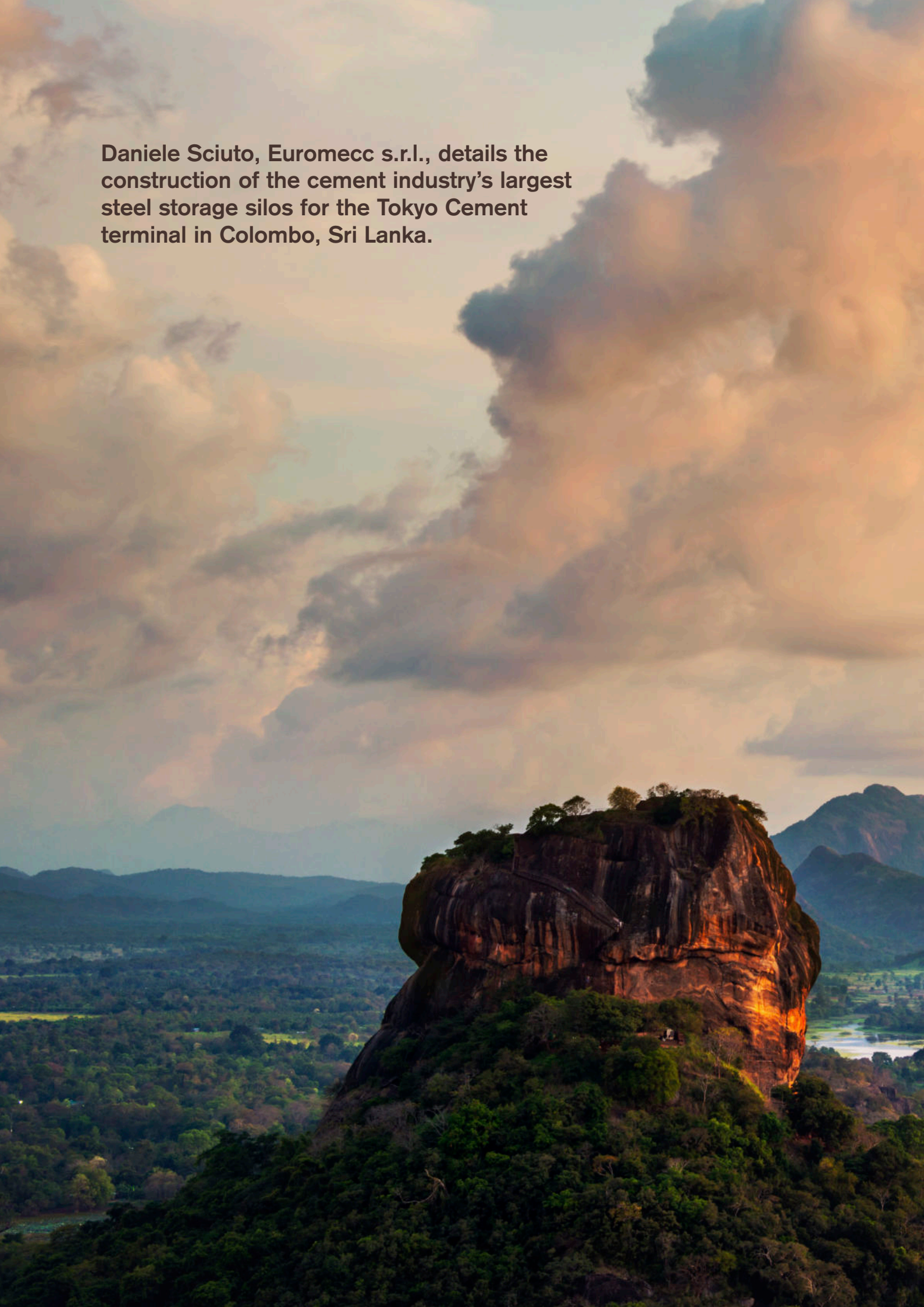

Daniele Sciuto, Euromecc s.r.l., details the construction of the cement industry's largest steel storage silos for the Tokyo Cement terminal in Colombo, Sri Lanka.

SILOS IN Sri Lanka

Sri Lanka represents the fourth-largest cement importer in the world. This is largely to the removal of import duties from some raw materials that cannot be produced domestically, and growing demand from large scale housing schemes, highways and small and medium-build projects. Although domestic production has been growing over the last few years, most cement still arrives from Vietnam, Pakistan, Malaysia and surrounding areas.

In 2018 the market leader Tokyo Cement Co (Lanka) PLC, which has only one cement plant, located at Trincomalee, decided to improve its import capability by installing a 15 300 m^3/20 400 t storage facility in Colombo's port. The project then was postponed due to a significant drop in the domestic market together with the pandemic, and only shipped between February 2020 and January 2021. It finally went into operation in June 2021.

Storage

The project was realised with three main cement silos of 5100 m^3 each which, being the first ever produced with this size, set a new benchmark in the steel storage bolted silo industry. The silos have a diameter of 15 000 mm, and are installed over a 16 m drive-through carrying structure. This brings the total height up to 47 200 mm (43 500 mm without the filter). The shell is built in twenty radial sectors over three rings in order to limit the number of horizontal flanges down to four, all located on the external side and adequately protected with EPDM gaskets.

Discharge is achieved with a truncated 60° cone with an aerated 15° flat bottom to reduce the overall height and simplify the downstream distribution. The construction method of the cone follows the design used for the shell, and leads to a unit made up of 52 single pieces connected by external flanges. On the inside, a complex bed of open airslides is responsible for the correct fluidisation and high-degree of emptying of each silo, which is served by a 700 m^3/h blower.

Another technical aspect of note is that the structure that is made up of ten Ø610 mm steel pipes with a thickness of 30 mm. During the manufacturing process, every leg went through an eight-hour phase of automatic welding for each end, where a bespoke position tool was used.

The installation was carried out with a precise order due to the narrow site and limited space available for storage and pre-assembly.

Silos are connected to each other and have a wide platform at the discharge to host pneumatics and electronics, as well as protect them from the weather.

Filling and emptying

Silos are pneumatically fed directly from vessels through a 200 m 12 in. double pipeline. This new facility is in-ground and connected to the existing main pipeline served by a high-capacity pump. This setup allows different varieties of cement to be received by standard dry bulk cargo ships.

At the top of the silos, every unit is equipped with an active filtering device capable of treating up to 15 000 m^3/h, with a filtering surface of 180 m^2.

The electronics and control system ensure that silos are not overfilled, matching the loading data with the filling percentages detected by either mechanical and radar level indicators.

On the emptying side, one of the main features of the terminal is its own ability to feed either trucks or an existing storage facility. To do so, every silo has an aerated three-way tank serving on one side a de-dusted loading spout with a capacity of 250 m^3/h, and on the other an airslide system that conveys the material into a pneumatic pump. Under each loading spout, there is a dedicated 80 t weighbridge for operations.

After a long architectural discussion, the final setup was designed in order to avoid any queue for bulk loading. Hence, every silo can be accessed with a 45° high-radius curve, and hosts a 4000 mm wide track underneath to avoid any waiting or crowding of the port facility, ensuring a one-way site.

Logistics and installation

The full project was designed around site measures of nearly 25 m by 110 m. Therefore, with the available area being very narrow, the installation method had to follow a strict and precise sequence in order to not affect the viability of Colombo's port. In particular, it was necessary to erect one silo at time and use a designated area for storage and pre-assembly.

Due to this restriction, the total delivery of 84 containers was split into five different lots.

Every container was packed using a special system of racks and connectors to prevent materials from damage or distortion during navigation and handling.

The site was originally meant to be overseen by Euromecc during installation, however, due to the pandemic and the introduction of severe travel restrictions in the region, it was not possible to physically attend the site. Accordingly, in conjunction with a very detailed erection handbook and video-training, a team of Euromecc professionals was made available to remotely support the site throughout the installation period, in spite of time differences.

Despite this entirely new approach, the results were still impressive and allowed the end user to fully install and set this major facility into operation, a process which was then verified and commissioned by a Euromecc project manager.

Conclusions

This project represents one of the major investments encouraged by the Sri Lankan government to develop the country.

Despite its apparent simplicity at first-glance, this project was characterised by two main challenges: Firstly, the use of a single upright steel silos to store approximately 6700 t of cement, the biggest ever realised for the industry, and secondly, the need to remotely oversee and manage such a complex project and its execution during a global pandemic. In the end, both challenges were successfully addressed, and the project has become part of Euromecc's 30+ years of worldwide references. ■

A complex system of racks and packaging has been developed to prevent items from damage during sea transportation.

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.