

Complete systems from a single source:

Bürkert displays its competence with a reverse osmosis system



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Cyrus Ardjomandi, Segment Management Water

Bürkert Fluid Control Systems provides custom system solutions for industrial applications. The company's competence goes far beyond the development and production of high-quality components for the measurement, instrumentation and control of gases and liquids. This will be demonstrated by Bürkert experts at Aquatech on the basis of a reverse osmosis skid for water desalination that was constructed with Bürkert products.

The Bürkert Systemhaus used Bürkert components to build a reverse osmosis system that is suitable for desalination of industrial process water and drinking water. The goal of the system was to demonstrate Bürkert's competence in the development of custom system solutions and automation concepts on the basis of its own products and comprehensive expertise. The portable unit will be on exhibit at Aquatech, to be held in early November in Amsterdam. "Of course, we are not planning to include reverse osmosis skids in our product spectrum," explains Cyrus Ardjomandi, Segment Manager Water at Bürkert. "It is intended as a demo system to display our capabilities and the spectrum of the many single solutions for water treatment in practical use," Ardjomandi explains. "Our system competence for all types of applications involving water always generates added value for our customers in the long run."

Basic construction of the system

The demo system consists of a water circulation system for desalination of softened water. For the demonstration, permeate and condensate are pumped into a common collecting tank, from which they are later removed as raw wa-



ter. The water first passes through a fine filter with a 5 µm filter cartridge, after which it is desalinated in three membrane modules. A centrifugal pump with a frequency converter functions as a high-pressure pump, and an energy-efficient circulating pump with a frequency converter circulates the water. An ultra-quiet compressor provides the control air for the pneumatic valves. To better illustrate the single volume flows, Bürkert chose rotameters, which are standard components in water treatment systems. Additional paddle wheel flow meters – which are ideal for measuring non-conductive media – also measure the flow rates and send them to the controller. Pressure switches monitor the input pressure and system pressure. The system is designed for a permeate capacity of 300 l/h with a desalination rate of up to 97 % and a yield of 75 %. The operating pressure reaches approximately 9 bar.

The right type for every application

Several perfectly coordinated valves control the liquid flows: an especially low-maintenance and compact Type 6213 input solenoid valve, which operates very quietly and efficiently, controls the water supply to the system. Three process valves with control heads are provided on a welded multi-functional valve block for regulation, bypass and recirculation of the concentrate. The valve block enables easy replacement of the valves, as well as an optimal connection to the compressed air supply. The globe valves can be either Type 2301 control valves or Type 2101 on/off valves. The concentrate control valve regulates the ratio of permeate to concentrate at 3:1, which corresponds to a yield of 75 %. The concentrate bypass opens for start-up and for flushing. Recirculation is set to a fixed value of 700 l/h in this case. The control of the volume flows for the three valves is performed by the Type 8611 flow controller installed on the permeate side of the system. It is designed for 2-point, 3-point and on/off control, as well as ratio control.



For Aquatech, the Bürkert Systemhaus used Bürkert components to build a reverse osmosis system that can be used for desalination of industrial process water and drinking water.

Multi-functional parameter processing

Control of the sensors is performed by the Type 8619 multiCELL multi-functional transmitter. It is designed as a panel built into the front of a stainless steel control cabinet with a display for real-time monitoring of all parameters. Of course, the Type 8619 can also be installed separately within the system or directly on the pipe. The modular multiCELL monitors up to six input and output signals, for example: pressure, flow rate, pH value, conductivity, redox potential and free chlorine. Other features include mathematical functions, control functions and data logging. It can be pre-configured for the particular customer application and displays all measured parameters in real time. In addition, the mathematical functions allow display of the retention, yield and differential pressure of the membranes, which gives the operator a complete overview of the critical values of an in-situ reverse osmosis system. If thresholds are exceeded the unit sends digital signals to the controller.



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Online monitoring for water applications

With the Type 8905 online analysis system Bürkert offers a unique compact and modular complete system for water analysis that can be expanded to include up to 30 analysis sensors (cubes). Five sensors directly mounted on the demo system are connected with the Type 8905 by means of a field bus that has been adapted by Bürkert (büS): the untreated water is measured to determine the pH value, redox potential and conductivity, the pure water to determine the pH value and redox potential. This allows real-time monitoring of the parameters. Type 8905 provides new process control and quality assurance options especially for waterworks. Since these cubes are connected to a complete Type 8905 measuring system at the other end of the booth, visitors

can view the parameters there directly, or even via the app for smartphones and tablet computers.

Professional control cabinet configuration

Also integrated in the control cabinet is the PLC with a 10" display for control of the system. The display shows a flow diagram of the system with animated control components. The control cabinet was designed and implemented entirely in the Bürkert Systemhaus in Menden. All electrical systems are in conformity with VDE 0100 and VDE 113. With its control cabinet construction Bürkert offers complete automation from a single source. In the reverse osmosis system, only the electrical components are connected to the control cabinet; pneumatic control takes place directly at the valve blocks within the system. Of course, Bürkert can also integrate the valve islands in the same control cabinet installation. A unique feature of the valve islands is the direct interface to the Siemens S7 controller.

The entire spectrum of sensor technology

System control and flow rate regulation require precise and reliable sensors. Bürkert offers a broad spectrum here, which also benefits the reverse osmosis system. Especially important – also with respect to safety – are the pressure sensors. Bürkert decided to use two space-saving Type 8311 pressure transmitters and switches that measure the pressure upstream and downstream of the high-pressure pump. They also prevent the pump from running dry and protect the system against excess pressure. Additional very robust Type 8316 pressure sensors with ceramic cells are installed downstream of the pressure pipes. They monitor the pressure difference of the membrane modules on both sides of the membranes. An increased pressure difference can be an indication of scaling or fouling of the membranes.

Several Type 8030 paddle wheel sensors send flow rates to the system controller. They allow cost-effective and space-saving installation in pipe systems with minimal pressure loss and can be connected directly to the PLC. The untreated water and the permeate are each monitored by a separate Type 8220 conductivity sensor, whose signal is processed by the multiCELL transmitter. Finally, the fill level in the collecting tank is monitored by a Type 8136 contactless radar sensor. This compact transmitter is ideal for measuring the fill level of small and large tanks.

Although the reverse osmosis skid demonstrated by Bürkert at Aquatech may not correspond to actual operating conditions, the system is exemplary for the company's extensive expertise in this field. "The system does not exist in this form in reality. However, it demonstrates all the capabilities and functional components that Bürkert can offer its customers in this branch of industry," Cyrus Ardjomandi concludes.



Contact

Can we help you to optimise your steam sterilization processes
or do you have further questions? Just contact us:

Bürkert Fluid Control Systems
Bürkert Werke GmbH
Cyrus Ardjomandi
Segment Management Water
Christian-Bürkert-Straße 13-17
74653 Ingelfingen
Telefon +49 7940 1096-847
Telefax +49 7940 1091-448
E-Mail: cyrus.ardjomandi@burkert.com
Website: www.burkert.com