

SCREEN CALL

MOBILE SCREENERS ARE VERSATILE – AND DEMANDING – PIECES OF KIT. OEMs REQUIRE CONTROLS THAT WILL PROVIDE ACCURATE AND CONSTANT MATERIAL DELIVERY, ENABLING HIGHER OUTPUT, AND EVEN REDUCING FUEL CONSUMPTION

▶ Mobile screening machines are versatile heavy equipment used in a variety of different fields, such as mining, construction, landscaping and quarrying. Material screening is the process of sorting a material of mixed-size composition into different end products with homogenous size compositions. There are a variety of different material types being screened on an industrial scale – everything from gravel, dirt and topsoil to recycled waste, wood and compost are just a few examples.

Hydraulic systems' manufacturer Nimco Controls AB, based in Malmö, Sweden, has a long experience in the screening market and has worked together with some of the leading screener manufacturers.

There are several different types of screening machines, of which the most common ones for use on an industrial scale are vibrating screeners and trommel screeners. Trommel screeners make use of a large rotating drum – usually slightly tilted – that enables the finer material to sift through it, while the larger particles slide down and out of the drum.

Vibrating screeners go down the route of a vibrating grid that encourages the finer material to sift through to the bottom where it falls through the screen. It is possible to have more than one screen deck stacked above another, enabling up to four different material sizes to be sorted in a single machine.

Apart from the screen itself, a screening machine normally consists of a feed hopper into which the material is loaded, a feeding conveyor belt that transports the material to the screen, and one or more material stacking conveyors, which then transport the screened material to the stacks of different material sizes away from the machine itself.

One of the key issues when designing a screening machine is to give the end user the ability to accurately set the speed of all the different conveyor belts. This is of great importance because the



McCloskey's R155 high-energy vibrating screener incorporates the Nimco CV691 and CV791 control valves for optimum performance

wrong speed ratio between feeding and stacking conveyors will cause the material to pile up inside the screen. Too high a conveyor stacking speed will cause the material to bounce off the belts when hitting the guide rollers.

Once the correct speeds of all the conveyors have been adjusted, this has to be maintained constantly throughout the whole work shift with the varying operating conditions it offers, such as

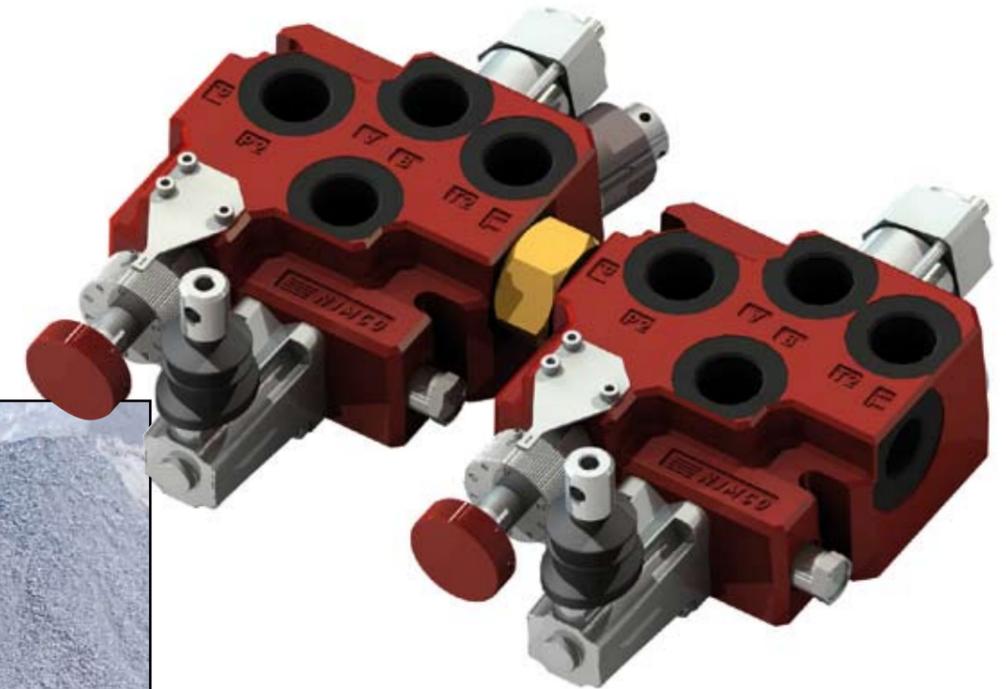
increasing oil temperature, varying load on the conveyors and changes in ambient temperature.

Traditionally this has been achieved by connecting a pressure-compensated, flow-control valve for speed adjustment to a directional-control valve for starting, stopping and reversing of the conveyor. This solution, however, requires a fair amount of plumbing, which is not only space consuming and

costly for the machine builder in the form of fittings and pipes, as well as the time it takes to assemble these, but it also increases pressure drop in the system, resulting in higher fuel consumption and greater heat generation, which is a long-term end-user cost.

CV691 control valve

Nimco Controls AB have worked closely together with McCloskey International Ltd, one of the leading screener manufacturers, to design a valve



CV691 and CV791 pressure-compensated flow-control valves in serial connection with special high-pressure carry-over adaptor

especially for the purpose of driving conveyor belt motors in an open-centre circuit. The result was the CV691 control valve, which consists of a pressure-compensated flow control integrated with a directional-control valve in a single compact unit.

The pressure compensator spool also doubles as the main stage in a pilot-operated pressure-relief valve, giving the valve a very distinct pressure cut-off point and making it able to keep the output flow constant all the way up to the set maximum pressure. This ensures a constant material delivery throughout the varying operating conditions, and savings can be made in plumbing, assembly time and most importantly energy consumption, as the pressure drop in the unit is considerably lower than in a traditional system.

Another feature of the CV691 is that it is possible to serially connect two units, using a low-built high-pressure carry-over adaptor, and then to use the return oil from the first motor plus the oil bypassed from the first valve unit as inlet flow to the second unit. This enables the entire pump flow to be used to drive two separate conveyors with pressure-compensated output flows and fully individual operation of each function. The first valve in the serial connection will then be equipped with a relief valve to protect from over-pressure downstream – this valve is then called the CV791.

McCloskey has optimised its hydraulic system by using an array of fixed gear pumps to obtain a very high energy efficiency in its machines. The design philosophy is to drive the conveyor belts by using one gear pump to drive a pair of conveyor motors, controlled by a unit of serial connected CV691 and CV791 control valves.

As the normal working conditions of these systems are very stable and can be predetermined to a high extent, it is possible to optimise the size of the pumps so that more or less the whole flow is used when the machine is in operation. When driving two motors with serial connected valves, the highest load pressure determines the power consumption for the whole unit, and the only loss from the lower load-pressure function is the pressure drop through those components.

This means that you get one function more or less 'free of charge'. In this way, by carefully designing the system to make sure that every pump uses near the full flow to drive a function during the machine operation, and by using the CV691 and CV791 control valves in a smart way, the system losses can be kept at a minimum. The system efficiency will therefore be as good as, or in some cases even better, than if a variable pump was used – but at a considerably lower initial cost.

McCloskey International has now been running Nimco's CV691 and



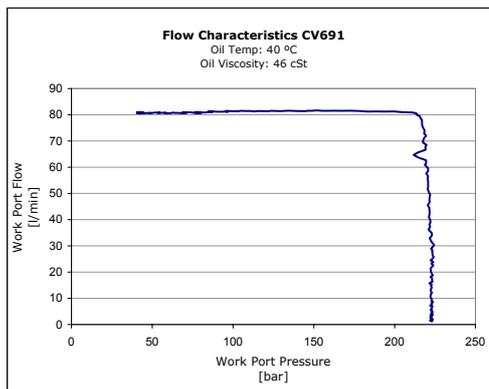
Some of the other main features of the CV2000LS are that it can be electrically unloaded for use as emergency stop, or for energy saving in an open-centre application in situations when no hydraulic functions are required. The electrohydraulic version has a built-in pressure reducer for pilot oil supply, and the proportional solenoid pilot valves are built directly into the section modules, for increased cost effectiveness and to achieve a more compact unit.

These pilot valves are operated from a pulse width modulated (PWM) signal and are equipped with a filter screen as standard to make them less sensitive to any oil contamination. The section modules can be equipped with port-specific load-sense pressure limiting valves together with shock/anti-cavitation valves to protect from over-pressure on the work ports. There are several different inlet modules for both fixed- and variable-displacement pumps to cover all the different user needs.

In addition to the control valves, Nimco offers a variety of electrical controls, such as joysticks and a rugged modular CANbus-based system, built especially for the demanding off-highway environment. The system is programmable through the highly intuitive software EasyProg and gives the user complete control of all the components in the system, such as control valves, joysticks, sensors and switches. The possibility of installing a GSM-link gives the OEM the opportunity to remotely connect to the system for implementation of software revisions or to perform troubleshooting and analysis of system status. The CANbus interface can also be equipped with a Bluetooth module for remote control of the machine with a standalone control unit, giving the machine operator a higher freedom of movement and better visibility when making adjustments in the machine operation.

This, together with its wide product range of standard open- and closed-centre control valves, orbital motors, cartridge valves and controls, combined with a broad experience and knowledge base around these specific systems, means Nimco Controls AB can be the complete system supplier for the mobile screening machine manufacturer. **ivt**

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ABOVE: CV2000LS post pressure-compensated control valve, equipped with mid-inlet module for high inlet flows and electrohydraulic actuation

LEFT: CV691 measured flow characteristics on work port, regulated flow adjusted to 80 l/min and main relief valve set at 220 bar

CV791 control valves on its screening machines for more than three years with very satisfying results. The heat generation in the system has been dramatically decreased, along with the overall fuel consumption, and the performance of the conveyor belts have improved due to lower internal leakage rates and better pressure compensation at high loads, resulting in higher material output volumes.

CV2000LS directional-control valve

For screening applications where an electrohydraulically controlled flow-sharing valve is needed, Nimco can offer the CV2000LS stackable directional-control valve. This is post pressure-compensated with individual compensator spools for each work port, meaning that it can deliver a multifunction load-independent work port flow – even in a pump overdemand situation – ensuring operation of every hydraulic function at all times, as opposed to a pre-pressure-compensated valve, where the flow will be directed to

the function with the lowest load pressure, causing the functions with higher load pressures to slow down or, in the worst case, stop altogether.

The port-specific compensators also enable individual remote unloading of each work port for automatic stopping functions when a certain pre-determined limit is reached, such as pressure overload or reaching of an end position. These features make the CV2000LS the perfect choice for driving conveyor belt motors or other situations where a stable load independent flow is required, as it has excellent flow compensation all the way up to the pressure cut-off point.

The OEM can take advantage of the modularity of this valve unit to achieve a fully customised system solution, with a variety of functions integrated in a single compact unit. Equipped with the IVM mid-inlet module, the CV2000LS can take an inlet flow of up to 250 l/min, with the output work port flow ranging up to 125 l/min, making it ideal to drive, for example, track motors.