

The construction business is currently undergoing an enormous change as the requirements for safety and efficiency are steadily on the rise. The issue of environmental protection in recent years has thereby been gaining in importance. STREICHER has made this issue one of its primary objectives to close an existing gap. A sound base of many years of working experience provides the subsidiary enterprises of the STREICHER Group with the knowledge and craftsmanship to design and realise technological developments and modifications in this field. A case in point for STREICHER's expertise is the company's specially developed HDD rig with a modern electric drive technology – it has been designed by experienced expert personnel for practical operations.

MAX STREICHER GmbH & Co. KG aA ranks among the experts, as an international provider of systems for public energy infrastructure, in the field of planning, building construction and systemic maintenance of the most diverse public supply facilities such as gas, water, electricity, long-distance heating, sewage, as well as communications and broadband systems. STREICHER employees have many years of international experience and high standards of quality, safety, environmental technology and energy management, and this contributes to the successful implementation of a wide variety of large-scale projects on an EPC basis, even under the most adverse technical and climatic conditions. Numerous laying methods come to use in the construction of pipelines – depending on the requirements of the respective project. Among other items, this applies to the trenchless horizontal directional drilling (HDD) method. The experience and expertise that such projects have yielded to the STREICHER Group in the field of pipeline construction have been used for the development and design of the HDD rig. This has subsequently led to a custom-tailored solution for a series of full-electrically driven HDD rigs – which have been employed for internal operations and external customer use alike.

The new HDD rig

The HDD rig, as a new design, is the result of a highly-ambitious project, which has united

Boris Böhm, MAX STREICHER GmbH & Co. KG aA, Germany, describes the development of a full-electrically driven HDD rig, designed to meet sustainable development goals.

HDD GOES ELECTRIC





Figure 1. HDD80-E rig is field-tested within e.g. projects of trenchless laying of electric power lines.



Figure 2. The system of HDD80-E is constructed as electrical in its entirety.

STREICHER's broad-range expertise in a unique manner. The development was carried out by an interdisciplinary team of specialists from the relevant technical departments, by drillers and designers. Whereas the regular HDD-drive technology is based on a diesel-run hydraulic system – which has been used by STREICHER over the past 15 years – the new drive concept for the electrified drilling rig has been entirely re-designed. This meets the new technology requirements and takes full advantage of the resultant technological enhancements. The system is, in accordance with STREICHER's electrical design concept, constructed as electrical in its entirety: all drives – spindle, carriage (thrust/pullback), mud pump and crawler tracks are run by electric motors. The complete concept of electrification attains its fullest efficiency by the deployment of an integrated battery and an intelligent circuit of power distribution throughout the system. Hybrid solutions of other manufacturers, in contrast, may use an electric motor instead of a diesel engine but will also apply a classic hydraulic drive for all their other functions of the drilling rig.

The HDD-E-facility

The system is much quieter than conventional models, due to the electric drive technology, which ensures better acceptance of the related construction work in populated areas and shows its advantages for the protection of the environment in nature reserves. This will be a benefit to drilling construction personnel and the operators of the drilling rig, as noise level will be significantly reduced, thereby protecting the occupational health and safety of personnel. CO₂ emissions are also significantly reduced by this new technology. The reduction in emissions is part of an industrial trend and will gain in significance and importance when it comes to a call for projects.

A further great advantage is that the system is compatible with the public power supply when working on inner city projects. It provides flexible compatibility for project-specific requirements. A feed-in module generates with an active-front-end technology a mutual direct current intermediate circuit. Due to the system structure with an integrated battery, it is possible to feed back braking energy and later return it into the system where required. Conversely, this also means that less energy has to be replenished from the supply grid or the energy store. With the energy storage located in a high-voltage intermediate circuit battery, it is possible to temporarily store excess energy and use it flexibly only when required. The system is accordingly designed for efficient use of space. The drilling rig can be moved without an external power supply by use of an integrated battery.

In terms of maintenance, the new system has noticeable advantages, as the electrical drive technology is subject to comparatively little wear.

A new operating concept

STREICHER has used its many years of experience and extensive know-how to select the right components and suppliers in order to contribute to the electrically driven HDD rigs. Along with many further innovations and design concepts, these rigs have been rendered highly efficient for their designated purpose during practical project operations. The entire power electronics system, as one of the feature items, has been built with elements from the mobile electric drive technology. These are particularly shock and vibration resistant and offer good protection against dirt and water. With the water-cooled and specifically developed synchronous motors, the rig drive technology is very robust, powerful and highly efficient compared to the conventional devices.

The completely newly developed, intuitive operating concept of the HDD80-E rig adds another highlight feature. From the technical field of drilling, to construction and software development, the design process involved a close co-operation of the STREICHER internal departments to

integrate valuable suggestions, experiences and objectives. On this basis, a simple and highly functional control cabin was drafted with two joysticks for the control of all main functions. The large and clearly designed 19 in. touch panel displays all relevant drilling parameters and maintenance data of the system at one glance. Many elaborate automated functions facilitate the operation of the system at the convenience of the system's operator.

An enabled device of automatic recording of drilling data provides a further feature that can be re-applied for later analysis. The integrated anti-collision system should also be noted here, which harmonises the interaction of the various mobile components and prevents possible collisions. The drilling rig can be moved, maneuvered and erected by remote control – even in confined spaces, ensuring an optimal field of vision and a reduced risk of accidents.

A system with four cameras installed in key positions will ensure that the drilling operator has an overview of all ongoing activities. The HDD80-E supports the working personnel in terms of occupational safety.

The package

Drill rods are handled by the new rig with a loading crane and a rod handling system. The loading crane places up to five drill rods on an intermediate rod rack next to the mast, from which two gripping arms feed the rod individually to the drilling process. Two automatically height-adjustable rod supports are also integrated into the mast structure for handling special components and for readjustment. These can move at a high precision rate to previously taught positions by the push of a button. The drill rods are screwed and unscrewed by the breakout system, which can be moved along the mast. Accessibility and work safety for the drilling crew is significantly improved by use of a wide walkway along the mast for cable-guided drilling and by clear separation between the working and rod handling area. The system is equipped with an on-board high-pressure cleaner. All these are features that bring along significant advantages for daily work.

A look at the performance data, moreover, shows the new rig's high technological level of sophistication. The crawler-based rig has a thrust and pullback force of 80 t and is designed for Range 2 drill rods (i.e. 9.5 m drill rod length). The spindle drive has a powerful drilling torque of 57 000 Nm and a maximum speed of 100 revolutions per minute. In order to run these high-performance components, the power electronics and the entire electric system has been made suitable for a feed-in power of 400 kVA. The same power source also drives an integrated mud pump, which is easily accessible to the maintenance working personnel.

Over the course of this year, STREICHER will complete a new electrified HDD rig as a smaller design model, based on the impressive HDD80-E design. It will wield 45 t of thrust and pullback force and will be equipped with a specialised rod handling system with rod boxes.

Great potential for pipeline construction

With its state-of-the-art technology, the HDD80-E is suitable for a wide array of projects. An interdisciplinary

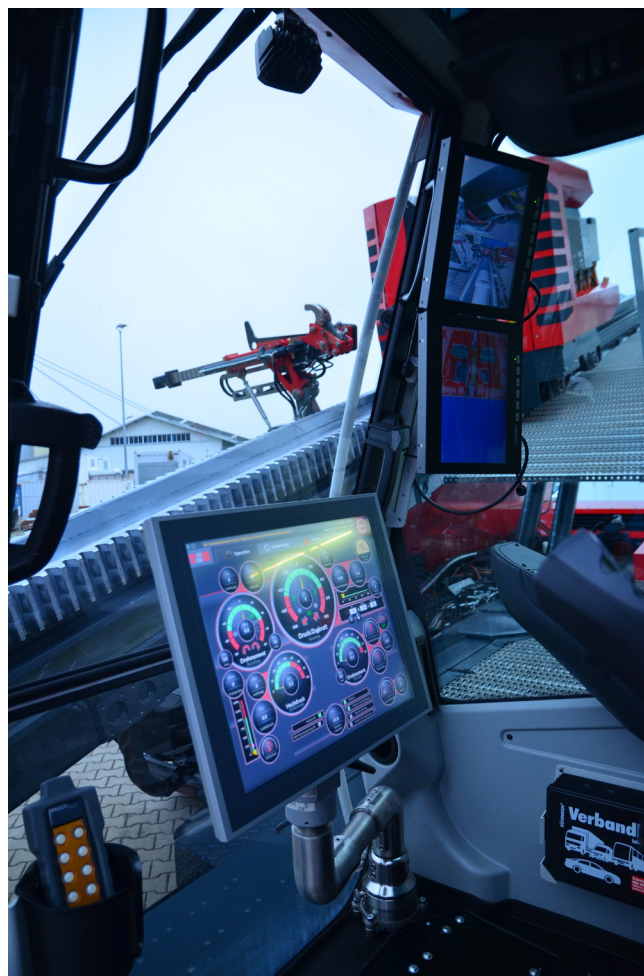


Figure 3. 19 in. touch panel displaying all relevant parameters and maintenance data.

development team of STREICHER particularly emphasised the company's strengths in this new development. The fact that these strengths have brought noticeable improvements, not only in theory but also in practice, was shown on the one hand by their intensive test operations and internal acceptance tests, and, on the other hand, by the system support and optimisation within the framework of a pilot project. The drilling rig has been used in the meantime in the underground, trenchless laying of electric power lines. STREICHER has created with these projects a product that is second to none.

The STREICHER Group heralds a new era with the HDD80-E project – and the all-electric welding tractor, designed and developed prior to this project – bringing with it many exciting new developments. Experience gained from these projects shall come to use for future design and construction of machines. According to the motto 'from practitioners to practitioners', STREICHER continues to break new ground in the pipeline construction business. Future-oriented, sustainable solutions and conventional technology find their improvement in all core areas of technological development, from occupational safety and environmental protection to operative efficiency. These projects will stand for better results and a healthier environment. 