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The production hub of major projects

Behind every major infrastructure project that aspires to create something extraordinary - being it a viaduct, a superhighway, a railway tunnel or a large dam - there is always a merger of brilliant minds, talent, experience and audacity. These qualities are crucial for the success of major projects. In Italy, numerous construction sites of national importance are transforming the country's urban planning, improving the transport network with new roads and routes to facilitate the movement of people and goods with more efficiency and safety. This article is about one of these key infrastructure projects: the construction of the Messina-Catania railway line, part of the Scandinavia-Mediterranean Corridor of the TEN-T (Trans European Network Transport).

The collaboration behind the project

The Messina-Catania project, with a value of approximately EUR 2.3 billion, is being implemented by the Messina-Catania Consortium, consisting of Webuild (leading contractor) and Pizzarotti, with the collaboration of companies such as Euromecc and CP Technology. The project includes more than thirty-six kilometres of tunnels, most of which are constructed by mechanised excavation and the laying of tunnel lining rings. This excavation is carried out by TBMs (Tunnel Boring

Machines), advanced machines that perform the excavation and lining of the tunnel with prefabricated concrete rings, composed of shaped sections called segments.

Factory 4.0: An example of innovation

To meet the need for speed and precision, the Messina-Catania Consortium, in collaboration with Euromecc, developed a fully automated 4.0 factory strategically positioned to supply the TBM with the necessary segments. Euromecc, with over 50 years of experience in the sector, followed the project from the beginning, conducting a detailed feasibility study in collaboration with Webuild and Pizzarotti.

The transition to the executive design and construction phases resulted in the construction of four warehouses dedicated to the different production activities and a concrete production plant, specifically designed to meet the strict specifications of the required mix designs. The factory, located in Belpasso, Catania, and operational from November 2023, represents a cutting-edge example at national and international level. Roboplant, the name given to this innovative factory, is a symbol of efficiency and sustainability. The automated carousel production line manages the entire process, operating in continuous cycles 24 hours a day, 7 days a week.



Production area of segments



View of manufactured segments

Each 2.7 m³/6.5 ton segment is produced in just 7 minutes, with a daily output of 168 segments and a total of 224.350 segments to be manufactured in less than 48 months.

The production plant

The four halls built by Euomecc house the different production areas. The reinforcement hall is dedicated to the reinforcements inserted into the segments; the 'carousel' hall is the heart of the system, where the segment moulds move in an automated sequence, receiving the concrete casting that forms the final segment structure. After casting, the carousel advances to the kiln hall, where steam reduces the setting time, quickly solidifying the concrete. Once ready, the segment is removed from the formwork and transported to the temporary storage shed before being moved to the outdoor area.

The performance required by the project led to the choice of a plant equipped with a twin planetary mixer. The aggregate batching unit, with a capacity of more than 300 m³ divided into six different compartments, is fed by an aggregate feeding system consisting of two hoppers of 25 m³ each. The extraction, independent for each hopper, conveys the selected aggregates by belts that rapidly distribute the different grain sizes in the six main bins.

To combine speed and precision, the aggregate batching system is equipped with six independent weighing hoppers, each one having a four-cell load cell system that guarantees capacity and accuracy in accordance with the mix design. This configuration allows the six aggregates to be dosed simultaneously and with high precision, thanks to the use of advanced automation and control software equipped with a state-of-the-art self-learning system. The sand compartments are equipped with microwave probes for moisture detection, which transmit the data in real time to the automated system, allowing the necessary adjustments of the mixing water and its weight compensation. The aggregate material dosed in this way is transported via a reversible belt that alternately



MEP planetary mixer brand Euomecc

feeds two skip hoists. The skips, acting as holding hoppers, feed the two mixers continuously and without downtime. To achieve the best quality and operational performance, Euomecc has implemented two advanced Euomecc MEP planetary mixers with a capacity of 2 m³ each and shared discharge. This system guarantees an hourly production of approximately 60 m³, with a mixing time of more than 60 seconds. The two mixers allow simultaneous pre-mixing and the production of up to four m³ of concrete per batch. This method ensures that the required amount of concrete for each segment is produced in a single step, minimising downtime due to transport between different production stages and ensuring a homogeneous distribution of concrete during casting for each segment. Each mixer is equipped with independent hoppers for cement, admixtures and water, as well as two binder silos of 90 m³ each and a shared silos for silica fume, together with a high-pressure washing system and a hygrometer. The entire production process is completely managed by automation, which not only controls the concrete production steps, but also exchanges data in real time with the other production modules of the factory via the data concentrator. This ensures the traceability of all operations, from the batching of raw materials to the production of the segments. Each batch is uniquely identified and linked to the corresponding segment, creating an identity document in which all production data is stored.



Assembly phase of concrete batching plant

Environmental sustainability and water management

In order to minimise the environmental impact of the production process, several consistent measures were taken. A complete cladding over the aggregate batching unit, made of sandwich panels with adequate thickness, helped reduce dust emissions during aggregate loading activities and mitigate noise during the batching and transport phases. The same approach was applied to the cover of the two mixers, creating a large weather-protected compartment to allow technicians to work safely in all weather conditions.

Special emphasis was placed on water management and its reuse. A sophisticated water recycling and reuse system allows the recovery of 100% of the wash water, which is first mechanically separated from the aggregates using the Euromecc Eurowash system. The water thus recovered is stored in a 50 m³ above-ground steel tank, equipped with an agita-

tor to prevent sedimentation. Subsequently, the water is sent to a filter press integrated in the process, which separates the solid part from the water. The liquid part undergoes further chemical/physical treatment and is stored in a second tank, where the pH is controlled and corrected by CO₂. This process allows the treated water to be reused as process water for concrete production, optimising the use of primary water resources and minimising waste.

Conclusion

The Roboplant factory, built with a significant contribution from Euromecc, is an example of how technological innovation and sustainability can go hand in hand in the realisation of large infrastructure works. Thanks to an automated production process and the adoption of state-of-the-art solutions, the Messina-Catania railway project demonstrates how complex works can be built to high quality standards. Euromecc, with its experience and expertise, continues to be a key partner in transforming Italian cities planning and contributing to the development of modern and efficient infrastructures around the world. ■

FURTHER INFORMATION



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