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HRB BLENDING

Hydraulic road binders (HRBs) are chemical stabilisers made by blending substantial amounts of supplementary cementitious materials (SCM) - which may be granulated blast furnace slag, pozzolans, fly ash, burned shale or limestone - with clinker. The use of HRBs is more cost-effective and has CO_2 emissions 5-25% lower than conventional road base mixtures.

Biko-Serwis was asked to design and build an HRB blending plant by Carmeuse for a site in Belgium. The installation's main product was to be HRBs produced according to EN 13282-1 and EN 13282-2 standards, as well as composite cements according to EN 197-1 and limes according to EN 459-1. Depending on the selected recipe, the finished product may consist of: lime, cement, slag, fly ash and gypsum, as well as other additives. The assumptions and requirements specified were:

- 4 steel silos, each with capacity = 250m^3, Ø = 4150mm;
- 1 buffer silo, capacity = 100m^3, Ø = 3100 mm;
- Automatic dosing, weighing, mixing, conveying and loading;
- Operating temperature of -15°C to 40°C;
- Air humidity up to 75%;
- 5 stations to unload raw materials from silo trucks;
- 2 loading stations with 2-axis positioners;
- 2 automatic sampling stations for products;
- Maximum installation height up to 45m.

Unloading

Semi-finished products are supplied by silo trucks. The driver parks the silo trailer in the correct loading zone, then scans the QR code or manually enters the product number. This determines which silos will be filled. The driver connects the silo tanker with a flexible hose to the unloading pipeline that leads to the correct silo. The driver confirms that unloading can commence by pressing the appropriate button on a local control panel.

Depending on the type/size of the compressor installed on the vehicle, the unloading time may vary, but should not exceed 40 minutes. The installation has been designed in such a way that, at the end of unloading, it can take over the entire amount of air stored in the tanker under a pressure of 2 bar. Thanks to this, it is possible to almost completely eliminate the risk of dust emissions.

Accuracy is key

The heart of the blending facility is the accurate weighing and dosing of appropriate portions of semi-finished products from buffer silos. The system works in batches, not continuously, which improves accuracy. There is no need to buffer the finished product in additional buffer tanks, as the risk of overfilling the tanker is very small.

The dosing systems under each silo are based on two drum gate valves. The first is a cut-off valve. The second is a regulating flow valve equipped with a pneumatic digital positioner. The semi-finished products are dosed from individual silos through aeration slides to weighed tanks with a capacity of 3m^3 each.

The weighed doses are transferred from the weighing buffers directly into a 3.65m^3 batch mixer. They must be loaded in the correct order, as this has a significant impact on the quality of the mixture. The mixing process takes about 60 seconds, after which the finished product goes to a continuous mixer below, with a buffer capacity of 4m^3. The continuous mixer, thanks to its reversible screw conveyor, transports the product to one of the two loading stations.

Loading

The two loading points are fitted with a 2-axis positioner. They have loading spouts with a central cartridge dust collector. The operating range of the positioner is ±500mm for the x-axis and ±150mm for the y-axis. This allows the loading chute to be positioned centrally in relation to the axis of the silo trailer hatch, which has a positive effect on the durability of the spout components. It makes positioning of the truck within the loading bay less crucial.

The system checks the amount of raw materials in the buffer silos, then determines the number of portions to be prepared according to the blend requested. Depending on the volume of silo trailer and the quantity composition of a given mixture, it can be from a few batches to more than a dozen.

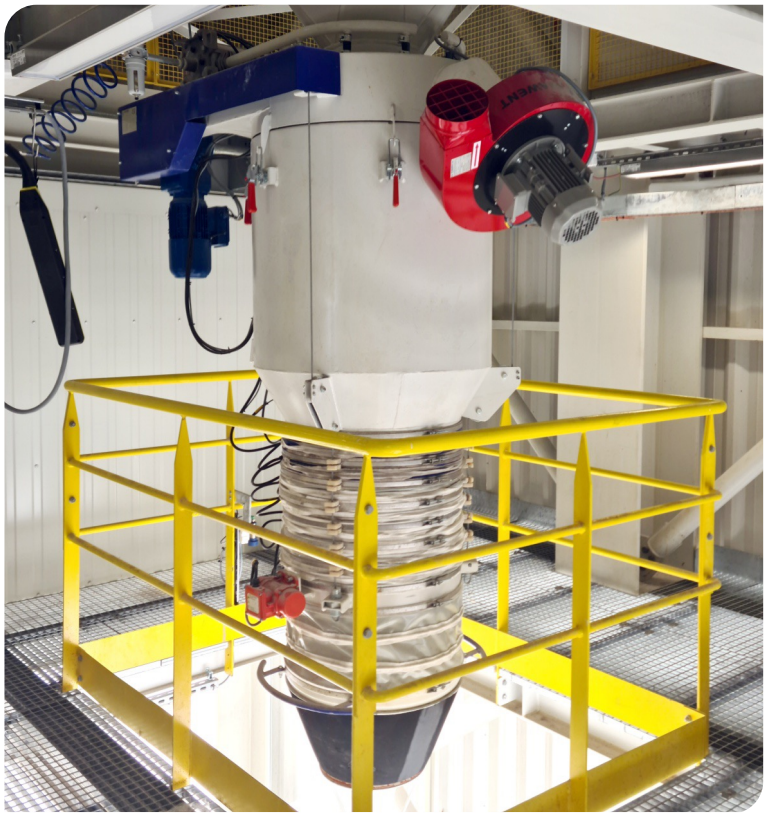
After the road tanker is loaded, the driver lifts the loading spout, which the system interprets as the end of the loading process. Then it is possible to leave the loading zone and drive in the next silo trailer. It's also possible to immediately start loading mixture at a second loading zone.

At every stage of the loading and unloading processs, Biko-Serwis places great emphasis on ecology and zero-emissions policy. It uses recycled materials and has modernised its equipment to deliver sustainable performance for its clients.

The entire loading process is carried out without dust emissions, thanks to the use of a high-performance 3000m^3/hr bag dust collector, which collects dust from weighed tanks as well as from batch and continuous mixers.

Simultaneous loading and unloading

The blending plant has three operational zones for silo trailers: one for unloading and two for loading. This enables simultaneous unloading of semi-finished products of a silo trailer into buffer tanks while loading another silo trailer with the finished product. However, it is not possible to load two silo trailers at the same time. This is due to the complexity of the production process of the finished mixture.



Loading can be performed by two 2-axis positioners.
It is possible to unload and load different vehicles at the same time.