

Latest advancements and applications in variable speed actuation

SIPOS observes that a key strength of its actuation solution is the flexibility provided by software. This results in a capability that goes beyond a basic service to providing a tailored, total offer for customers and the company reports that this will continue to differentiate the Variable Speed Actuation (VSA) solution. Matthias Rebhan reports on these latest applications and advancements.

By Matthias Rebhan, SIPOS Aktorik

With a hundred-year history, originally part of the Siemens organisation, SIPOS supplies both standard and VSA actuators. The company, which has been established as SIPOS Aktorik for over a decade, made its mark in the actuation industry in 1998 when it launched the SIPOS 5 Flash VSA. Introducing an integrated frequency converter to valve actuation, and pairing with intelligent controls, gave the organisation the ability to facilitate the smooth control of valves in both an open and closed loop. Additionally, functional reliability was provided, which could be monitored in the interests of efficient process operation. The initiative also meant that the actuator's output speed could be changed at any time, depending on valve/process requirements. The SIPOS 5 Flash actuator remains the flagship product in the organisation's portfolio. Key features include integrated frequency converter and robust gearbox with minimised backlash. The electrical design eliminates the usual current peaks experienced when the valve motor



SIPOS solar switching cabinet with solar panel. SIPOS 5 Flash actuator inset

starts; this ensures that even unscheduled stops do not result in torque damage. Additionally, the impact of power supply fluctuations is mediated because, even within a 20% voltage drop, speed and torque are not affected. The benefits of VSA technology are well established across power and water industry sectors and earlier this year the company secured its fourth major order from RWE. The German-based power company supplies over sixteen million electricity customers and approximately eight million gas customers.

Over 1,000 actuators were contracted to be installed at RWE Eemshaven in the Netherlands, a coal fired power station due for completion 2012/ 2013. Variable speed functionality and the capability to communicate with the latest DP V2 protocols were design features that attracted the end user. The availability of full PROFIBUS support and knowledge of successfully running a fieldbus-controlled plant with 1,000 SIPOS 5 actuators for almost ten years also contributed to the selection of the company's technology.



An established nuclear specialism for SIPOS

Additionally, a pioneering actuation development further convinced RWE: the initiative ensures that, unlike conventional actuators, continued operation is enabled, even at 30% under voltage, without needing to oversize the actuators.

The appeal of Variable Speed Actuation technology goes beyond traditional plant applications, one example of this is in flood detention work at the Brettachtal basin in Germany. The installation illustrates the use of VSAs for challenging flood management projects with remote power supply.

Flood detention basins, such as the one at Brettachtal, are frequently located a considerable distance from power supply sources. When using conventional actuators with long cable runs, high start-up current can cause voltage drop problems which can only be overcome by using expensive compensation techniques or soft start devices. If soft start devices are selected, reduced start-up actuator torque problems and space restrictions in low voltage switching cabinets can be an issue: these issues are avoided with the VSA's built-in frequency converter.

District Cooling Development

District cooling is a further valve application area that is opening doors for VSA technology. The centralised production of cooling energy is an increasingly attractive, environmentally friendly solution which has proven to be a major contributor to greenhouse gas

reduction in many cases. Chilled water delivered via an underground pipeline to office, industrial and residential buildings to cool the interior air is recognised as more cost-effective than distributed, building specific cooling. Peak electric power demand is replaced by district cooling and storage using ice or chilled water: this benefits the local power grid by reducing peak power demand and alleviating power congestion due to power transmission limitations in cities. As a result, district cooling not only helps cool cities; it alleviates the challenges posed by high electric consumption. VSA technology is applied with actuators controlling the cooling water flow and protecting the systems' hydraulics from water hammer.

One example illustrating the scale of the installations is at Zayed in the UAE where a total of seven schemes provide a



VSA developments reported in district cooling

contracted 90,000 tons of cooling across a military base. Each scheme increases the efficiency of the cooling for the complex and provides a reduction of 60% in power generated in the grid.

Water Hammer Prevention

As part of actuation advancements, the requirement for prevention of water hammer has been identified. Rapidly closing, or opening, a valve causes pressure transients in pipelines, known as water hammer. This can result in pressures well over the steady state values. Typical triggers include pump start up/shut down, power failure and sudden opening/closure of line valves. A simplified model

of the flowing cylindrical fluid column would resemble a metal cylinder suddenly stopped 'dead' by a concrete wall.

An illustration of an application where addressing water hammer was a key requirement is the East Cherry Creek Valley (ECCV) water and sanitation district booster pump station, which serves around 50,000 people. A linear characteristic was essential for flow control from a high volume pump: if this had not been achieved, a hammer effect would have resulted, potentially damaging the station's water system.

Due to its variable speed capability, SIPOS' actuator technology met the challenges of this installation. A travel-dependant, adjustable positioning time of the company's Flash actuators generates a linear flow through the ball valve which enables fine tuning of operating speeds through ten different positions to prevent water hammer.

Additionally, with the capability of continuing operation using a pump station emergency generator, the actuation technology also provided a fail safe option – if a power failure occurs, the actuator will close in emergency mode in different speeds using power from a UPS system, allowing for the system to drain. The positioning time curves can be programmed individually for close/open direction and also for emergency mode.

Solar System

Alongside customer and sector demands, wider industry needs are monitored. One initiative has been a turn-key solar solution designed to resolve the problem



VSAs – a new force in flood applications (photograph of Brettachtal basin installation)



New encoder (centre) adopted by SIPOS Aktorik

of power supply to remote locations. With low power consumption and no start-up current, the development has been a natural progression as the single phase SIPOS 5 Flash actuators are ideally suited for the solar application.

The solar package includes a planning/specification service. Component configuration combines all required elements i.e. solar power module, switching cabinet and remote control system – these combine with SIPOS 5 Flash actuators for a complete bespoke solution.

The solar actuation system supports a range of challenging applications where there is no reliable mains supply, or it exists but is not reliable. The result is a solution suitable for applications including controlled irrigation of agricultural land, level control for reservoirs/river installations, drinking water, storm water systems and pipeline flow control.

Range Review

SIPOS ensures that its product portfolio is under constant review. As a result, an extreme precision actuator has recently been launched. Offering advanced flexibility and accuracy, the SIPOS 5 HiMod is designed to address the most challenging valve control requirements for high end modulating duty, precision and longevity. Typical installations include high end control valves, boiler startup valves, turbine regulation and other instances where high levels of accuracy and flexibility are demanded.

Key design and performance features of the new actuator include high precision position encoder and modulation class D (continuous duty) according to DIN EN 15714-2. Sitting within a range of specialist variable speed and standard actuators, the product provides high end sophisticated

technology with long life components backed by a five year warranty for motor and gearing.

Additional features offered as standard for the new HiMod actuator include external or wireless Bluetooth COM-SIPOS interface, encoder for position measurement, easy non intrusive commissioning without tools and highly sophisticated modulation software functions.

In partnership with its suppliers, SIPOS remains at the forefront of its VSA specialism. One example of this is a new approach for actuator position detection adopted for SIPOS 5 Flash actuators. As an alternative to the company's established signaling gear, the new encoder solution affords highest precision position detection. A design breakthrough offered by the encoder is an ability to detect position equally precisely, without battery or buffer capacitor, when power is off.

Introduction of the new technology enables measurement of over 300,000 revolutions of the output shaft with an ultimate high position resolution provided for every turn.

Total non-intrusive commissioning is

offered as end positions can be set without opening the actuator housing. Additionally, when combined with the actuator's double-sealed customer connection compartment, the protection of electronics from harmful environmental conditions is ensured – a feature that is particularly important during challenging commissioning phases.

SIPOS concludes that, while the basic functionality of an actuator will always be that of valve control, manufacturing enhancements will be an ongoing focus. Developments will result from a combination of customer driven needs, technology partner initiatives and market requirements.

For further information visit www.sipos.de.



Matthias Rebhan combines management and R&D roles to champion VSA initiatives



Water hammer is controlled at East Cherry Creek

About the Author

Dr. Matthias Rebhan is the General Manager and head of R&D for Sipos Aktorik GmbH. He helped develop the SIPOS 5 Flash, a variable speed actuation solution with soft-start capability. His role included active management of SIPOS' relocation to new premises and equipping enhanced R&D facilities.

Dr. Rebhan received his diploma (Dipl.-Ing. (Univ.)) in Electrical Engineering at University Erlangen-Nuremberg, Germany and his doctorate (Dr.-Ing.) in Electrical Engineering at Technical University Braunschweig, Germany.

Dr. Rebhan holds two patents in the fields of control algorithms for frequency-converter fed induction motors.

