Market on the horizon
Break through for flexible tractor valves page 6-7
Dear Customer,

The positive feedback to the first issue of The Circuit has encouraged us to go on. So it is with pleasure that I can now introduce the second issue which, like the first, is full of news and information about the activities in our field.

The largest part of this business year has already gone by, bringing us better results than we had expected in view of the ailing world economy. This is not least due to developments within the agricultural sector – an area in which we have made some important gains. Several examples of this can be found in this issue of The Circuit, demonstrating that our leading technology has once again been seen to provide cost-effective solutions that benefit the daily operation of customer machinery.

The development of system solutions in partnership with customers is our highest goal. To achieve this, our highly motivated employees located around the world are at our customers’ disposal. Agritechnica 2003 in November provides us with an important opportunity to talk to many of our customers in person. We look forward to seeing many of you there.

Wolfgang P. Weisser
Vice-president
Sales & Marketing Europe

---

Finnish Hydrolink draws on Sauer-Danfoss technology in its Formatic Super G – the most powerful snowgroomer in the world

Fashionable skiing resorts have their work cut out when it comes to satisfying the hoards of enthusiasts that take to the snow-clad pistes each winter. But with the Formatic Super G snowgroomer from Hydrolink, they have all the capacity they need to keep the pistes in tip-top condition. The Formatic Super G rolls power, performance and strength into one. A digital RedCAN control system, fully hydrostatic transmission, working hydraulics and planetary gears supplied by Sauer-Danfoss are all part of the equation that is making the Super G an increasingly popular choice among Europe’s skiing businesses.
Managing director of Hydrolink, Mats Carlson comments on the machine that has marked the Finnish, family-owned company’s entrance onto the downhill skiing market: “Our goal is to make the best snowgroomer on the market,” he says. “So it is very important to us that we can get the whole electrohydraulic system from the same supplier. The RedCAN system has made us the only company in the snow-grooming business with such sophisticated electronics. It has put us a step ahead.”

**Tackling tough demands**

Downhill skiing resorts provide some of the most difficult terrain there is. Driving up steep gradients of up to 45%, pushing tonnes of snow back up the piste at the end of a day’s skiing, tilling and finishing the snow to give it the right density and smoothness, and even shaping the snow into jumps for snowboarders, the Super G is designed to tackle the toughest skiing demands.

“It’s a versatile machine. And that’s necessary as new market requirements continue to emerge. Power is particularly important, especially in the Alps where some of the hills are very long,” says Mats Carlson.

**Precise operation**

Among the unique features of the Super G, the Sauer-Danfoss RedCAN and colour QVGA screen display all working parts of the machine. Via a joystick or steering wheel, these digital controls enable user-friendly and precise operation of the tiller, front blade and other cabin functions. The programmable memory caters easily for the needs of different markets and customers.

Another first in a machine of this type is the use of Sauer-Danfoss’ variable displacement pumps, which are lined up one after the other without any sign of a gearbox. The three pumps and proportional load-sensing PVG valves are key components in the main hydrostatic transmission system – securing a smooth performance with maximum power and easy maintenance. A fourth pump can be found in the Super G’s hydraulic winch machine which, with its kilometre-long wire, comes into its own on extra steep gradients.

For Hydrolink, the Super G is the latest in a series of development projects involving Sauer-Danfoss. The company’s first snow-grooming machine, launched in 1994, and hydrostatic farm feeders are also fitted with Sauer-Danfoss components.

Hydrolink and its owners, the Carlson family, value the long and fruitful relationship with the Sauer-Danfoss company in Finland. Mats Carlson’s father, Kaj Carlson, who produced the world’s first ever hydrostatic forestry machine, also used Sauer-Danfoss.

“Sauer-Danfoss provides a very good local service and always has the components we need in stock,” says Mats Carlson. “We are very satisfied with the performance of the Super G and the possibilities it gives us for future development.”
The Sauer-Danfoss DP600 displays a strong will to please

Safe, accurate and efficient machine control is available at the press of the button with the new Sauer-Danfoss DP600 graphic terminal. Fitted with an advanced transflective, TFT screen, the DP600 is a striking opportunity to dispense with traditional dashboard instruments and integrate all functions in one compact control centre.

The large screen and combination of soft keys and control buttons provide rapid access to all the information required by the operator. Just as in modern car navigation systems, the screen has an automatic backlight that ensures maximum visibility in the brightest sunshine and at night. The backlight in the keyboard is an additional benefit.

Sauer-Danfoss has incorporated a series of other advanced features in the new display terminal. Two CAN ports, one of them RedCAN compatible, are available for linking up to the transmission or other parts of the hydraulic system and the diesel engine. A USB port enables rapid software down-loads, and two camera inputs make it possible to monitor machine operations. For top operator comfort, an external NAV button can be mounted as desired, allowing the operator to navigate swiftly and easily through all control functions.

Built-in flexibility makes the DP600 the ideal choice for anything from simple speedometers to complete interactive machine management and control centres. On top of that, the terminal is fully compatible with ISO 11783, the new global standard for agricultural machinery. Software tailored to each application is developed either by Sauer-Danfoss according to customer specification or with the use of Sauer-Danfoss development tools on the customer’s site. In this way, customers can freely design their own graphical user interface.

Mobile equipment operation has never been simpler. In earth moving, road building, forestry and agricultural machines, material handling equipment, road sweepers and garbage trucks to name a few, the DP600 is destined to catch the eye.
PVE Series 4 brings the latest technology to the market

Electrical actuators revolutionised valve control when Sauer-Danfoss introduced the first ever series to the market in 1978. Today, more than three decades later, the company is still at the forefront of actuator design with its latest generation – the PVE Series 4.

While still relatively new to the tractor market, electrical actuators are widely used by many other types of mobile machinery, including cranes and man-lifts. PVE Series 4, which replaces Series 2 and 3, includes the latest electronic technology for a top performance designed to satisfy the needs of mobile hydraulics for the foreseeable future.

Among the new features is a new solenoid valve coil package, a disable mode option, and a redesign of the solenoid valve, which enables faster operation. A softer potting material covering the coil package, transducer and electronics and a specially designed cable connector system also give improved protection against the environment. In addition to resisting water and humidity, the PVE Series 4 can withstand temperature extremes ranging from -30°C to +70°C. Improved electromagnetic compatibility (EMC) protection guards against other external interference up to 100 volts/metre.

Comprising some 50 variants, the series takes all needs into account. Options range from analogue to digital controls and lower frequency controls for customers’ existing machines. Efficient fault monitoring supervises valve operation, reporting back on any problems discovered. All in all, it adds up to a PVE series with built-in universal appeal.
Sauer-Danfoss is fast breaking through onto the market for tractor valves. Close customer cooperation has produced a highly flexible series designed to meet all modern demands.

There was no holding back for Finnish tractor manufacturer Valtra over the summer when it launched what it called the most powerful four-cylinder tractor in the world. At Valtra, the M-Series is the third new generation tractor to hit the market in two years, the company’s large S-Series and smaller T-Series having also been upgraded to harness the full potential of today’s advanced tractor implement technology.

All three represent a major milestone for Sauer-Danfoss – marking the long-anticipated move into the market for load-sensing proportional valves tailored to the tractor industry. Similarly, in Germany, specialist tractor manufacturer Fendt has chosen Sauer-Danfoss to supply valve blocks for its new narrow gauge tractor range, FENDT Farmer 200 VP.

Successful developments

In road building, construction, agriculture and forestry machinery, Sauer-Danfoss modular proportional valves and high performance electrical actuators have been proving their worth since 1988. The valves’ load-sensing characteristic means they only take the required amount of oil from the system for a particular function, leaving the rest available for other simultaneous movements. Now further development of the success-
the plough

ful PVG 32 series has extended the application range to tractors – and the world’s biggest market for proportional valves.

Low leak ports, special inlet sections and innovative electrohydraulic actuator options are, today, all part of Sauer-Danfoss solutions. On the valve side, the special PVBZ load-compensated module plays a particularly important role; the pilot-operated check valves integrated in the work ports reducing port leakage to virtually nothing. Diverter valves, capable of directing the hydraulic oil flow in two directions, are another main selling point. Providing the option of performing two functions with one valve block, they pave the way to automated cost-optimisation.

From analogue to digital

Close cooperation with tractor manufacturers has given Sauer-Danfoss clear insight into the needs of the future. As manufacturers gradually make the move away from analogue to digital valve controls, the company has created a new electrical actuator concept designed to meet all requirements. Growing manufacturer requirements with regard to power lifts are also catered for in Sauer-Danfoss’ hydraulic tractor systems. Hitch valves based on the PVBZ module have been developed for the three-point suspension to enable precision raising and lowering of tractor implements.

A reliable reputation as a supplier of steering components had already made Sauer-Danfoss a well-known name at Valtra when the two companies started work on valve solutions. Today, Valtra’s M, T and S-Series are equipped with fully programmable Sauer-Danfoss hydraulics that are safely and simply operated using Sauer-Danfoss joysticks and control panels – a package designed to satisfy the sophisticated requirements of modern agriculture.

Meanwhile, the narrow gauge FENDT Farmer 200 VP tractor promises to set a new standard in the efficient management of vineyards and other fruit plantations. Sauer-Danfoss valve blocks are helping to make it happen.
Benefits that won’t keep you waiting

The Sauer-Danfoss Series 45 range is ready to meet all open circuit needs

Open circuit axial piston pumps from Sauer-Danfoss have never offered so many opportunities to so many applications. The addition of two new frame sizes to the Series 45 range has extended the scope of the benefits for manufacturers of cranes, telehandlers, forklift trucks, forestry and agricultural machinery and numerous other mobile vehicles.

Highly efficient and reliable with low noise levels, Series 45 meets all the needs of highly responsive hydraulic systems. With their load sensing and pressure compensated flow controls, the pumps are the perfect match for Sauer-Danfoss’ PVG proportional valves and PVE electrical actuators. The ability of the load sensing controls to harmonise pump outlet flow with system demand ensures cost-effective operation and a longer working lifetime for the pump.

Fast and compact
The latest additions to the Series 45 range – Frames E (100 to 147cc/rev) and J (45 to 75cc/rev) – follow the family tradition for a compact size that allows more space for other components. Fast response times are secured by the servo pistons, which are located close to the pump controls. Four-bolt assembly minimises potential leak points, increases reliability and customer satisfaction and reduces the already low number of system parts. The low noise levels also reduce operator fatigue and meet the legal requirements for vehicle noise. Both new frames sizes have maximum continuous pressure ratings of 310 bar and 400 bar peak.

Series 45 today covers displacements from 25 to 147cc/rev and incorporates high power auxiliary drives for multiple pump configurations and a wide variety of installation options. And, to cap it all, the entire range is immediately available.
Go for a spin in the JCB Teletruk and enjoy perfect control – even when the conditions are at their most extreme

Traditional forklift design was turned on its head when JCB broke into the material handling market with the innovative Teletruk. But an eye-catching appearance is not all the Teletruk has to offer. Behind the sleek exterior with its ingenious telescopic side arm, Sauer-Danfoss has contributed some of the technology that makes the Teletruk an efficient workhorse.

A Sauer-Danfoss anti-spin control system is largely responsible for the Teletruk’s excellent performance in difficult, off-road terrain and high driver comfort. Consisting of a high-tech steering sensor, an S1X microcontroller, four pulse pick-up units (PPUs) and two ASC twin valves, the system effectively prevents wheel spin, enabling the Teletruk to handle slippery conditions with ease.

“Wheel spin is almost impossible to provoke, even in muddy terrain,” says JCB Teletruk engineering manager Paul Wild. “This improved drive performance allows the Teletruk to operate in ground conditions that are less than ideal for, and not normally associated with, forklifts.”

The S1X microcontroller is a key element of the anti-spin control system, calculating wheel speed with the aid of electronic input received from the four PPUs. Based on the speed of the slowest wheel, the S1X detects possible slip and instantly reduces oil flow to one or more propel motors for effective wheel-speed alignment. Wheel angle and turning circle data supplied by the steering sensor enables the S1X to perform the same wheel aligning function when the machine is turning.

**Balanced transmission**

The Teletruk’s enhanced performance and unique driver benefits are due to the near perfect combination of power and controllability. Here, the hydraulic and electronic control mechanisms in the Sauer-Danfoss NFPE-controlled transmission system play a vital role.

System engineer Jan Bendixen from Sauer-Danfoss in Neumünster explains: “The primary advantage of the NFPE (Non-Feedback Proportional Electric) system is that it automatically balances transmission ratio with engine speed, desired propulsion speed and load conditions. The closed circuit pump is controlled via two proportional solenoid valves acting as transmission actuators. Placed in a so-called NFPE control block, the valves are piloted by an S1X microcontroller. And, due to the S1X, everything works automatically, the result being greatly enhanced driver feel and maximum controllability.”

The S1X in the NFPE system makes it possible to tailor machine performance to driver preferences and varying terrain. Due to its direct line of communication to the diesel engine, the S1X also cuts down the number of necessary sensing elements, saving space and reducing costs. Last but not least, the constant balance between transmission ratio and engine speed, propulsion speed and load conditions equips the Teletruk with a built-in anti-stall function.

After years of success within the construction sector, JCB could hardly have achieved a more noteworthy entry into the industrial material handling market. Advanced internal technology and a telescopic side arm that allows operators to reach over and across obstacles with little effort have secured the Teletruk a popular welcome.
The long arm of the farm

Sauer-Danfoss expertise goes into farm robot project

A farm robot that can register and map weeds in crops and monitor crop conditions could well become a familiar sight in the not too distant future. Sauer-Danfoss teamed up with Danish university scientists and three other companies in a joint research project to develop a working prototype.

Known as API – Autonomous Platform and Information System for registration of crops and weeds – the robot project is part of a programme run by the Danish Agricultural Network in Engineering and Technology. Three Danish research institutes led the task of creating and testing the prototype in collaboration with four industrial partners.

Sauer-Danfoss provided the research project with both financial and technical support, including automated steering components, expertise and work on the integrated modular design. In return, the company gained the opportunity to learn about new trends within agriculture – information Sauer-Danfoss uses in its own product development.

The robot integrates existing technologies, including real time kinematics, differential global position system (GPS) and computer vision. For farmers, it presents exciting prospects for the development of novel management systems. Weed registration, for example, could be used to determine the optimum level of herbicides required for weed control. Highly accurate, non-chemical weed control is another possibility. With potential like this, the farm robot is worth watching out for.

Per Lindholdt from the mobile systems group at Sauer-Danfoss in Denmark was among the project participants. “We produce many components for agricultural machinery, which is becoming increasingly automated,” he says. “In this project, we learnt a lot about the direction in which agricultural automation is going. Our cooperation with scientists working at a very high-tech level has also sharpened our theoretical knowledge.”

German manufacturer Paus draws on Sauer-Danfoss electrohydraulics for the PIT 500 – the new inspection vehicle for the Transrapid hoverrail. Sauer-Danfoss regional sales manager Horst Urban describes a unique solution for a unique vehicle.
The Transrapid uses a magnetic levitation system to move along its guideway (track) at speeds of up to 450 km/h, in order to do this high safety standards for the guideway are required.

The Transrapid operating company IABG needed a special vehicle to inspect the guideway. The German company Paus from Emsbueren gained the contract to design and build the vehicle to run on the test guideway situated in the Emsland area. Paus is a renowned company with vast experience in the making of special vehicles; they have been using Sauer-Danfoss equipment from the very beginning.

The PIT 500 is used for all the inspection and maintenance work. Computer supported video cameras and other sensors check the guideway. Should any reclamation occur platforms each side of the vehicle can be lowered to allow maintenance crews to take closer visual examination.

The decision to use a hydrostatic transmission drive was a result of the specifications required for the different situations in which the vehicle was to be used. Sauer-Danfoss was asked to design and provide a complete system solution.

A heavy weight with a speed of 65 km/h

With weight of 35 tons the vehicle has a top speed of 65 km/h, with a towing load of 1.5 to. the PIT 500 travels at a speed of 45 km/h. The vehicle is powered by a 330 KW diesel engine.

The 4 drive axles run hydraulically parallel with each other they are driven separately by 4 variable motors S1 V 250, they must also be able to run independently to provide a differential lock function. Four variable pumps 90 L 100 made as tandem pumps are fitted to a splitter box these are controlled by one Non Feedback Proportional Electrical valve (NFPE). The S1X-NFPE controller is connected to both solenoids. The drive system provides four different drive modes.

A main control panel at the front of the inspection vehicle together with other docking facilities for a mobile control panel are available for the driver around the vehicle.

PIT 500 Paus - Inspection vehicle - Transrapid 500
a precursor of drive technology for tomorrow’s world

A statement from the Project Manager Dieter Plagemann from Paus “The excellent team work between the Transrapid operators IABG, the vehicle manufacturer Paus and the system supplier Sauer - Danfoss, made the realisation of this ambitious project the success it has been.”

Project Manager
Dieter Plagemann
Efforts to promote health and safety at Sauer-Danfoss Nordborg in Denmark have paid off once again with an occupational health certificate that proves the company lives up to Danish state regulations.

The certificate extends the OHSAS 18001 certificate attained by the company earlier this year with two additional areas – workplace health promotion and the inclusive labour market. This means Sauer-Danfoss Nordborg has showed its commitment to identifying and preventing occupational health risks and accommodating the personal requirements of individual employees. In addition, the company is required to publish an annual environmental report.

The health and safety programme at Sauer-Danfoss has so far produced impressive results. Accidents at work have been reduced to a third of what they were a year ago. Employee sick leave is also in decline.

Sauer-Danfoss chairman Klaus Murmann sailed to an impressive third place in this year’s gruelling DaimlerChrysler North Atlantic Challenge. Of the 63 open sea yachts in the race, his UCA proved itself the fastest, covering the 6,700 kilometres from Newport, USA, to Cuxhaven, Germany in just over 13 days and 7 hours.

Aged 71, Klaus Murmann is still a busy man, dividing his time between family, business and his favourite sport – open sea yacht racing. Sauer-Danfoss was among the sponsors of the UCA, which was built in Kiel last year. At 26.5 metres long, the UCA is the biggest carbon-fibre yacht in Germany and has a sail area of 900 square metres.

King of the waves
Sauer-Danfoss chairman Klaus Murmann sailed to an impressive third place in this year’s gruelling DaimlerChrysler North Atlantic Challenge. Of the 63 open sea yachts in the race, his UCA proved itself the fastest, covering the 6,700 kilometres from Newport, USA, to Cuxhaven, Germany in just over 13 days and 7 hours.

Aged 71, Klaus Murmann is still a busy man, dividing his time between family, business and his favourite sport – open sea yacht racing. Sauer-Danfoss was among the sponsors of the UCA, which was built in Kiel last year. At 26.5 metres long, the UCA is the biggest carbon-fibre yacht in Germany and has a sail area of 900 square metres.

Double win in Slovakia
Sauer-Danfoss Slovakia brought home an “engineering product of the year” prize from the 2003 international machinery fair held in the historical Slovakian city of Nitra. The company’s first appearance at the annual fair, Sauer-Danfoss received the award for its electrohydraulic transit mixer system.

Two other companies received a similar accolade. Prior to the event, Sauer-Danfoss Slovakia won a “best exporter” award in recognition of excellent achievements in 2002. Presented by the Slovakian ministry of finance in cooperation with Eximbank SR, the award was last won by Sauer-Danfoss in 1997.

Meet the team
Sauer-Danfoss will have the latest technology on display at a series of trade fairs in the months ahead.

Look out for us at Agritechnica in Hanover from November 9 to 15 where we will present our newest products and system solutions. Catch up with our components and solutions for agricultural machinery at EIMA in Bologna from November 15 to 18.

Find us in early 2004 at Mecanelem, Paris from March 22 to 26 and Bauma, Munich from March 29 to April 4. The product news presented at these two events will be covered in the spring 2004 issue of The Circuit.