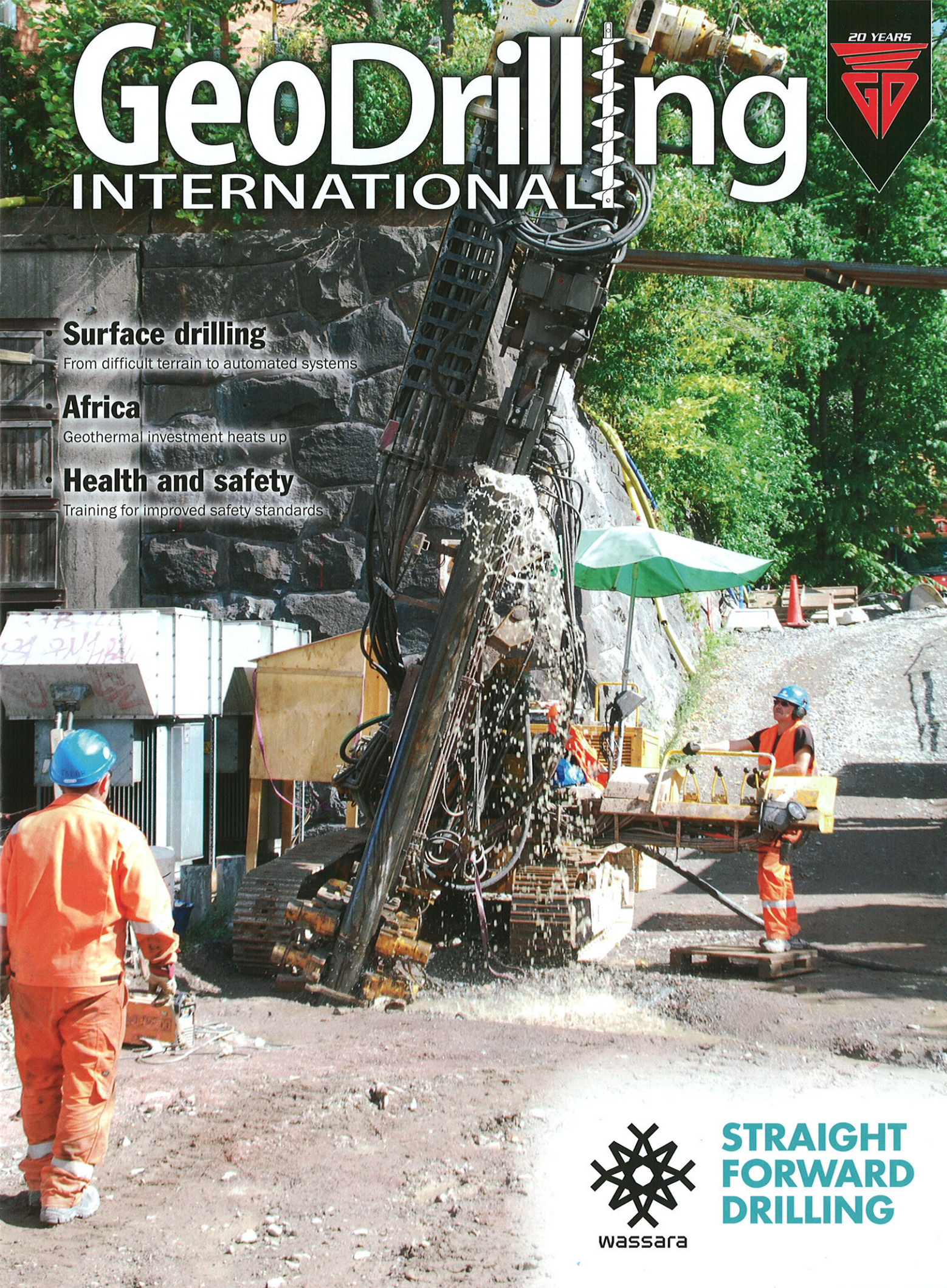


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Developing the foundations

From cutting-edge technologies to reducing the Leaning Tower of Pisa's tilt, Italian manufacturer Soilmec leans on innovation

Since its inception in 1969, Soilmec, which is a part of Trevi Group, has been involved in the design, manufacture and distribution of equipment solutions for the ground-engineering field.

Since 1990, the company has changed its production system and product range. Its initial 'craftsman-style' system, where machines were made to order, has gradually evolved into a more industry-oriented one, with higher quality control.

Additionally, a step-by-step improvement of its workshops has allowed the production of more complex machines, from drilling attachments to fit on existing units to crawler- and truck-mounted rigs with easier transport to job sites; from self-erecting rigs that erect the mast automatically to large cranes.

Today, uses for the company's foundation technologies include, for example, the construction of displacement piles (no soil extraction) and tunnel widening from two to three lanes without stopping vehicle circulation.

Hydromill

The hydromill was first designed in France in the early 1970s and then developed over the course of the 1980s and 1990s to integrate improvements, making this type of equipment an essential tool in ground engineering.

Soilmec brought out its own version of the hydromill in 2000. The company's Cougar and Tiger hydromills are currently at work in the US, China and Denmark. In October 2012 a Tiger SC-200 hydromill with Hose Drums Design (HDD) system, designed to reach extreme depths, dug a slurry wall 250m below the surface.

Soilmec offers a double-patented system that uses the combination of 12 independent flaps (each adjustable in three different positions) and the independent movement of the milling drums to control the position of the milling module during excavation. This was also made possible thanks to the Drilling Mate System (DMS) fitted with a triaxial sensor that enables real-time monitoring of all drilling parameters.

CAP/CSP technology

The cased auger pile (CAP) and cased secant pile (CSP) technology is designed to construct cased piles with the

continuous auger method. The system is ideal for urban sites because it eliminates vibration and prevents problems for adjacent structures. It also reduces sound emissions and avoids the use of bentonite drilling muds. The CAP/CSP method is especially effective for constructing the secant piles necessary for structural diaphragm walls that must guarantee water-tightness.

Now Soilmec, known for its double independent rotary system, takes a further step by introducing the patented EAT (eccentric auger tip) system. Since the system can dig according to a radius of eccentricity, the excavation diameter can be increased by 40mm, thereby assuring the same size of the pile outside and inside the pipe.

The system is currently being used on a large construction site in Copenhagen, Denmark, to build the new M3+M4 metro lines, where Trevi is operating eight Soilmec SR-100 and two SR-90 hydraulic drilling rigs. The machines are tasked with the construction of over 95,000m of slurry walls made up of 1m-diameter piles extending down to a maximum depth of 28m, an operation that has also entailed drilling substantial layers of flint.

Complex projects

Due to the synergy between Soilmec and Trevi, the Soilmec rigs have been involved in large and complex foundation projects all around the world. These have included work on the Tower of Pisa in Italy, the Bibliotheca Alexandrina in Egypt and Wolf Creek Dam in the US.

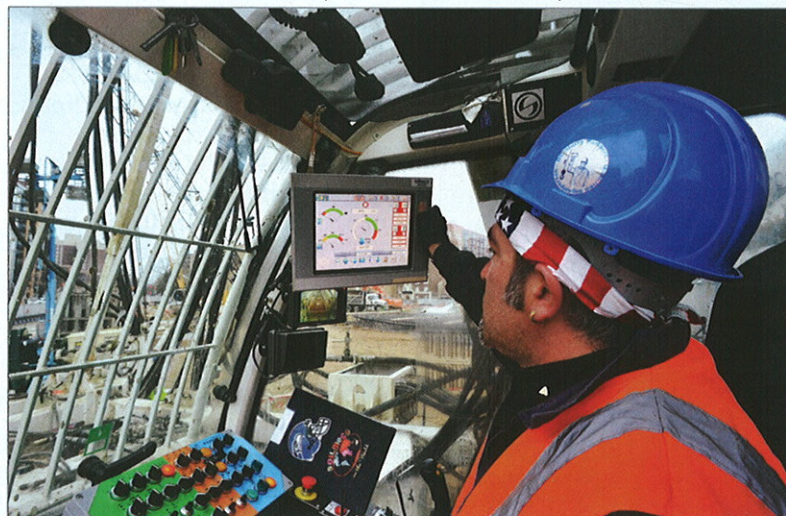
The Duomo bell tower, universally



recognised as the Leaning Tower of Pisa, is a truly unique building. Nevertheless, according to Soilmec, the numerous projects executed over the course of the past centuries have not been very effective; it was necessary to act underground in order to significantly reduce the tower's tilt and to assure its longevity.

The work of Soilmec's design team included the implementation of ▶

Soilmec launched its first hydromill in 2000



Soilmec's Drilling Mate System has a triaxial sensor that enables real-time monitoring of all drilling parameters

"Soilmec rigs have been involved in large and complex foundation projects all around the world"

Right: Soilmec SR-100 cased secant pile and cased auger pile rigs in use on a metro rail extension project in Copenhagen, Denmark.

Below: SC-100 in Copenhagen, Denmark



► anchoring blocks with lead counterweights, local reinforcements through injections and metallic bars, electro-osmosis stabilisation, and earth freezing.

The largest library of the ancient world, at Alexandria, was destroyed by a fire in

47 BC; 2000 years later, under the auspices of UNESCO, the cultural symbol rises again near the original site. In difficult geological conditions, with the area only 40m from the Mediterranean Sea, the architectural plan centred around a building whose glassed surface area is set on a horizontal 16° incline, creating an asymmetric weight on its foundations.

Trevi Group responded to this by using a large 'continuous armoured' diaphragm, for a total area of about 28,100m² and more than 600 bored piles to a 42m maximum depth, apt to support the compressive and tensile foundation loads.

Dams and shipwrecks

The Wolf Creek Dam, located on the Cumberland river in Kentucky, has had serious seepage problems for much of its existence. Over the years, despite numerous attempts to control seepage, the dam's karstic foundation has continued to deteriorate. The dam is owned and operated by the US Army Corps of Engineers, which awarded the barrier wall contract to the TREVIICOS-Soletanche joint venture.

Dam safety was to be paramount throughout all the different phases of construction. This approach resulted in a series of additional steps in the construction process. A protective concrete embankment wall (PCEW) was

designed to safeguard the embankment against the effect of the construction activities. Following the completion of this, a secant-pile barrier wall was installed to a depth of 84m into the underlying rock. With a minimum 0.6m thickness and a total surface area of the face of approximately 27,750m², the Wolf Creek barrier wall is unlike any other in the world.

Recently, Soilmec's equipment performed important preliminary works essential for the project to salvage the wreck of the Costa Concordia. Before that stage, however, the project incorporated a series of preparations crucial to later operations, including a seabed survey to precisely determine the composition and the construction of an anchor system to secure the wreck. ♥

Training

The innovation developed by the Trevi Group is becoming accessible to everyone through the Foundations Technology Academy (FTA). This is an international training project that offers an introduction to the foundation sector, and further knowledge and specialisation with regard to foundation technologies and relevant equipment to those already working within the sector.

