

# Slope solution

A new 'mountain drill' addresses tricky slope stabilisation issues

Most inspiration for new drilling products comes from the field, and it seems this cycle is repeating itself once again in North America.

TEI Rock Drills, the US manufacturer of drilling attachments and limited-access drills, has begun development of a new mountain drill. According to the company, its customers were being asked to perform more difficult slope-stabilisation projects due to the increase in urban populations and recent extreme weather events, and it recognised a need for a new product.

"The need for lighter-weight and more powerful drilling rigs is an old story but a reality nevertheless," says the company's vice-president, Joe Patterson. "There are a few old pneumatically powered three-wheeled wagon drills still being used for slope stabilisation, but they lack the power needed to install the tiebacks and micropiles used in modern engineering designs. To fill this need, it was determined that the new drill would have to be hydraulically powered.

"Then came the question of where to place the power unit. TEI's customers wanted the power pack to be mounted on a self-contained drill carrier. In this way there would only be three lines going to the drill – the air/grout hose, the electric cable and the winch cable that is secured on top of the slope. And finally, it had to have enough power to operate either a rotary head or a hydraulic drifter in order to install hollow-bar grouted soil nails."

One of the new features required for the mountain drill is a variable-volume hydraulic reser-



voir (VVR). TEI installed Smart Reservoir's VVR-400 to solve hydraulic issues with its drill prototype. The VVR was chosen due to its compact size, low weight and ability to supply the hydraulic pump at extreme angles. With a standard reservoir, at certain angles the inlet to the pump may become uncovered, leading to starving of the pump; the constant pressure provided by the VVR solves this issue.

"The VVR allowed a reduction in hydraulic reservoir size. Overall, the operation of the unit was extremely smooth and the VVR significantly reduced the size and weight of the power unit," says TEI engineer Luke Zamoyski.

Once complete, the slope drill was tested with a RDS350 rotary drill and a down-hole hammer. The unit operated smoothly and without starving the pump.

"Although there was some thermal expansion noted in the VVR, the Emmegi hydraulic cooling unit installed on the machine kept the oil temperature low even in midday heat," adds Zamoyski.



## IMPROVEMENTS

The first version of the TEI mountain drill was displayed during the company's open-house event in October 2013.

"There were many strange looks as nobody had ever seen a drill quite like this. Four rubber wheels, a chain where there would normally be a crowd cylinder, and a mast that is mounted backwards and tilts forward are not things you usually see on a drill rig," says Patterson.

"During the open house, the mountain drill showed why these features were necessary and installed a few micropiles for attendees. Since then, the drill has completed two jobs and provided valuable feedback for improvement on the drill design."

The latest job for the mountain drill includes installing over 4,000 soil nails on a 2m grid for slope stabilisation near Nashville, Tennessee. On this job the entire mountain had to be soil-nailed to repair damage done while installing a 0.5m natural-gas pipeline.

"The mountain drill has been working daily with positive feedback from the operators, noting that the drill is quiet, easy to manoeuvre and has a stable platform," says Patterson.

The last few adjustments to the drill are being made at the factory, with the final version due to be displayed at the upcoming Conexpo trade fair in Las Vegas in March. ▽

*The mountain drill's hydraulic winch, power pack and the ability to lay the mast uphill to adjust the installation angle. Inset: the drill's variable-volume hydraulic reservoir*

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*The TEI mountain drill installing soil nails with a standard anchor rig working the flat areas in the background near Nashville*