

Dispatch from cement silos 1+3

- equipment for the silos outlet regulation (Reconstruction of the discharger A5)



Client: Cement Hranice, a. s.

Realization: August - September 2009

Z 4991



Prime condition

Customer's requirement

To design a device of the side outlet from the cement silo and to carry out necessary modifications of transport lines with fluid trough conveyors to tank trucks in order to attain higher speed of filling and so to shorten the total period of filling of a tank truck from the present 30÷35 min to the period less than 15 min.

Task, final formulation of a design:

- Aeration plates fixed on the steel structure were installed for the material aeration inside the cement silo at side outlets. To prevent deposits (lumps) to get into the outlet, a protective "cage" of steel tubes was created around the structure with aeration plates.
- There is a non-aerated part of the outlet from aeration plates to the outlet onto which regulation technological equipment is connected.
- Each outlet is fitted with two sets of regulation technology so that it would be possible to fill two parallel transport lines at the same time.
- There is a distribution system of "compressor" pressure air regulated to approx. 5 kPa as a source of pressure aeration air for aeration plates inside the silo.
- A radial fan positioned outside the cement silo in a free area, not covered, with opened suction (technical parameters of the fan: $Q=0,25 (0,13) \text{ m}^3/\text{h}$, $P= 5 \text{ kPa}$) is used as a source of pressure aeration air for transport trough lines.
- Aeration "cushions" were installed additionally on the silo wall near outlets. The last expected modification for improvement of the material flow from the silo outlet not realized so far is installation of a protective roof over aeration plates in the silo. The present speed of filling of a tank truck is approx. 30÷35 min, so approx. 60 t/h.
- Inclination of transport trough lines is 4 °.

Stated modifications of outlets and existing transport lines will guarantee increase in speed of filling of tank trucks at the capacity approx. 200÷250 t/h when the material column above the outlet is min. 3 m.

A separator of non-ground, strange pieces and automatic sampling of material dispatched can be installed in transport lines.



Description of the final design discussed and approved by the customer:

Measures we proposed in order to attain more intensive filling of tank trucks by the cement discharge through the side outlet from the silo are divided into five areas:

1. Aeration in the silo at the outlet

Installation of aeration plates in the silo with the effective aerating area 1,5 m² was designed. Aeration plates are arranged as far as the outlet edge from the silo. Aeration plates were installed on the supporting structure so that the plates would be descending to the outlet hole inclined min. 10 °.

We recommend the protective "cage" that reduces speed of material movement towards the outlet hole to be removed.

Installation of the protective roof over aeration plates in the silo was rejected. This passive element that is installed over the lower central outlets is to prevent creation of material deposits. In this case the roof would decrease the material column above the outlet and so necessary pressure for the material flow from the silo.

2. Regulation of the material flow from the outlet

There is a safety hand-operated slide closure designed for the silo closing on the outlet flange. Then a dosing roller closure driven by a motor for regulation of the material flow from the silo is connected to it. All regulation elements will be aerated with pressure air.

3. Fluid trough transport lines

Manufacturing of new troughs from the outlet to the nozzle or at least stretching of a new cloth to the existing troughs was recommended. Arrangement of a separator of non-ground material before the filling nozzle so that possible lumps contained in the material would be separated is worth considering. We recommend inclination of transport lines to be min. 6 °.

4. Source of pressure air for material aeration in the silo

Regarding the possible height of the material column above the outlet a blower providing pressure 50 kPa and aeration air amount of 270 m³/h for one outlet was designed as a source of pressure air of aeration plates in the silo. This pressure air from the blower serves for aeration of regulation elements of the outlet at the same time.

After testing and equipping the remaining silos with new outlets, this blower will be replaced by a bigger one (if it is necessary to discharge material from two and more silos concurrently) that would supply air to all four silos. The smaller blower used for the operation of one silo would remain as a spare source in case of breakdowns of a bigger blower operated.

5. Source of pressure air for transport lines

We recommend so that high-pressure fans with a filter at a suction providing pressure 68 kPa (regarding the possible lumps in material) would be used. The HP fans will provide pressure air in necessary amount and quality. In case they are installed outside the silo in a free area we recommend so that a noise elimination cover would be used.

