# Diamond Award 2011

***TECNO-CORTE Y PERFORACIONES THAYR S.L.***
***C/TALES DE MILETO Nº 15, MANZANA II, NAVE 15***
***POLIGONO INDUSTRIAL LA GARENA***
***28806 – ALCALA DE HENARES – MADRID – ESPAÑA***
***TFNO. 902-011-185 / 91-880-71-82***
***FAX. 902-013-736 / 91-882-10-47***
***Web: www.thayr.es***
*E-MAIL*: ***thayr@thayr.es***

TECNO-CORTE Y PERFORACIONES THAYR, S.L. was founded in 2004 to provide technical demolition services for concrete structures in the following key areas:

- Cutting of concrete with diamond wire and disks
- Demolition of concrete structures
- Anchoring systems with resins
- Drilling of concrete structures

Since then, Thayr has greatly expanded its technical and human resources. The company began with only two employees and now employs an average of 25 highly qualified professionals. Additionally, Thayr has an impressive range of precision equipment, including drilling and cutting equipment, road and floor saws, diamond wire and disk cutters, remote controlled Brokk demolition robots.

Our goal of constant improvement and the aim to provide the best possible service led the company to become a founding member of AEDT (Asociación Española de Demolición Técnica), which has recently become an active member of the International Association of Concrete Drillers and Sawers (IACDS).

We regard quality service as a client's right and, as such, must be a core value of all company personnel. We are also aware that all company activities have a direct or indirect impact on the environment and that environmental protection is the responsibility of all members of the organisation. Therefore, TECNO-CORTE Y PERFORACIONES THAYR, S.L. has implemented a Quality and Environmental Management System, according to ISO 9.001 and ISO 14.001 norms, as part of its commitment to incorporating Quality and Environmental Management within its global management policy.

## DESCRIPTION OF PROJECT

Expansion of the "Ingeniero Juan Gonzalo" wharf in the outer port of Huelva.

## MAIN CONSTRUCTION

ACCIONA INFRAESTRUCTURAS

## UNDERWATER SERVICES COMPANY

CRATERA INTERVENCIONES SUBACUATICAS

## DESCRIPTION OF CUTTING AND DRILLING WORK

"Demolition of the 26 pilings with a diameter of 1,200mm of reinforced concrete with a 6mm steel casing. Each piling will be drilled twice and be cut twice using a diamond wire.


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***PHASE 1:***

- Underwater drilling of 26 holes, one in each piling, diameter 150mm with a thickness of 1,200mm, made at between 0.50m and 2m below sea level.

- Underwater cutting of the 26 pilings using diamond wire, one for each piling, at 10m below sea level.

***PHASE 2:***

- Underwater drilling of 26 holes, one in each piling, diameter 150mm with a thickness of 1,200mm, made at 12 m below sea level.

- Underwater cutting of the 26 pilings using diamond wire, one for each piling, at 20m below sea level.

## INITIAL EXECUTION SCHEDULE FOR PHASES 1 AND 2

The timeframe for phase 1 is 13 days (two holes and two cuts per 10 hour working day).

The timeframe for phase 2 is 26 days (one hole and one cut per 10 hour working day).

## MACHINERY EMPLOYED

- Two Braun HAE 22V hydraulic power units
- Two Braun BBD 4 W drill rigs
- Hydraulic drilling equipment
- Multi-pulley diamond wire system

## NUMBER OF EMPLOYEES ON THE PROJECT

- Two technicians
- One assistant
- Diving team (five divers)

## COMPLEXITY OF PLANNING AND EXECUTION

This project posed significant challenges to Thayr's technical team, as do all underwater demolition projects, which present a range of difficulties and unknowns. Visibility at the site is severely limited given the dredging work being performed nearby and the strong currents in the estuary, with tides of up to 4.5 metres.

Another problem was the distance of the pilings from the shore, the majority of which are over 30 meters from the wharf.

For phase 1, one option was to attach the Braun BBD 4 W and multi-pulley system to the section of the piling above the water line and merely submerge the pulleys to guide the diamond wire to the -10m level. (1$^{st}$ cut). But this option was unfeasible for phase 2 as the second cut to the pilings will be made at the -20m level, and the first section of the piling will have been removed. This would make it necessary to fix the Braun BBD 4 W and multi-pulley system at a distance of 38m, the distance between the wharf and the majority of the pilings. Cutting would therefore require a wire of approximately 85m in length, resulting in a loss of power and the possibility that the diamond wire would take an excessive time to cut the 6mm casing before penetrating the concrete core of the pilings.


Given these factors, Thayr's technical team decided that the Braun BBD 4 W and multi-pulley system should be fixed to the piling at the designated cut level by a team of divers, using only the length of wire necessary to encompass the perimeter of the piling and pass through the drive pulley and directional pulleys, for a total length of 7.5 m.

This option basically presented two problems to be resolved:

1. A rapid, effective and simple system to attach the machine to the piling in water with zero visibility and with very restricted immersion times at a depth of -20m. Due to safety considerations, immersions which would require decompression periods were not an option. Thus, each diver would have a total immersion time of 40 minutes per work day, totalling 120 minutes of immersion time per day to perform the assembly and disassembly operations for the machinery and any possible incidents.

2. Operation of the machine in a zero visibility environment, for example:

    2.1 Tighten the diamond wire correctly to prevent the wire from slipping in the drive pulley and to start up correctly.

    2.2 Maintain the correct revolutions and progress, ensuring the wire puts the appropriate pressure on the piling while cutting the steel casing, the interior rebar and the concrete itself without the diamond wire becoming slack and slipping from the pulley circuit or becoming too tight and breaking or damaging the machine. (The possibility of installing a CCTV system with lights to observe machine operation was considered to monitor the progress of the cut and possible incidents. This was dismissed given zero visibility in the area due to inert suspended debris from nearby dredging work and strong currents at the port entrance). In order to operate the machine and make adjustments for differing resistance of the materials being cut (steel casing, reinforced concrete) the R&D department designed and developed a series of innovations.

## INNOVATIONS

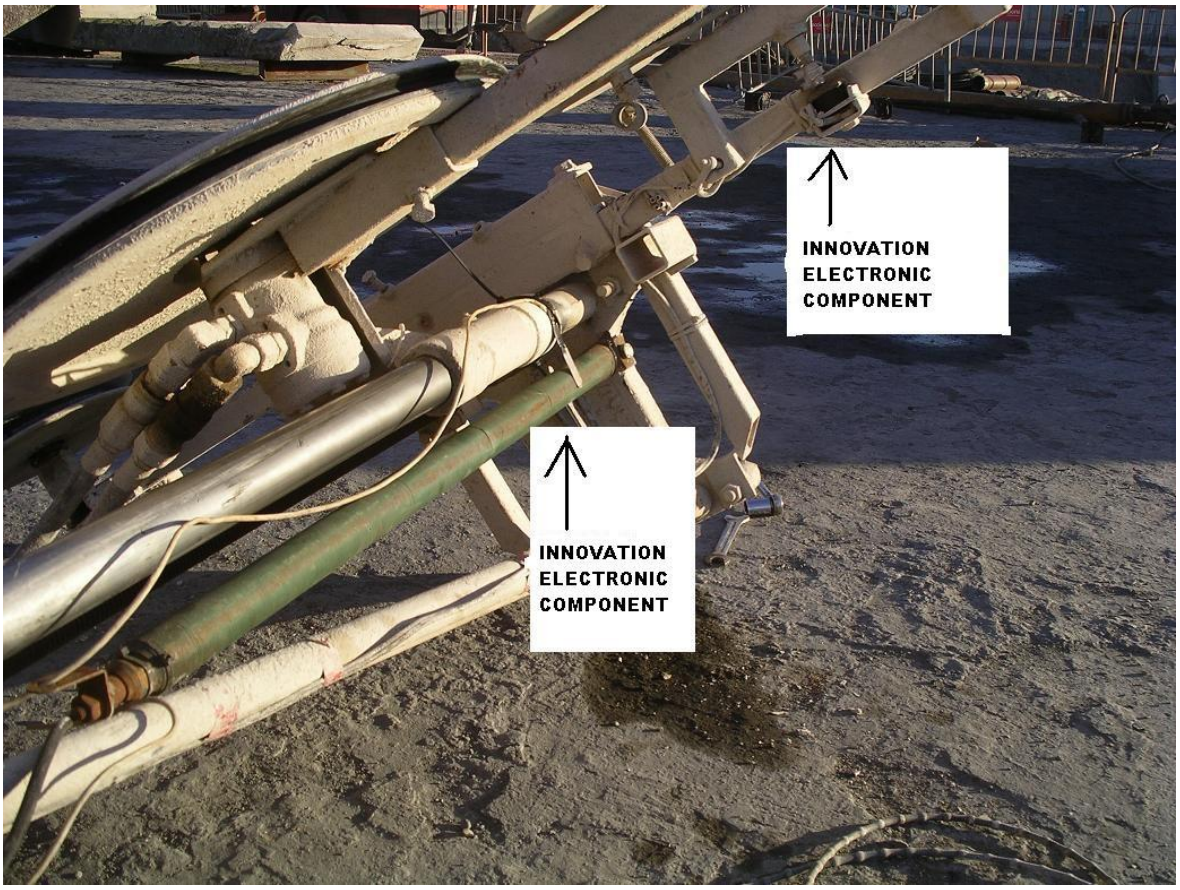
The first problem was solved by manufacturing a metal belt attached to the BBD 4 W column with a double hinge and a rear closure using two pins which the divers only needed to put into position and close. Fixed to the piling, the divers installed the wire in the pulley system and the machine was ready to begin cutting.

For the second series of problems various innovations were developed:

1. The first modification was to the wire storage system of the pulley unit, enabling it to collect 5m of wire without having to resend it through the circuit. In this way, the complete piling section is cut without requiring any immersion by the divers.

2. The second innovation was the installation of a mobile pulley with a spring which puts pressure on the diamond wire circuit and the installation of an electronic device on the axis, enabling the position of the wire to be determined on the surface. In this way, when the resistance on the wire circuit diminishes, the wire need only be accelerated to recover the correct parameters. Thus, the wire maintains constant pressure on the piling, preventing excessive pressure that could break the wire or damage the machine.


3. The third innovation was the installation of another electronic device to determine, on the surface, the percentage of the piling which has been cut. By reading the device on the surface, the operator will know exactly how much of the piling has been cut and what section remains to be cut. This is very important as the project includes two cranes: a 50Tn truck crane, used to install and remove the cutting machine when cutting is complete and a 400 Tn crane to extract the piling. The 50Tn crane is available all day while the 400Tn crane must be notified a day in advance of the time when the piling must be secured and extracted, as this crane will be in use loading and unloading ships in the port. In this way, crane time is optimised, averaging two hours per day, one hour for each piling as the piling is secured when half of the diameter has been cut. For this reason it is very important to know the progress of the cutting operation without requiring immersion by divers.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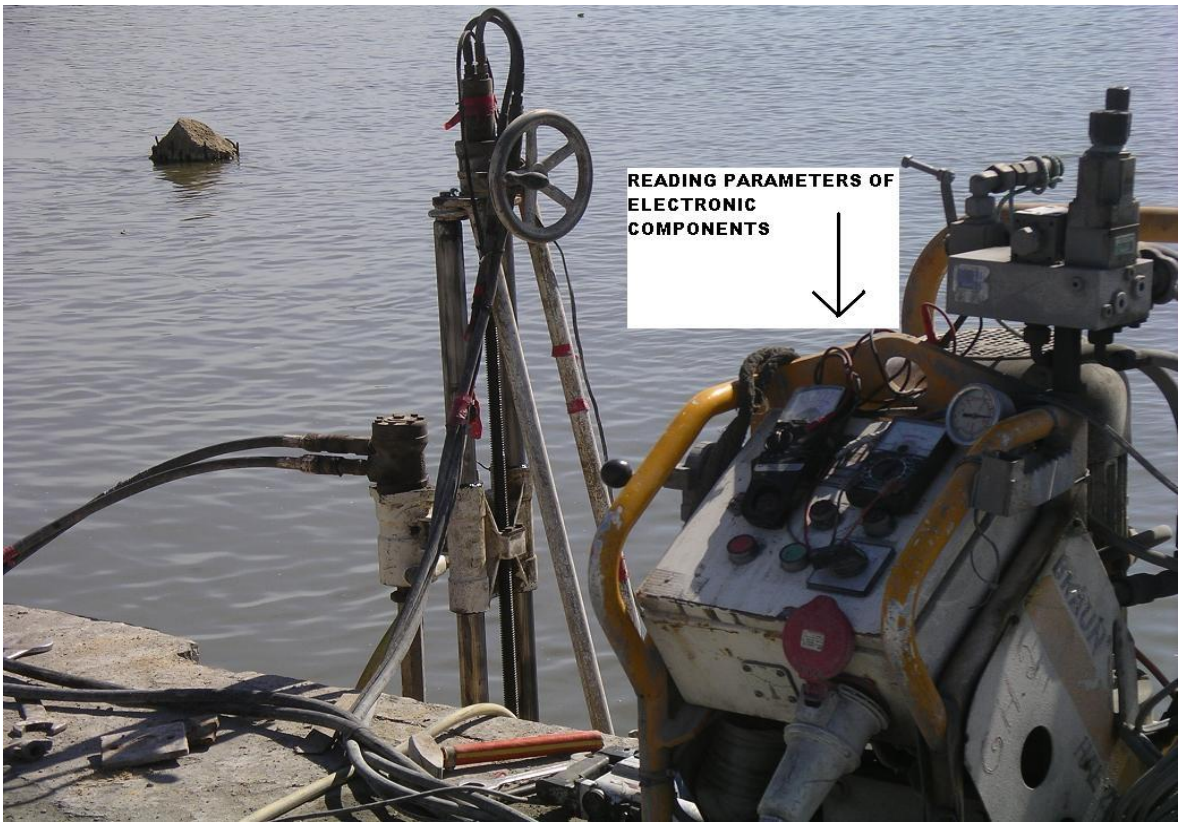
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## QUALITY SPECIFICATIONS

The greatest restrictions we faced were due to safety considerations. The Huelva Port Authority did not permit immersions which required decompression time. For this reason, and given the distance of the pilings from the wharf, and in order to optimise usage time for the 400Tn crane, the R&D department designed and developed innovations to the equipment which allowed the operator, without direct visual contact with the machine, to know the progress of cutting. This allowed us to take full advantage of diver immersion time, solely for the assembly and disassembly of the machine on the pilings. 120 minutes per day was enough and 120 minutes per day for the 400Tn crane.


## TIME EMPLOYED IN EXECUTING THE TWO PHASES

Phase 1 had a total duration of 10 days, 3 days ahead of schedule.

Phase 2 required some technical improvements to the equipment and close coordination. Work could be accomplished in half the scheduled time, 13 days rather than the initial 26.

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| THAYR-Diamond Award 2011 | Demolition of the 26 pilings underwater |