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Building for the Future

Martin Wuerth, Managing Director of Wuerth Consulting Engineers, Switzerland, discusses the exchange of two existing cement mills for a Polysius mill at the Jura cement plant at Wildegg.

Introduction

The Jura cement plant in Wildegg, Switzerland, part of the CRH Group, recently made the decision to exchange two of its four existing cement mills, each with a capacity of approximately 20 tph, for a second-hand Polysius cement mill with a capacity of 50 tph.

The new mill with a total weight of 344 t (including gear unit and engine), a diameter of 3.40 m and a total length of 26 m had to be fitted into the pit of one of the existing mills, which was much lighter, shorter and had a diameter of 2.6 m.

The target for the engineering team was to fit the new cement mill into the existing mill building to ensure sufficient running of the meal process, as well as a smooth supply to the mill with aggregates and energy. The dedusting had to fit to the existing filter, the foundation had to take up the additional loads without large settlement, and the final cement quality had to correspond to the owner's standard. These changes had to be made without hindering sales.

Realising these goals within such a short time, meant that the planning team had to work well together. In the team, JCF was responsible for project management and electrical works; R. Bolliger Consulting Engineer was responsible for process engineering and assisted the project manager, Wuerth Consulting Engineers was responsible for the structural adjustments. The planning team was supported by the equipment suppliers Polysius and Maag.

Local preconditions

The cement mill building was erected in 1928 and was built for four cement mills. Due to the age of the building, missing drawings and structural design of the cement mill foundations, a concrete investigation was necessary. The test results revealed a good concrete density and pressure strengths of approximately 35 MPH were present. Reinforcement was hard to find and therefore new calculations had to be carried out to allow for this.

Figure 1. Mill in front of the mill building.

Figure 2. Mill exit side foundation.

The local soil conditions were already well known from earlier projects on the same site (mostly gravel, medium density based on the compaction through the last ice age).

Foundation

Two main problems had to be solved by the structural designers. Firstly, the loads of the new mill were approximately 25% higher and the resulting forces were acting on different places compared to the existing mill foundations. Secondly, the base plates for the equipment (mill and gear unit) had to be set into existing part foundations, which meant, that the 0815 standard base plate construction had to be modified.

To ensure, that the settlement of the new mill and gear unit foundation was in a small enough range, the existing foundations had to be enlarged and reinforced. Figure 3 shows the resulting soil pressure and settlement of the reinforced foundation for the mill entry side.

The original base plates for the second hand mill had to be modified (Figure 4), because of the fact that only the last 65 cm under the base plate were poured with fresh concrete. The original shear connection made by cast wet in concrete bolts with an anchor length of over 1.5 m had to be replaced with two ver-

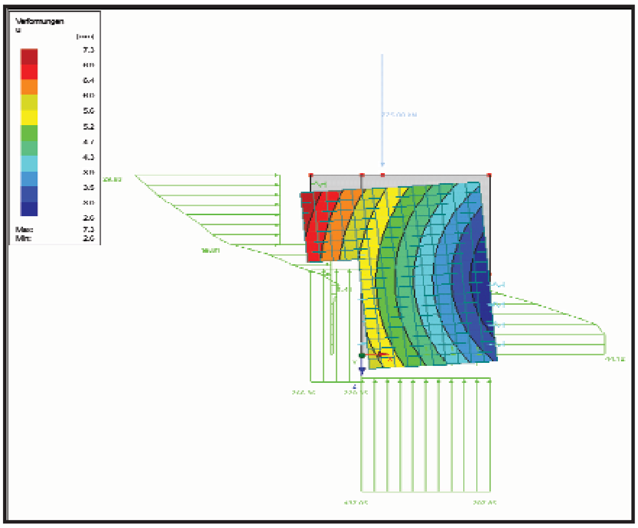

Figure 3. Soil pressure and settlement of the mill entry side foundation.

tical steel sections, which were set in drilled holes (diameter 35 cm) and filled completely with non-shrinking concrete. After the plates were fixed into the drill holes, the space between the old foundation and the steel plate could be reinforced and poured with concrete (Figure 2).

The same problem was encountered when fixing the base plate (5.00 m x 2.20 m) of the gear unit. The original shear connections were deeper than the new foundation. The problem was solved with chemical anchors M24, being drilled into the fresh concrete. The load capacity of one chemical anchor is R shear = 150 KN, R tension = 245 kN. In total, 22 anchors now fix the gear unit to the basement.

Realisation

In each case, great effort was taken to ensure the required accuracies of the equipment suppliers were met.

When building a foundation for a machine there must be an understanding between equipment supplier and the civil contractor. For example, the equipment supplier will manufacture a machine with a tolerance of 0.5 mm, but the civil contractor has to make a big effort in achieving a tolerance of up to 5 mm. Clearly solutions have to be found that are acceptable to both.

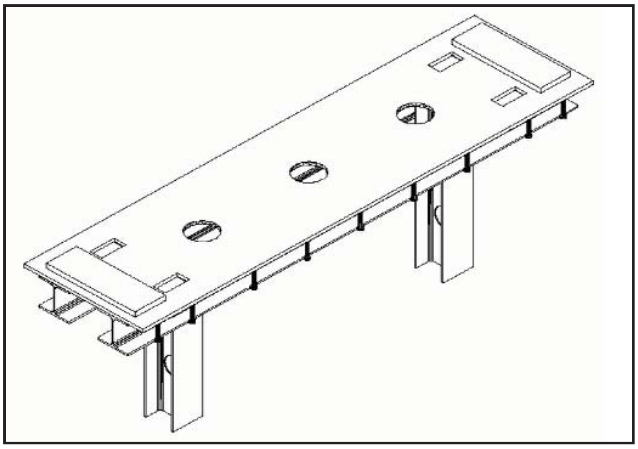

Figure 4. Modified mill base plates.