

Inside

Customer control in one easy package

page 4

System fit for a Cat

page 6

Valves meet the market

page 8

A model of intelligence

page 10

the
circuit

PLUS 1
by SAUER-DANFOSS



Intelligent controls on the move

Sauer-Danfoss introduces PLUS 1, a whole new approach to
customised mobile machine control | page 5

the
circuit

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Dear Customer,

Positive business news from all round the world has got 2004 off to a good start, a trend we hope will continue for the foreseeable future. This spirit of optimism is not least apparent in the European construction industry, where the signs of economic recovery have long been awaited.

Sauer-Danfoss is well prepared to play a role in this upswing, both in relation to installed and potential capacity and an extensive product portfolio in the areas of propel, work and control functions.

Proof of this can be seen at the BAUMA trade fair, where a number of new products will be presented and demonstrated – among them PLUS 1™, a user-friendly system that is set to revolutionise and simplify the control of propel functions. We will also show how our products can be pooled in system competence centres and applied to optimise the performance of, for example, backhoe loaders, wheel loaders, transit mixers, road rollers, pavers, aerial lifts and telehandlers.

Sauer-Danfoss stands for solutions and partnerships that aim to improve the productivity of your machines. We look forward to seeing you at BAUMA and feel sure that this trade fair will prove to be yet another positive stimulus in the economic upswing.

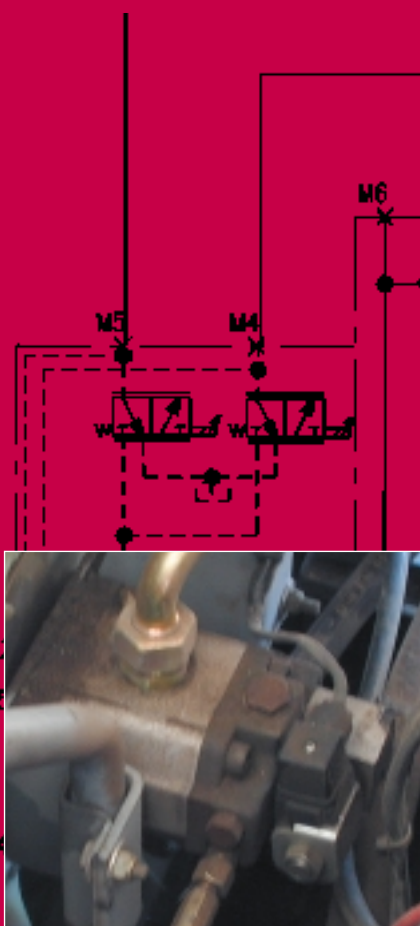
Yours faithfully

W. P. Weisser

Wolfgang P. Weisser
Vice-president
Sales & Marketing Europe



Mixing business with pleasure





UK-based Severn-Lamb has an international reputation for its handcrafted leisure and resort vehicles, with customers that include Euro-Disney and many other major theme parks. The just-launched SVI 4001 Power Unit, fitted with Sauer-Danfoss hydraulics, brings a unique, sleek and highly capable transport opportunity to this niche market

"Our brief was to produce a modern, sleek, road-going vehicle that could pull 28-32 seat carriages – weighing some 9 tonnes when fully loaded – up a 12% gradient at 15 miles an hour," recalls Nick Bell, design manager at Severn-Lamb.

There was no doubt that a performance of that calibre called for high quality hydraulics. Severn-Lamb went in search of a supplier. "We were looking for reliability, a good name and a cost-effective solution," says Nick Bell. "We found that Sauer-Danfoss is a very proactive, hands-on company and keen to help."

The vehicle order was for the Janfusan theme park in Taiwan – a park characterised by steep hills and in need of a road train to transport visitors between the hotels and car parks and the park amphitheatre. For Severn-Lamb, a company specialised in the design and production of authentic steam locomotives, leisure trains, trams and monorail systems, the order was yet another in a long series of engineering challenges.

The result lives up to the high standards for which Severn-Lamb is known – the SVI 4001 Power Unit. Available as two or four-wheel drive, this powerful

addition to the Severn-Lamb range is expected to have a strong impact on the market. The specially adapted Sauer-Danfoss hydraulic system has proven an admirable performer from day one.

"The four-wheel drive SVI 4001 is a very capable vehicle designed for extreme gradients and loads," says Nick Bell. "For level ground use, the vehicle can be fitted with a smaller engine or two-wheel drive."

Dependable system

A Series 90 75cc pump and two Series 51 60cc motors are the main components of the propel hydraulics. Among the advantages of the system is the direct connection between the motor and the axle, achieved by plugging the spline on the motor into the axle's mating spline – eliminating the need for a propeller shaft. "For us, fewer components mean less can go wrong and make the system more reliable and less expensive," says Nick Bell.

The pump and motors are controlled by a S1X microcontroller, the customised software securing optimum acceleration and deceleration control.

A Sauer-Danfoss OSPB steering unit, steering column and wheel make up the fully hydraulic steering system. Requiring no mechanical link to the axles, the steering system makes it easy to accommodate individual customer specifications regarding the driver's position in the vehicle. All in all, drivers will find the SVI 4001's steering solution light and comfortable to use.

An unusual feature of the SVI 4001 is the hydraulic modulating fan drive that cuts in as necessary to

cool the 5.9-litre Cummins diesel engine located at the rear of the vehicle. Here, a Group 2 1/2 gear pump is mounted on top of the Series 90 pump to supply oil to both the fan motor and the steering system. The quiet action of this hydraulic fan drive makes it ideal for use in noise-sensitive areas.

Key supplier

Since its initial involvement in the SVI 4001 development project three years ago, Sauer-Danfoss has been taken on board by Severn-Lamb as a supplier to many other vehicles. "All our rail locomotives and vintage vehicles today have Sauer-Danfoss hydraulics. For all the one-off specialist vehicles we produce, we typically choose Sauer-Danfoss due to the support and service we receive," says Nick Bell and adds: "It's probably the best relationship we've got with a supplier."

As part of that service, key people at Severn-Lamb will this year participate in Sauer-Danfoss customer training to increase their knowledge and understanding of the Sauer-Danfoss components they employ – input that will, perhaps, provide valuable inspiration for the next generation of Severn-Lamb's exclusive transportation.



<... Hydraulic diagram of a fan drive system.

Article 1. For further information:
TheCircuit@Sauer-Danfoss.com



Bauma 2004 is the launching pad for an ingenious new approach to customised mobile machine control. PLUS 1™ from Sauer-Danfoss is a complete package of hardware and software modules that can be shaped to meet almost any demand for cost-effective, intelligent machines with a longer working life

OEM manufacturers need look no further to meet their many, diverse needs for mobile machine control. In PLUS 1, they gain all the easy-to-use tools and components they require to develop fully customised control and monitoring networks and put good ideas quickly in motion.

Based on a new line of Sauer-Danfoss microcontrollers and I/O modules, PLUS 1 enables custom configuration and precise tuning of work and propel functions, such as speed, position and pressure control, engine anti-stall and automotive propel control. A powerful programming environment, software tools, graphical terminals and joysticks make up the complete PLUS 1 series.

"We expect PLUS 1 to be the new industry standard for developing machine control due to its endless expandability," says product manager Dan Ricklefs. "Our goal was to give design engineers an easier way to integrate control functions for their specific operating requirements, knowing that they range from highly intelligent, automated, heavy-duty uses to smaller, more simple, lighter uses.

"The beauty of PLUS 1 is that design engineers can use it for almost any application, and everything they need is in one package."

Using this flexible, extendable and highly reliable system, OEM manufacturers will save both time and money as better machines are brought faster onto the market. Agricultural, construction, forestry, material handling, municipal and road building equipment are among the ideal applications.

Flexible hardware

Stackable microcontrollers and I/O modules are the foundation of the PLUS 1 network. Available in three housing sizes and nine total

Custom controls in

P R O D U C T S



PLUS by SAUER-DANFOSS

I/O configurations for multiple-control options, they provide the building blocks for virtually any function. Digital Signal Processor (DSP) technology and CAN-based communications secure advanced control performance, while the extensive mounting flexibility and durable design pave the way for more machine design options – even for the harshest operating conditions.

Powerful software

Customised applications are built using the PLUS 1 Graphical User Integrated Development Environment (**PLUS 1 GUIDE**), a powerful programming tool with user-friendly graphics. Here, individual control functions are drawn from a library of software control objects, eliminating the need to develop software from scratch. These operating parameters can be finely tuned as required. To analyse operating and servicing data over time, the control system can be programmed to capture specified information.

Design engineers can also determine the diagnostic and service options open to service technicians by connecting a laptop or PDA to the machine – all in all, a system with plenty of opportunities for differentiated solutions.

Versatile joysticks

The versatility of modular PLUS 1 is equally evident in the Sauer-Danfoss family of PLUS 1 compliant joysticks, creating a seamless man-machine interface. Suitable for anything from light to heavy-duty service, the joystick configuration offers an almost endless array of options, including detents, friction locks, redundant outputs, can interface and switch functions. Both hall effect and potentiometric sensing technologies are available, along with grip options suited to the needs of specific applications.



Wide-ranging graphical terminals

PLUS 1 compliant DP600 graphical terminals adapt to the functions of each vehicle, monitoring everything from the basics, such as oil pressure, to machine angles. Easy to read during the day and at night, they can be tailored to provide instant diagnostics and servicing information – external device inputs for cameras and multiple CAN buses providing for a wide range of vehicle and environment monitoring. USB and RS232 connections allow laptop and PDA interfaces, a buzzer alarm output providing audible feedback.

“As mobile equipment becomes more automated, the electronic control system will determine a machine’s performance, reliability, cost-effectiveness and position in the market,” says Dan Ricklefs. “The PLUS 1 system will just keep growing as we build everything else around it. All these options put the power to develop specialised control solutions in the hands of those who know best which features the operator needs for the type of work to be accomplished.”

Article 2. For further information:
TheCircuit@Sauer-Danfoss.com

one easy package



Systems fit for a

World-leading manufacturer of construction equipment, Caterpillar works closely with Sauer-Danfoss on solutions that improve and extend its product range

Stabiliser legs that stay in position are a critical feature of a backhoe loader. With the assistance of Sauer-Danfoss, US-based Caterpillar gained a solution that was both better and more economical than existing ones on the market.

A specially developed PVG 32 valve has provided a smooth and highly dependable stabiliser leg function. Within the PVG 32, two PVBZ spool sections have built-in pilot operated check valves. The new, patented design of the check valves secures zero leak work ports and eliminates the juddering action often associated with traditional,

externally mounted pilot-operated check valves.

Developed and made ready for production within just one year, the new stabiliser valve broke all time-to-market records for Sauer-Danfoss, which also had to expand its capacity by investing in new production and test equipment. Today, no other stabiliser leg solution is better prepared for the highly competitive market.

Integrated HIC block for 4-wheel drive

Continuous cooperation between Caterpillar and Sauer-Danfoss means joint development projects are underway at all times. Among the other results of this teamwork is a new steering unit with integrated HIC block for Caterpillar's 4-wheel drive telescopic handlers.

Sauer-Danfoss has long supplied the steering

units used for these machines, a separately mounted HIC block hydraulically linking the front and back wheels to allow all-wheel steering with front, round and crab modes. To cut costs and create a more compact steering solution, Sauer-Danfoss has now designed a new unit where the HIC block is fitted on top. The elimination of various connecting hoses and fittings means leakage risks have been reduced and the steering system generally simplified, giving high operational reliability.

High capacity steering unit

In another project involving Caterpillar's articulated dump trucks, Sauer-Danfoss was asked to upgrade the existing steering unit. The aim was to design a more cost-effective and compact unit with a gear set capacity of around 1200 cm³ oil per wheel rotation – just beyond the range of Sauer-Danfoss' standard steering units with a





Cat

capacity ranging from 40-1000 cm³ of oil. Although higher capacity needs can be met by the addition of an OSQ flow amplifier, which can increase capacity up to 5000 cm³, this was no economical solution for the 1200 cm³ requirements of the articulated dump truck.

The Sauer-Danfoss answer to the problem was to develop a new OSPL1200 steering unit, incorporating a larger gear set and correspondingly larger valve functions. While the demand for steering units of this size had previously been too small to allow profitable production, the Caterpillar order changed all that – with the result that Sauer-Danfoss has been able to add a new product to its steering unit range.

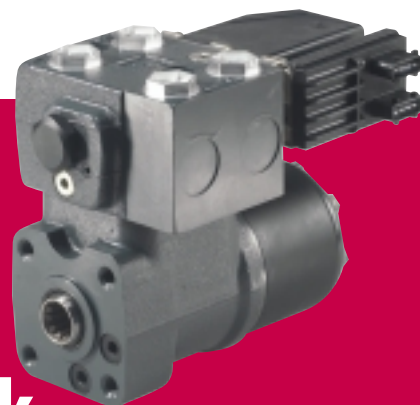
Design engineers from Caterpillar and Sauer-Danfoss continue to maintain regular contact. For a leading company such as Caterpillar, the task of upgrading machinery with innovative features is an ongoing process. Joint projects with its key supplier of hydraulic solutions are always underway.

Article 3. For further information:
TheCircuit@Sauer-Danfoss.com

Rear

<... Hydraulic diagram of a steering unit with integrated HIC block

Automatic steering stays on track



Drivers of heavy off-road vehicles can look forward to hands-off steering with maximum control thanks to the new EH valve from Sauer-Danfoss

Reliable electrohydraulic steering solutions are at last within affordable reach for manufacturers of agricultural, road-building and other heavy vehicles. The EH valve developed by Sauer-Danfoss is a central part of the new, electrically actuated steering concept, which includes the option of high performance, automated guidance via the satellite-based Global Positioning System (GPS).

The EH valve is based on Sauer-Danfoss' well-known proportional valve technology and serves as an alternative to the existing EHPS system for off-road vehicle control by means of an electric signal. Suitable for flanging on, the valve is fitted onto an OSP steering unit, creating a compact, highly competitive solution that saves on hoses and fittings and is easy to mount and demount. The valve can also be mounted in-line.

Vehicles likely to gain most from the EH valve are those controlled by an electric signal from GPS or row sensors, a joystick or mini-wheel, a variable steering ratio or different steering modes. With a flow of 12, 20 or

40 l/min, the EH valve is a pressure compensated solution with an internal priority valve. A PVE actuator enables analogue or digital communication – the PVED-CL for digital solutions including specially designed software that adapts to the needs and functions of specific vehicles. This gives vehicle designers free rein to combine the possibilities inherent in the steering software with the requirements for steering performance.

Automatic steering is ideal for tractors, combines, harvesters and sprayers, where precision driving is a must. Road-building machines can be steered to great benefit by laser-based guidance systems, such as TSD. In addition to improved vehicle performance, the driver is better able to concentrate on the operation of vehicle functions, generally enjoying a higher degree of comfort in the process.

Safe and dependable opportunities for auto steering of off-road vehicles are becoming increasingly sought after. With the new EH valve, Sauer-Danfoss has found the key to an efficient, highly reliable steering solution at a competitive price. Just what vehicle drivers need to keep their mind on the job and not on the driving.

Article 4. For further information:
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High capacity and reduced crop damage are unique features of the tank-free slurry spray boom from Agrometer. Sauer-Danfoss supplies the hydraulic solution

Securing crops the right amount of nutrients and protecting them from damage by heavy agricultural machinery – all in one cost-effective operation – is a challenge few can claim to have overcome. Danish manufacturer of slurry spreading machinery, Agrometer is among those who can. With the Pioneer 2001 self-propelled slurry spray boom, Agrometer has come up with a machine that can satisfy all agricultural requirements.

Sauer-Danfoss systems are the heart of the machine – in the high-power variable displacement S90/100 KA propel pump and S51/110 PC motor responsible for the four-wheel drive and the S45/57 LS open circuit axial piston pump that enables smooth and efficient work functions, including a cabin that rotates 180° to give all-round visibility. Additional features include an anti-spin function, secured via a S1X-49 microcontroller, and slurry flow control provided by proportional, load-sensing PVG 32/5 section and 10 section valves. The complete precision machine is capable of operating in all weathers and in the muddiest and hilliest of terrains.

Main slurry connection

What makes the Pioneer 2001 particularly special is that, unlike other slurry booms, it does not have its own slurry tank. Instead, it carries a 600-metre long hose that feeds the machine directly from a remote pump station connected to the main slurry holder or a mobile tank parked close to the field during slurry spreading. Extra hose sections can be fitted to give the Pioneer 2001 a 3km range. Without a tank, the machine is considerably lighter than traditional vehicles – the pressure on the ground actually being less than a footprint. Capacity is also higher as the Pioneer 2001 can keep on going until the job is done.

“With the Pioneer, it is possible to start slurry spreading earlier in the season without damaging the crops or leaving deep tracks in the soil that can cause later problems for harvesting machinery,” adds Ivan Petersen, managing director of Agrometer.

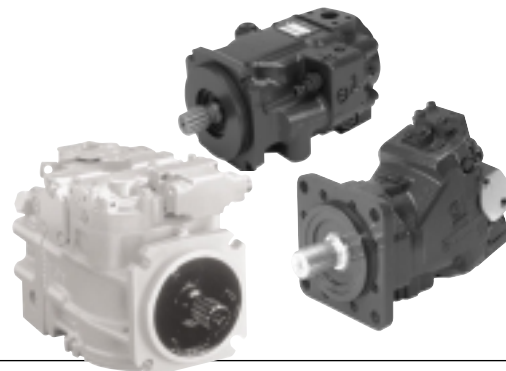
Accurate flow control

The slurry flow is regulated by the speed of the machine. Via a radio signal to the PVG 32 valve in the pump station, the operator can adjust flow up or down to ensure a pre-determined slurry dosage is accurately applied all over the application area.

Sauer-Danfoss is currently working with Agrometer to make it even easier for operators to manage slurry flow. Based on the Sauer-Danfoss S1X-49 microcontroller, an automatic control system has been designed to adjust machine speed according to slurry flow. All the operator has to do is enter how much slurry is to be deposited per hectare, and the control system will ensure an even spread, whether on flat ground, uphill or downhill.

Since Sauer-Danfoss first started supplying solutions to Agrometer, each year has brought a new Pioneer 2001 model with upgraded hydraulic functions – meeting continuous demands for improved productivity, driver safety and comfort, and environmental operation. As Ivan Petersen explains: “If you find a supplier that speaks your language, then the solution is generally also the best.”

Article 5. For further information:
TheCircuit@Sauer-Danfoss.com



Valves meet the market

Manufacturers of complex machines look increasingly to Sauer-Danfoss for straightforward, cost-effective components that ease assembly

Multi-functional, integrated components that improve performance, cut costs and save space are in big demand on the mobile equipment market. Sauer-Danfoss has developed a series of valve solutions to answer this call – and, at the same time, benefit manufacturers with a shorter time to market for new and improved vehicles.

Twenty-five years after the first PVG proportional valves made their market debut, the latest development is the PVG Hybrid – one in a series of integrated components where Sauer-Danfoss has combined various technologies and functions to great synergistic effect. New modules for the PVG 32, a digital actuator and cartridge valves also largely follow the integration trend.



A compact combination

The PVG Hybrid brings together the sheer power of the PVG valve and the aluminium hydraulic integrated circuit (HIC) block, with its smaller, finely tuned functional capabilities. For large, complex machines such as pavers, road-rollers and aerial man lifts, the integration of these two key components gives a number of advantages.

Comprising an aluminium manifold with cartridge valves located in the cavities, the HIC is normally fixed onto the vehicle and wired up to the electric controls to obtain a series of customised functions – including locking systems, stopping mechanisms and stabilisation. The HIC is, though, insufficient for heavy-duty/high-flow functions, such as raising or lowering the big booms on vehicles such as cranes and man-lifts. For this reason, a separate PVG valve is fitted onto the machine.

The integration of the HIC and PVG functions in one shared component provides a compact, more flexible solution that means fewer parts have to be fitted onto the machine. Fewer connections reduce the machine's complexity, cutting both costs and sources of problems, such as external leakage, during the machine's working life.

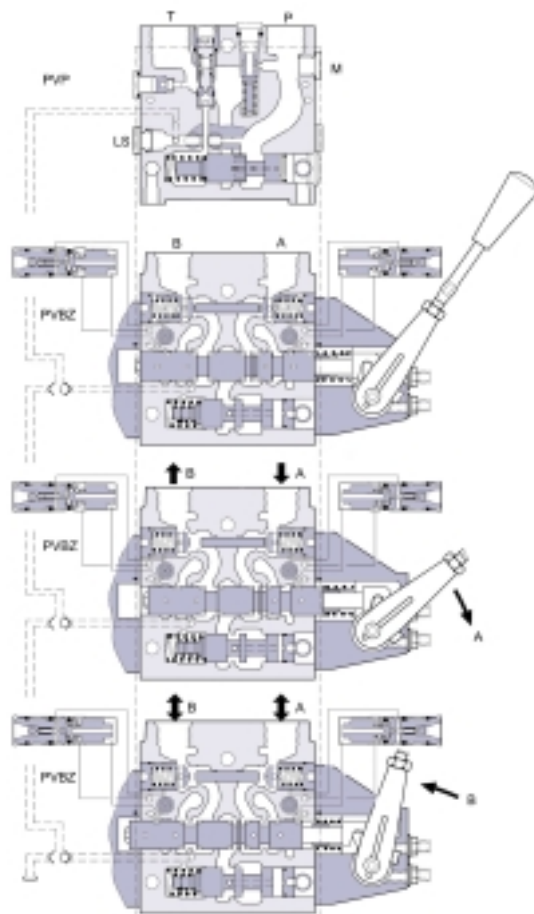
"Our customers look increasingly for their needs to be harmonised in integrated components. Apart from saving time and money, the vehicle is aesthetically improved," explains technical support manager Giovanni Iori. "Integration also makes it easier to meet requirements for vehicle weight."

Work and steering function in one

Within the PVG 32 valve range itself, the newly developed PVSP priority module represents another example of successful integration. In this case, the PVSP gives priority to both working hydraulics and steering units and can be incorporated within the valve block, reducing the number of necessary components and the overall complexity of the finished machine. The priority module ensures sufficient oil flow to the OSP steering unit at all times, as the law requires for maximum operational safety, but is no longer mounted separately.

Technical support engineer Finn Kaad outlines the benefits: "Using the PVSP, manufacturers gain a highly flexible valve function that saves space and

is easy to mount and maintain. The module can be combined with open or closed-centre PVP pump side modules, with flows up to 160 litres/minute, and works with the PVB basic module that manages the working hydraulics."



Low leakage

The development of a new PVBZ load compensated module, giving PVG valves the benefit of low internal leakage, has made it possible to improve the controllability and performance of hydraulic work functions. Originally developed for tractors, the PVBZ is highly suitable for a broad range of

Continued on page 10

applications that can benefit from low leakage and the precision control it provides.

The low leakage and smooth operation secured by the PVBZ is due to the specially designed pilot operated check valves built into the PVBZ spool sections. The PVBZ includes standard 4/3 spools, 4/4 float spools and an integrated thermo relief valve that protects against excessive pressure in the hydraulic cylinder. Custom spools are available on request.



Advanced digital control

Since the late 1980s, the PVG 32 range has been accompanied by a series of high performance, PVE electrical actuators. The development of the digital PVED-CC has now created opportunities for advanced safety and diagnostic functions via ISO-BUS CAN control. When programmed according to the flow curve for a specific spool type, the PVED provides flow control instead of spool position control. This enables the PVED to estimate the actual flow going out of the valve, improving machine control and providing a clearer overview of machine functions.

For operator convenience, a number of process control functions, such as ramps and scaling, have been integrated in the PVED. The ramps can be used to prevent sudden stops and starts – all the operator has to do is enter a time, and the actuator will take care of ramping the flow up or down. Ramp, scaling and progressivity parameters can be set using ISOBUS Process Data CAN telegrams.

The PVED is prefigured to work with modules in the new Sauer-Danfoss PLUS 1™ range via an automatic CAN connection. By employing the PLUS 1 diagnostics tool for data logging and parameter setup, user needs can be reduced to just one PC tool for all PLUS 1 devices.

Double solenoid proportional cartridge valve

For the performance of a proportional valve combined with high cost efficiency, Sauer-Danfoss has developed the space-saving PSV 10 – a 4-way, 3-position double solenoid proportional cartridge valve for industrial cavities. The low hysteresis of the PSV 10 makes it perfectly suited to double-effect actuators up to 20lpm–210 bar.

PSV 10 can be used in a separate block or integrated in the HIC block with other components, producing a pressure-compensated load-sensing system.

Hybrid use with a PVG valve ensures a very cost-effective performance in machines requiring both high and low-flow function control. The valve is designed for ED 100% heavy-duty conditions and offers the option of top-level IP67 protection.

A joint development project involving Sauer-Danfoss engineers in Europe and the USA has also produced a new cartridge-style counterbalance valve.

Sauer-Danfoss will present all these new valve solutions at Bauma 2004.

Article 6. For further information:
TheCircuit@Sauer-Danfoss.com

A model

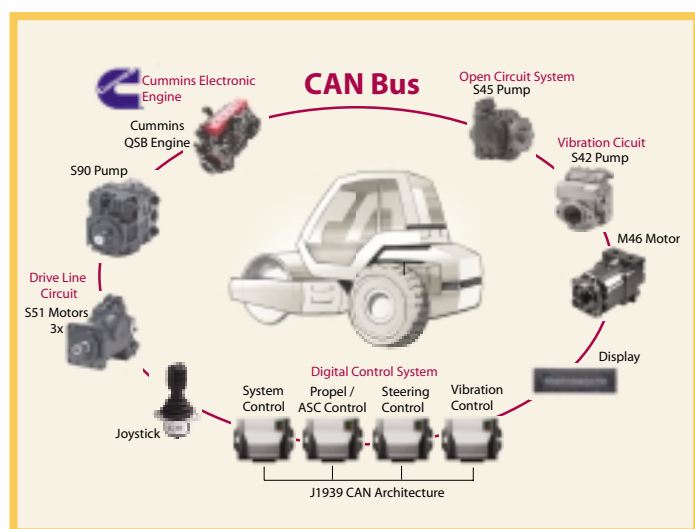
Self-regulating machines that swiftly and easily adapt to operator requirements and operating conditions will soon be more than a pipe dream for manufacturers of off-highway vehicles. Following in the footsteps of the automotive industry, Sauer-Danfoss is well on the way with the development of the distributed intelligent components and advanced system controls that can make dreams happen

A technology development team at Sauer-Danfoss in Iowa has translated emerging mobile hydraulic trends into a demonstration model of intelligent systems technology. The basis for their investigations was a well-used road roller which, after 10 years in action, was stripped down, analysed and refitted.

The engine, hydraulic propel pump, three hydraulic propel motors and hydraulic fan drive were all replaced with components that have dedicated microprocessors, sensors and electronic actuators. These intelligent components are linked by a Controller Area Network (CAN) bus and are managed by an overall advanced system master controller. Leader of the US team, Jeff Herrin explains the benefits:

"This kind of distributed intelligence gives more flexibility to machine designers and a more user-friendly man-machine interface. It also means future machines will be able to adjust their operating limits and reduce the impact of failures caused by operator error. Incipient failure detection will enable the machine to stop before catastrophic damage occurs."

of intelligence



A 10-year-old road roller was approaching the end of its working life when it was bought by Sauer-Danfoss in the US. Today it is a working model of the very latest intelligent technology

Variable operating modes

While most machines today have only one operating mode, the souped-up road roller demonstrates infinite operating possibilities. Best point operating modes are among the key machine management features, giving operators the opportunity to select their target vehicle optimisation parameters, such as noise, efficiency, emissions, speed and productivity, in order to obtain the best performance possible for a given set of conditions.

"It's a dynamic scenario," says Jeff Herrin. "The intelligent components send messages to the central

computer which then assesses operating conditions and compares them with operator demands. It's all about simultaneous optimisation of components to achieve the desired result."

Broad application potential

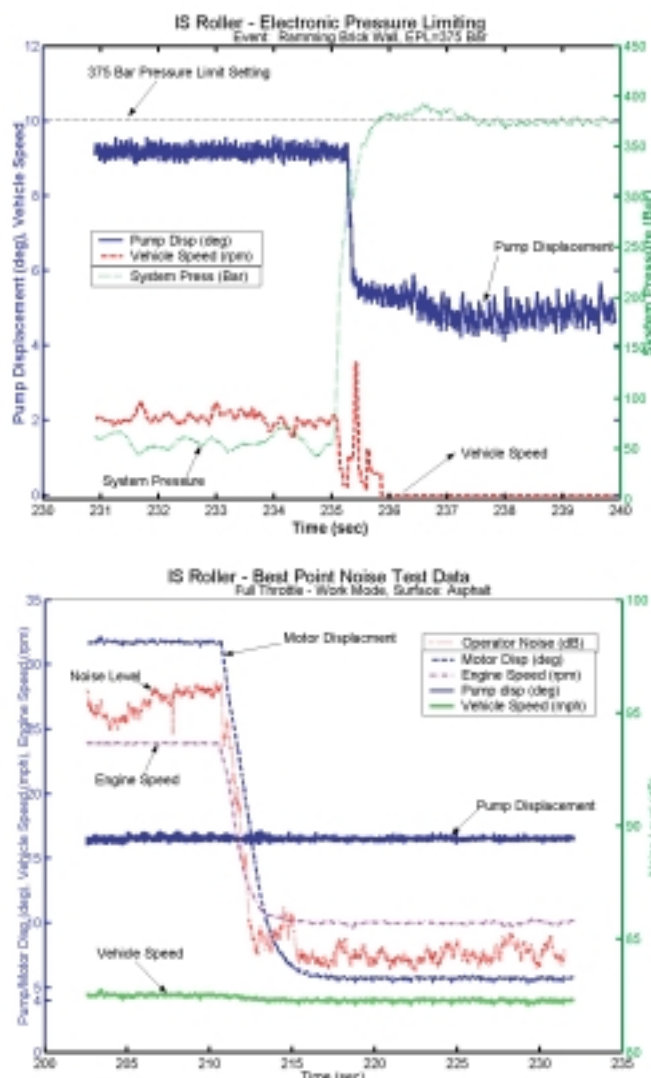
The software developed for the demonstration model is suitable for implementation in many machine types. In addition to this, the project has defined the requirements for the sensors, actuators and electronic hardware.

"These functions are not commonplace on the market today, but in three or four years they will

be. For us, this was a research and development exercise to show what will be possible in the future and to secure our position at the forefront of technology," Jeff Herrin says.

The demonstration machine is currently being shown to customers in the US – a conventional road roller so intelligent that it almost thinks for itself.

Article 7. For further information:
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Moment of truth. The very first test of the PVG valve was watched by Mrs Bitten Clausen and top Danfoss management. Below: the PVG brochure from 1980.



Article 8. For further information:
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A long-standing leader

A quarter of a century since its launch, the PVG proportional valve series continues to prove its worth

The promise of a large potential market and an emerging trend for built-in electronics were key drivers behind the development of the first Sauer-Danfoss PVG proportional valves. Today, the development team behind the PVG series can celebrate 25 years at the forefront of the proportional valve industry.

The first PVG valve – the PVG 60 – was launched at the Hanover trade fair in 1979 along with the electric and hydraulic remote controllers/joysticks PVRE and PVRH.

"There were a few early problems, particularly with the electronics," recalls Jens Christian Hansen, who has worked with the series since the beginning. "On several occasions, there were discussions about whether to separate the electronics from

the hydraulic valve. But eventually it was decided to maintain the built-in electronics – a decision that has proven to be one of the main reasons for the PVG's success."

The introduction of the PVG 120 for larger flow in 1985 was followed in 1988 by the launch of the PVG 32, replacing the PVG 60 and comprising an altogether more compact and cost-effective series of flexible modules suitable for numerous applications. Within a few short years, the PVG 32 became a central part of the Sauer-Danfoss valve business.

Since then, there's been no looking back for the PVG. The series is continuously extended with new standard and custom-designed modules, joysticks and electronics based on the latest technology.



Showtime at Bauma



The world's largest trade fair for construction machinery, vehicles and equipment, Bauma 2004 kicks off on March 29 in Munich, Germany. Sauer-Danfoss will be there

Sauer-Danfoss comes to Bauma 2004 armed with big news for manufacturers of equipment for the construction industry. On a news-packed stand, six competence centres will display system solutions for construction machinery, and an innovation centre will demonstrate the latest product developments. A service centre will give visitors an overview of the global Sauer-Danfoss network, technical service facilities and opportunities for mutually beneficial partnerships.

Among the major items of news is the brand new PLUS 1 range of hardware and software modules.

A new electrohydraulic steering system, representing one of the most cost-effective solutions of its kind, is another dynamic development.

On the valve side, Sauer-Danfoss will present a series of components for multi-functional, integrated systems that not only result in better vehicles but also bring them faster onto the market.

The last Bauma exhibition held in 2001 broke all attendance records with more than 2,300 exhibitors and over 406,000 visitors. This year, the organisers are promising the 5-day event will be even



bigger. Find Sauer-Danfoss in Hall A5, stand number 339/446.

Article 9. For further information:
TheCircuit@Sauer-Danfoss.com