DRILLING RIGS FOR GEOTHERMAL ENERGY

Company is investing in electric drilling rigs powered by renewable energy

Submitted by Fraste

Geothermal energy is thermal energy generated and stored in the Earth and is a significant renewable energy source in many countries. Furthermore, it is clean and inexhaustible, allowing industries to avoid releasing greenhouse gases into the atmosphere.

Due to the increasing worldwide development of geothermal drilling to exploit natural energy, the demand for special drilling rigs to install underground loops has grown considerably these last few years.

Fraste offers a complete range of drilling rigs properly designed for geothermal drilling and heating pump installations with new solutions and technical proposals. All products are certified to the highest safety standards and monitored under the European Drilling Machinery Directives. In addition, geothermal ground loops for heat pumps can be easily installed with a specific Fraste geothermal drilling rig.

The Fraste rigs that are extensively employed within the geothermal projects are the rotary drilling rig Multidrill XL 170 DR and Multidrill XL MAX with their unique arrangements. The Multidrill XL 170 DR with double rotary is used mainly for air drilling, and the Multidrill XL MAX

Fraste's Multidrill XL 170 DR

is primarily used for mud drilling. However, both can drill with air and mud circulation.

The Multidrill XL 170 DR with a double rotary head for drill pipes and casings is specially designed for simultaneous drilling with drill pipe and casing. It is generally fitted with a low noise 173 horsepower (HP) Caterpillar diesel engine. As a result, its performance and drilling values are significant:

- Rotary head for drill pipes: 1,280 decanewton metre (daNm) maximum torque and 110 revolutions per minute (RPM) maximum speed.
- Casing rotary head: 3,100 daNm maximum torque and 60 RPM maximum speed.
- Two-metre-long drill pipes with an outer diameter of 89 millimetres and two-metre-long casing pipes with an outer diameter of 140 millimetres or more.
- Eight-tonne pulling capacity.
- 20-tonne double-pulling cylinders for casing lifting.
- Dimensions: weight of 8.5 tonnes and width of 2,100 millimetres.
- Crawler mounting.

The Multidrill XL MAX is a larger version of the basic Multidrill XL 170. Its main technical features are:

Fraste's Multidrill XL MAXe's control panel

- 173 HP Caterpillar diesel engine
- Rotary head: 1,920 daNm maximum torque and 1,000 RPM maximum speed.
- 12-tonne maximum pulling capacity.
- Three, four and five-metre-long drill pipes with different mast configurations.
- Dimensions: weight of 14.5 tonnes and width of 2,100 millimetres.
- Crawler mounting.
- Mud treatment with piston or centrifugal pumps.

Depending on drilling conditions, the Multidrill XL MAX's average drilling capacity is 150 metres in depth and 150 millimetres of maximum drilling diameter. These rigs can be supplied with various drilling equipment, drill pipes, casings and accessories ready for the drilling site.

Another Fraste rig commonly used in geothermal drilling is the Multidrill ML MAX. In this case, compactness is the driving concept. The Multridrill ML MAX is ideal for use where access is possible only with small and not invasive units (maximum width of 2,150 millimetres), featuring a soft setup with suitable performances. Main features of this lightweight and productive unit are the compactness, safe operation and the smooth manoeuvrability – it can go easily everywhere and it is ready to work within a few minutes.

Main specifications of the Multidrill ML MAX are:

- 148 HP Caterpillar diesel engine.
- Rotary head: 1,180 daNm maximum torque and 220 RPM maximum speed.
- Six-tonne maximum pulling capacity.
- Four-metre-long drill pipe mast.
- Dimensions: weight of about nine tonnes and width of 2,150 millimetres.
- Crawler mounting.
- Mud treatment with piston or centrifugal pumps.

Fraste goes electric

Fraste recently launched the fully electric version of the Multidrill XL MAXe, its most-sold drilling rig in production. Following the new challenges in the environmental field linked to the reduction of polluting emissions – primarily CO_2 – Fraste has recorded a constant increase in the demand for drilling rigs powered by alternative energy.

Currently, the choice falls mainly on electric solutions, as it is possible to produce electricity from renewable sources with very low or almost zero CO_2 emissions.

For one of its long-standing Dutch customers, Fraste has

Fraste's Multidrill XL 170 DR

How does a drill driven by a heat engine for eight hours a day with an average load of 60 and 70 per cent of its power benefit the environment? It goes from an estimated CO_2 emission of 400 kilos per day to zero.

decided to take up this challenge and design a drilling machine that any source of electricity can power. Fraste focused their attention on a specific model, developing a scalable system for all sizes of models.

But what drilling rig is this?

The model that paved the way for electrification at Fraste is a classic – a top model for more than 20 years – the Multidrill XL MAX 170.

The Multidrill XL MAXe unit will be used for drilling wells to install geothermal probes. It has a centrifugal mud pump and drilling mast suitable for using 5,000-millimetre rods with 12-tonne pull-up, double clamp and a two-speed rotary head.

The automatic loader of the drilling rods, the Manipulator, is a must, which makes Fraste's drilling units extremely productive and safe.

As per their customer's specific request, the Multidrill XL MAXe is powered by an independent battery pack that can be recharged with electricity from renewable sources.

However, this solution could present logistical problems related to the handling of the batteries. Therefore, Fraste's team of designers has made the machine compatible with other, more conventional power sources such as grids or generators (powered by natural gas or a fuel cell). This feature makes the machine adaptable to different market demands.

The drilling rig is equipped with a battery pack on board to facilitate site logistics. This powers a 30-kilowatt (kW) electric motor dedicated to the movement and positioning of the rig.

This technical solution is highly beneficial as it allows the machine's loading, unloading and positioning without any connection to external energy sources. As there are no live cables during handling, safety is improved. Furthermore, the battery automatically recharges during the drilling cycle.

The standard Multidrill XL MAX is powered by a 129 kW diesel engine, which, in its electric version, has

been replaced by an electric motor with a nominal power of 90 kW.

Thanks to the greater energy efficiency of electric motors, it has been possible to reduce the installed power while maintaining the same level of performance as a machine driven by a heat engine.

How does a drill driven by a heat engine for eight hours a day with an average load of 60 and 70 per cent of its power benefit the environment? It goes from an estimated CO_2 emission of 400 kilos per day to zero.

The Manipulator system

The onboard automatic drill pipe loading system, the Manipulator, benefits the Multidrill XL MAX and the ML MAX. This system can handle four-metre or three-metre-long drill pipes for the ML MAX and four-metre or five-metre-long drill pipes for the XL MAX. It is an excellent feature because it allows the rigs to get the work done in less time, and prevents the driller from encountering heavy and dangerous weights. In addition, all the rods can be carried onboard, making transportation easier.

One of the most innovative and interesting features is Fraste's mud cleaning system, which can be used with direct and reverse fluid circulation drilling methods.

This mud cleaning unit allows the recycling of drilling fluids by a separator system that produces clean water through a water tank supplied with a screen for five millimetres of solids and a cyclone-type de-sander for sand and silt separation.

Thus, the conventional mud pit is not required, and there is no mud to dispose. In addition, the separated sand obtained from this process can be recycled in the re-mixing with the geothermal grout and re-injected in the borehole after the loop installation.

This way, the drilling area will not be polluted or damaged, and the few residual cuttings will be easily treated. The Manipulator system, drilling rig, mud cleaning system and separator tank are supplied in a single package assembly, ready for operation.

This unit features a very compact structure with high technology and quality; it provides first-class performance drilling for geothermal drilling, soil investigations and water wells according to the components and accessories it is ready for.

All Fraste drilling rigs are designed on a modular base that allows the user to have a flexible unit composed according to drilling systems, environmental conditions and the driller's technical requirements.

Available accessories include many attachments that give the driller the best options for professional and profitable working: foam injection pump, down-the-hole hammer lubricator, electric generator and welding unit, mud mixer, recycling water de-sander, winches, automatic percussion device, compressor, crawler carrier and radio control.

PHOTOS: COURTESY OF FRASTE

For more information about Fraste geothermal drilling rigs, email Fraste at fraste@fraste.com or visit their website at www.fraste.com.

Fraste's Multidrill XL MAXe

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