SIEMENS

Sustainable automation solutions for our most important resource

Worldwide references for the water industry

Incoteq

We're dedicated to the finest solutions – because water is the source of all life

As one of the world leaders in industry automation and a prime supplier of integrated technologies, Siemens is part of the solution to the global water challenge – as our numerous references show.

Desalination

Since 97 percent of all water on earth is seawater, efficient desalination technologies from Siemens are crucial for balancing freshwater supplies in dry areas.

Drinking water

Siemens provides integrated solutions for the automation of drinking water production technologies all over the world.

Wastewater

Siemens' automation technologies shed a new light on wastewater and open up new possibilities to utilize it as a source of water, energy, and potential recyclables, rather than it leading to added costs.

Water transport

Our solutions for water transport are based on our comprehensive portfolio of automation and drive technologies as well as our extensive expertise in optimized pipeline operation.

Worldwide references

S-Hertogenbosch (Netherlands)

Kelowna (Canada)

Valdelentisco (Spain)

Jacksonville (USA)

Lüneburg (Germany)

Warsaw (Poland)

Roetgen (Germany)

Baku (Azerbaijan)

Al Hidd (Bahrain)

Xiangcheng (China)

Istanbul (Turkey)

Perth (Australia)

Cost-effective and energy-efficient desalination solutions – in harmony with our environment

Perth seawater desalination plant, Australia

Totally Integrated Automation performs positively at Australia's first seawater desalination plant, the largest seawater reverse osmosis plant powered entirely by renewable energy, and wins PACE Zenith Award for Automation

The requirements

Perth, the capital of the state of Western Australia, is particularly affected by droughts that have not only endangered the drinking water supply, but have also led to severe economic losses. To cure this problem, the Water Corporation of Western Australia decided to build a seawater desalination plant using reverse osmosis technology for better energy efficiency and a more compact footprint compared to a conventional thermal desalination plant. The undertaking was awarded to a joint venture between Suez Degrémont S.A. and Multiplex Engineering Pty as a private operating agency project. The contract includes a 25-year term of operation and maintenance, with extremely high requirements for performance, availability, and profitability, in particular in the area of process automation and energy efficiency. In addition, this largest project of its kind in the southern hemisphere had to be completed in just 18 months.

The solution

With a capacity of 45,000,000,000 liters per year, Kwinana Beach supplies some 20 percent of Perth's water requirements. Because of their success in many other desalination projects, SIMATIC PCS 7 and PROFIBUS were chosen for the plant's process control system. The server, all con- trollers, and the PROFIBUS connection to the field instrumentation were designed with complete redundancy. Facility management is significantly simplified through the use of a SIMATIC PCS 7 Web Server that allows operating personnel to remotely access all facility data. In terms of energy efficiency, several SINAMICS G150 frequency converters reduce power consumption by up to 50 percent compared to unregulated electrical drives, while ensuring that delivery volumes always meet the actual demand. For better motor management, SIMOCODE pro is applied in the Motor Control Centers (MCC).

The benefits

The automation system is based on the principles of Totally Integrated Automation (TIA) and meets all re- quirements of the operating agency. Programming, maintenance, and exchange of components even during operation are easy and efficient, thanks to a common profile for all instrumentation and electronic devices. In line with TIA philosophy,

comprehensive diagnostic information allows for predictive maintenance, which significantly reduces costs. SIMATIC PCS 7 allows access to all internal parameters from a single point, which also simplifies commissioning. Operations and maintenance staff added a PCS 7 Web Server to extend their coverage. The server gives them the tools to access plant data from off-site, in a secure environment. Besides providing plant parameters for optimization or reporting purposes, this aids plant maintenance, especially outside normal working hours. The performance and reliable future-orientation of the system have even impressed independent experts: PACE, Australia's leading magazine for process control technology, honored Perth-Kwinana with its Zenith Award for the best automation project of 2007.

System brief
- Project duration: 18 months
- Capacity: 140,000 m³/d (30.8 MIGD) design; prepared for 250,000 m³/d (55 MIGD)
- Reverse osmosis process
- Energy usage: approx. 4.6 kWh/m³

Scope of supply
- Distributed control system SIMATIC PCS 7 with SIMATIC PCS 7 Web Server
- Four redundant SIMATIC S7-400H Controllers
- Client/server system with complete hard- and software redundancy, including fully redundant Ethernet- and Profibus networks with fiber optic cables
- 300 PROFIBUS PA devices
- SINAMICS G150 frequency converters
- SIMOCODE pro motor management system

Benefits at a glance
- Maximum reliability of freshwater supply thanks to fully redundant system design
- Efficient engineering for high cost effectiveness during construction, for example, centralized configuration of all actuators and sensors
- Reduced operating costs through predictive maintenance and energy-efficient electrical drives means correspondingly low water costs per household
- Complete scalability, an open system architecture, and long-term availability of spare parts ensure the investment over the long-term and enable future plant expansion

Seawater desalination plant Valdelentisco, Spain

Totally Integrated Automation in Europe's largest seawater desalination plant

The requirements

In January 2008, Europe's largest seawater desalination plant was completed in Valelentisco, located in the south of Spain between Mazarrón and Cartagena. The project was facilitated by the A.G.U.A. program of the Spanish Ministry of Environment and will contribute to ensuring the drinking water supply and the agricultural irrigation in this water-scarce region. One of the requirements for the plant was the application of significantly fewer chemicals for pre-treating the seawater than in established plants. Furthermore, a fully-automated operation with maximized process security and availability was required to guarantee the highest possible supply security. In addition, through compre-

hensive research projects, energy consumption for seawater desalination needed to be reduced by up to 30 percent in order to lower the costs for the water produced by up to 15 percent.

The solution

The plant operates according to the Totally Integrated Automation principle. All processes, from the seawater pre-treatment up to reverse osmosis, are automated and controlled by the SIMATIC PCS 7 Process Control System. For extra reliability, all crucial system components have been configured redundantly. This is true for all servers and all controllers of the SIMATIC S7-400H line as well as the PROFIBUS connection of the field instrumentation via the SIMATIC ET 200M distributed I/O.

Access to all process data via the Internet is possible through the SIMATIC PCS 7 Web Server. An engineering station in the control room permits the centralized configuration of all field devices (process instrumentation from the SITRANS product family and frequency converters) via the SIMATIC PDM configuration software. The highly efficient H-compact motors and the installed SINAMICS and MICROMASTER frequency converters are major contributors to the plant's operational efficiency. With these frequency converters, an energy reduction of up to 40 percent can be achieved compared to fixed-speed drives.

End customer
Aguas de la Cuenca del Segura S.A.

System integrator
Cadagua, Sindosa

The benefits

The Valdelentisco seawater desalination plant is a fundamental pillar for efficient use of the resource water and thus sustainability. For its largest and most modern plant, operator Aguas de la Cuenca del Segura S.A. received an automation system that ensures maximum availability and virtually excludes any plant downtime. The redundantly built distributed control system PCS 7 with its TIA philosophy provides not only a maximum of process security and plant availability, but also continuous transparency of the entire process, with consistent information regarding all process parameters up to the single field device or drive.

System brief
- Europe's largest seawater desalination plant
- Completed in early 2008, the plant is a fundamental part of the reliable water management in the region
- Two production lines
- Current capacity of 145,000 m³/d (32 MIGD); expansion to 200,000 m³/d (44 MIGD) possible
- Reverse osmosis process
- Highly available process through a consistently redundant automation system

Scope of supply
- Distributed control system SIMATIC PCS 7 with five redundant SIMATIC S7-400H controllers and 73 SIMATIC ET 200M (distributed I/O)
- Redundant PROFIBUS with FO cabling
- SIMATIC PCS 7 Engineering System with SIMATIC PDM (process device management)
- SIMATIC PCS 7 Web Server
- 24 flow, 40 pressure, eight level and eight temperature meters from the SITRANS product family
- Six H-compact medium voltage motors for high pressure pumps (1.5 MW)

- 14 SINAMICS G150 frequency converters
- 30 MICROMASTER 440 frequency converters
- Nine UPS SITOP power supplies
- 71 network analyzers and 34 SIPROTEC Motor protection relays

Benefits at a glance
- Maximum supply security through complete hard- and software redundancy
- Operational efficiency through transparency on all plant levels
- Efficient engineering through centralized configuration of all actuators and sensors with SIMATIC PDM
- Reduction of energy costs through tailored pumping with SINAMICS and MICROMASTER frequency converters

Seawater Desalination Plant Al Hidd, Bahrain

Siemens and Solution Partner EKIUM jointly provided and implemented SIMATIC PCS 7 control technology for the world's largest thermal multiple-effect distillation seawater desalination plant to secure drinking water supply in Bahrain

The requirements

The Kingdom of Bahrain, an archipelago in the Persian Gulf – with its 718,300 habitants – has immense water needs. Less than three percent of the land is naturally arable, so irrigation is a must. To satisfy the great need for water, Al Hidd Power Company (HPC) decided to expand the existing seawater desalination plant, more than doubling its capacity. Currently, it is the world's largest thermal multiple-effect distillation (MED) plant, producing 400,000 m³ of freshwater every day (90 MIGD). Within the largest privatization project ever realized in Bahrain, HPC also took over the operational management of the plant for 20 years. Since the commissioning of the new plant was to be carried out two years after the acquisition of the old plant, the capacity expansion had to be realized in the shortest time possible.

The solution

The contract for the plant expansion was given to SIDEM (Société Internationale de Dessalement), an affiliate of Veolia Water Solutions & Technologies. SIDEM opted for multiple-effect distillation (MED), where drinking water is gained through the evaporation and the subsequent condensation of seawater. The complex process management of the MED process requires an efficient and reliable distributed control system. After an intensive evaluation, SIDEM chose the Siemens' distributed control system SIMATIC PCS 7 as the plant's automation system and entrusted EKIUM (formerly Cira-Concept), a highly experienced SIMATIC PCS 7 system integrator and Siemens Solution Partner, with the engineering and implementation. The

expansion project consisted of ten desalination units, which evaporate and condense seawater within a number of vacuum chambers, separating the water from the salt. In this context Siemens delivered 33 H-compact motors for distillate, brine, and seawater pumps with a capacity of between 300 and 642 kW. Also in use are a cleaning unit, a hypochlorination unit, a carbon dioxide unit, three boilers, a seawater pump system, and a metering system. These combine to produce an additional 273,000 m³ of water every day.

The benefits

Since its on-schedule completion in 2008, Al Hidd covers approx. 75 percent of Bahrain's drinking water demand. A decisive criterion for SIMATIC PCS 7 was the option of complete hard- and software redundancy that guarantees maximum supply security. Furthermore, the openness of SIMATIC PCS 7 allows the uncomplicated connection of external third-party systems. One example is a Profibus link to the boiler management system, another is the secure OPC-DA connection to the plant's accounting system, which records the consumption data and forwards it automatically to the accounting department. Another important fact was the asset management system PCS 7 Maintenance Station because it provides troubleshooting diagnostic support through visualization of materials over the PCS 7 network. With this, highest plant efficiency and availability levels are ensured.

System brief
- Al Hidd, Phase III, is in many regards a project of superlatives. Phase III is not only the largest MED plant ever, it is also the largest privatization project in Bahrain. Al Hidd supplies potable water for 750,000 people.
- Extension from 30 MIGD to 90 MIGD (408,000 m³/d)
- Multiple-effect distillation (MED) with ten evaporator units
- Operating contract for 20 years
- Total project time 1.5 years
- Six months for commissioning and training

Scope of supply
- Distributed control system SIMATIC PCS 7 with asset management system PCS 7 Maintanance Station
- Nine redundant SIMATIC S7-400H controllers
- Redundant PROFIBUS with FO cabling
- 11 H-Compact high-voltage motors (300 kW)
- 11 H-Compact high-voltage motors (340 kW)
- 11 H-Compact Plus low-voltage motors (642 kW)
- Approximately 7,000 I/O devices

- All the control materials (including switch cabinets, four kilometers of fiber optic cable for the network, and the control room equipment)
- Electrical and network studies
- Engineering and implementation
- Configuration of the PCS 7 system and factory acceptance test
- Project documentation
- Local performance commissioning
- Training of the operators and maintenance personnel

Benefits at a glance
- Maximum supply security for ¾ of Bahrain's inhabitants
- Extremely short project duration of less than 18 months from kick-off to completion
- High efficiency through centralized configuration of all actuators and sensors as well as facility-wide asset management
- Easy connection of existing systems through an open system architecture

Sustainable automation solutions – for an ecologically and economically sustainable supply of drinking water

Water treatment project s-Hertogenbosch, Netherlands

A water treatment company in the Netherlands works to replace a multitude of incompatible legacy control systems with a single new automation concept for water purification

The requirements

The Aa en Maas Water Authority supplies pure water and treats wastewater in the south of the Netherlands. It includes seven wastewater treatment plants and 107 sewage pumping stations, spread across five regions, covering an area of 1,162 square kilometers. Currently, in order to operate and monitor the installations, no fewer than 11 different control systems are used, a legacy of the piecemeal development of water treatment in the past. These "islands of automation" present the Aa en Maas Water Authority with significant difficulties. Workers often cannot transfer from one site to another without being retrained on the different systems, and there is no integration of the water treatment data with the management information systems of the head office. With a view to the future, the water authority decided to standardize the water process automation systems and integrate them with its management information systems. This would enable it to automate its maintenance management and to compile production data over longer periods, facilitating more accurate forecasting of future water treatment demand. The Aa en Maas Water Authority began by drawing up a supplier-independent master plan for process automation, which was reviewed with potential automation system suppliers. Following several rounds, Siemens was selected to be the systems and automation supplier for the water treatment automation project.

The solution

The system proposed by Siemens was based on the SIMATIC PCS 7 Process Control System in combination with a SIMATIC S7-mEC (modular Embedded Controller) at every location. The S7-mEC is a fully-fledged PC accommodated in the housing of a modular S7-300 CPU. The distributed SIMATIC S7-mECs function as programmable logic controllers (PLCs) but communicate with a centrally located server in order to deliver all management reporting and visualization data. Process automation and office automation functions are combined in one platform. In a low-lying country like the Netherlands, a system failure can have serious consequences. To achieve a service availability of 99.95 percent, the system employs a multilayer topology with redundancy at each layer. To reduce the risk of data loss due to network failures, the SIMATIC S7-mECs can communicate through both public telecommunication networks and a backup satellite connection.

End customer
Waterschap Aa en Maas

System integrator
Siemens

The benefits

The great advantage of this project is its character of independence from people and place. Every sensor will be accessible from every site in the company, and every employee will have access to the process automation system – also via tablet PCs. Depending on their function, staff members may also be able to control the system. Another great advantage is that adaptations will only have to be implemented once, whereas formerly they had to be programmed up to four times. Furthermore, the central, object-based library considerably reduces the chance of failure. The system will accurately monitor which adaptations have been carried out where, when, and by whom. This enables a faster and more efficient diagnosis of failures.

System brief
- The large geographical spread of the Waterschap Aa en Maas from Den Bosch to the German border and in the south to the borders of the province of Limburg and Belgium constitutes a management challenge
- Harmonization of 11 different control systems
- Centralized automation system for seven wastewater treatment plants and 107 sewage pumping stations
- 99.95 percent water purification availability

Scope of supply
- SIMATIC PCS 7 OS as overview for whole area, including SIMATIC PCS 7 Web Server mobile and online access
- SIMATIC S7-400 controllers and industrial PCs for water treatment plants
- SIMATIC S7-mEC modular Embedded Controller used as controller and HMI for pumping stations
- SIMIT process simulation and operator training systems

Benefits at a glance
- Secure central access to all system components thanks to Internet link via SIMATIC PCS 7 Web Server
- Decentralized system access via tablet PCs
- System availability of 99.95 percent thanks to high redundancy levels
- Cost reduction through uniform PCS 7 automation system
- Higher system and data transparency for future management initiatives
- Improved operating flexibility and maintenance management

Water treatment plant Xiangcheng, Suzhou, China

Securing the water supply in one of China's largest water treatment plants with Totally Integrated Automation

The requirements

The city of Suzhou, located in the province of Jiangsu in Eastern China, has a population of approximately six million. The city's water treatment plant in the Xiangcheng district belongs to Suzhou Tap Water Company. It has a designed capacity of 300,000 m³/d, and is the first highly automated water treatment plant to apply the leading water treatment technologies of ozone pre-oxidation and biological activated carbon treatment. The requirement was for an efficient and reliable automation system that would be easy to use and maintain. As an expansion of

the facility is planned, the installed system has to be scalable, open for and compatible with future system components.

The solution

Suzhou Tap Water Company chose system integrator Pacific Water Treatment Co., Ltd., which is a Siemens Solution Partner and a SIMATIC PCS 7 specialist. A core part of the plant is the distributed SIMATIC PCS 7 Process Control System. All key hardware components, such as the PCS 7 OS Server and the SIMATIC S7-400 H, are redundant. At the field level, SITRANS products for process instru-

mentation and energy efficient motors are implemented, along with ROBICON Perfect Harmony frequency drives for drive systems. Field devices are connected to control level via distributed SIMATIC ET 200 I/O modules with Profibus DP connection. Thanks to TIA uniformity, all field devices can be configured in the central control room. Power distribution is monitored and controlled via SIVACON electrical cabinets and motor control centers with SIMATIC HMI Panels.

The benefits

Redundant system design – from field level to control level – ensures highest plant availability. The centralized process monitoring and control in the central control room, with its very intuitive operator interface, minimizes operational errors, while optimized data and process transparency help the owner to reduce operating costs. The application of high-efficiency motors also plays a part in this,
while uniform SIMATIC products and tools offer significant time and cost savings during engineering and commissioning. Through the open and scalable architecture of SIMATIC PCS 7 and TIA standardization, future expansion will be problem-free.

System brief
- One of the largest water treatment plants in China, with a high degree of automation; first plant with application of new technologies (disinfection by ozone pre-oxidation and biological activated carbon treatment)
- Current capacity: 300,000 m³/d; expansion to 700,000 m³/d planned
- Project duration: March 2008 – December 2011

Scope of supply
- Distributed control system SIMATIC PCS 7 with redundant PCS 7 OS Server and six redundant SIMATIC S7-400H controllers
- SIMATIC ET 200 distributed I/O devices (81 x SIMATIC ET 200M, 10 x SIMATIC ET 200S)
- 7 x SIMATIC Multi Panel MP370 Touch engineered with SIMATIC WinCC flexible
- SITRANS process instrumentation (96 x SITRANS P, 56 x SITRANS Probe LU, 44 x SITRANS F M MAG 3100)
- Bus systems PROFIBUS DP/PA, Modbus
- SENTRON 3WL circuit breakers
- SIRIUS switchgears (3R, 3SB)
- SIVACON cabinets and motor control centers
- 3 x ROBICON Perfect Harmony frequency converters (900 kW)
- 4 x H-compact medium voltage drives (900 kW)

Benefits at a glance
- Increase in operational safety through fully automated monitoring and control and redundant hardware
- Reduced engineering costs due to facility-wide TIA products and standard SIMATIC tools application
- Minimized risk of error thanks to centralized process monitoring and control, and early warning of process changes
- Remote control system for ease of remote operation management
- Easy expansion of the facility due to openness and scalability of the automation system

Drinking water treatment plant Roetgen, Germany

Totally Integrated Automation with SIMATIC PCS 7 in Germany's largest and most innovative ultra-filtration membrane system for drinking water treatment

The requirements

The WAG Wassergewinnungs- und -aufbereitungsgesellschaft Nordeifel mbH produces about 33 million m³ of drinking water annually and supplies the region around the city of Aachen, Germany. Unique to WAG, raw water from only four reservoirs in the northern Eifel region is used to produce drinking water. The drinking water treatment plant (TWA) Roetgen, with its capacity of 30 million m³ annually, takes care of more than 90 percent of WAG's water supply. To ensure future delivery reliability of drinking water, WAG decided to expand TWA Roetgen, so that highest-quality drinking water can be produced even under extremely adverse raw water conditions. Because of the central importance of TWA Roetgen,

high demands were placed on its automation technology with regard to reliability and safety. At the same time, the total cost of ownership (TCO) needed to be reduced as much as possible.

The solution

After extensive preliminary investigation, WAG decided to use membrane technology for raw water ultra-filtration. To control the membrane modules' complex sequence of operations requires an efficient and very reliable process automation system that also relieves staff of time-consuming and error-prone routine work. Other decisive factors for WAG were long-term security of investment and the ability to set up a fully-redundant system

architecture in both control and communication channels – a prerequisite for the highest possible plant availability. And finally, WAG chose SIMATIC PCS 7 as a key part of Totally Integrated Automation – with its highly efficient engineering environment – which also enabled quick, easy, and reliable integration of SENTRON circuit breakers that are capable of communicating.

The benefits

Since project completion in 2005, WAG has profited from a future-proof solution offering high operational security and substantially reduced operating costs. Important for the system operator: The consistent use of the SIMATIC PCS 7 engineering tools throughout the entire project

enabled cost-effective project development. Using partially automated engineering at multiple levels made automation project development and implementation more efficient and less time-consuming. In addition, the communications capabilities of the implemented SENTRON circuit breakers made central monitoring and controlling of both the facility's process technology and its energy distribution easy and efficient. TWA Roetgen is currently the largest drinking water treatment facility in Germany to use membrane technology. Its successful commissioning has helped the trend-setting and innovative membrane technology make a large-scale breakthrough.

System brief
- Largest membrane filtration system in Germany: open sand filtration with upstream ultra-filtration
- 30 million m³/year, 70,000 –110,000 m³/d with a maximum processing capacity of 6,000 m³/hour
- Drinking water reservoir with 6,000 m³ volume
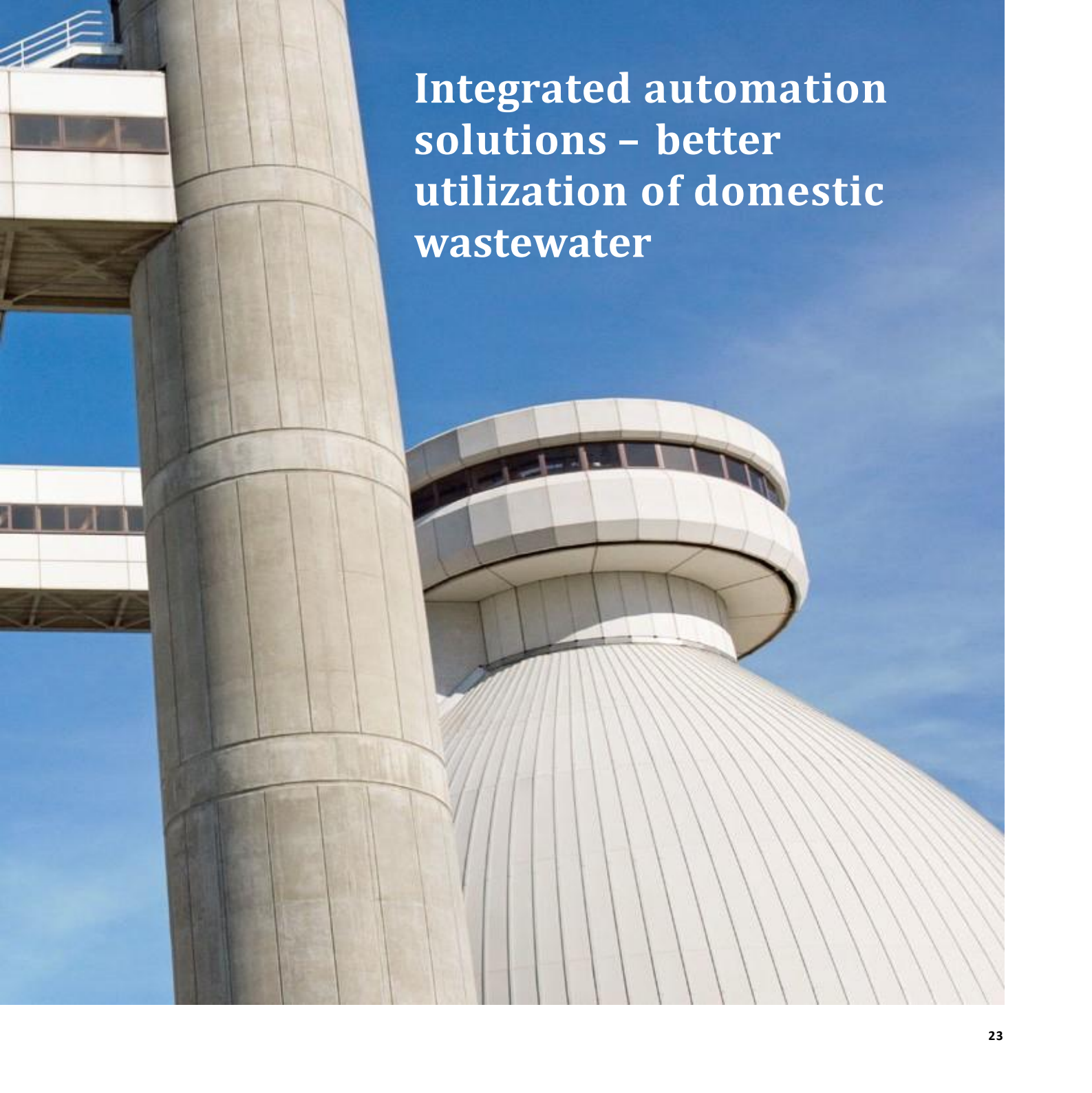
Scope of supply
- SIMATIC PCS 7
- SIMATIC S7-400 controllers with distributed I/O ET 200M
- SIMATIC S7-300 controllers
- SIMATIC PCS 7 client/server architecture with complete hard- and software redundancy
- Redundant terminal and system bus (Ethernet) with fiber optic cabling
- SENTRON 3WL/3VL communications-capable circuit breakers
- SITOP power supplies
- External access to all system parameters via Internet over SIMATIC PCS 7 Web Server

- Connection of remote stations via SCALANCE 414 router and fiber optic cabling
- SIMATIC PDM Product Device Management
- BANYnet for management and monitoring of networks

Benefits at a glance
- Maximum security of supply for approx. 600,000 customers in the Aachen metropolitan area through standardized user interfaces
- High cost-effectiveness through efficient engineering, for example via centralized configuration of all actuators and sensors
- Low operating costs through reduced training and optimized spare parts management
- High security of investment through long-term promise of delivery

Integrated automation solutions – better utilization of domestic wastewater

Wastewater treatment plant Lüneburg, Germany

Modern control and telecontrol technology allow efficient operation down to the substations in the Lüneburger Heide

The requirements

The wastewater treatment facility of the Abwassergesellschaft Lüneburg mbH (AGL) serves the northern German city of Lüneburg and six additional nearby towns. Daily, up to 25,000 m³ of wastewater from approx. 110,000 area residents and industrial and commercial customers are fed to the plant through a widely branching pipeline network. The facility not only treats the wastewater in a series of process steps, but also reuses the resulting waste materials, such as sludge and biogas, and improves the water quality of the Ilmenau River, the largest of the small rivers that flow through the Lüneburger Heide (Lüneburg Heath). An efficient operation of such a complicated water management process requires a reliable automation system. When Siemens announced that it would discontinue the SIMATIC S5 controllers used in the facility, AGL decided on a complete replacement of its control technology.

The solution

Since the beginning of 2011, the distributed control system SIMATIC PCS 7 using SIMATIC S7 automation components, has been deployed. While the system was being modernized, the plant ran in parallel operation. To accomplish this, the system integrator GreyLogix Aqua first set up the new client/server architecture in the central control center and then installed a central automation system for data exchange between the old and new process control systems. When the individual parts of the plant were retrofitted, even the reporting system ran in parallel: A continuous supply of relevant operations data to the logging system was assured until switchover. Thus, AGL could meet legal requirements for seamless data logging, long-term data storage, and report generation. An important part of the new control concept is the integration of 34 widely distributed remote plant sites: pumps, pumping stations, and gauging wells. Actuators are still controlled using existing hardware; data exchange is managed by SIMATIC S7-1200 automation units. All large substations are equipped so that continuous monitoring of operations over an encrypted DSL connection is possible. Smaller substations communicate using GSM. The telecontrol technology used in the central control center enables the communication of the substations with the centralized SIMATIC PCS 7 system and seamlessly merges the automation of centralized and distributed process areas into one system. The data collected in the stations, the operating status of the aggregates, and the measured values from the pump stations are integrated into process screens, as well as message and alarm lists. This creates a consistent "look & feel" across the entire network with all its substations, in a familiar operating environment, making process control easier.

End customer
Abwassergesellschaft Lüneburg mbH

System integrator
GreyLogix Aqua GmbH

Solution
Partner

SIEMENS

The benefits

The modernization brought the central plant, as well as the remote stations up to a state-of-the-art level of technology. The selected control system was chosen for its ability to optimize plant performance and made a more flexible process control possible. The new plant and process technology saves energy during aerating of the aeration tanks and is more stable during abrupt weather changes. The connection of widely-distributed pump stations, the ability to access detailed information from the stations and their integration into operations offers clear benefits in efficiency and diagnostic tools. The data communicated about power usage and flow rate allows operators to draw conclusions about the status of individual pumps. Above all, the addition of more detailed monitoring and the seamless integration of the external stations using telecontrol assures more reliability in wastewater treatment and a more efficient operation of the entire facility.

System brief
- Biological wastewater treatment, utilization of sewage sludge, block heating works and laboratory
- Total capacity: 325,000 PE
- Wastewater quantity: 11 million m³ annually
- Pipeline network with more than 450 kilometers of sewers and 24 pumping stations
- Planning time until contract award: nine months
- Total duration of project: 14 months

Scope of supply
- Control system: SIMATIC PCS 7 with three SIMATIC PCS 7 OS Servers and ten SIMATIC PCS 7 OS Clients
- Automation system: 12 SIMATIC S7-400 and three SIMATIC S7-300
- Telecontrol technology stations: 36 stations with SIMATIC S7-1200 automation, data exchange via DSL or GSM
- Reporting software: ACRON
- SCALANCE network components

Benefits at a glance
- Increased plant reliability through consistent operation at all levels, including remote stations
- Improved diagnostic tools and integrated runtime monitoring of pumps via expansion of data exchange and integration into the control system
- Easier operations control through additional operator stations in the plant and remote access through secure VPN connection

Czajka wastewater treatment plant, Warsaw, Poland

After modernization and upgrading with a SIMATIC PCS 7 process automation system, the Czajka wastewater treatment plant is Eastern Europe's biggest and most modern plant

The requirements

When Czajka wastewater treatment plant (WWTP) was completed in 1991, after 17 years of construction, much of its technology and equipment was already outdated by the time the plant came online. To treat the waste- water of approximately 2.1 million people in the Warsaw area, a series of modernizations were started almost immediately. The Czajka upgrade and extension project is part of the Warsaw water supply and wastewater treatment plan, phase three of which includes the plant's upgrade, the construction of a thermal sludge drying facility, new transmission sewers, the modernization of the wastewater system, and the implementation of a modern monitoring and control system. The major goal of the plan is to upgrade the plant in order to increase wastewater treatment capacity from the current 240,000 m³/d to 435,300 m³/d, rising to a potential 515,000 m³/d at peak times.

The solution

A key aspect of the facility's modernization program involves a completely new distributed control system, the SIMATIC PSC 7 system from Siemens, providing comprehensive visualization, control, and monitoring of all processes involved. The design includes more than 50 controllers, two redundant SIMATIC PCS 7 OS Servers, five SIMATIC PCS 7 OS Clients as operators' workstations, more than 1,000 analog measurements, and more than 2,000 drives. The SCADA automation and monitoring ensures optimal flow through the plant processes, providing full control and operational visualization, with real-time data measurement, equipment status, alarm notification, and system failure alerts.

Another significant plant improvement at Czajka is the thermal sludge treatment, which reduces the volume of material and facilitates its use as landfill. The new sludge combustion plant generates power and heat – and is also entirely controlled by the SIMATIC PCS 7 Process Control System from Siemens.

The benefits

Through the completion of the Czajka upgrade and extension project, important aspects of the city's potable water supply have been improved. In addition, the plant is now able to handle more than 300,000 m³/d of wastewater from the left bank of the Vistula River, thereby greatly improving water quality in the river, the city's prime source of potable water, and ultimately reducing the contaminant load entering the Baltic Sea.

End customer
Miejskie Przedsiębiorstwo Wodociągów
i Kanalizacji w Warszawie

System integrator
Veolia, Warbud, OTV, Kruger and WTE Wassertechnik

With the new SIMATIC PCS 7 Process Control System in place, staff can centrally control all processes of the huge (56 acres) plant, based on data collected from process instrumentation and analytics devices from Siemens, such as MultiRanger devices for level monitoring or SITRANS FM flow meters. In addition, energy-saving SINAMICS drives for the pump stations contribute to the substantial reduction in operating costs.

System brief
- Poland's largest and most modern wastewater treatment plant
- Population served: 2.1 million (on completion) mid-2012
- Project start: January 2008
- Current capacity: 200,000 m³/d
- Final capacity: 435,000 m³/d (normal); 515,000 m³/d (peak)
- Sub-Vistula flow rate 3–11 m³/sec (to include additional rainwater element)
- Current sludge production 80,000 tpa (160,000 tpa on completion)

Scope of supply
- Distributed control system SIMATIC PCS 7
- Client/server architecture with two redundant SIMATIC PCS 7 OS Servers and five SIMATIC PCS 7 OS Clients
- Two SIMATIC PCS 7 Engineering Stations
- SIMATIC PCS 7 Web Server
- SIMATIC PCS 7 Central Archive Server
- Video wall server with video wall 8 x 55''
- Automation stations
  (5 x SIMATIC S7-400H,
  30 x SIMATIC S7-300,
  1 x redundant SIMATIC S7-400H)

- SIMATIC ET 200 distributed I/O devices (SIMATIC ET 200M, SIMATIC ET 200S)
- More than 750 devices for process instrumentation for flow, pressure, temperature, and level measurements, most of them from the SITRANS family
- 23 SINAMICS G150 drive converters (400 kW)
- More than 100 fields of medium-voltage switchgear
- More than 300 SIVACON S8 fields for low-voltage distribution
- Motor Management System SIMOCODE pro
- SENTRON low-voltage devices
- 29 transformers (up to 3.15 MVA)
- Approx. 700 km of cabling
- Technical documentation
- Software engineering, commissioning

Benefits at a glance
- Safe, reliable, and efficient process control through SIMATIC PCS 7
- Open and scalable SIMATIC PCS 7 architecture supports future expansion
- Engineering, assembly, and service from one source
- Modernization parallel to the operation of the existing plant

Wastewater treatment plant for the City of Kelowna, Canada

Upgrade and expansion of the existing APACS+ control system to the most modern distributed control system with SIMATIC PCS 7

The requirements

Kelowna's sewer system collects, conveys, treats, and disposes of domestic and industrial wastewater from the rapidly growing city in the interior of British Columbia. The wastewater is conveyed to Kelowna's wastewater treatment facility (WWTF), an innovative treatment plant utilizing cutting-edge UV disinfection processes and a state-of-the-art odor control system. The city's wastewater system currently services close to 80 percent of Kelowna's population and is being expanded to reach areas presently unserviced and to accommodate growth. Today's capacity of 40 million liters of sewage per day will soon be reached, so an upgrade to the treatment facility will almost double this capacity to 70 million liters a day over the next four years. The city of Kelowna's challenge was not only to upgrade their existing APACS+ operating and control system while protecting their original investment, but also to lay the foundation for their future control system, driven by the plant's expansion.

The solution

To achieve all this simultaneously, system integrators TURN-KEY CONTROLS suggested a step-by-step migration from the old APACS+ control system to the most modern SIMATIC PCS 7/APACS+ Operator System with minimal risk and highest return on investment. The first step was to replace the old IFIX HMI with SIMATIC PCS 7 OS. As a second step, new SIMATIC S7 controllers were used for site expansions and tied into SIMATIC PCS 7 OS. Future steps of the migration include replacing the APACS+ ACM controllers with SIMATIC S7-400 controllers, using DP/IO link to tie in the APACS+ IO into SIMATIC S7-400 controllers, and replacing the APACS+ IO modules with SIMATIC S7 IOs. The City of Kelowna project proves Siemens' continued commitment to support and improve APACS+ systems currently installed worldwide.

The benefits

The step-by-step migration concept holds numerous benefits for the operators. First, the new system is a secure investment, since eventually all APACS+ products will be replaced by a modern, future-proof SIMATIC PCS 7 product. Second, the concept prolongs the life of currently installed APACS+ assets (both controllers and IOs), thus reducing the customer's investment to the necessary minimum. And, since the old system serves as a backup in parallel as long as the new system is being commissioned, the switchover requires little to no system downtime. Apart from this, the concept allows upgrading the system along the customer's own timeline and the available capital, while the customer profits from shorter lead times and increased plant productivity, thanks to the use of Totally Integrated Automation (TIA) and SIMATIC IT in their processes.

End customer
Kelowna wastewater treatment facility

System integrator
TURN-KEY CONTROLS

In practice, the new distributed control system SIMATIC PCS 7 offers significant functional enhancements and improvements compared to the existing control system. These include SFC visualization (Sequential Function Chart) for sequential control at the operator station, asset management for improved diagnostics and preventive maintenance, and a process device manager for central parameterization and configuration of intelligent field devices. As a result, operator efficiency is improved, and maintenance cost and the overall cost of ownership are reduced. Furthermore, SIMATIC PCS 7 paves the way for vertical and horizontal integration from field to the MIS/MES levels, while the Web server allows the operator system to be published on the Internet for remote monitoring and control.

System brief
- Wastewater treatment plant services close to 80 percent of the City of Kelowna's population
- Total capacity: 70,000 m³/day
- More than 30 pump stations

Scope of supply
- Distributed control system SIMATIC PCS 7/APACS+ OS (redundant PCS 7 OS Server with APACS+ system interface) with seven connected SIMATIC PCS 7 OS Clients
- Central archive server SIMATIC PCS 7 CAS
- One SIMATIC PCS 7 Engineering Station with SIMATIC PDM (Process Device Manager)
- Manufacturing execution system SIMATIC IT
- SIMATIC PCS 7 Maintenance Station (asset management system)
- SIMATIC PCS 7 Web Server
- Three SIMATIC S7-400 controllers
- 500 SIMATIC S7 I/O
- Terminal and plant bus networks

Benefits at a glance
- Future-proof step-by-step modernization without downtimes, thanks to parallel operation of control systems
- Protection of capital investments by prolonged use of APACS+ hardware
- Fast, reliable, and highly available monitoring and control system, accessible from any office PC with SIMATIC Web Server
- More diagnostic features with Totally Integrated Automation (TIA) and SIMATIC IT reveal process optimization, security, and productivity potentials
- Prolonged service life of installed APACS+ components
- Complete transfer of engineering data collected over years of operation
- Reduced risk of plant outages through better data quality and density
- Reliable connection to manufacturing execution system (MES)
- Reduced costs for stocking spare parts and for maintenance
- Continuity of process control system investments for higher efficiency and productivity

Easy access to potable water – anywhere, anytime: water transport automation solutions

Automation of the Oguz-Gabala-Baku water pipeline, Azerbaijan

Siemens helps secure water supply in Baku, the capital of Azerbaijan, by implementing automation solutions in the new water transport system

The requirements

The Oguz-Gabala-Baku water pipeline project dates back to plans from the 1970's. Baku's growth was historically driven by the booming oil industry and required the import of drinking water from outside of the city. Before the construction of the pipeline, some 60 percent of the city's households received water for only a few hours daily. After completion of the project, 75 percent of the two million Baku residents are now served around the clock with potable water, based on World Health Organization (WHO) standards. The 262-kilometer pipeline requires no pumping station, but uses the altitude differences between the Caucasian mountains and the capital to supply 432,000 m³/d to the Ceyranbatan water reservoir. To the people of Baku, the pipeline is "the most important project not only in 2010, but of the last 20 years."

The solution

The project was realized in cooperation with CASPEL, a regional system integrator specializing in solutions for data transfer, software development and supply, and maintenance of state-of-the-art IT hardware and software from leading manufacturers. Siemens supplied the automation technology for the pipeline project. For the comprehensive monitoring of water pipes and avoidance of potential emergencies, CASPEL installed a SIMATIC WinCC control and data management system. CASPEL adjusted the connected IT system and ensured that global standards were met. Major reconstruction work was carried out at various sites of Baku's water system. The Siemens automation solution is based on the SIMATIC product suite: SIMATIC S7-1200 and SIMATIC S7-300 were installed for the control of the pipeline gate valves and in order to collect the flow meter data for leak detection. The flow meters were implemented with SIMATIC PDM. The HART protocol was applied for the relevant communication. The visualization and supervision of the entire plant was realized based on SIMATIC WinCC. The SIMATIC S7-300, positioned at the 75 wells in the higher region, communicate via GPRS modems with the redundant SIMATIC WinCC OS Servers in the central station, while the different stations along the pipeline are connected by redundant fiber optic cable ring.

The benefits

Thanks to the application of the SIMATIC automation technology that has been proven in numerous operations, Siemens was able to provide increased functional reliability for the

entire plant. Thanks to using decentralized SIMATIC S7-1200 and S7-300 with Telecontrol via GPRS, all components of the 262 km pipeline can be operated and monitored with WinCC. Existing components were easily integrated via OPC. In addition, the operator benefits from full plant transparency, thanks to state-of-the-art communications technology, and early fault detection through better diagnostic functions, such as reporting and archiving of leak-detection system alarms, etc. Higher transparency also pays off in terms of a more secure investment, as troubleshooting is greatly accelerated, for example in case of an emergency pipeline shut-off. By implementing Siemens' stringent international project management standards, the project was realized on time, within budget, and with an outstandingly high quality of work.

System brief
- 262 kilometer pipeline to supply 432,000 m³ of potable water to two million Baku residents
- Project duration: March 2007 to December 2010
- Water transport thraugh altutude difference – no pumps required
- More than 100 control locations
- Two water flow stations
- Percentage of population receiving continuous supply of drinking water increased from 40 to 75 percent

Scope of supply
- Delivery and implementation of automation technology concept
- Redundant control and data management system SIMATIC WinCC
- Communication technology
- Engineering
- SIMATIC S7-1200 and SIMATIC S7-300 along the pipeline for gate valves control and collecting the data for leak detection – connected with redundant fiber optic cable ring
- 75 decentral SIMATIC S7-300 controllers for 75 water supply wells connected via GPRS to the SIMATIC WinCC Server

- Connection of an existing leak-detection software with SIMATIC WinCC via an OPC-interface

Benefits at a glance
- Easy and central monitoring of the whole system thanks to implemented GPRS and fiber optic technology – leading to increased transparency of pipeline operation
- Easy integration thanks to open standards
- Early fault detection thanks to better diagnostic functions: reporting and archiving of events such as online reporting of leak-detection system alarms
- Reduced engineering time/cost thanks to easy and efficient configuration
- Easy operation thanks to various operation modes: for example local/remote, manual/automatic
- Security of investment thanks to fast trouble shooting, for example emergency pipeline shut-off

ISKI Asia Zone pump stations, Istanbul, Turkey

Siemens supplies five pump stations for the extended water supply network of Istanbul

The requirements

ISKI, the Istanbul Water and Sewerage Administration, is part of the Istanbul municipality and is responsible for the administration and operation of the water distribution, sewer network, and infrastructure of wastewater treatment. About 13.2 million inhabitants are connected to an infrastructure comprising 12 wastewater treatment plants and a 16,900 km water distribution network.

Due to the steadily growing population of Istanbul, the water and wastewater infrastructure had to be extended. As a consequence, the project was started with the objective of modernizing the existing pump stations and constructing new ones, in order to connect a further one million inhabitants of Istanbul.

For the realization of the project, ISKI looked for reliable equipment and solution providers as a success factor for secure and uninterrupted water supply. As a long-standing supplier of ISKI, Siemens was selected as the solution provider for local control stations, medium- and low-voltage installation, as well as drives and related equipment.

The solution

Siemens Turkey supplied the electrical solution for all pump stations of the project. The quality of work was ensured by Siemens supervisors and experienced commissioning teams. Fulfilling the requirements of ISKI, Siemens Turkey designed the single line diagrams and panels. In a second design step, the regional Siemens engineering department selected the pump drives according to the appropriate water pressure, operation philosophy, and efficiency. For the medium voltage supply, the Siemens SIMOPRIME solution was selected. The power supply system was designed with the various summer and winter time load curves in mind. The existing, modernized pump stations as well as the new ones were integrated into the central control desk system, which was also part of the overall design solution.

In order to support failure-free operation of the pumps, Siemens installed SITRANS-L type ultrasonic level sensors for water level supervision in the different supply zones. The technical solutions of Siemens followed the standards defined by TSE (Turkish Standards Institute) and TEDAS (Turkish Electricity Distribution Corporation). Furthermore, the technical solution was aligned with ISKI and the Istanbul Asia Site Electrical Authority (AYEDAS).

End customer
ISKI

System integrator
Siemens

In order to ensure interoperability between drives and pump systems Siemens worked closely with the Turkish subsidiary of the international pump manufacturer, KSB.

The benefits
Thanks to the experienced Siemens engineers and project teams, the project was finalized on time and the budget held on target. In addition, Siemens supplied reliable and proven electrical solutions that were perfectly integrated with the mechanical components. As a result, the customer's energy management could be improved, for example by optimizing peak demands, while continuous monitoring at the field level allows for higher process quality and reliabil- ity. The high quality of work included the project documentation and was complemented by employing inter- national Siemens quality standards.

System brief
- Extension of existing water infra-structure by five pump stations
- Season-optimized power supply concept
- Project start: 2006
- Project duration: approx. one year

Scope of supply
- SIMOTICS low- and medium-voltage motors
- Medium-voltage switchgear SIMOPRIME
- Siemens Motor Control Centers (MCC)
- DC panels and batteries
- Process instrumentation of SITRANS familiy (flow, level, pressure transmitters)
- Cabling and cable trays
- Pipes
- Electrical and mechanical installation
- Commissioning
- Compensation system

Benefits at a glance
- Efficient energy management by optimizing current peaks
- Increased transparency thanks to central operation access from a central control desk
- High reliability and process quality through continuous monitoring at the field level
- Continuous process monitoring with ultrasonic level sensors implemented at the field level
- Similar system architecture at five different pumping stations enables faster and easier engineering, maintenance, and process control

Jacksonville water supply project, Florida, USA

Siemens helps utility JEA keep the waters flowing in Northeast Florida by introducing SINAUT telecontrol

The requirements

JEA is responsible for electricity, water, and sewer services to the residents and businesses of Northeast Florida. JEA's water system serves more than 305,000 water customers and 230,000 sewer customers and comprises 4,208 miles of water lines as well as more than 3,760 miles of collection lines and seven regional and eight non-regional sewer treatment plants.

Siemens' challenge was the modernization of the outdated pumping control system for the 1,273 lift stations that keep wastewater flowing through 14 treatment centers and help JEA manage storm water flows. In addition, the new automa- tion system needed to be capable of controlling additional pumping capacity and communications, as JEA continues to acquire adjacent water systems and connect current septic tank owners to their system.

The solution

To supply modern capabilities and ensure easy expansion, Siemens installed an automation solution based on a SIMATIC S7-300 with SINAUT ST7 telecontrol, SIMOCODE pro V motor management, and SIMATIC WinCC HMI. The SIMATIC S7-300 system provides local logic as well as data collection for the SINAUT ST7 and is also the Profibus master for two SIMOCODE pro V systems that provide motor overload protection, local I/O to read in the analog well level, and the digital floats' signals. If the PROFIBUS connection is lost, the SIMOCODE pro V provides redundancy and takes over full control of the pumping operation until the network is restored. In addition, SIMOCODE pro V also provides key diagnostic and operational data to the control center, which can be used to evaluate system performance.

The SINAUT ST7 extends the SIMATIC S7 automation system by integrating special hardware and software components. This enables remote data transmission. In order to provide fully monitoring and control, the SINAUT ST7 provides a reliable data transfer between the lift stations and the master control center. In case of connection failures, the respective SINAUT ST7 buffers the data and transmits it as soon as the connection is restored. Thus, SINAUT ST7 enables fast access to all lift stations and central, complete data collection in SIMATIC WinCC. For high reliability, a SITOP DC UPS system provides backup power.

The benefits

Thanks to the new automation system, JEA can use two-way communications capabilities with the SINAUT ST7 for remote diagnostics, software upgrades, and other fixes and maintenance that would other-

wise have to be done onsite by a technician while maintaining communications with any other RTU on the system. In addition, energy savings are realized by using pumps in concert rather than having them pump against each other. And thanks to the automatic diagnostic logs of all communications between the central control system and the remote lift station, along with details of the type and time of any failures, troubleshooting is substantially accelerated. In addition SIMOCODE pro V provides extra peace of mind, since it keeps the lift station pumps working even if the PLC control network goes down.

System brief
- Modernization of outdated pumping control system for 1,273 lift stations that keep wastewater flowing through 14 treatment centers
- Management of stormwater flows
- Controlling of additional pumping capacity and communications

Scope of supply
- SIMATIC WinCC runtime station with SINAUT ST7cc runtime
- SCADA connect software SINAUT ST7sc
- A SIMATIC S7-300 PLC with SINAUT TIM and redundant motor management SIMOCODE pro V at every lift station
- PROFIBUS
- Central time synchronization for the whole plant
- SITOP UPS power supply
- Engineering
- Commissioning

Benefits at a glance
- Much improved communications thanks to SINAUT ST7 telecontrol system, for example exception reports in case of system failure
- Faster and more cost-saving diagnostics, software upgrades, and maintenance thanks to remote acces via SINAUT ST7 protocol
- Energy savings thanks to optimized hydraulic control (Pump stations are controlled so that they run in concert and are not pumping against each other)
- Considerable reduction of trouble-shooting times thanks to automatically compiled diagnostic logs (of all communications between the central control system and the remote lift station)
- High system availability thanks to SIMOCODE pro V motor management system, which keeps the pumps working even if the PLC control network goes down
- Up to 20 percent less energy demand thanks to SIMOCODE pro power management features
- System open for extensions and upgrades

Water links

From drinking water purification and wastewater treatment, right through to water distribution and seawater desalination, Siemens meets municipal water management requirements across the board – and is a reliable partner throughout the entire water cycle. Our portfolio incorporates sustainable solutions that lower energy consumption and enable water recycling, all while minimizing water loss and reducing life cycle costs. Certified solution partners all over the world dedicate themselves to delivering outstanding solutions specially designed to your needs.

For more information regarding automation in the water industry, please visit our Website:

www.siemens.com/water/automation

SIMATIC Water Library

As a system integrator, you need to quickly and efficiently adapt standardized systems to customer-specific requirements in the water and wastewater industry. Operators, on the other hand, need simple and intuitive signals and displays that prevent faulty operations right from the start. The SIMATIC Water Library supports efficient engineering of the distributed control system SIMATIC PCS 7 and the SIMATIC WinCC HMI system with water-specific function blocks.

Learn more about the SIMATIC Water Library at:
www.siemens.com/water/waterlibrary

Consultant DVD

With the free Consultant DVD, Siemens provides an efficient tool set for consultants, system integrators, and plant operators to efficiently support these user groups in all planning phases for plants in the water sector.

The Consultant DVD is available after prior registration at
www.siemens.com/water/consultantdvd

More worldwide Siemens references

Desalination plants

- Victoria, Australia
  End customer: Melbourne Water
  System integrator: Hunter Watertech, Techeng, and Siemens

Water transport

- City of Larissa, Greece
  End customer: DEYA Larissa,
  System integrator: AKATT S.A. and INIOCHOS Ltd.
  (both of which are Siemens Solutions Partners)

- Sallmannsberg, Germany
  End customer: Bayerische Rieswasserversorgung
  System integrator: Wetzel & Partner Ingenieurgesellschaft GmbH

Water treatment plants

- Hamburg, Germany
  End customer: Hamburg Wasser
  System Integrator: GreyLogix (Siemens Industry Partner)

- Wien-Mauer, Austria
  End customer: Wiener Wasserwerke
  System integrator: Siemens

- Vörde Löhnen, Germany
  End customer: Wasserwerke Dinslaken GmbH
  System integrator: Siemens

Wastewater treatment plants

- City of Luxembourg, Luxembourg
  End customer: City of Luxembourg
  System integrator: Alpha Umwelttechnik

- Adelsdorf, Germany
  End customer: Commune of Adelsdorf
  System integrator: Hemos AG (Siemens Solution Partner)

- Bad Salzuflen, Germany
  End customer: City of Bad Salzuflen
  System integrator: GreyLogix Aqua (Siemens Industry Partner)

- Vienna, Austria
  End customer: Entsorgungsbetriebe Simmering GmbH (EbS)
  System integrator: Cegelec Anlagen- und Automatisierungs-technik GmbH & Co. KG

- Steinhof Brunswick, Germany
  End customer: Abwasserverband Brunswick
  System integrator: GreyLogix Automation
  (Siemens Industry Partner)

- Peine, Germany
  End customer: City of Peine
  System integrator: BN Automation (Siemens Industry Partner)

- Lobau, Austria
  End customer: Wiener Wasserwerke
  System integrator: Siemens

- Coomera, Australia
  End customer: Gold Coast Water
  System integrator: Water Alliance (United Group Ltd. together with Gold Coast Water)

More references: **www.siemens.com/water/references**