PROJECT PARIS

With extensive development underway in Paris, the increasing demand for cement has encouraged companies such as LafargeHolcim to expand their assets. This was one of the reasons behind the company's decision to install a flexible 9000 t storage facility that was capable of both feeding and being fed from barges/vessels or road tankers, together with a direct load from train wagons. The decision stemmed from a long discussion involving both Euromecc and LafargeHolcim's technical departments and other consultants and sub-suppliers, aiming to outline the basic requirements for the project. Every aspect of the project was discussed over 9340 design hours, focusing on specifications, expectations and environmental integration.

Storage

The storage compartment is made up of a 4710 m^3 main unit, available in a single Ø15 000 mm internal diameter silo, which set a new benchmark in the industry of bolted steel silos, and two satellites of 1890 m^3 each, with an internal diameter of 9276 mm. Every silo is installed over a steel support structure with drive-through setup, designed to have sufficient room to house the pneumatics and discharge components, which are the technological heart of the site.

Daniele Sciuto, Euromecc s.r.l., describes the company's role in the installation of a 9000 t storage facility for LafargeHolcim's Gennevilliers cement terminal in Paris.

At the top, a common penthouse has been built to protect all the filtering and detection devices from the weather, thus reducing the impact of any kind of dust or acoustic emissions. This kind of installation required proper engineering of the connections and junctions, and the possibility for minimum oscillation over the total height of nearly 46 m.

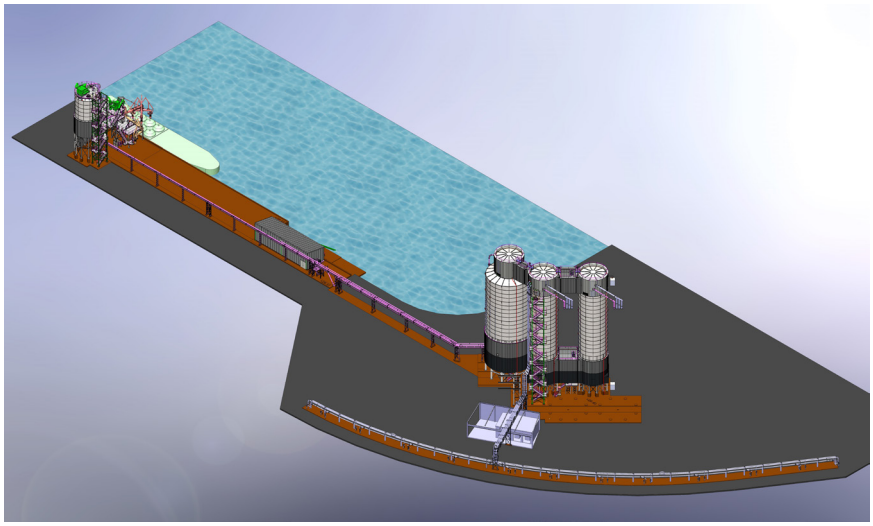
Although the storage area can be recognised from the surroundings as a large single compartment, this configuration allows the flexibility of independently and safely storing up to three different products with no contamination.

In addition to the three silos, a Ø7680 mm buffer is located near to the wharf, increasing the total storage capacity by an extra 460 m^3, with the purpose of serving the barges' load operations.

All the silos and steel work were manufactured using high-quality steel, in compliance with both the UNI EN 1090-2 and the UNI EN ISO 3834-2, which regulate the processes and welding operations. Additionally, a large amount of CNC equipment such as automatic welders or painting robots helped achieve a quality finish, in line with the contractor's expectations.

For the support structure of all three silos, steel pipes with a diameter of 610 mm and 30 mm thickness were used. Therefore, to weld each leg, it was necessary to use tailor-made positioning tools. Looking at the bodies, the Ø15 000 mm is made up of 60 vertical panels, and the Ø9276 units have 36 vertical panels each. This was one of the key factors of the construction technology, and was achieved by using large welded sections that are externally flanged, in order to limit the number of vertical connections and achieve a high-grade of sealing as well as reduce the number of bolts for installation. The same principles are used for the cones construction, made up of 52 sections on the bigger unit and 30 on the smaller ones.

The Gennevilliers cement terminal is located over an area of 5300 m^2, in Paris.



The design phase involved several CAD instruments which focused on the main features as well as every single bolt.

Receiving

Powders that are meant to be stored can be loaded into the silos either by road, rails or wharf. Road tanker is probably the easiest option, and this is realised by connecting the tankers to dedicated pneumatic lines.

For rail wagons, there is a single lane system with a compressor and the provision for an extra lane and two additional compressors as part of the customer's expansion programme. At present, up to 11 single wagons can be positioned and then, one by one, they are put under pressure with a dedicated compressor and emptied into one of the three silos. The extra lane will be able to

Having long vertical panels with limited horizontal flanges reduces the need for operations at height and the overall number of bolts.

This setup only requires four horizontal connections per silo, for a perfect sealing of each unit.

The train unloading area is served by multiple inlets that reduce down to one manoeuvre required for positioning.

connect 11 additional rail wagons to different silos, and the two extra compressors will give the site more flexibility to boost one lane or the other, provided that the filters are already designed to assist with it. To reduce the loading phase, the filling pipeline has been equipped with a dedicated booster which is meant to increase the efficiency as well as shorten the process duration.

Looking at the wharf, the facility is suitable to receive materials from barges at a rate of 180 m^3/hr: there is a designated area where either a pump can be connected or material can be fed from a compressor and unloaded onto one of the three main silos.

The complexity in loading operations has required the use of high-spec filters which can adjust to different situations without compromising on external emissions and internal contamination. For this reason, of a total filtering capacity of 58 000 m^3/hr, 33 000 m^3/hr are dedicated to the main storage silos.

Delivering

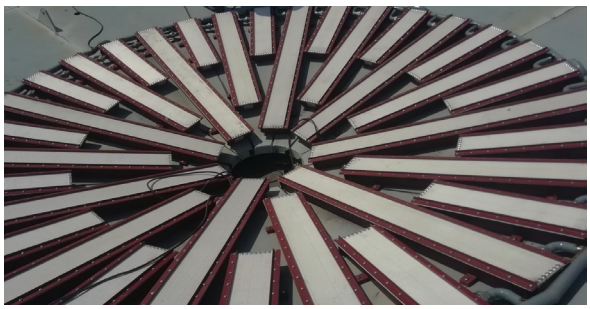
Considering the emptying phase, the powders can follow different routes. First of all, the material goes through the extraction process, which ensures an emptying rate of up to 98% and is realised with an aerated flat bottom. The internal fluidisation covers most of the flat surface, so that every silo can efficiently meet the discharge criteria, and is designed in order to avoid any build-up or funnel effect. After leaving the silo, the material flows through a system of airslides, able to feed both road or wharf loading operations.

Road tankers can be loaded with a drive-through setup, which allows two lanes under the biggest silo and one for each satellite. Every spout is fed by airslides and can reach a capacity of 250 m^3/hr, reducing the loading time per truck down to 7 min., 12 sec.

The barge loading operations require the material to be conveyed with a main pump from the storage area to the small buffer. Then it is delivered to a rotating arm that can feed any of the proposed barge models with only two manoeuvres. To achieve this result, the arm can pivot around a main axle, and then can also rotate the loading spout in order to reach four different positions with a fixed angle on the pivot.

Surroundings and installation

A key role in the project was played by the integration of the terminal with Gennevilliers' landscape. From the beginning of the project, a team of architects were involved in the



Each silo has a truncated cone covered by fluidisation airslides able to guarantee an emptying percentage of 98%.

Under the discharge cone, it is possible to see all the pneumatic equipment.

The movable arm has two main pivots in order to feed barges in only two manoeuvres.

Every silo is designed to feed cement tankers with movable and retractable loading spouts.

discussion regarding the best way for the plant to integrate with its surroundings. Looking at the whole industrial area, five different colours were selected and used to 'vest' every single item. This process was supported by 3D simulation, as well as monthly meetings at the site, which led to the decision to use the four different greys for silos, main structures and cladding and the red which blends in with some of the neighbourhood sheds. The complexity of the terminal required nearly one kilometre of pipelines, serving both loading and unloading operations, and also required extensive use of supports and bridges to merge with the site. In total, more than 1000 t of steel have been used for the construction of the entire terminal, manufactured over more than 30 000 manhours.

Euromecc looked after the mechanical side of the installation phase and had its own staff attending every phase, from the casting done by local contractors, up to commissioning, ensuring that the logistics at every phase did not affect the viability at the site. In order to achieve this, a Euromecc team of around 20 experienced fitters, engineers, and other professionals from Italy moved to Paris and lived there for several months on a shift base, alternating with those based in Italy, for a total of nearly 32 500 manhours.

The whole process took almost one year to complete, with a satisfactory start-up in February 2020, in line with the set target.

Conclusion

The project has required the design and construction of Ø15 000 mm bolted silos, through the entire production chain from engineering and 3D modelling that has been validated by a pool of expertise, continuing with trails, shop-assembly and factory tests.

The Gennevilliers terminal has now been operating for nearly one year, with some fine tuning conducted over the first period of operations in order to reach the customer's full satisfaction, setting a new benchmark for cement terminals that can easily be recognised as infrastructure assets, and whose role is becoming more popular due to their flexibility and ease of integration with their surroundings. ■

About the author

Daniele Sciuto is the Area Sales Manager for UK and Commonwealth regions at Euromecc. He has a Mechanical Engineering background, and has been involved in the costing and sales of several terminal projects all around the world since 2012.