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Reference

Industrial Communication

Network Monitoring for Zurich's District Heating Supply

Increased System Availability in the Cogeneration Plant thanks to effective Network Management Software

The expansion of the cogeneration plant Aubrugg by a modern wood-fired power station is a step towards the implementation of Zurich's ecologically sustainable energy concept. To improve the availability of the plant and thus the supply reliability of the district heating grid, the operating company ERZ decided to automatically monitor the communication network.

Even from afar, it's hard to miss the distinctive industrial facility of the cogeneration plant Aubrugg, which rises in the middle of the highway interchange Zurich-East. But who would have thought that the cogeneration plant with its imposing smokestack is part of the ecologically sustainable energy concept of the city of Zurich? In 2010, the wood-fired power station went into operation at Aubrugg. It was integrated into the existing facility, which – since 1977 – has been supplying peak load energy for Zurich's district heating grid using two fossil-fueled boilers. The energetic utilization of local wood contributes to the production of sustainable, CO_2-neutral thermal energy.

The wood-fired power station produces 104 GWh of heat annually, and thus replaces a large portion of the fossil fuels oil and gas. In addition, an 11 MW steam turbine generates approximately 38 GWh of electricity, which is marketed under the label "eco-power". By utilizing the exhaust steam in accordance with the cogeneration principle, the energy efficiency of the plant is further increased.

The cogeneration plant Aubrugg produces peak load energy for the district heating system "Zürich Wärme" (Zurich Heat). The base load is generated by the refuse incineration plant Hagenholz. The district heating grid spanning 150 kilometers supplies around 20,000 homes, business properties, and public buildings in the Zurich North regions, the university district, and parts of the municipalities of Wallisellen and Opfikon with thermal heat and energy for water heating.

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The network management software SINEMA Server from Siemens not only recognizes Siemens devices, but also devices from third parties, and supports the customary industrial communication protocols.

To increase the security and reliability of this network, the persons in charge of the operating company ERZ (see Box II) decided in 2013 to employ a network management software. Choosing SINEMA Server from Siemens was a logical step for Sasa Stevanovic, industrial electrician and project manager with ERZ: "Since we primarily employ Siemens PLCs in our facility, the consistency from the switches to the controllers to the components controlled is thus ensured."

Easy Configuration of extensive Network Topologies

At the beginning, the software had to be configured for the existing network, and the network topology be mapped with all switches, controllers, and field devices. That sounds like a lot of work requiring a great deal of engineering expertise – there are over 100 switches after all. Sasa Stevanovic dismisses that notion: "Following an introduction on-site, I was able to configure the network monitoring on my own in about two weeks – without special knowledge."

The installation and commissioning of SINEMA Server proceeds according to the plug&play principle – and is thus quick and self-explanatory. The operation of the software was designed to be exceptionally easy and user-friendly. Via a web browser, multiple users can simultaneously access SINEMA server data from anywhere. The topology of industrial networks is generally more complicated and heterogeneous than, for example, in the office area. There are many special applications running on PCs, embedded systems for the operation and monitoring, PLCs, peripherals, drive equipment, and sensors. Even though the majority of PLCs are from Siemens, the Aubrugg plant also employs special components from other manufacturers. The software recognizes devices from third parties by means of "autodiscovery", and supports the customary industrial communication protocols.

Supply Reliability comes first

For the district heating customers, the ecological energy production and especially the supply reliability are of utmost importance. Nobody wants to be without heat in the cold wintertime. Through redundancies in the heat production and various other available primary energy sources, some of this risk is reduced. But what if the "nervous system", i.e., the communication network of the plant, fails?

In the course of the modernization of the cogeneration plant in 2010, various plant and building control systems as well as the distributed field devices were integrated into an Industrial Ethernet. The basis for this consists of a fiber-optic network with ring topology. The connection takes place with several SCALANCE X Industrial Ethernet switches (see Box I). Due to the expansion and the complexity of the entire facility, a network totaling 14 kilometers in length with over 100 switches emerged.

The cogeneration plant Aubrugg generates peak load energy for Zurich's district heating grid using two fossil-fueled boilers.

Following an introduction by Siemens, Sasa Stevanovic, industrial electrician and project manager with ERZ, almost single-handedly carried out the configuration of the network monitoring with SINEMA Server.

Monitoring and Documentation of the Network

SINEMA Server was specifically designed for the continuous monitoring of industrial communication networks, such as Industrial Ethernet via PROFINET, efficiently supporting the plant operator as well as the maintenance and service personnel. In prescribed intervals, the entire network is scanned to identify any changes to the network and the components contained therein. Network problems can then be quickly recognized and stoppages or malfunctions within the plant be corrected. Besides the monitoring function, the network management software can also document the device inventory and the network availability.

Increased Availability of the Cogeneration Plant

This ultimately results in fewer network-related stoppages and a higher availability of the production facilities of the cogeneration plant. This provides district heating customers with a greater supply reliability and lets the managers of the operating company sleep better.

Sasa Stevanovic is already thinking about expanding the monitoring functionality: "In the future, we also want to use the system for occupational safety. In the event of an accident or other problem in the vast pipe channels of the district heating grid, our maintenance personnel could then be more quickly located."

Network Technology

Industrial Ethernet Switches SCALANCE X

In the cogeneration plant Aubrugg, industrial-grade switches of the types SCALANCE X204, X308, and X324 are used in the field, in the cabinets, and in the relay room (19" format), respectively. They feature a redundant power supply and are suitable for fanless operation at high and low temperatures, and also withstand vibration.

These are so-called managed switches. Access occurs via an IP address. Moreover, the switches are "ring-enabled", i.e., the failure of one switch does not affect the other switches in the network.

Network Management Software SINEMA Server

SINEMA stands for SIMATIC Network Manager. With version 12 of the network management software, up to 500 devices per SINEMA Server station can be monitored. Every SINEMA Server can also display the status of up to 100 other SINEMA Servers in the network. Altogether, this enables the monitoring of up to 50,000 network participants.

The components connected are automatically recognized via SNMP (Simple Network Management Protocol) or, for PROFINET devices, via DCP (Device Control Protocol). For SCALANCE network components, a more in-depth diagnostic is available.

The reporting function informs the plant management about the performance and capacities of the network – thus creating the basis for a targeted control and planning of the network infrastructure.

Three Partners on the Eco-Track

Entsorgung + Recycling Zürich (ERZ; Waste Disposal + Recycling Zurich) is the operating company of the district heating grid "Zürich Wärme" (Zurich Heat) comprised of the cogeneration plant Aubrugg, the refuse incineration plant Hagenholz, and other heat suppliers. The new, integrated wood-fired power station at Aubrugg is jointly operated by the three partner firms ERZ, EKZ (electric works of the Canton of Zurich), and the ZürichHolz AG (Zurich wood).

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