Keeping watch over dams in distress

With three important contracts from the US Army Corps of Engineers, Treviicos Corp has bolstered its reputation for technical competence, high quality and safety

TREVIICOS Corporation, in operation since 1997, is the North American subsidiary of the Trevi Group of Italy. With its headquarters in Boston, Treviicos plays a key role for its parent company, both in terms of project portfolio and profitability.

ENGINEERED GROWTH

Through the acquisition in the late 1990s of Icos Boston, which had been long established in the US, Treviicos took part in building the complex system of foundations for the megaproject to sink Boston's Central Artery, better known as the Big Dig. With that experience chalked up, Treviicos began to extend its reach deeper into the country, becoming involved in major projects with resonance well beyond the US.

Key to securing contracts for dam rehabilitation projects was the cut-off wall construction for the Walter F. George Dam on the Chattaoochee River in Alabama; a scheme that was instrumental in earning Treviicos the attention of the US Army Corps of Engineers (USACE). "Our growth could have been much more accelerated over the last five years, but we chose a different approach – one that focuses on safety and quality," says Ricardo Petrocelli, president of Treviicos Corporation. "We believe our expertise in specific areas, in addition to our resources, should be put to work only in contracts where our technical competence is indisputable. So, aside from a few cases, we now favour bidding projects where we can operate directly as the main contractor."

The list of 130 top-priority dams includes Tuttle Creek

This policy, which has led Treviicos to team up in important joint ventures (such as with Kiewit for the recent foundation work at Ground Zero), has reaped visibility and recognition for the contractor, and also earned it rewards from a profitability standpoint.

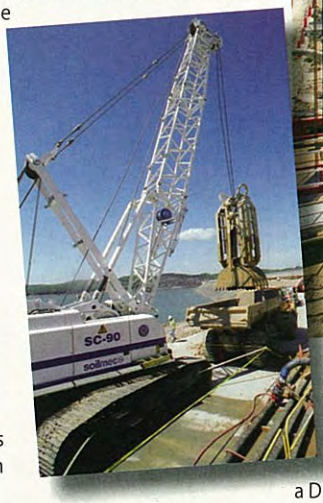
Franco Filippi, vice-president and CFO at Treviicos, is quick to back that up. "We're very pleased with our recent performance," he says. "Also because it comes with a substantial backlog [of work] that takes us well beyond 2010."

This year has seen Treviicos undertake projects for the rehabilitation of three dams in Kansas, Kentucky and Florida, all considered top priorities by the USACE.

THREE CHALLENGES

The USACE is also in charge of controlling the water resources in the US. Its range of responsibilities includes the direct management and monitoring of the state of efficiency of more than 600 dams. As part of this complex task, USACE has drawn up a report establishing priorities for intervention on 130 dam facilities that require routine and extraordinary maintenance. →

The Portfolio of Risk Assessment Program for Dam Safety categorises the dams managed by the Corps according to their Dam Safety Action Class (DSAC). This study determined that six of the 130 dams with a rating above Class V (where V is normal) are designated as top priority. The state of efficiency of these six dams, and the potentially catastrophic consequences ensuing from their partial or total collapse, convinced USACE technicians to assign them a DSAC I (urgent and compelling) rating.



The outstanding work by Treviicos at the Walter F. George Dam in Alabama in 2003 laid the ground for the contractor to bid on other contracts to place three dams in conditions of safety.

Treviicos vice-president of operations Stefano Valagussa comments: "With the USACE, we've established a level of partnering that enables us to meet the challenges and technological complexities of these projects. We're proud of our reputation with the Corps and repay the trust placed in us with high safety standards, on-time delivery and unparalleled parameters of quality."

Wolf Creek on the Cumberland River, Kentucky, tops the list of the six dams with a high safety risk (DSAC I)

The list of 130 top-priority dams includes Tuttle Creek Dam in Kansas, which was assigned a DSAC II classification. Of the three sites where Treviicos is operating, this dam is the one in the most advanced state of completion. The facility was built on the Blue River in the decade spanning the early 1950s to early 1960s, and is located in the Humboldt Fault Zone.

Originating in Nebraska, the fault runs north to south, crossing the eastern part of Kansas and coinciding a few miles from Tuttle Creek Dam. With a potential of triggering earthquake activity up to an intensity of 6.6 on the Richter Scale, the fault is insidious because the combined action of seismic activity and seepage over a period of time – a situation carefully monitored by USACE – could bring about the liquefaction of the sandy base on which the dam rests and cause the structure to slump. Such an event would have a huge impact on a vast area downstream.

After careful study, USACE designed a solution entailing a system of reinforcement to prevent the undermining of the dam, so as to allow the passage of water and muddy seepage pushed under the core by the water pressure. The project provided for buttresses to be built on the downstream side along the entire length of the dam. This technical solution was also implemented thanks to innovative contract terms based on what the Corps defines as 'early contractor involvement'.

The method of partnering between USACE (which operates through the Kansas City District) and the contractor was instrumental in achieving a reduction of costs and a much earlier than anticipated project completion.

Situated on the Cumberland River in Kentucky, Wolf Creek Dam is at the top of the list of the six dams with a high safety risk (DSAC I). The Corps has kept a tight watch on seepage and its effects for years, concluding that the catastrophic consequences that would result if the dam gave way either partially or totally, and the threat to public safety, calls for its classification as an 'infrastructure emergency' in the US.

"USACE has drawn up a report establishing priorities for intervention on 130 dams"

Treviicos won the 'best value' RFP solicitation to ensure the dam's safety after undergoing the USACE (Nashville District) evaluation process, which examined the contractor's experience, safety record, technical expertise, site logistics, personnel training and availability of specialised equipment. As in other instances, Treviicos decided to undertake the project by forming a 50/50 joint venture; this time choosing French contractor Soletanche-Bachy as its partner.

The project, still in its early stages, is significant because it prioritises the highest conditions of static stability during the whole construction process. For the cut-off wall, Treviicos-Soletanche will use a combination of secant piles and panels that exceeds the depth of a previous consolidation project carried out in the 1970s, which is no longer sufficient to contain the seepage of the layers beneath the dam. The new project is designed to create an effective barrier against the damage caused by the flow of water.

Third and last on the timeline of the three projects is the site recently started at the Herbert Hoover Dike located on Okeechobee Lake, Florida. This levee, which surrounds the lake for 143 miles, is also on the list of the six classified as a high risk. Built between the 1920s and 1930s, since the devastation wreaked by a hurricane the infrastructure has long been under the watchful eye of the USACE in Jacksonville District.

After a series of studies, the Corps decided to focus on a 25-mile stretch at the southern end of the lake; an area subject to seepage that endangers the ability of the dam to withstand the potential consequences of a weather-induced disaster.

Again, Treviicos stood out among numerous contractors to be the Army Corp's choice. The rigid pre-qualification process was aimed at identifying three contractors based on their proposed technical solution. Treviicos's selection into the final three was based on a project entailing that the cut-off walls be built using a hydromill and a special, self-hardening mix that was purposely studied for this application.

BACKED BY A STRONG GROUP

Founded in 1957 as a company specialising in the construction of deep foundations, today Trevi Group comprises a ground-engineering division (underground engineering and specialised foundations, as well as the manufacture of drilling and foundation equipment), an oil division (services and drilling technologies) and an energy division (operating in the renewable energy sector).

Over the span of five decades, Trevi Group has seen steady growth through its ability to develop innovative techniques and machinery. These skills have enabled the group to take on major contracts all over the world.

The countless projects undertaken by the company over the half-century include: the stabilisation of the foundations and rebalancing of the Tower of Pisa; the foundations of the new library in Alexandria, Egypt; the foundation system on which the pylons of the Vasco da Gamma Bridge in Lisbon rest; the construction of the entire foundation works for the Ertan Dam in China, one of the largest in the world; a recent project at Ground Zero, and dozens of others of international merit.

Third and last on the timeline of the three projects is the site recently started at Herbert Hoover Dike, Florida, also on the list of the six classified as a high risk

IMT patents seismic piler

AT INTERMAT 2009, Italy-based IMT International presented a new patented system for piling in seismic areas.

The drilling system is a machine capable of preparing the ground with a soil-mixing system and inserting steel tubes of diameters up to 38in (965mm) to reach depths greater than 40m.

The IMT equipment has two hydraulic devices to connect casing tubes and clamp the steel tube that will be inserted through a rotation-translation movement.

In California, the use of a tube closed at the bottom and inserted in virgin ground is commonly used. IMT has also supplied the machines for soil-mixing.

Several machines have been at work in Japan for a number of years now on new buildings, and for the reconstruction of buildings that are no longer in compliance with the latest regulations for anti-seismic constructions.

In this case, the type of drilling requires the use of different kinds of equipment necessary for driving casing (a casing oscillator), the execution of soil-mixing (a drilling machine) and, finally, for the laying of steel tubes (a vibrator and powerpack with crane).

The process of carrying out the entire pile by one single machine that does not need to be moved is achieved through the use of a particular rotation device of the upper part of the mast and lifting ropes, whereby it is possible to work on the same axis, both with the lower rotary (exposed) and the two upper ones for soil mixing.

The three working phases for the entire execution of the pile can be described as follows:

- The driving of the casing and partial internal emptying is carried out with the machine having the two soil-mixing rotaries lifted by means of the main winch and rotated, the lower rotary predisposed with a casing tube extracted from the previous pile, and the kelly bar with a tool on its lower end lifted by an auxiliary winch.
- The soil-mixing phase is carried out with the casing, tool and kelly bar removed, with the mast rotated for the alignment of the double rotaries with the lower rotary. This phase consists of a descent with injection of the water-cement mixture that comes out of the cutting tool; passing through the tube, and a swivel joint positioned above the rotary while the mixing tool turns in the opposite direction. The ascent phase is similar, but with greater power supplied to the mixing tool.
- The soil-mixing tools are disconnected and the corrugated steel tube lifted by means of the auxiliary winch. The upper part of the mast and, consequently, the soil-mixing rotaries and steel tube (that is, therefore, in axis with the lower rotary) are rotated. Then, the tube is lowered inside the lower rotary, clasped by the hydraulic clamp that is inside the rotary, and inserted into the ground by means of the push force of the hydraulic translation cylinders and rotary rotation. When the casing has been lifted up, the machine is ready to make another pile.

IMT said it will soon be able to provide information regarding the resistance and capacity of the piles carried out with this procedure and, given that they have shown exceptional resistance to seismic stress and can be verified after such events, use of this procedure is very likely to expand rapidly.

Soilmec unveils next-generation micro-drillers

SOILMEC has launched the next generation of micro-drilling rigs, the SM-18, which it claims is unique in the field of micropile multi-purpose rigs.

The SM-18 was developed from the fusion of Trevi Group's job-site experience and Soilmec's technological research.

The Soilmec SM-18 offers greater drilling depths thanks to a higher hoist force (more than 11t) and engine power transmitted to the tool through a rotary with a power capacity of 160hp.

The SM-18 is also faster, with a load-sensing control system on hydraulic power. More than 500 litres/min of oil flow is producted by twin piston pumps. Drilling movement is also faster.

The control of all operations is hydraulic and proportional, utilising a remote-control board of functions for finding the best working position in any condition. Noise reduction is achieved thanks to an engine speed of only 1,900rpm.

An innovative emergency stop for drilling functions and safety light for active drilling mode enhance the safety aspects of the model which also benefits from telescopic counterweight and telescopic stabilisers for increased stability.

As well as the SM-18, Soilmec also displayed the PSM-8GT hydraulic drilling rig at Intermat. It has been designed and built specifically for geognostic use. The high rotation speed of the hydraulic rotary allows continuous conventional core drilling, both with hard-alloy crowns and diamond crowns. The rig is suitable for wire-line core-drilling down to a depth of 320m. The wide section mast with a fixed, kinematic mechanism houses a cylinder pull-push system for precision core drilling.

The PSM-8GT has specific pressure gauges on the control panel for balancing the hydraulic drilling batteries to protect the diamond crowns.