

Harmoniously hammered

A MODERN ROCK-DRILL RIG DEMANDS HIGH-PRECISION HYDRAULIC COMPONENTS, A WELL-DESIGNED REMOTE-CONTROL SYSTEM AND EASY OPERATOR CONTROL OF THE KEY PARAMETERS

RIGHT: CV2000LS drilling-rig valve, post-compensated sections equipped with mid-inlet module for high pump flow

BELOW RIGHT: KG-Mekaniska KGCT rock-drilling rig breaking black granite

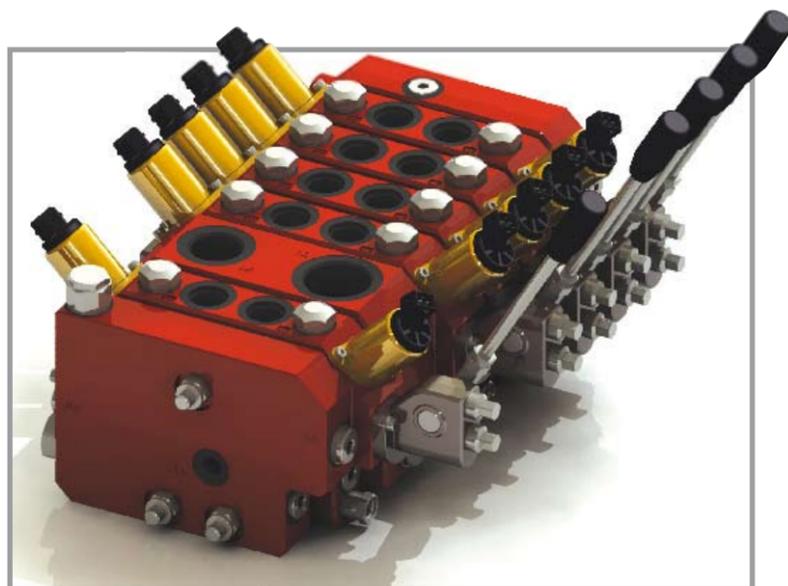
Percussive drilling to achieve both cost-effectiveness and high productivity demands that a number of important factors work well together. Nimco Controls AB has developed an electrohydraulic system that integrates the advantages of EasyProg, its advanced CANbus-based remote-control system, with its CV 2000 LS series post-compensated hydraulic valve. In this way, a sophisticated and user-friendly solution is achieved for the rock drilling industry.

Top hammer percussive drilling – the most common method for drilling holes up to 140mm in diameter – breaks the rock by hammering impacts transferred from the rock drill to the drill bit in the hole bottom. Hydraulic pressure generates the force required – the pressure is built up and when released, drives the impact piston forward. When the piston strikes the shank adaptor, it releases its kinetic energy in a stress wave transferred through the drill rod to drill bit which transfers the energy to the rock. To obtain the best drilling productivity and economy, all the components in the system – rock drill to drill steel to rock – must be in harmony.

When designing the hydraulic system for a modern rock drill rig, it is vitally important to give the operator complete and independent control of the key parameters – percussion pressure, percussion frequency, feed force and rotation – to achieve optimum drilling efficiency.

When all of these parameters are optimised to suit current working conditions, the drill bit has good contact with the material and the shockwave can utilise its kinetic energy to the maximum, providing the best possible productivity.

The machine design itself can contribute to part of the optimisation, but to achieve maximum productivity and meet cost targets, high-precision hydraulic components must be used. They can be further optimised and synchronised via a well-designed remote control system. This also enables better visibility, controllability and safety for the operator. It can also collect



data that can be used to further improve the design of the mechanical structure as well as the optimisation of components for future generations of machines.

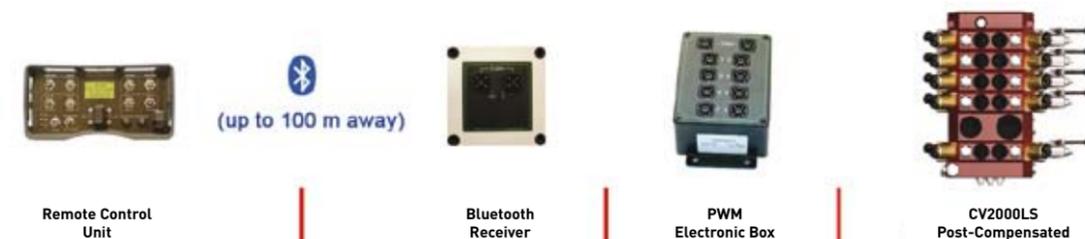
Nimco Controls AB has developed a system to meet these criteria which has been implemented on KG-Mekaniska AB's Swedish drill rigs and has produced optimal results over the last two years. The EH system consists of a variable pump, Nimco's CV 2000 LS post-compensated valve and the EasyProg Canbus system.

The CV 2000 LS valve is a post-compensated valve with a flow rate of 125 l/min on each cylinder port and is designed to work with both fixed and variable pumps. Work port flow is controlled with either 12 or 24V proportional solenoids,

with manual hand lever override functions available. LS pressure limiters can be fitted on each individual work port together with shock/anticavitation valves. For large pump flows a mid-inlet is available.

The EasyProg control system is a PC-based system that can be programmed in modules, and where the hardware can be built together in the same modular way, depending on the OEM's requirements. It is available in a standard panel-mounted form, a manual carry-with unit or a combination of both. It is CANbus based and allows for both digital and analogue input and output signals, and has an easy-to-use menu where all settings and standard functions can be entered. There are also a number of automatic functions for drill rigs, for example, which will enhance the speed of parameter settings as well as ensuring certain safety parameters.

The KG-Mekaniska CT series drill rigs use the CV 2000 LS valve to control key functions such as percussion pressure and frequency, rotation and feed force, as well as other functions such as tracks, positioning and fan drive. To achieve optimal productivity and economy, the operator sets the percussion



LEFT: Electrohydraulic system interface

pressure and frequency, and thereafter the rotation speed is set against the frequency. The last setting is the feed force which is set against the percussion pressure to position the drill bit close to the rock. These settings are all maintained by the CV 2000 LS valve, which has two compensators per spool section – one for each cylinder port.

The hydraulic setting is made via the EasyProg electrical remote-control unit. The feed-force function is remotely controlled by the CV2000LS pressure compensator via a pilot electrical proportional-relief valve. This enables a continuous setting of the feed

force and still maintains the possibility of a second pressure limiter working as an over-pressure cut-off valve. The design enables two pressure limiters for one cylinder port and exceptionally fine, stable pressure control.

The CV 2000 LS series compensators' flow/pressure curves are very flat and give a constant flow, independent of load pressure. The frequency and rotation of the drill bit is harmonised with the precise pressure setting for the feed force. The PL-2000 pressure limiter's distinct pressure cut-off point guarantees that the correct flow is maintained over the whole pressure range.

The EasyProg drill-rig version software has automatic setting functions to help the operator perform the initial setup faster. It also contains maintenance and service-frequency options that can be accessed remotely by OEMs through a GSM unit that can be connected to any mobile phone. Additional functions and portable remote control units can be integrated either by wire or by Bluetooth which, in the new version, has a range of 100m. **ivt**

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