

Assentoft

Bolted storage silo for Ecocem, Fos-sur-Mer plant

Ecocem France, a joint operation between Ecocem Materials and ArcelorMittal has built a new blast furnace slag grinding plant in Fos-sur-Mer, France. The plant is a part of the Ecocem Group expansion program with a capacity of 700,000 tonnes annually. Ecocem contracted Assentoft Silo in Denmark for the design, manufacturing and erection of the steel silo for storage of the GGBS.



The newly inaugurated slag grinding plant alongside the ArcelorMittal steel plant at Fos-Sur-Mer is equipped with a 3400 tons bolted storage and delivery silo. This article looks at the design and construction of the new silo for ground granulated blast furnace slag (GGBS).

Silo design

The silo is designed according to the Eurocode building regulations, including the National Annex for France (which additionally considers the Fos area's anticipated seismic activity and windspeeds of up to 26m/sec.) This created demands for the horizontal absorption of forces into the foundations, which therefore had piles driven into the ground in order to be able to absorb the loads.

The silo is 12.2m in diameter and 40m high. The bottom section is 12.9m high. The silo has a capacity of 3417m³ of ground slag.

The bottom section allows for free passage of trucks for loading. In the silo cone there is a fluidising system, consisting of 24 elements for fluidising the slag. The system is run by four valves. Below the cone there is a manual valve, two pneumatic valves, a lump catcher and a loading bellows with a built-in filter unit for dust-free loading. Loading is performed directly into trucks, parked on the weighbridge below the silo. It is possible to dose the slag into the trucks very accurately by means of the two pneumatic valves. Loading time per truck is approximately five to 10 minutes for 25 tons, inclusive of weighing.

Left: The erected silo in all its
erecting glory.

The platform under the cone is designed to incorporate an auger including a second loading bellows from an eventual second storage silo.

Since the material is easy to handle, it is possible to use a rather flat cone, however a 45° angle cone was chosen, to be the most cost efficient due to static calculations. Above the bottom section, the silo wall consists of bolted steel panels, as well as a bolted roof section, supported by beams.

Integration with the plant

All electrical control is carried out from a central Siemens system meaning that control of the loading bellows, the cone fluidisation system, the weighbridge and the filter is carried out from this central computer. As the plant is new, this allows for a control unit that ensures all activities at the plant.

Below: Construction underway on the bottom section of the new slag silo for Arcelor Mittal at Fos-101-Nier.



Erection

Assentoft Silo's extended experience and know-how with manufacturing of large steel silos and tanks is a considerable advantage. Assentoft Silo was established in 1940 and specialises in supplying turnkey silo and tank plants, developed as standard plant design, which can easily be adapted to individual customer specifications, and to various lines of industrial business. Assentoft supplies storage for all types of powders, granulates and some fluids within the cement industry.

All the parts for the silo are manufactured at Assentoft's facilities in Denmark, ready-made for erection at the building site – inclusive of surface treatment. The parts are bolted together, and supplied at the site according to building sequence – providing the following advantages: high use of the crane, simpler logistics, lower need for available stock space around the site, less handling of the goods, use of standard trucks for transport to the site – all things which keep the costs to a minimum.

The bottom section parts are craned in position and bolted together. This design enables two men to assemble the 12.9m high bottom section in one week. On top of this section, a temporary platform was prepared to allow space for the later erection of the silo wall.

First the roof section was built next to the silo. This section is craned in position on jacks on the top of the bottom section. After this, the steel panels of 1900mm x 1250mm are bolted together, and the silo was slowly erected, as new rings were added. A total of 23 rings were built in 16 days. The silo wall being finished, only the cone was left to be welded – in order to obtain the necessary strength and tightness.

Surface protection

The silo design keeps future costs for corrosion protection at a minimum. Unlike silos welded on site, the bolted design enables the manufacturer to deliver a high quality surface treatment.

All panels for the silo wall and roof are hot-dip galvanised, and the lower bottom section, which includes the skirt and cone section, is sandblasted and painted to C4, DS/EN ISO 12944/5 standard in Assentoft's paint work shop, ensuring a high quality paint in good environmental conditions.

Conclusion

The bolted design is extremely flexible and adaptable for most materials. Since a minimum of work on site is required, the building process is very short for this kind of project – making the silo ideal for locations where a short building period is required due to existing running plants or remote locations with severe weather conditions. In addition, since welding and processing of the steel is done in specialised and effective workshops, the cost of the silo is very reasonable. ☺