Laying foundations in Norway

A large number of bridges and tunnels are being built for the Vestfold Railway. Foundation contractor Entreprenøservice is working with an Italian-manufactured Comacchio drill rig on the Paulertjønn bridge

The Vestfold Railway (Vestfoldbanen) is a 138km line between the cities of Drammen and Eidanger in Norway. Opened as a narrow-gauge line in 1881, the line is exclusively used for passenger trains.

The route still bears the stamp of 19th-century building techniques, with many turns and a low capacity. Since the 1980s there have been plans to upgrade the Vestfold line to high speed.

The modernisation project is part of a wider infrastructure plan (the National Transport Plan/NTP, 2010-2019) and involves the three sections of the Vestfold line. The Barkåker-Tønsberg section has a total construction length of 7.8km. The new double-track railway was completed in November 2011.

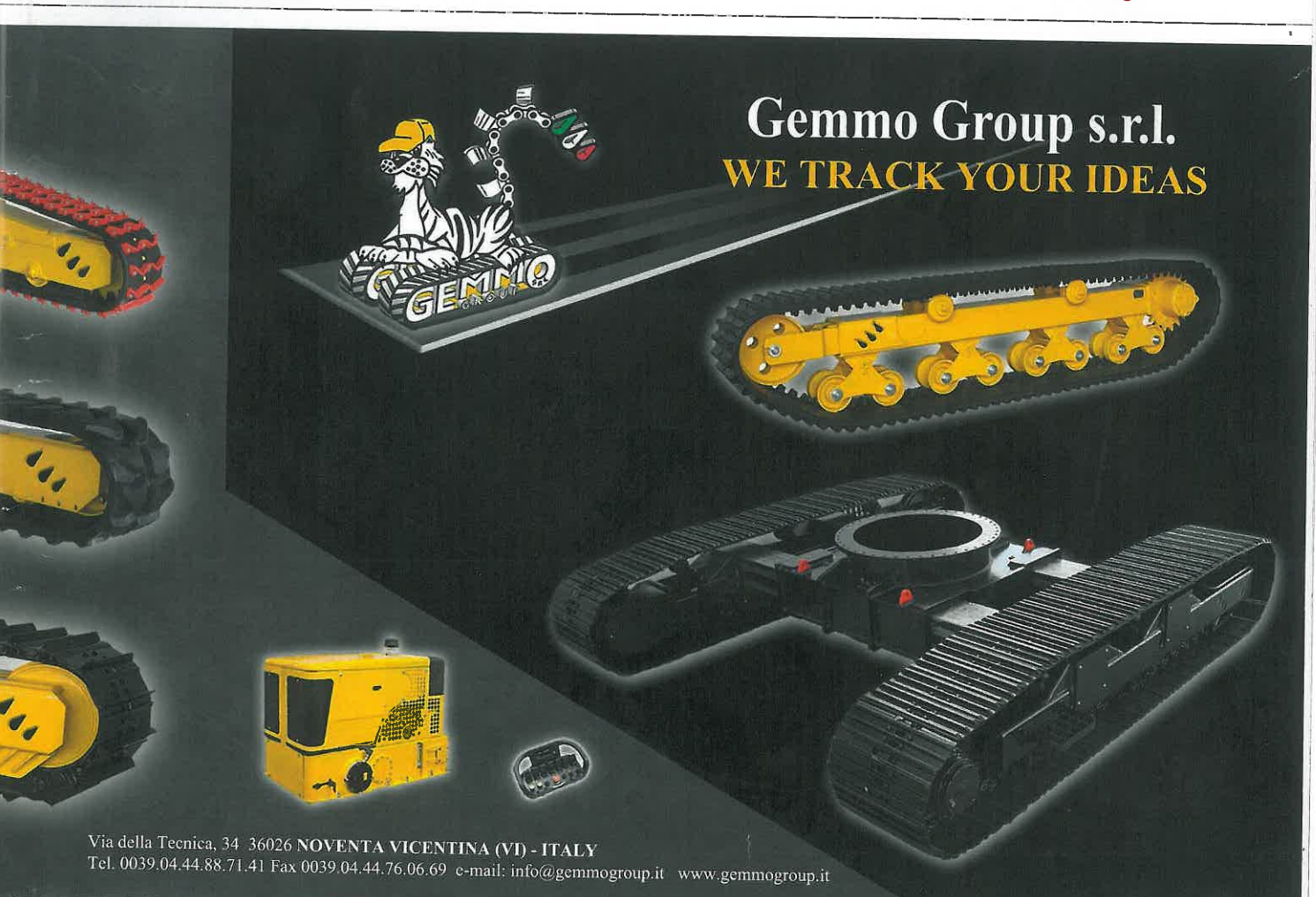
The Holm-Nykirke section, in northern Vestfold, is one of the largest parts of the project. The new 14km double-track section will replace a current 15km single-track service. It includes a 12.3km rock tunnel and a new underground station that will be built inside the mountain under the town of Holmestrand. Construction started in August 2010 and is scheduled for completion in 2016.

On the Farriseidet-Porsgrunn section, a new double-track railway will replace the current alignment. The new route of 23km includes seven rock tunnels (between 110m and 4,700m long) for a total of 14.5km, as well as ten bridges, at a total cost of about €740 million (US$976 million). Construction started in 2012 and is due to be completed in 2018. The new tracks are laid to support 250km/h trains.

A Comacchio MC3000 rig delivered to Entreprenør-service last year is drilling foundation piles for the Paulertjønn bridge

PAULERTJØNN BRIDGE

Works are currently in full swing on the Farriseidet-Porsgrunn section for the construction of the ►



Above: the job site with the entrance of the 3.7km-long Martineåsen tunnel in the background

Above right: JCB JZ235LC excavator, featuring a two-piece boom and extra-long chassis, on the rig platform. It is used, among other things, for handling drilling rods and sheet piles

Paulertjønn bridge, by the entrance of the approximately 3.7km-long Martineåsen tunnel. Entreprenørservice was commissioned to execute the drilling and sheet piling for the foundations of the 343m-long bridge. The Norwegian company, headquartered in Bærum, is working as a subcontractor for Skanska.

"We will install about 60 sheet piles with a 813mm diameter and an average length of 40m," says Ørjan Ausland, rig operator at Entreprenørservice. He explains that the project involves about 2,400 drilling metres in connection with the bridge foundations.

To perform this, the company has invested in a new drilling rig, an Italian-manufactured Comacchio MC3000. This is the fifth and so far the largest Comacchio rig that the company has acquired through the Norwegian dealer of Comacchio, IRM Norway, and was delivered last year.

RIG ADJUSTMENTS

"This rig is also among the largest in the extensive model range of Comacchio," explains Alessandro Comacchio, territory sales manager. "The machine is equipped with an engine delivering 188kW (295HP) power and features a special mast with a total length of 20.25m and 16m feed stroke providing 30,000daN pull-up force. This makes it possible to use 12m pipes. It can also be folded for reduced shipping dimensions.

"The design of the machine was adapted to incorporate the requests of Entreprenørservice and allow the use of casings of 813mm diameter. We also developed a new type of automatic down-the-hole (DTH) lubricator that facilitates the use of the DTH hammer. The machine features a variable-width undercarriage with adjustable hydraulic jacks, providing a wide, stable base for operating on the one side, and a narrow gauge that allows access to confined job sites on the other."

Some modifications were made to allow the installation of reverse-circulation (RC) drilling equipment from US company Holte Manufacturing. For the RC method the compressed air for the (RC) DTH hammer is blown down between the outer and inner pipes in the double-wall RC drill string, through the hammer and drill bit. Drill cuttings are then blown up through the centre of the drill bit, RC hammer and drill pipe, and brought out through a 6in (152.4mm) hose pipe for discharge into a container/pond. The equipment supplied to Entreprenørservice by Holte Manufacturing includes a rotary head, 'casing driver', DTH hammer, drill bit and drill pipes.

Ørjan Ausland, rig operator at Entreprenørservice, performing drilling using Comacchio's radio-controlled technology

The casing driver is a special unit that makes it possible to 'hammer' the casing down from the top instead of pulling it down with the drill bit through a welded drill shoe. The 20in and 24in DTH hammers cover casing diameters from 508mm to 1,016mm.

The rig is designed to be used with 12m drill rods, but when working at Paulertjønn bridge, it is used with 6m-long casings with a diameter of 813mm.

GROUND CONDITIONS

The drilling rig is placed on a solid platform in the swampy terrain. This is the only way to access the area where the bridge foundations will be cast. Ausland explains that the ground consists of marsh and mud. He has to drill through two to three metres of marsh before reaching the hard clay layer.

"It's almost like drilling in rubber," he says. With the radio-control system developed by Comacchio, all the machine functions, such as trimming, set-up and drilling, can be easily managed from one console, thus offering the operator a complete view of the job site and enhanced security.

AT COMPLETION

Once completed, the new works will reduce journey times from Tønsberg to Oslo to an hour, compared with the current 90 minutes, and will save an hour on journeys between Skien and Oslo. A modern railway will also provide the ability to run more trains, offering improved service to the people of the Vestfold and Grenland areas.

This article was written by Njål Hagen and originally published in Anleggs Magasinet