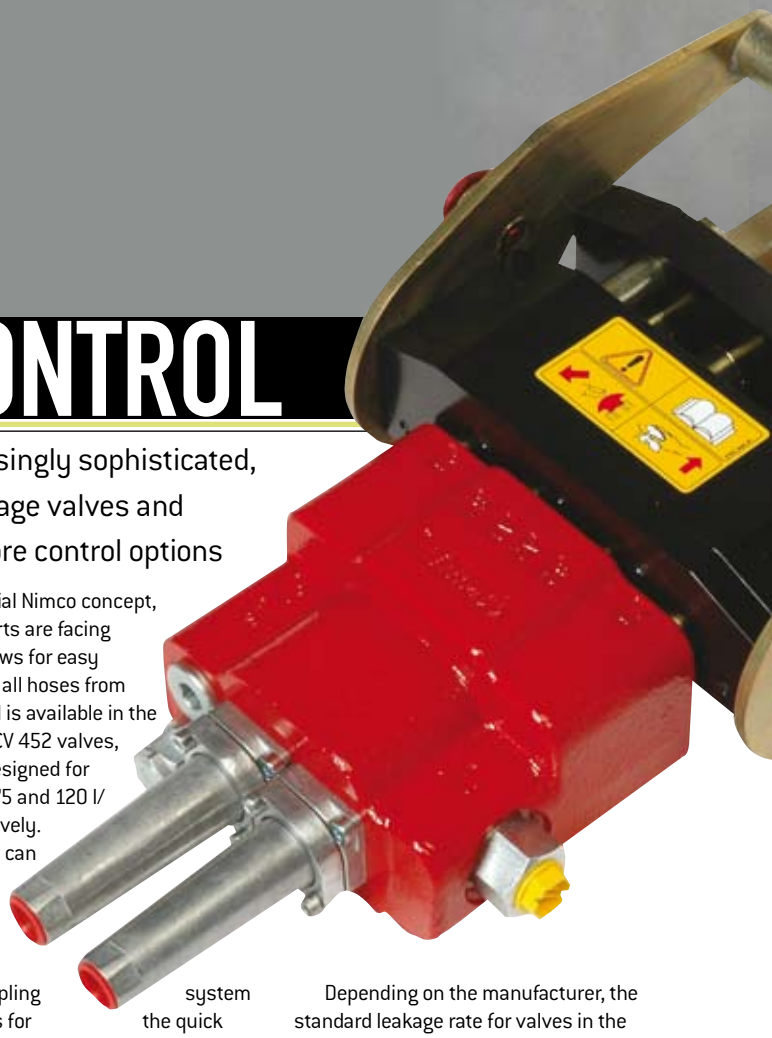
TORBJÖRN NORD

LOADS OF CONTROL

Agricultural loaders are becoming increasingly sophisticated, with load-sensing pumps, low spool-leakage valves and electrical proportional valves offering more control options



RIGHT: **The CV152 is a loader valve for flows up to 75 l/min (shown here with QDC coupling)**

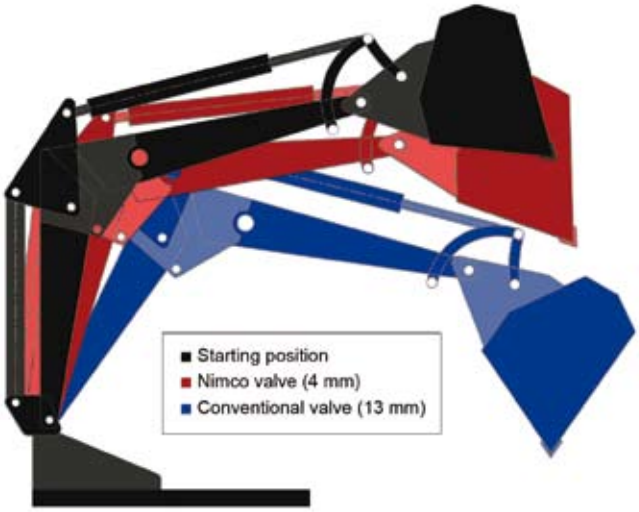
The agricultural loader market has become far more sophisticated over the last 10 years. The main developments are the use of load-sensing pumps on larger tractors, the introduction of more advanced valves that offer very low spool leakage for load-holding operations, and the integration of electrical proportional valves that can offer a number of control options that were not previously possible with earlier hydraulic systems.

Nimco Controls has been at the forefront of this evolution. The company has introduced a number of solutions and has been instrumental in bringing the market to its present technical level.

Most tractors with engines below 80hp are equipped with fixed displacement pumps, while tractors over 80hp usually feature a load-sensing pump which requires either an open-centre valve or a load-sensing valve. Load-sensing pumps have traditionally had a standby pressure of around 24 bar, but new models are being introduced with standby pressures as low as 5 bar.

Nimco Controls offers a full range of open-centre and load-sensing valves covering all tractor and loader sizes with flows ranging from 15-120 l/min. All Nimco loader valves can be offered as open-or closed-centre and can accommodate all levels of standby signals down to 5 bar.

Comparison of a Nimco low-leakage (2cc/min) valve with competitive model (8cc/min) on a parked loader, concerning drift of lift and bucket cylinders over 10 minutes with a 100 bar load and a 46 cST viscosity



The special Nimco concept, where all ports are facing forward, allows for easy assembly of all hoses from one side and is available in the CV 152 and CV 452 valves, which are designed for flows up to 75 and 120 l/min respectively. Both models can be fitted with the company's QDC fast-connect coupling system which allows for the quick coupling of all the hoses to the loader from the tractor in a single movement.

With a maximum flow rate of 45 l/min, the CV 112 loader valve is an option for smaller loaders mounted on tractors. It has proven very popular as it can be equipped with a variety of spools including float and regen, and can be fitted with a direct-acting joystick as well as cable control options. As mentioned earlier, the CV 112 valve is offered in a load-sensing version.

Complete control

One of the most critical factors for any mobile machine operator today is absolute control of the load at all times. This is made easier by the use of well-designed valves that include load-holding check valves and 'tuned' spools which not only allow the operator to have absolute control of the load at all times for safety reasons, but also give him the ability to keep the load steady without cylinder drift.

The float position is a necessity for most loaders. As it is not feasible to use traditional over-centre valves in combination with the float position, it is necessary to achieve very low spool leakage in the directional control valve to obtain minimum cylinder drift. Nimco has solved this problem by offering valves with exceptionally low spool leakage rates, which is the combined result of continuous improvement in the design of the valve itself and the finished spool bore through highly specific spool bore finishing methods.

Depending on the manufacturer, the standard leakage rate for valves in the mobile industry is around 8cm^3/min spool leakage at 46 cSt, which gives a traditional cylinder with a diameter of 63/40mm at 100 bar pressure a drift of 1.3mm per minute per lifting cylinder. While this might be acceptable in many applications for many customers, it is not the case for most loader applications as the operator often needs to keep the load steady without any cylinder drift, so that he can carry out other operations simultaneously.

Nimco offers its customers a leakage rate which is below 2cm^3/min on all of its loader valves, which translates to only 0.4mm per minute cylinder drift. A conventional valve would have 13mm in cylinder drift over a 10-minute period, while a Nimco valve would have only 4mm. Considering the geometry of the loader, this has a big effect on where the load ends up over this period of time. This has proved particularly useful when the agricultural loader is being used for precise work such as pallet stacking or animal and goods transporting.

Not forgetting the ergonomics

As tractors and loaders have become more sophisticated and efficient with regard to productivity and hours used, good ergonomics and operator comfort have become increasingly important. This has lead to rapid development of electrohydraulic control of the directional control valve, where the traditional manual cable control joystick has been exchanged for an electrical joystick (analogue or CANbus), which will eliminate the need for

the machine operator to manually shift the valve spools through the mechanical joystick and cables.

This type of control is used mainly on larger-flow tractors, due to the cost difference over cable control units. However, there is a clear trend towards this kind of system for smaller equipment, as a new generation of farmers is appreciating and demanding all the productivity-improving factors that the programmable electrical proportional systems offer.

To develop electrical proportional control for the loader market is probably one of the most demanding tasks due to its many application areas. This has lead to a move from traditional analogue controls to the more adaptable CANbus systems. Nimco offers a full range of electrical hydraulic proportional controlled valves (EHPs) as well as a large number of different joystick controls from the simplest on/off control to proportional controls where a number of productivity-enhancing features can be integrated as options into the system.

For loaders, Nimco's EPC-600 second generation of fully programmable electrical proportional CANbus control systems is now available. The series is built around a CANbus joystick unit with an integrated display on which the user can call up any of the preprogrammed features available for any specific loader. Specific programs for different types of operations are available, as well as sub-menus for specific tools or pre-programmed movements.

The EPC-600 has the processor capacity to send, receive and process information, which means it enables the use of preset movements based on the information received from the different sensors placed on the machine.

The CANbus joystick is connected to a driver box which operates the proportional pressure-reducing valves integrated in the main valve via a PWM signal.

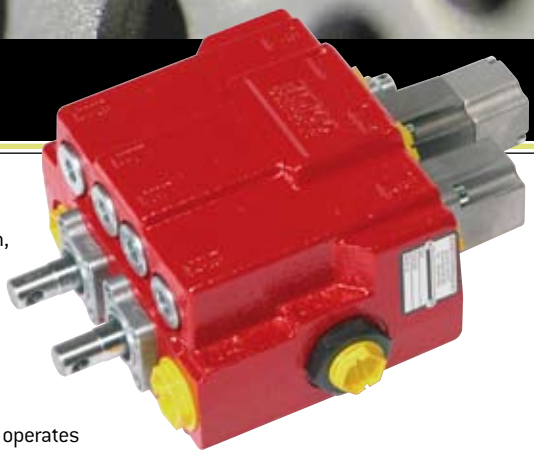
Feature rich

A number of different standard features have been incorporated into the EPC-600 system for loaders, which can be used for open-centre as well as load-sensing systems. The latest feature is a complete electrical self-levelling function that removes the need for mechanical or hydraulic self-levelling as used on loaders today.

The most basic feature of the EPC-600 system is the electrical proportional control of the lift, lower, tilt, dump and float functions, which copies the mechanical control used today, albeit in a more ergonomic way.

Standard features are the activation of any third and fourth functions such as circuit selector valves operating grapples, soft drive accumulators and hydraulic tool lock and release functions via an electrical switch in the joystick hand grip.

Other features include fast and slow mode selection where the operator can reduce the speed of any operation to any level in relation to the stroke of the joystick; a rattle function whereby the operator can simply push the joystick button to shake the bucket to release any material stuck inside; a quick-dump function; an automatic return to dig cycle; and speed control for post hole diggers driven by hydraulic motors.



The CV452 is a special front-loader valve in open- and closed-centre versions for controlling flows up to 120 l/min

The EPC600 is a programmable CANbus joystick with integrated display

By combining load-sensing technology, advanced valve technology and programmable electrical controls, even relatively simple loaders can become sophisticated, highly productive machines compared with the small loaders of 10 years ago. The operating features and ergonomics offered in the EPC-600 system have improved the working conditions for operators, who can utilise their equipment to a greater extent and make further increases in productivity.

The challenge that remains is to further improve cost efficiencies in the components so that these types of systems can be made available for all machines. ***iVT***

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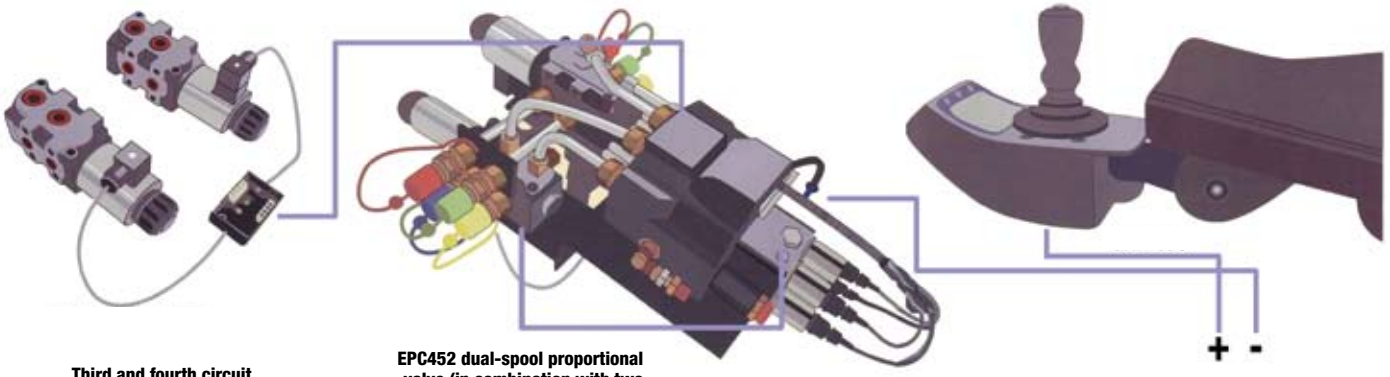

Third and fourth circuit selector valves

EPC452 dual-spool proportional valve (in combination with two circuit selector valves)

CANbus