



Along the A14 motorway

The project, which has a Comacchio CH 150 as its protagonist, involves the seismic retrofitting of a entire viaduct, and the simultaneous reinforcement of the foundations of all the piers and abutments

Maintenance and safety work does not stop, even during the hot summer season, on the numerous viaducts of the A14 Bologna-Taranto motorway, the second main North-South backbone of Italy. Many of these construction sites are concentrated in a hundred kilometers stretch along the coast of Abruzzo, from Giulianova to Vasto. In addition to the refurbishment and reinforcement of these structures, the projects under way are aimed at improving the anti-seismic performance of the viaducts, located in a region of Italy that is known for a high

level of earthquakes. The general contractor Divisione Cantieri Stradali S.r.l. was awarded the contract by Autostrade per l'Italia S.p.A. (the joint-stock company that manages this motorway section under concession). Thanks to their cooperation, we were granted a visit to one of these construction sites, located in the municipality of Vasto.

THE CONSTRUCTION SITE

"The project involves the seismic reinforcement of the entire viaduct, which is approximately 400m long, as well as the simultaneous reinforcement of the foundations of all piers and abutments.

The use of sensors and electronic devices that detect the position and inclination of the machine has allowed to speed up and facilitate all positioning phases

Indeed, the project envisages expanding the existing structures on which the piers rest, in order to increase the number of piles that currently support the base of the foundations", explain Mr. Marco Pezone (Site Manager) and Mr. Mario Iorio of the Purchasing Office of Divisione Cantieri Stradali S.r.l. A total of six piles of 1,000mm diameter will be constructed beneath each of the piers for both carriageways. The lowest piers will require piles of 20m depth, whilst the piles beneath the highest piers, will be 25m deep. "The additional piles have a larger diameter compared to those of

the existing piles," the managers of Divisioni Cantieri Stradali S.r.l. confirm, "moreover, as they are positioned further away from the centre of gravity of the pier, they are better able to absorb the normal stress caused by the movements of the piers compared to the existing piles. The same can be said for the shear stress." Given the characteristics of the region, the piles will be tested, taking into account the subsequent stresses from the full spectrum of seismic actions. The existing structures will then be integrated within the new design. Characteristically, the soil within this area is typically made up of consolidated clays with sand and silt layers and intermittent pockets of aggregates of about 10cm diameter. The Site Supervisor, Mr. Vincenzo De Cristofaro explains, "the main challenge we are facing on this site is the low headroom. The drilling and grouting needs to be performed underneath the viaduct, with a clearance ranging from a minimum of 7m to a maximum of 19m below the deck beam".

THE SITE'S STAR

This is where the new Comacchio CH 150 comes into play. The rig is operated by a Vasto-based foundation contractor, Edilflorio

→ Edilflorio

The CH 150 is the new addition to the Edilflorio fleet, which includes two further Comacchio piling machines, as well as several Comacchio micropiling and anchoring rigs. Deeply rooted in the territory, the company was founded in 2013, following the amalgamation of the sole proprietorship Edilflorio (founded in 1990 by Mr Giuseppe Nicola Florio) and FGA S.r.l., both managed by Mr. Florio. This collaboration has allowed the company to build a competitive advantage as well as establish itself within the industry as a highly reliable partner, based on the competence and reliability of the 25-employee team, led by the Technical Director, Giuseppe Nicola Florio. The highly diversified activities of the company encompass various business areas, from the construction of civil and industrial buildings, infrastructural works, consolidation works aimed at preventing and mitigating hydrogeological extremes and fluvial flood risk, to soil remediation and environmental protection projects. Therefore, the company runs a large and diverse fleet and embraces the most advanced construction technologies. In addition to the SOA certification, the company has achieved numerous certificates, in line with its commitment to health and safety management in the workplace (UNI ISO 45001: 2018), environmental management (UNI EN ISO 14001: 2015) and quality management (UNI EN ISO 9001: 2015) and is enrolled with the Italian Register of Environmental Operators.

S.r.l., who are responsible for the completion of the installation of the foundations. This latest addition to the CH range of Comacchio piling rigs (unveiled during the last Geofluid), uses an 8-10-ton class excavator as a base carrier. This excavator is equipped with a modular mast system and a multifunctional rotary head. Thanks to its design, the Comacchio CH 150 can be utilized for the construction of both bored piles (with or without casings) and CFA piles, using simple conversion kits. "The compact size and low weight allow for trouble-free transport of the machine with the rotary head and Kelly bar in

situ. The design and construction of the CH 150 allows for access construction sites with difficult access conditions. Our company mainly operates in Central Italy, where the majority of the terrain consists of mountainous areas, and therefore, the road connections are not conducive to the movement of large and heavy vehicles. Many of the projects we complete often involve the construction and maintenance of medium-sized infrastructures which require us to operate in small and difficult-to-access spaces, under bridges, adjacent to roads or alongside railway lines. The Comacchio CH 150, with its compact size, is the ideal solution for these types of projects. Within the confines of this construction site, we simply remove the cathead to allow us to operate in low headroom conditions", explains Vittorio Florio, who, along with his father Giuseppe Nicola, heads up family-owned Edilflorio S.r.l. Positioned between the piers of the viaduct, you cannot but notice the extremely small footprint of the machine. This is possible thanks to the base excavator configuration which accommodates the ballast within the size of the tracks. What is striking is the agility with which the machine manages to complete the entire work cycle. Such maneuverability is simply unthinkable for larger, heavier, and cumbersome "conventional" piling machines. "The kelly set-up allows for the installation of bored piles with a diameter ranging

Standing between the piers of the viaduct, one cannot but notice the extremely small footprint of the machine



→ A multipurpose machine

Versatility is a key feature of the CH 150. In addition to the kelly set-up, the machine can be configured to perform CFA piling. In CFA configuration, the machine offers up to 170 KN extraction force and can operate with augers up to a maximum diameter of 750mm. The maximum achievable depth of CFA piles is 12m, which are achieved using a bespoke extension. The required stability is guaranteed by means of the extendable undercarriage (2,320mm -2,920mm), which is included as part of the standard configuration of the machine. In addition to kelly and CFA applications, the machine can be configured for the installation of micropiles using either rotary or rotary-percussion drilling.



from 750mm to 1,000mm. In this case, we are working to the maximum diameter achievable, to a depth of 20-25m, which is quite an achievement for a machine within this weight category. The CH 150 is proving to be more than capable of meeting the needs of this task, thanks additionally to the 44 kNm torque rotary head that has the option of being operated in "constant power" mode. Essentially, the regulation between speed and torque occurs automatically, thus optimizing performance", Vittorio

continues; "on average, we complete four piles per day with production only slowing when we encounter particularly stony layers."

A HIGH-TECH MULTIPURPOSE MACHINE

Performance and productivity are not the only advantages the CH 150 offers. The same systems that are normally used to optimize efficiency and safety on their larger piling machines are consistently applied by Comacchio to the smallest rigs within their CH range.



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The sensors and electronic devices used to detect the position and inclination of the machine allow for the increase of speed and facilitate all positioning phases. Moreover, sensor technology allows for the machine to automatically adjust the set-up to synchronize with the actual operating conditions, thus preventing potential hazards. All machine functions are managed through the Comacchio Control System (CCS) software, which provides the operator with comprehensive data of the machine operating parameters via a user-friendly touch screen display. The hydraulic system of the base excavator has been optimized for this type of application. The CCS system electronically controls the diesel engine, thus allowing the hydraulic system to acquire the maximum available power from the engine and therefore maximize productivity. In addition, the cooling system of the base excavator hydraulics has been enhanced to cope with demanding environmental conditions along with the intensive use that is typical of a foundation construction site.

In this instance, construction will continue once the seismic reinforcements on the viaduct piers is completed. Mr. Pezone concludes, "further construction work will be carried out on the abutments of the viaduct, both on the north side which will be consolidated using a jet grouting technique to discharge a proportion of the seismic stresses, and on the south side with the installation of five active tie rods which will assist with a reduction to the shear stresses on existing foundations".

Divisione Cantieri Stradali

Divisione Cantieri Stradali S.r.l. is a general contractor established in 2008 following the incorporation of the business branch of the Giuseppe Iorio Group S.r.l. (formerly the sole proprietorship Iorio Antonio, operating in the construction industry since 1967).

With its registered office in Rome, the company operates in both the public and private sector throughout Italy. Over the years, it has specialized in infrastructural projects, focusing on the restoration of bridges and viaducts and on the construction and maintenance of roads (structural

restoration and consolidation, seismic adaptation, bridge lifts and structures, replacement, and maintenance of supports and joints). Its main customers include organizations such as ANAS (the joint-stock company, managing 90% of Italy's national roads), major governmental bodies

(for example municipalities and provinces) and the main motorway concessionaires, as well as the major private companies operating in the field of infrastructure, environmental and territorial engineering, such as, SPEA S.p.A., SINECO S.p.A., SINA S.p.A. and the GAVIO group.

October 9/2022

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