Modern electric actuators: retrofit makes plants fit for the future

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Whether it's a wastewater treatment plant, a power plant or a tank farm – when equipment items have been in operation for many years, the question of modernisation inevitably arises sooner or later. By retrofitting intelligent electric actuators, existing plants can make the leap into the digital future.

There are plenty of reasons to modernise or replace process equipment such as actuators. Is a new control system to be introduced? Have the requirements for process accuracy increased? Do gas pipelines need to be upgraded for hydrogen? Perhaps there is a drive to increase the level of automation across the plant, or to use digital tools to monitor the condition of equipment items to reduce unplanned shutdowns. Replacement with modern devices can also be worthwhile when equipment reaches the end of its service life and is failing more frequently, or when spares are no longer available.

In numerous plants it has been shown that installing high-performance modern actuators can significantly increase the efficiency and safety of processes, and plant availability – while also reducing operating costs.

INTRODUCING A NEW DISTRIBUTED CONTROL SYSTEM

When a new distributed control system (DCS) is to be introduced, the communication standard used for field-level communication often changes as well. However, this does not always mean that entire actuators need to be replaced.

Source: AUMA

Figure 1: By retrofitting previously manually operated valves with electric AUMA actuators, the degree of automation at the Nokianvirran Energia biomass power plant, Finland, was significantly increased, thus maximising process efficiency.

For modular actuators such as the SA multi-turn and SQ part-turn actuators from AUMA, it may be sufficient to retrofit actuator controls with the appropriate interface if the actuator itself is still in good condition. This saves investment costs and resources by extending the service life of existing assets. The actuators can be easily and seamlessly integrated into any modern DCS thanks to suitable interfaces for all common communication systems, from classic fieldbus like Profibus DP and Modbus RTU to Industrial Ethernet like Profinet, Modbus TCP and EhterNet/IP.

UNLOCKING DIGITALISATION POTENTIALS

When the monitoring of field devices in a plant needs to be expanded, or when new diagnostic requirements arise that existing actuators can no longer meet, investing in modern, intelligent actuators often pays off. With integrated sensors and extensive operational data collection, AUMA actuators create the foundation for successful digitalisation. They automatically log a wealth of meaningful operational and device data, such as number of starts, motor runtime and temperatures in a time-stamped event log. Thanks to automated analysis and diagnostic functions in combination with CORALINK, the AUMA digital ecosystem, plant operators can obtain information about the current condition of their actuators at any time. For each actuator, the analysis provides recommendations for actions that should be carried out to ensure availability and avoid costly failures. Remote diagnostics via the control system is also possible.

AUTOMATING MANUALLY OPERATED VALVES

Valves that rarely need to be operated often still rely on handwheels. With fewer staff available, however, and higher costs for their time, plant operators may now find it profitable to automate these valves by adding electric actuators. A retrofit may also be necessary if the valves need to be controlled or monitored from a central control room. In such a retrofit project, a crucial first step is to record all the relevant dimensions at the valve connection, plus process parameters such as torque and operating time. With this information in hand it is then possible to select the appropriate actuators.

SINGLE-SOURCE PROJECT MANAGEMENT

To address all these questions, AUMA has developed comprehensive retrofit services. Experienced retrofit experts within the AUMA service organisation work together with the plant operator or planner to develop a customised modernisation plan for actuators across the plant. The first step is to analyse the conditions and specific requirements of the project, with the goal of always offering the most sensible and resource-efficient solution. The retrofit experts then take care of all phases of the project execution, from detailed on-site recording of dimensions and operating parameters for all valves, through the selection and design of suitable actuators from AUMA's extensive portfolio, to smooth and timely installation and commissioning by qualified AUMA service technicians. These retrofit services are available worldwide as part of AUMA's global sales and service network. A large number of successfully completed retrofit projects demonstrate how different types of plants, including power plants, water and wastewater treatment plants and tank farms, benefit from such modernisation measures. This is illustrated below in two practical examples. More information can also be found at retrofit.auma.com.

Source: AUMA

Figure 2: High-precision state-of-the-art SEVEN HiMod modulating actuators make the Duisburg-Huckingen power plant fit for the future.

Source: AUMA

Figure 3: Before the retrofit.

Source: AUMA

Figure 4: After the retrofit: By using appropriate adapter plates between the new gearboxes and the existing space rods, it was possible to retain the complete kinematics on the valves and replace the existing actuators with new, modern SEVEN HiMod modulating actuators.

CASE STUDY 1 - EFFICIENT HEAT SUPPLY THANKS TO AUTOMATION OF MANUALLY OPERATED VALVES

By retrofitting AUMA actuators, the Nokianvirran Energia biomass power plant in Finland significantly increased its degree of automation and thus maximised process efficiency. The AUMA Service team in Finland handled the entire project management.

Nokianvirran Energia Oy built a steam cogeneration plant in Nokia in 2016. The plant produces process steam for a paper mill and a tyre manufacturing plant, as well as district heating for customers of a large energy company. The aim was to replace the natural gas previously used with renewable wood-based fuels from the region.

SUSTAINABILITY THANKS TO AUTOMATION

AUMA specialists learned that it took around 30 minutes to start up the boiler from zero to full power, that valves had to be operated manually, and that there were repeated interruptions in the steam supply. The customer's desire for more automation meant that additional AUMA SA 07.6 and SA 14.2 actuators, each with intelligent AC 01.2 actuator controls, were added during the overhaul in 2022. They now enable the system to be started up in just six minutes. Thanks to Profibus interfaces in the actuator controls, the actuators can be remotely controlled with Profibus DP from the central control room. In areas subject to heavy vibration or high process temperatures, the modular product design allows the actuator controls to be mounted on wall brackets at a distance from the actuators to protect the electronics.

PROJECT IMPLEMENTATION FROM A SINGLE SOURCE

One of the main reasons for the customer's decision in favour of AUMA was that the entire solution was provided by a single supplier. The AUMA team took care of data acquisition and on-site measurements, planning and order processing from quotation to delivery, as well as installation, commissioning and customer training on site.

AUMA Finland's many years of expertise were particularly valuable when it came to measuring the essential dimensions at the valve attachments and producing the tailor-made adapters required to mount the actuators. The actuators could thus be perfectly adapted to the valves with only minor field modifications. This meant that the existing manually operated valves could be successfully converted to use electric actuators, so it was not necessary to replace the entire valves.

CASE STUDY 2 - RETROFIT WITH MODERN MODULATING ACTUATORS

By replacing old actuators with modern, high-precision modulating actuators AUMA Service is making the Duisburg-Huckingen power plant in Germany fit for the future.

Operator RWE is successively modernising the control technology and associated field devices at its Duisburg-Huckingen power plant. More than 100 existing modulating actuators are to be replaced by modern actuators in each of the plant's two blocks. The old actuators support operating mode S9 with continuous duty in accordance with IEC 60034-1. This corresponds approximately to class D of the current actuator standard EN 15714-2, so the replacement actuators need to meet class D requirements.

The torque of the actuators is transmitted to the valves via lever mechanisms. The existing valves and lever systems were to be retained.

It was important for RWE to have a single supplier for the entire project to be able to deal with potential problems immediately. A comprehensive service was required, from data acquisition and actuator design to delivery, installation, commissioning and test runs.

THE SOLUTION – PRECISE AND CUSTOMISED

In view of the high-precision and very dynamic modulating tasks that the actuators have to perform, AUMA suggested the high-end SEVEN HiMod modulating actuators. The actuators developed by SIPOS Aktorik, a member of the AUMA Group, support continuous duty according to class D. The actuators are combined with high-quality AUMA S.1 part-turn gearboxes. A highlight of the project is the way the gearboxes have been modified so that their output shafts match the shafts of the old actuators. By using appropriate adapter plates between the new gearboxes and the existing space rods, it was possible to retain the complete kinematics on the valves and mount the existing levers directly on the gearbox output.

This meant that the existing actuators could be replaced one-to-one with new, modern modulating actuators with greatly improved ease of operation, service-friendliness and functionality. Communication with the control system (4 – 20 mA for both setpoint and position feedback) is also retained one-to-one. The customer does not need to do any rewiring and all the existing cables are retained.

COMPREHENSIVE SERVICE

AUMA Service took on the complete service package including dismantling the old devices, installing the new devices, commissioning and test running the actuators; this was a weighty task, as the heaviest of the old actuators weighed 700 kg. The AUMA service experts have the necessary equipment and are trained appropriately, so they are the clear choice for jobs like this one.

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