

Fly ash handling solutions

by Bulktechnik AB, Sweden

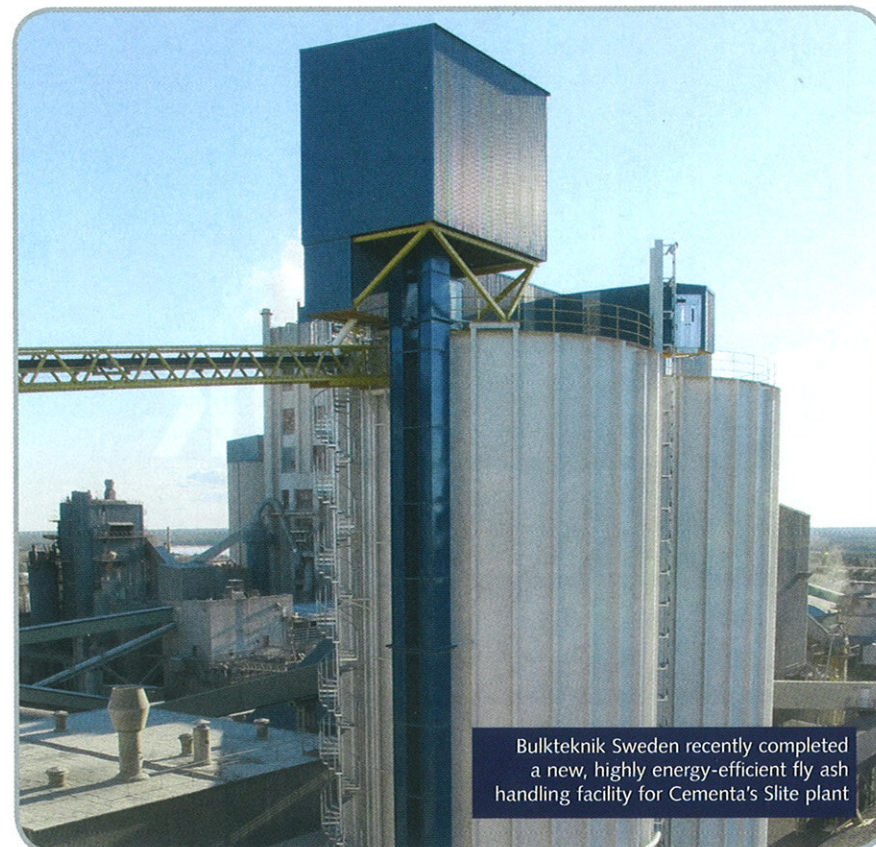
Part of HeidelbergCement, Cements AB in Slite, on the island of Gotland in Sweden, is one of Europe's most modern and energy-efficient cement plants. Bulktechnik Sweden recently finished building a new, highly energy-efficient fly ash handling solution for the cement works.

The new fly ash handling facility is a complete turnkey solution that handles the fly ash from its arrival by ship at Slite until it is added to the cement mills, including all transportation systems, storage silos, buildings, dosing equipment, foundations, electrical and compressed air installations. One of its key features is its highly energy-efficient operation, mainly based on a Trelleborg Scirocco II fluidisation hose, which works on principles similar to those of a conventional airlide.

Key project features

The fly ash arrives to Slite on self-discharging ships, which blow the material 100m up into a cyclone that separates the air used for the transport from the fly ash. From the cyclone, the ash is transported in a 120m-long Trelleborg Scirocco II hose to a bucket elevator. It lifts the material to the top of the new silos, where it is distributed via the same type of hose to the silos. The energy needed for the transport to drive a 52m bucket elevator, filters and compressed air to transport the material a distance of 145m from the cyclone to the silo inlet is less than 0.5kWh/t while transport capacity amounts to over 250tph. When designing the system, Bulktechnik paid particular attention to energy consumption for all motors above 5kW, of an energy-efficient class IE3.

The installation at Cements Slite is the longest and largest installation of Trelleborg Scirocco II hoses ever manufactured and installed. Different hose sizes make up a total of 400m while the installation also represents the first use of the 12in hose. The longest hose from the harbour to the storage silos is 120m and is the longest continuous Scirocco hose ever installed. Bulktechnik ensured its perfect operation over the long distance through several tests.



Bulktechnik Sweden recently completed a new, highly energy-efficient fly ash handling facility for Cements Slite plant

Working principles and benefits

The function of the Scirocco II hose is similar to an airlide. It works on the principle that the material slides on a bed of air and that gravity does the rest of the work. A small amount of compressed air is added into supply ducts at the lower wall of the hose. From these ducts small openings lead into chambers, which are covered with felt. Thus, each chamber is supplied with compressed air and works like an independent airlide. Since each airlide is very small, a good fluidisation level is achieved. This is why the hose can be installed at very small inclination angles. The transported material must be a fine powder that can be fluidised, such as cement, microsilica, fly ash and pulverised limestone.

The Scirocco hose offers several benefits when compared to a conventional airlide:

- totally dust-proof
- requires less energy
- quieter operation
- no moving parts
- almost entirely maintenance free
- flexible.

Moreover, its flexibility has made the equipment easy to install, a distinct advantage as much of this installation has been inside or in close proximity of existing buildings and machines.

To be able to have a transport system that can be adapted on site has been a great advantage, for example, when the customer decided to change the connection points for one of the hoses in a late stage of the installation.



Silos

Two self-discharging steel silos act as storage for up to 9900t each. The 6150m³ silos have a diameter of 14.5m and a height of 46m.

They are welded on site from prefabricated steel, which is very price competitive compared to concrete equivalents. Since hydraulic jacks are used to raise the silos, most of the work can be achieved at ground level. The silos have a 45° cone equipped with a fluidisation system. It consists of Solimar silo fluidisers mounted in a special pattern, a design proven by Bulktechnik to achieve complete emptying of the silos with the added benefit of very low power consumption. After the silos have been emptied, the only material still left in the silo is a thin dust layer as the system offers a guaranteed reclaim rate of 99.75 per



Clockwise from top right: Building for cyclone and filters
Hose installation with the new silos in the background
One 10m Scirocco hose from each silo feeds a bucket elevator that lifts the fly ash 18.5m to a 77m Scirocco hose. This longer hose transports 60tph of product to a bin that is placed in close proximity to the two cement mills where the fly ash is to be added

cent. A well-designed fluidisation system is also essential to ensure that the material entering the Scirocco II hose contains enough air to guarantee a good flow.

Bulktechnik has been building this type of steel silos for 15 years and throughout this time, more than 30 silos similar to the ones that have been installed at Cements, mostly in Scandinavia, but also in other parts of northern Europe.

Dosing

One 10m Scirocco hose from each silo feeds a bucket elevator that lifts the fly ash 18.5m to a 77m Scirocco hose. This longer hose transports 60tph of product to a bin that is placed in close proximity to the two cement mills where the fly ash is to be added.

To ensure an accurate fly ash dosing, each cement mill has a separate, 0-30tph feeding system with a rotary valve that is controlled by the measured material flow of a Coriolis mass flow meter. The bin also stands on load cells, enabling an easy calibration of the mass flow meters. From the mass flow meters to the bucket elevator after the mills, Scirocco hoses transport the material the last 40-50m.

In addition to the above configuration, some extra transport equipment was

Technical facts

- Storage capacity 12,300m³
- Ship unloading capacity 250tph
- Dosing to two cement mills 2x30tph

Main equipment:

- Engineering and project management Bulktechnik
- Silos and buildings Bulktechnik
- Screw conveyors Bulktechnik
- Scirocco II fluidisation hoses Trelleborg
- De-dusting equipment Donaldson
- Level measurement Endress+Hauser
- Bucket elevators Beumer
- Elevator Alimak

installed to enable the storage of cement in the new silos. Six screw conveyors transport cement from two cement mills to the bucket elevator normally used for the intake of fly ash. It is also used to empty the cement from the silos. In this case it feeds a 40m Scirocco hose that connects to an existing airlide system. The hose is placed on a bridge spanning 30m and 42m over a public road.

Successful completion

The project time from the first groundwork until the first test with fly ash was 12 months. The jobs were completed according to plan and all performance and function tests have been very successful.



The first ship unloads fly ash at Slite