September 6/2021

we are drilling foundations

POSTE ITALIANE SPA SPED. IN ABB. POSTALE D.L.353/2003 (CONV. IN L. 27/02/2004 N. 46) art. 1 comma 1 - dcb NO/NO

World debut at Geofluid for the Enteco Electra E6050, the first hybrid drilling rig that uses a patent covering the Italian manufacturer's entire range. A state-of-the-art hybrid that promises to achieve even more ambitious objectives. The market now has a green alternative that costs less and guarantees excellent performance

#THE.COVER

The chrysalis and the butterfly

EVERYTHING WORTH KNOWING ABOUT DRILLING, SPECIAL FOUNDATIONS AND NO-DIG

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World debut at **Geofluid** for the **Enteco Electra E6050**, the first **hybrid drilling** rig that uses a patent covering the **Italian manufacturer's** entire range. A state-of-the-art hybrid that promises to achieve even more ambiwtious objectives. The market now has a **green alternative** that costs less and guarantees **excellent performance.**

BY **FRANCESCO FANZINI** BY **ENTECO**

A highly-innovative hybrid that promises to achieve ambitious objectives and debunk various myths. Just a few words to summarise the patent for the Enteco Electra, the Italian manufacturer's new hybrid system fitted for the first time to the E6050 on show at Geofluid 2021. Enteco Electra is a idea that became a design and has materialised as a machine with quite remarkable performance and cost savings. At the same time, it is a hybrid that contains all the ingredients for a complete switchover to electric.
A splendid chrysalis ready to turn into a butterfly.

Introduction

When talking about electric propulsion, we often associate environmental benefits with a poor price/performance ratio. In short, electric is very nice but too expensive for what it offers. With this new solution, Enteco aims to prove the exact opposite: it is possible to cut costs whilst at the same time increasing performance. All this without neglecting lower noise and CO2 emissions and the benefit that operators and the environment in general will obtain. Indeed, one of the features of the new Enteco Electra E6050 is the option of full electric operation with diesel engine switched off. A result achieved by means of various ingredients that represent an out-and-out hallmark for Enteco: hours and hours of research, completely in-house design, high quality of the components used and severe testing at real sites.

Enteco's take on hybrid

"Our idea, that we believe to be a winning one", explains Renzo Porcellato, Enteco Chairman, "arises from the configuration of a parallel hybrid: a new way of operating the machine, a revolution for piling sites". Indeed, the patented Enteco Electra solution employs an innovative powertrain comprising, in sequence, diesel engine, clutch, electric motor and inverter, hydraulic pumps. And to complete the Enteco patent, we have a decidedly unusual battery system. But let us proceed in an orderly manner.
"In the case of the Enteco Electra E6050", the Chairman of the Italian company clarifies, "the diesel engine has a power rating of 175 kW. Whilst machine demand is less than 175 kW, the diesel engine, besides delivering power, also acts as a generator, thus charging the batteries. As soon as demand from machine devices exceeds 175 kW, the electric motor comes into play and immediately delivers the power required up to a maximum of 200 kW". Indeed, the Enteco Electra E6050 is fitted with a 200 kW electric motor whose power, when added to that of the standard engine, produces a rated capacity of 375 kW.

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Renzo Porcellato, Enteco Chairman

Reduced noise, lower vibration and less CO_2

As is clearly the case for this type of machine, the new Enteco Electra E6050 offers numerous environmental benefits. The most obvious is the reduction in CO2 emissions that is directly related to lower fuel consumption. Next, noise levels are much lower. Downsizing of the diesel engine and its use at low revs make it a lot quieter than the standard engine. Without forgetting the periods in which the machine can operate in electric mode only (or be switched off), during which emissions are entirely eliminated. Cutting noise levels benefits not only the operator and site team, but also the community as a whole, especially when working in the city. Finally, we should note the considerable reduction in the vibrations produced by the machine, in this case also as a result of combustion engine downsizing and the electric motor's smooth operation.

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ENTECO ELECTRA EMBRACES AN AMBITIOUS VISION THAT WISHES TO COMBINE COMPLETE ENVIRONMENTAL SUSTAINABILITY WITH ABSOLUTE ECONOMIC SUSTAINABILITY. THE ELECTRICAL REVOLUTION SHOULD NOT BE BASED ON ACCEPTING LESS AND, ABOVE ALL, SHOULD NOT BE JUST FOR THE FEW. ENTECO HAS MADE THE HYBRID AFFORDABLE AND IT IS NOT A "THROWAWAY" HYBRID. THE ENTECO ELECTRA CONTAINS ALL THE INGREDIENTS FOR A COMPLETE SWITCHOVER TO ELECTRIC. IT IS BOTH CHRYSALIS AND BUTTERFLY.

"The presence of the electric motor", Porcellato continues, "then paves the way for different operating modes that in the past were not possible. The most important, originating from the automotive sector, is start & stop. There is no longer any need for the alternator and starter motor, the machine is started directly by the electric motor. This means that, when the machine is not working, the combustion engine shuts down and as soon as the operator activates a command, the drilling rig automatically restarts, courtesy of the electric motor. In addition, the presence of the clutch means that the diesel engine can be entirely disconnected leaving the Enteco Electra E6050 capable of moving and working in full electric mode". Control of the powertrain occurs in a transparent manner using the on-board electronics that manage the diesel engine autonomously and to

#Special within special

The Enteco Electra Patent installed on the E6050 fitted with Long Mast Kit

Surprise within the surprise. Enteco designers never tire of coming up with new ideas. And whilst in these pages we have unveiled the new hybrid system fitted to the Enteco Electra E6050, the more attentive observers will certainly have noted that the same machine pictured in these photos is in itself a somewhat special model. It is in fact an E6050 fitted with Long Mast Kit that also boasts the additional innovation provided by the new diesel-electric powertrain.

The Long Mast Kit, or LM for short, is another Enteco patent that enables the rotary stroke to be increased by 6 m, passing therefore from the 15 m of the standard version to the 21m of the LM version. The kit can be fitted or retrofitted to any E6050 regardless of engine/motor choice. The LM Kit consists of a 6 m extension piece, to be inserted under the jib, and two backstays, that are fitted between undercarriage and mast. When combined with mast base and rear stabilisers,

great effect, activate the electric motor when more power is required, manage the batteries and enable the various operating modes. This is all thanks to extended application of EIAS (Enteco Interactive Automation System) functions, Enteco's electronic control system designed to digitalise piling equipment, that the manufacturer from Musile di Piave has been fitting to its drilling rigs for several years.

Titanium batteries

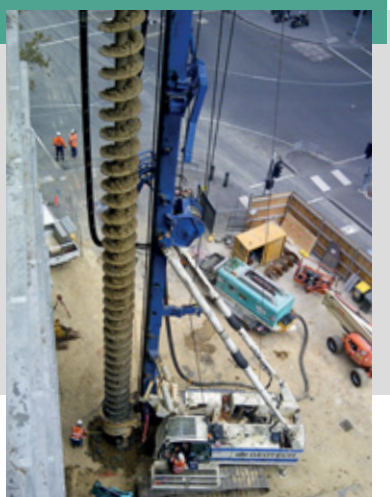
As previously hinted, the battery pack also offers a nice surprise. "Without false modesty", Renzo Porcellato resumes, "the battery pack is a true collection of research and technology in no way inferior to the automotive industry's most advanced systems. Quite the opposite. Installed on top of the powertrain, our batteries are the latest in Japanese technology and we can safely say, without fear of contradiction, that they have the best chemistry in the world: indeed, we are talking about titanium batteries or, more precisely, lithium-titanate batteries. Excellent quality, unquestionable reliability, unrivalled longevity".
This type of battery is capable of storing more energy and delivering it more quickly. And charging is also faster. According to Enteco engineers, the batteries used on the Enteco Electra E6050 can be charged up to ten times faster than standard low-cost batteries. This optimises the charging performed by the combustion engine and ensures a prompt supply of power upon demand. Data indicates that a set of titanium batteries cam hold more than 30,000 charge cycles. This means that the life expectancy of the batteries is equal to (or greater than) that of the machine. And at end of life they are not discarded, but can be used as storage batteries in many applications, first and foremost solar energy. Icing on the cake: safety. Titanium batteries won't catch fire or explode.

A smart, value-for-money choice

Having explained how it works, it is now time to discover the benefits. "The first cost saving", Renzo Porcellato

explains, "is achieved by downsizing the combustion engine: for a machine of the same weight, the engine is smaller than a standard diesel engine. Indeed, the Enteco Electra E6050 is fitted with a 175 kW diesel engine, whilst a standard E6050 utilises diesel engines with a rating of around 310 kW. Obviously, a smaller engine means lower fuel consumption. Next, the combustion engine fitted to the Enteco hybrid system can run at low revs (even just 600/800 rpm) because the electric motor manages peak power and torque. Finally, there are all the steps in which the machine can operate with the diesel engine switched off that, when added to everything else, further reduce the demand for litres of diesel fuel".
Despite adding the electric motor, Enteco's technical solutions make a direct contribution to the reduction in the equipment's Total Cost of Ownership (TCO).

the backstays create an extensive "force triangle" that lends the machine rigidity and stability. A solution whose main effect it to optimise stress distribution, ensuring that the E6050 performs at the highest level. The LM Kit really excels in configurations where drilling is completed in just one go, such as the Enteco SP (Soil Displacement), CFA or Soil Mixing. And when combined with the special 12 m extension piece, depths of 32 m can be achieved. A performance level that places the E6050 amongst the top drilling rigs in its class (less than 60 tons), enabling the Enteco machine to compete with considerably larger drilling rigs. And that is not all. Despite the two backstays and mast extension, the E6050 LM is still a self-erecting rig and can be folded to a compact size ready for transport without the need for any dismantling.



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The new Enteco Electra E6050 is the result of hours and hours of research, completely in-house design, high quality of the components used and severe testing at real sites

Maximum **safety**

Despite using the safest batteries on the market, there is however a risk associated with such high voltages. In particular, in the connection between electric motor and inverter, where direct current is converted to alternating current. Whilst the automotive sector has overcome this critical problem by integrating inverter and motor in a single unit, you won't find a similar system for the off-highway sector (Editor's note: to which foundation equipment belongs), therefore Enteco decided to develop its own solution. And it is also thanks to this additional improvement in the inverter/electric motor unit, perfected entirely in-house and patented, that Enteco guarantees a totally safe and reliable powertrain.

Calculations by Enteco designers show that the fuel saving alone allows the additional cost of the hybrid powertrain to be recovered in less than three years. Thus, when taken out of service an Enteco Electra will have a considerably lower TCO than an equivalent machine with a standard engine. In short, Enteco has made hybrid a worthwhile investment in many ways.
As our account shows, hybrid machines allow a notable increase in rated capacity. Indeed, a standard E6050 would have a rated capacity of around 310 kW, whilst the E6050 Enteco Electra unleashes 375 kW. Therefore, lower consumption leads to 20% more power, all to the benefit of productivity. "This also paves the way for other scenarios", Porcellato states enthusiastically, "by doubling the size of the titanium battery pack and installing larger combustion engines, we can obtain rated power capacities that up until now were unthinkable. An Enteco E9080 with a 405 kW combustion engine and 400 kW electric motor would achieve a rated capacity of more than 800 kW. An absolute record for piling equipment".

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Look for Enteco at GEOFLUID, outdoor area, booth F12

The future is upon us

Technical innovation is such when it paves the way for new opportunities. In line with this axiom, the powertrain installed on the Enteco Electra E6050 is designed to be ready for a different use, i.e. the plug-in hybrid. Indeed, on the same machine, we have only to fit an additional battery pack in order to supply the machine with the energy needed to operate in electric mode for many hours. Charging can be performed by the diesel engine or an external source.
"The further development", Porcellato adds, "is the full-electric version. This means an Enteco Electra E6050 capable of operating with electrical energy at all times. May I point out how, once again, the technology we are using is much more than just advanced and very far-sighted: the same Enteco Electra E6050 can be used in three different modes (hybrid, plug-in hybrid, full-electric) according to the needs and characteristics of the piling site. Customers will therefore not have to invest additional financial resources to buy new equipment. They will simply have to add additional battery packs".

The Revolution of construction site

Basically, Enteco has set its sights on a cost-effective, green, piling site. A site where the revolution will not be limited to simple electrification of construction equipment, but also allow the various machines to have swappable energy resources.
Enteco Electra technology actually works with battery modules that can be hot-swapped between various pieces of Enteco equipment, as well as being "rested" whilst charging. For example, a typical Enteco SP (Soil Displacement) technology site requires an E6050 drilling rig, an Enteco E8018 service crane and an Enteco ECP10 concrete pump.
Use of the Enteco Electra plug-in hybrid or full-electric system would allow all machinery to run on battery packs readily available in the storeroom or swappable from unused equipment or at rest.
"At Geofluid 2021", Renzo Porcellato concludes, "with the Enteco Electra E6050 LM we are not unveiling simple technological innovation, but a new vision of the future that awaits us and which together we can build ".