

# Clean and Safe in the Subsea: Use Cases for Electric Actuators

## THE ELECTRIC SUBSEA VALVE ACTUATOR SVA R2 IMPROVES SUSTAINABILITY IN THE PROCESS INDUSTRY.

The process industry is looking closely at ways to manufacture products more sustainably. The petrochemicals industry, for example, must cope with energy transition without either endangering the energy supply for the population or massively increasing the energy costs. While our society still relies on crude oil and natural gas, the priority must be extracting these resources in the most environmentally friendly way possible. This applies in particular to production sites in delicate ecosystems such as the deep sea. Furthermore, we will only be able to achieve the Paris climate targets if we develop new technologies, such as carbon capture and storage or hydrogen fuel cells. If this technological revolution is to be achieved in a cost-effective manner, we need disruptive innovations!

In order to actuate process valves under water, plant engineers still rely on hydraulic systems in spite of their massive energy losses caused by hydraulic piping that can be up to several kilometers in length. The only reason for this is the field-proven safety technology. Electric systems are the key to a sustainable subsea factory. Until now, there was no suitable solution to electrify the actuators and keep safety functions without increasing the complexity of the systems and thus the costs involved.

The SVA R2 is a disruptive innovation for electrically actuating valves in the subsea process industry.



**SAFETY  
ON  
BOARD**

**i4.0  
CONNECTED  
INDUSTRY**

**4EE  
ENERGY  
EFFICIENCY**

## TECHNICAL INNOVATIONS

Up until now, operators of process systems mainly relied on hydraulic cylinders to open and close valves under water. With offshore installations, such as for oil and gas production, these cylinders must be supplied by a central hydraulic power unit using hydraulic pipes up to several kilometers in length.

This solution utilizes a significant portion of the overall required energy in order to compensate for the cumulative losses, and it can only roughly control the movement. To date, plant engineers and operators have relied on hydraulic cylinders because they are the only components to offer field-proven safety systems with a mechanical spring in a compact design. The electric valve actuators, which are available, do not have such a safety function as this is not possible given the size and weight requirements. Approaches designed to ensure safety using costly underwater batteries cannot guarantee the reliable closing of valves over the required operating life of up to 25 years.

For the agile development of the SVA R2, a team from Bosch Rexroth has worked closely with a number of suppliers and operators of offshore installations, as well as international universities.

The new module is housed in a pressure-compensated container for use at a depth of up to 4,000 m which contains an electric drive, a motion control system and a safety device. Thanks to condition monitoring and the field-proven spring, the SVA R2 satisfies the Safety Integrity Level SIL 3 in accordance with IEC 61508 and IEC 61511.

It can replace the hydraulic cylinders previously used on a 1:1 basis and requires only one cable for the power supply and communication. The SVA R2 is designed to actuate valves reliably with the power supply for the subsea sensors which are normally used.

The integrated electronic control system offers precise motion control. It was developed for the automotive market, with its stringent requirements, and offers proven robustness and reliability. The SVA R2 is protected by a number of patents and is designed to operate for 25 years. Bosch Rexroth relies on globally standardized interfaces throughout, supporting the standardization of the subsea industry, providing ease-of-use application and reliability benefits to plant engineers, operators and offshore service providers.

### The new SVA R2 subsea valve actuator

- ▶ is the world's first electric valve actuator which can replace conventional hydraulic cylinders with field-proven safety technology and without taking up additional space.
- ▶ can actuate valves with a torque of up to 225 Nm with the power supply for a sensor.
- ▶ can be used in new or existing systems thanks to standardized interfaces.
- ▶ minimizes the environmental risks of subsea systems thanks to electrification, a proven safety spring and condition monitoring.
- ▶ consists of mass-produced components in order to ensure maximum quality and flexibility with minimal costs.



## BENEFITS FOR USERS

### The SVA R2 is

▶ **Compact**

- ▷ As compact as today's hydraulic cylinders
- ▷ Systems become smaller and lighter without the additional hydraulic components (pipes, valves, accumulators or hydraulic power unit).

▶ **Safe**

- ▷ Fail-safe system with field-proven springs
- ▷ Improved safety thanks to condition monitoring which satisfies SIL 3 in accordance with IEC 61508 and IEC 61511

▶ **Efficient**

- ▷ Actuators with 225 Nm of torque requiring the power of a 24 V DC instrument according to SIIS L2.
- ▷ Actuator requires only a sensor's power supply.

▶ **Easy to use**

- ▷ Can be used in any system thanks to standard interfaces in accordance with API 17 and ISO 13628
- ▷ Low weight, and thus easy for subsea robots to handle

▶ **Clean and Lean**

- ▷ Developed for use in delicate ecosystems
- ▷ Cost-competitive with robust industrial and automotive components

### For applications, this means

▶ **Brownfield**

- ▷ The SVA R2 automates valves which, in the past, were manually actuated through risky diving work or by costly subsea robots.
- ▷ Existing subsea systems can be expanded or modernized without having to lay electrical or hydraulic lines.
- ▷ Replacing existing hydraulics with modern electric systems reduces significantly CO<sub>2</sub> emissions.

▶ **Greenfield**

- ▷ When the SVA R2 is used in subsea factories at a depth of up to 4,000 meters, hydraulic pipes or power units are no longer required and the electric supply lines which are already planned for sensors are adequate to ensure the reliable operation of the actuators.
- ▷ The actuator minimizes energy consumption and the risks for the environment, e.g. caused by hydraulic fluid leakages.

▶ **Carbon Capture & Storage (CCS) and hydrogen**

- ▷ The SVA R2 is suitable for other applications under and above water such as green hydrogen production or CO<sub>2</sub> storage.
- ▷ Thanks to low-cost, precise control, it can help to boost the industrialization of new applications such as CCS and H<sub>2</sub>.



## ECONOMIC VIABILITY

### The SVA R2 improves the economic viability of Subsea process systems in all life phases

#### ► Engineering

- ▷ The system design is simplified thanks to standardized interfaces.
- ▷ The certified SIL 3 controller makes designing the safety systems much easier.

#### ► Procurement

- ▷ The hydraulic pipes several kilometers in length, along with the associated power units and hydraulic controls are no longer required.
- ▷ Thanks to standardized interfaces, the SVA fits into existing process valves with no additional electric power supply.

#### ► Manufacturing

- ▷ There is no need to lay hydraulic pipes or install power units and hydraulic controls.
- ▷ The plug-and-play actuator with standardized interfaces allows easy and safe installation.

#### ► Commissioning in the field

- ▷ There is no need to connect the actuator to hydraulic systems and the time-consuming flushing and cleaning of hydraulic systems is no longer necessary.
- ▷ With a digital twin, commissioning can be prepared in virtual form so that it can be carried out efficiently in the field.

#### ► Operation

- ▷ The costly maintenance of hydraulic systems and the resulting downtimes are eliminated.
- ▷ The reduced energy consumption significantly reduces operating costs and improves the carbon footprint.

#### ► Service

- ▷ The costly maintenance of hydraulic systems and the resulting downtimes are eliminated.
- ▷ Thanks to standardized interfaces and lower energy consumption, systems can be modernized at any time.

The compact, safe and efficient SVA R2 electric subsea valve actuator is a disruptive technology for increasing the sustainability of all subsea process systems.

It increases the sustainability and cost-effectiveness of oil and gas production and allows new systems for carbon capture & storage as well as the offshore production of green hydrogen to be quickly achieved.

As a result, this innovation helps to protect against climate change.

Engineering	Purchase	Manufacturing	Installation	Operation	Service
<input type="checkbox"/> No hydraulic system design	<input type="checkbox"/> No hydraulic supply parts	<input type="checkbox"/> No hydraulic connections	<input type="checkbox"/> No hydraulic connections	<input type="checkbox"/> No hydraulic fluid refill	<input type="checkbox"/> No hydraulic maintenance
<input type="checkbox"/> Compact size and weight	<input type="checkbox"/> Simpler umbilicals	<input type="checkbox"/> No specialist needed	<input type="checkbox"/> No specialist needed	<input type="checkbox"/> No downtime for flushing	<input type="checkbox"/> No specialist needed
<input type="checkbox"/> Easy standard interfaces	<input type="checkbox"/> Open standard interfaces	<input type="checkbox"/> Usual standard interfaces	<input type="checkbox"/> Usual standard interfaces	<input type="checkbox"/> High energy efficiency	<input type="checkbox"/> Retrievable by ROV w/o tools
<input type="checkbox"/> Safety on board (SIL 3)	<input type="checkbox"/> Competitive supply chain	<input type="checkbox"/> Plug-and-play assembly	<input type="checkbox"/> Plug-and-play installation	<input type="checkbox"/> Low CO <sub>2</sub> footprint	<input type="checkbox"/> Plug-and-play installation
<input type="checkbox"/> Simpler electric cabling / control	<input type="checkbox"/> Global sourcing by local supplier	<input type="checkbox"/> Pre-calibrated @ manufacturer	<input type="checkbox"/> Digital twin: fast commissioning	<input type="checkbox"/> Digital twin: condition monit.	<input type="checkbox"/> Can automate existing valves
↗ Agile	↗ Optimization	↗ Efficiency	↗ Faster	↗ Productivity	↗ Useful Life

► Innovation to reduce costs, to increase productivity and to protect the environment