Photo: © Sensirion AG

In summer 2011, Sensirion moved into a new production building at its main site in Stäfa, near Zurich, which was designed according to the latest standards.

Innovative building services optimize the use of renewable energy resources

Optimum climate in the cleanroom

Sensor components and solutions from the Swiss company, Sensirion AG are in use in the millions, among others in the automotive industry, medical technology, building technology, industrial processes and in consumer goods. Since its establishment in 1998, the company has achieved impressive financial and technological success. In order to keep step with these developments, Sensirion has moved into a new production building at its main site in Stäfa, near Zurich, which adheres to the latest standards. The complex building services were implemented by the Swiss company, Bühler+Scherler AG with the use of Beckhoff automation components.

Photo: © Sensirion AG

The sensors are manufactured under cleanroom conditions. The largest cleanroom certified according to ISO 7 has a floor area of 1,000 m².

Sensirion manufactures sensors for the measurement of humidity, temperature, differential pressure as well as gas and liquid flow rates. Manufacturing is handled by highly automated production lines in cleanrooms with a total floor area of 10,000 m² distributed over three floors.

The core of the production building's innovative air conditioning system consists of geothermal probes and heat pumps as well as its own cooling system with heat recovery, enabling enormous energy savings. Bühler+Scherler AG from St. Gallen, a solution partner of Beckhoff Switzerland, was commissioned to plan and implement the building automation system.

The control architecture for the building services encompasses four Embedded PCs from the CX5010 series, to which over 1,000 hardware data points are connected. "The majority of the I/Os are required for the cooling plants," explains Bühler+Scherler project manager Martin Müller, who is responsible for the system technology. Analog temperature, humidity and other sensors as well as signal transducers are connected to the signal inputs. Numerous frequency converters are coupled at the output level for the control of the pump motors. "The specified setpoints are analog voltage signals from 0 to 10 V. The frequency converter forms the frequency value from these; for example, a setpoint of 5 V could lead to a frequency of 30 Hz inside the frequency converter," explains Martin Müller. If the associated sensor of a frequency convertor now signals that the control process is successful, or that the intended effect is not achieved, then the specified setpoint is corrected. This process is controlled in the CX5010 with TwinCAT PLC. Bus Terminals are installed in the control cabinets for the I/O infrastructure. All Beckhoff controllers are networked via Ethernet and communicate via Modbus TCP/IP.

Use of renewable energy resources with intelligent technology

For climatic control there are two water reservoirs each with a volume of 60,000 liters for heating and cooling. In order to ensure process reliability, the water is buffered there and only pumped into the air heater or cooler when needed. Despite these gigantic volumes, a dedicated controller is in use – with precise monitoring of pressure, temperature and further process variables.

The "exterior" air conditioning system, which consists of geothermal probes and heat pumps, is also controlled by a CX5010. "This technology must be seen in context with the two water reservoirs," stresses Martin Müller. Cold and heat are created on the one hand by the geothermal probes which, in connection with the four heat pumps, supply energy for heating and cooling. "In the winter we get heat from the ground and in the summer, cooling. A heat exchanger is used for this that produces cold water on the one side and hot water on the other, which is transferred by means of the pumps into the respective reservoir. The hot and cold water loads are regulated with the reservoirs; that means the

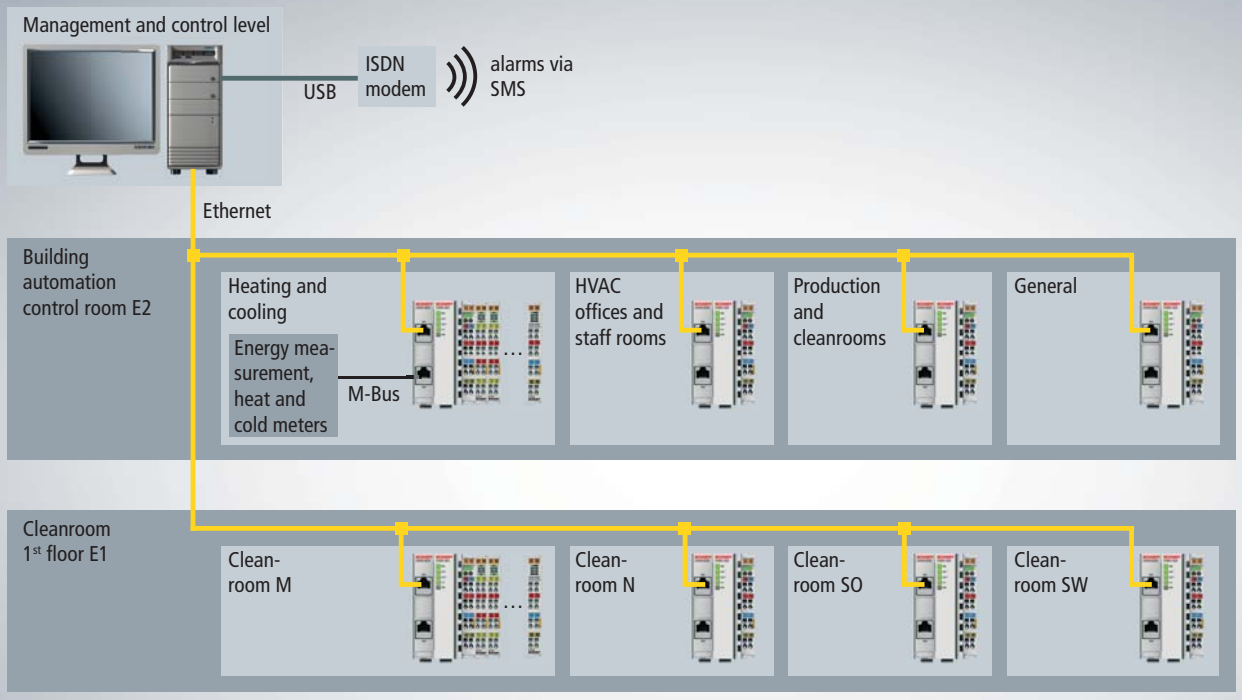

Photo: © Sensirion AG

In the new production building of Swiss company Sensirion AG, all building services including air conditioning of four cleanrooms are controlled via a Beckhoff automation platform.

Currently the world's smallest (according to Sensirion) humidity and temperature sensor, the SHTC1 was specially designed for mobile terminals in which the product size plays a decisive role. It measures the relative humidity over a measuring range from 0 to 100 % RH and the temperature from -30 to 100 °C with a typical accuracy of +/-3 % RH.

cooling requirement is covered in the summer and the heating requirement in the winter," says Martin Müller, describing the process. Sensors for pressure measurement are in use in the heat pump area; these are necessary for the precise regulation of the system pressure setpoint.

The temperature measured at the geothermal probes is used to control the heating and cooling management. This depends on the one hand on the actual temperatures and on the other on the fill level of the reservoirs. Naturally, there are also marginal areas that represent a challenge in terms of control. That is the case, for example, if cold water is produced even though the temperature in the cold water reservoir is already low enough. "In such a case, we cannot allow heating pumps to run any longer because they produce both cold and hot water at the same time," says Martin Müller. "This situation is covered by the control system – an alarm is triggered if limit values are exceeded. All single technical systems are monitored for quality and process reasons. For example, if a frequency converter fails, the controller sends a message to the higher-level control system. Depending on the priority, it will then send an alarm by text message or email so that an appropriate action can be initiated."

A higher-level control system logs each alarm, including the acknowledgement and rectification. However, the entire building controller works even if the control system is not available. "The control system is actually a visualization that has no controlling access to processes or systems," explains Martin Müller, "and that also corresponds to the usual demands on the building automation. The visualization supplies information about the status of the system; the specification or changing of setpoints and parameters, on the other hand, requires expert knowledge."

Further Information:

www.sensirion.com
www.buhler-scherler.com
www.beckhoff.ch