unknown parameters. The wall material is not available, which has an influence on the angle of the hopper wall and therefore the capacity. The final design can best be made in cooperation with the contractor that builds the hopper. Then some concessions will likely be made to the design in favor of the use of standard parts.

Another issue is that the origin of the problem might not lay with loading of the belt, but with the belt itself. A simple test showed that the closing procedure of the belt doesn't cause a Shockwave that fluidized the cement. But the shape of the cement is altered and thus the density changes. During testing this was very limited, but the real belt could have a different behavior. The movement of the belt and occurring vibrations can have a fluidizing influence on the cement.

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