System relevant!

We are living in turbulent times - the Coronavirus, with its massive impact on the economy and social life, has once again brought home to us one thing: The importance of reliable and resilient utility infrastructures. No one would like to imagine what would happen if network operators were no longer able to fulfill their tasks due to a lack of staff or insufficient technology and, in case of doubt, even the hospital was no longer supplied. The measures taken to maintain "system-relevant" sectors are therefore sensible and correct! By providing reliable technology, SAE is doing its part to ensure security of supply.

Overall, a lot is happening to make our grids more transparent, controllable and thus also safer. Be it the implementation of the NC RfG, among others through the VDE-AR-N 4110, which expands the technical requirements of decentralised generation plants to customer-, consumer-, mixed stations and storage facilities, the upcoming Redispach 2.0 or the increasingly frequent and sometimes large-scale roll-outs of the digital secondary unit substation. We have summarised our experiences and concepts with these tasks and would like to share them with you.

But there is interesting news not only in the German market. Together with our Spanish colleagues from LACROIX, we have had our first promising customer contacts and are sure that we will be able to offer tailor-made solutions for the Spanish energy sector as well.

The SAE district heating concept has also arrived in practice - at Stadtwerke Lemgo we were able to demonstrate the functionality, performance and competitiveness of our systems.

Of course, our portfolio has continued to develop in 2020, even if in many places it has been rather hidden. In addition to the LMK-1 power measurement module for FW-50 and BCU-50, the switch from Codesys to Straton and the integration of the MQTT protocol into our systems, the latter adds an LTE modem to our ultra-compact station mS. We are also proud of our initial certification according to ISO27001, which we were able to achieve as a team despite structural and process-related changes in the company.

No less than amazing is our growth trajectory in recent years, crowned by our best year ever in 2020. We are pleased that our steady effort to be a reliable, innovative and fair partner for you continues to bear fruit. As a result, we were once again on the lookout for new personalities to complement our team this year - we found some!

The LTE modem for the mS-4G can also be mentioned as actual innovations. The latter adds an LTE modem to our ultra-compact station mS. We are also proud of our initial certification according to ISO27001, which we were able to achieve as a team despite structural and process-related changes in the company.

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Intelligent secondary unit substation (SUS)  
State of the art

On 1st October 2021, the responsibility for ensuring grid stability will also be transferred to the distribution system operators within the framework of Redispatch 2.0. In combination with the continued strong expansion of decentralised generation plants, the simultaneous decommissioning of conventional power plants and the resulting changes in our public power grid, the demand for transparency and controllability of operating resources is increasing.

While these requirements for decentralised generation, procurement and mixing plants as well as storage facilities have already been specified by guidelines such as VDE-AR-N 4110 and 4105 or the upcoming redispatch regime according to §§ 13, 13a, 14 EnWG, there is no uniform set of regulations for the equipment of local network stations, due in part to the different needs and network topologies of the distribution network operators. In the following, the range of different technical implementation forms will be illuminated and “best practices” presented.

**Advantages of the digital local network station at a glance**

- The expansion of the digital (automated or intelligent) local substation, whether nationwide or only at strategically important stations and topologically critical points in the network
- Helps to quickly isolate errors
- Shortens downtimes for faster and more efficient resupply (e.g. through the possibility of disconnection point relocation from the control centre)
- Provides the data basis for optimised grid expansion planning
- Provides the data basis for determining the redispatch requirement or potential
- And thus represents a core task for ensuring grid stability.

**Create transparency**

Where can measurements be taken?

- Tapping the currents and voltages on the MV side
- Tapping the currents and voltages on the LV side

In new grid stations, intelligent short-circuit and earth fault direction indicators are usually already installed at the factory, and record numerous other measured variables on the MV side in addition to the short-circuit and earth fault signals. Their provision (possibly processing and selecting) by telecontrol technology to the grid control centre already creates a fundamental transparency with regard to network conditions.

In addition to the measurement on the medium-voltage side of the SUS, the monitoring of individual low-voltage feeders is increasingly useful. This is made particularly clear by the fact that today 93% of RES (renewable energy sources) plants already feed into the distribution grid and 80% of these are connected to the low-voltage grid. The prospect of a further increase in the number of e-charging stations, PVA and CHP units in residential areas will increasingly lead to critical loads on individual cables, which may not be noticeable when measured exclusively at the busbar.

Another aspect in favour of measurement on the LV side, especially in retrofit systems, is that retrofitting the conversion transformers for measurement on the MV side is often very complex and cost-intensive. If measurements are not to be made on both sides (MV & LV), some MV values can be calculated from the LV measured values, taking into account the transformer characteristics.

How can measurements be taken?

The tapping of the currents can be done by cable conversion or folding transformer, Rogowski coil, small signal sensors or by integrated transducers. For the detection of the values, SAE’s own PM-1-S, PM-1-R and PM-2 power measurement assemblies can be used.

However, external measuring devices and network analysis systems are also frequently used. They are usually connected to the telecontrol system via Modbus RTU or TCP. The smooth connection to the systems commonly used on the market has already been implemented. Among others, with the following:

- Horstmann ComPass B, B 2.0, Bs 2.0
- A.Eberle EOR-3D, EOR-ID, EOR D, PQi-DA Smart
- ESKAP ESM-ARG-96, ESM-NA-500, ENA 7000
- Janitza UMG 96, 103, 104, 604
- Jean Müller PLMulti-II
- PQ Plus UMD 9B
Interventions from a distance

Based on precise information from the grid, further options arise. Remote switching of load disconnectors or circuit breakers, perhaps even automatic disconnector relocation, allows for rapid resupply after faults in the grid and thus contributes to improving the quality of supply. The associated reduction in travel times saves costs and increases the efficiency of operations management.

In order to protect the personnel working on site and the operating equipment, the command control should be reliable. This can be ensured by_inline monitoring, external circuit testing and runtime monitoring of the switching operation. The DSO expansion modules of the FW_/five.lf product family have these functionalities integrated. In this way, reliable control of the switch-disconnectors can be realised.

Overall, it is recommended to equip stations at central positions in the network with uninterruptible power supplies to enable interventions for a certain period of time after a power failure.

Integration of telecontrol technology in practice

Especially if a large number of stations are to be equipped, it seems to make sense to use uniform concepts as far as possible. With a view to quick initial commissioning and service work, it is advisable to have a solution in a separate cabinet, as far as space allows. A uniform design and standardised connection concepts allow for very efficient implementation and exchange processes, e.g. by using a standardised plug to connect to the switchgear according to the “plug and play” principle.

In some cases, the telecontrol technology can also be accommodated in the relay box of the switchgear and represents a very space-saving variant for integration.

If the aforementioned possibilities do not exist, the telecontrol technology can also be installed in external cabinets outside the actual local network station. Comparatively complex cable routing, higher susceptibility to vandalism and exposure to the weather are additional challenges of this configuration.

For upgrading and retrofitting particularly compact stations, there is often also the option of accommodating the telecontrol technology in a reserve panel on the LV fuse strip. These integrated complete solutions offer optimal space utilisation, especially in combination with modern fuse rails or switch-disconnector-fuse rails (e.g. from EBG).

Integration of telecontrol technology

1. Solution built in the form factor of a low-voltage strip with integrated telecontrol technology, automatic circuit breaker, power supply and, depending on the configuration, measurement technology.

2. Tapping of the values below the fuse strip with separate transducers, Rogowski coils or small signal sensors (especially relevant for retrofitting) for connection to measuring technology

3. Acquisition by fuse strip with integrated transducers

4. Tapping of the transducer values at terminal, cable or RJ socket for connection to measurement technology

5. Tapping the measured values on the integrated measuring device for connection to telecontrol technology via Modbus

Side note on procurement / supplier concepts

For more efficient implementation, especially of large-scale rollouts, customers are increasingly changing their procurement concepts. Here, switchgear manufacturers or system integrators supply ready-to-operate stations with telecontrol technology already integrated. SAE also provides the latter to the switchgear manufacturers or system integrators completely ready for use and optimised for rapid integration. When setting up similar concepts, we will be happy to assist you with our expertise and contacts to established partners.

Side note on MQTT

The comprehensive information from the low voltage in particular cannot and usually does not have to be integrated into existing control systems. Increasingly, a separate provision of this data via cloud-based systems is being considered. For this purpose, our telecontrol systems support the MQTT protocol (Message Queuing Telemetry Transport) and can thus transfer selected information securely and reliably into the IoT world.
Design and realisation of a local control system for the self-sufficient operation of a SUS at Rheinenergie

For almost 150 years, Rheinenergie has been the energy and water service provider for Cologne and the Rhenish region. Around 2.5 million people in industry, trade and commerce rely on their expertise for electricity, natural gas, heat and water supply. As a company with around 3,000 employees, Rheinenergie continues to offer many development opportunities, perspectives and attractive jobs for young people and students. Bachelor’s theses are regularly written within the company and their results are tested in practice.

The topic of Mr Tallack's Bachelor's thesis was the installation of a local control station in an existing intelligent local substation in Neusser Straße, which is already equipped with the FW-five telecontrol device. The aim of the local control station was to control the system on site.

After the process point list was created in setiT, the visualisation was done with visiT. Since visiT runs as a runtime on the telecontrol device, access to current process data is possible at any time. The login screen is accessed by entering the IP address in the web browser. By means of the user administration, a list was created in which each user was given different authorisations, e.g. parameterising, switching, reading, etc.

After logging in, the user sees an overview plan of the switchgear. In order to keep the operation as clear as possible for the staff, the circuit diagram is based on the Rheinenergie grid control system:

View of the control centre

At the beginning of processing, the process variables had to be imported from setiT and assigned to their own visiT name. In the visualisation with visiT, the class-instance model of object-oriented programming was used. To ensure that all properties do not have to be reprogrammed for each object, the framework conditions were defined in classes. If, for example, a new image is inserted, only a new image from the corresponding image class has to be added. This saves an enormous amount of programming effort.

Mr Tallack has also designed and independently manufactured a close control cabinet. This contains a touch screen display on the front side, on which the created visualisation is played. All inputs and outputs are led out on a terminal strip at the bottom. The cabinet also contains an FW-5, which was mounted for testing the visualisation.

During the test, voltage was applied to the terminal strips, simulating the input states. However, the control system can also be operated completely autonomously. The changeover from on-site operation and remote operation is done via a so-called local-remote switch.

Conclusion

With the designed proximity control, significant progress can be made in terms of supply security. The current operating status on the system is displayed graphically, which also simplifies operation for the switching personnel.
Final technician project at Regionetz
“Visualisation of a high-pressure transfer station (HDÜ) for natural gas”

Regionetz GmbH, based in Aachen, is one of the largest network operators in the region of Heinsberg and Düren districts. They take care of all tasks relating to construction, operation, network management, asset and meter management in the areas of electricity, gas, district heating and water networks.

At the beginning of 2018, a team consisting of two Regionetz employees and two employees of external companies developed a model for the visualisation of a high-pressure transfer station (HDÜ) for natural gas, in the course of their final project as technicians.

The aim of the project was to ease the workload on colleagues on standby duty and to minimise the time spent by colleagues in the Ex zones. For this purpose, the visualisation software visIT and the parameterisation software setIT from SAE were used and tested within the framework of the project.

Model structure

The model is divided into an inlet line with recording of the gas pressure and of the gas temperature and three outlet pipes in different pressure stages. The pressure stages are limited to a maximum of 100 mBar by house regulators. The initial consideration of using a water loop to replace the natural gas was discarded due to implementation difficulties and compressed air operation was chosen instead.

The high-pressure transfer station is schematically displayed on a touch display via the visIT software and the following measured values of the transmitters are displayed:
- Inlet pressure
- 3 output pressures
- Temperature
- Odor tank level

Furthermore, the outdoor lighting can be switched on and off either via the visualisation interface using a created button or with the help of an iOS app via Bluetooth connection. The odorant tank level is determined by means of a radar-guided measurement and is forwarded to the FW-S as well as to the Siemens PLC. The FW-S shows the processed data as a bar chart and percentage value on the display.

In the PLC, the analogue signal of the transmitter is converted into an LED display. The odorisation is represented by a running light that is programmed in the PLC. Odorisation is necessary to make it possible to smell the natural gas. The simulation by the running light was chosen because the odor (tetrahydrothiophene THT) is highly flammable.

In addition to the visualisation, access control was implemented with the “ElegooMega” microcontroller from the company Elegoo. The door lock is only released after successful login with an RFID tag and subsequent entry of a PIN code.

Since this was a pilot project, no safety concept has been created for the microcontroller. No real implementation is planned for either the access control or the remotely switchable outdoor lighting. Furthermore, no control system was connected due to the model character. The display used has an integrated web browser via which the FW-S website is called up. The http protocol and the IP address of the FW-S are used for this. The display is connected to the telecontrol system using a LAN cable.

Findings

The project participants describe the use of the two software tools setIT and visIT as very practicable and, thanks to the training materials provided, pleasant.

The colleagues on call can undoubtedly have their workload eased by the visualisation. Via remote dial-in, the messages can be viewed and the errors can be localised directly by means of visualisation. The viewer can immediately see whether the colleagues need to be deployed or whether the work can be postponed until the next working day. Thus, the time that an employee must stay in an ex-zone can be minimised. An exact time value could not be determined in the project work, as no conversion of a real HDÜ has been carried out so far.

The implementation of the project took about 200 working hours per person, which the participants provided after their personal working hours only. Despite the challenge of coordinating work, school and project, the project was rated “very good”.

Representations of the high pressure transfer station with visIT
LACROIX in Spain
Smart Grids

As already comprehensively explained in the last issue of SAE News, SAE has been part of the LACROIX Group since 31st of January 2019. We proactively initiated this step on the part of SAE, in particular to expand our international market position. Together with our colleagues from LACROIX, we have already been able to identify some international target markets with high potential. One of them is Spain.

Brief description LACROIX Group in Spain

The LACROIX Group has been represented in Spain for more than 25 years by Lacroix Sofrel and Lacroix City and generates an annual turnover of approximately €15 million. About 100 people are employed in the factories in Bilbao (LACROIX Signaliation), Madrid (LACROIX Traffic) and in a subsidiary of LACROIX Sofrel. LACROIX Sofrel and LACROIX City are well positioned in the Spanish market and have a strong reputation and good image. In addition, the Spanish branch of the group also serves the Portuguese and Latin American markets and works with local partners and distributors there.

Why is the Spanish market interesting for SAE?

The Spanish electricity sector is currently undergoing a strong transformation and digitalisation process. In the course of the energy transition, an upswing in renewable energies and a move away from conventional power generation are being sought. This development is also supported by an announced law on climate change and the energy transition. The core intention of this law is to focus on renewable energies and improve energy efficiency. Spain’s declared goal is to generate 70% of its electricity from renewable sources by 2030. This year, a first major step has already been taken towards this goal and all coal-fired power plants were shut down.

Spain’s networks become smart

Smart grids are essential for the energy transition and the development of a more sustainable society. Part of this task is building more efficient distribution grids, which in turn requires investment in their monitoring and control. Intelligently integrating renewable energy sources and managing the decentralisation of energy production are tasks that Spain, like many other countries, is facing. LACROIX Group is pleased to be part of this challenge by supporting market participants in building smart grids through the provision of high-performance technologies and practical know-how.

Potential for SAE

The modernisation and digitalisation of local substations offers great potential for the use of SAE technology, as a significant proportion of the total of around 300,000 local substations in Spain will be modernised in the coming years. At present, Spain has no regulations regarding the monitoring and control of feed-in from renewable energies, as is the case in Germany. However, with the first decisive steps, the need to take action in this area is growing and is currently being examined by the Spanish authorities. The efforts to build smart grid structures in Spain give us the opportunity to put our extensive practical experience in the field of feed-in management and local grid automation in Germany at the service of new customers. Furthermore, we benefit from the knowledge that the local LACROIX subsidiaries have acquired about the Spanish market. We want to use the ability to flexibly adapt our products into customised solutions to set a benchmark in this field.

Guido Sartori, Business Development Manager of the LACROIX Group in Spain, adds:

“We can draw on a wealth of experience in scenarios and implementations to adapt to the needs of the market and market participants. Our expertise is highly appreciated internationally as it is a great source of inspiration for solving the specific local interpretation of the smart grid”.

Benito Perez, Business Development Manager of the LACROIX Group in Spain, adds:

“Spain is very interested in the concept for feed-in management and the distribution grid operators are now considering how they can regulate the issue. We encountered this problem 10 years ago in Germany and have developed corresponding solution concepts. We are convinced that by sharing our experiences, we can help and advise market participants on the best way forward.”
HEITEC stands for industrial competence in automation, digitalisation and electronics and offers solutions, products and services. With technically high-quality, reliable and economical system solutions, HEITEC supports over 2,000 customers in improving their productivity and optimizing their products. More than 1,000 employees at numerous locations domestic and abroad ensure customer proximity and industry expertise.

HEITEC’s competencies in protection and control technology include concept development, parameterisation and commissioning of the complete secondary technology, plant communication with standardized protocols as well as initial and recurring tests of protection devices, such as UMZ/AMZ, distance, differential or Q/U protection.

The end customer’s desire for simple project planning, parameterisation and operation prompted HEITEC to work with SAE as a partner in 2016. Since then, various projects have already been realised. One of these is the “Alte Meierei” project, in which the stations are used for local network automation as well as the telecontrol equipment of switchgear houses. In the project, the complete secondary technology of a medium-voltage switchgear was renewed. The primary technology (air-insulated MV switchgear) was retained and connected to the new technology. In addition, some communication paths are set up redundantly and deliver the information in parallel to several separate control centres.

Mr. Augustin, team leader in the area of protection and network control technology at HEITEC AG, praises the solution:

“We particularly like the technically mature and up-to-date technology, which is very stable in operation, and if there ever is a problem, help is provided very quickly and without complications”.

Furthermore, Mr. Augustin appreciates the close contact to sales and technology, as well as the customer-oriented service even after the project implementation, such as information about firmware updates, service, etc., when working with SAE.

HEITEC AG uses SHDSL on private cable routes as internet-based communication paths. The IEC 60870-5-104 protocol is used between the control centre and the substations. IEC 60870-5-103 and Modbus RTU / TCP is used between the substations and the devices connected to them. HEITEC relies on the use of a user administration and the use of secured protocols (https, ftps) in order to guarantee the highest possible IT security.

In the future, HEITEC is planning the ongoing renewal of a 30/10kV substation (protection technology and station control technology), as well as various other station conversions with SAE technology.

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The FW-S-GATE telecontrol unit with the associated 8DQ2AI and PM-1 expansion modules as well as the setIT parameterisation software were deployed. Four “SG-50 Kombisave” protection devices from NSE and the “UMG96RM” network analysis system from Janiza were connected to the SAE technology.
Improving power system availability in Indonesia by our partner Syntek Energy & Control

Founded four years ago and based in Jakarta, Syntek - Energy & Control is a consulting, engineering and construction company, whose vision is to contribute to the Industrial Revolution 4.0 in Indonesia, in the field of Renewable Energy, Industrial IoT, Industrial Automation, and Smart Grid.

With their extensive project experience both nationally and internationally, they are able to provide advanced solutions for control systems, instrumentation and electric power solutions. Their service portfolio includes consulting, design, system improvement and maintenance of technology and software.

Syntek offers excellent turnkey solutions for grid automation, process and power plant automation, as well as renewable energy plant EPC/O&M.

Syntek has been a partner of SAE since June 2019 and has already successfully implemented SAE telecontrol technology in more than ten medium voltage substations including one ongoing project.

In addition to the quality of SAE products, Mr. Andreas Yonas, Head of Syntek’s Control Division, is convinced of the product flexibility and the parameterisation software setIT, which he believes to be one of SAE’s greatest strengths.

The FW-50 systems have been implemented as 20 kV feeders telecontrol device across the country. The connections of the Micom and Multilin protection relays were quickly put into operation via IEC 60870-5-103 and IEC 61850 IED, the connections to the superimposed SCADA systems via IEC 60870-5-104 or DNP3.

PLN UP2D as their main customer can now remotely monitor and control their MV distribution network from their DCC (Distribution Control Center) with peace of mind. In addition to the restrictions due to the coronavirus pandemic, the limited documentation of old medium-voltage station feeds proved to be a difficult challenge during project execution. Syntek managed to complete all contracts on time, thanks to the relentless effort of their site team combined with close customer collaboration.

From SAE’s point of view, it is worth mentioning that our new partner is able to work and train independently, realizing extensive projects without prior setIT training.

Inside SAE
ISO 27001 at SAE

As operators of critical infrastructures, many of our customers have long been obliged to obtain certification according to ISO 27001.

As a responsible partner, there was no question for us that we wanted to meet the same high requirements! Thanks to the excellent work of our ISMS team, led by Markus Dewerny, as well as the spirited cooperation in all departments, our company has been officially certified according to the ISO 27001 standard since 8th of July 2020.

We are particularly proud of the fact that our “scope”, i.e. the area of application of the certificate, does not only refer to individual sub-areas and processes, but encompasses the entire company.

Electricity

Secondary substation local HMI & CCTV

m5-4G LTE for m5

The m5-4G is the LTE module for our m5. In addition to preparation for international radio approvals, it offers the parameterisation and diagnostic functions already known from the FW-5/GATE-4G via setIT. Furthermore, no additional power supply is necessary for the m5-4G, as it is powered by the m5 base module. Through this, extremely compact and attractive overall solutions can be created even for the smallest applications.
Inside SAE

New employees

SAE continues to grow strongly - in the current year 2020 alone, 14 new employees have already been hired. In sales, we welcomed five new employees:

David Puhlmann joined SAE IT-systems in August 2020 as a new sales representative. As a qualified electrical engineer, he has been in technical sales for over 13 years, including in the areas of industrial automation and building automation, network control systems and telecontrol technology. Now Mr Puhlmann is available to provide advice and support to our customers and interested parties in eastern Germany.

We also welcome Roland Speidel, a trained industrial electrician, to our in-house technical sales team. Mr Speidel previously worked as an electrical planner for electrical and control engineering in a Cologne engineering office and has always been familiar with switchgear technology, in particular in the field of medium voltage. In addition to preparing offers for telecontrol technology, he will also support our Finnish partner Arcteq in marketing their protection devices and implementing projects in Germany.

Since October, Dr. Torsten Kasel has been strengthening our sales team as Area Sales Manager. Dr Kasel, in close cooperation with Oliver Callegari, Olivier Bigot and his team, is responsible for the development and sales of the LACROIX Sofrel portfolio in the area of Smart Water Solutions. In order to place the products in Germany, Austria and Switzerland, Dr Kasel takes over the integration process during the implementation of individual projects.

Our project planning department also benefited from reinforcement: In June, Dany Nchimi joined us as a new project engineer. After his bachelor’s degree in mechatronics, he initially worked as a PLC programmer. Our team is looking forward to Mr Nchimi’s support in the parameterisation and commissioning of our systems as well as in the project business.

We would also like to welcome Kerstin Kerlen to our team. As a trained office administrator, Ms Kerlen can look back on a wealth of experience in the areas of production, purchasing and sales. Since May, Ms Kerlen has been supporting our sales team to the best of her ability in, among other things, the preparation of quotations, orders and training preparations.

Kerstin Kerlen

The technical sales office gained another employee with Erkan Cakir, who has been supporting the team since September 2020. Mr Cakir is a trained industrial clerk and has recently successfully completed his studies in electrical engineering. In addition to preparing and following up on quotations, he will contribute his expertise in determining the technical feasibility of customer enquiries and projects.

Erkan Cakir

Niklas Jaschkowitz was also hired as a project engineer and has been supporting the team since September. Previously, he worked in the field of building automation for four years. Thanks to his training as an electronics technician for automation technology and further training as a state-certified technician for electrical engineering, Mr Jaschkowitz has an extensive technical knowledge. We look forward to his support in device parameterisation and commissioning.

Even though, for reasons of space, we are only presenting colleagues who will be in regular direct contact with our customers in the future, other additions should not go unmentioned: we strengthened our teams in plant engineering and software development by two people each, in the area of support/test laboratory another employee supports us, and there was also an increase in colleagues in production and purchasing.

We hope all new colleagues enjoy a good start!

Anniversaries

Thank you very much!
The success of our company stands and falls with our employees:
They managed to successfully implement our projects even in a stormy and uncertain 2020 thanks to strong team spirit and professional skills.
Therefore, we would like to congratulate and thank all colleagues who had an anniversary in 2020:

Werner Wenzel, 40 years
Detlef Marx, 35 years
Stephanie Kramprich, 25 years
Klaus Wittitch, 20 years
Gregor Degener, 20 years
Sebastian Londa, 10 years

Niklas Jaschkowitz

Kerstin Kerlen

Dr. Torsten Kasel

Roland Speidel

Dany Nchimi
Stadtwerke Lemgo

The leakage monitoring of plastic casing pipes poses a challenge for small and medium-sized companies. District heating network operators face challenges. What is the easiest way? Should the district heating network be monitored via the control centre, or is an isolated solution desired? SAE IT-systems offers both.

Stadtwerke Lemgo supplies around 40,000 inhabitants with electricity, gas, water and district heating. The district heating network with a total route length of 64 km is in the middle of the field in terms of length in Germany.

In the past, cyclical measurements were carried out in Lemgo to monitor for leaks. For this purpose, each loop of the network was measured at least once a year by the district heating technicians of the Stadtwerke in an attempt to protect the network from leaks. Not an easy task, because between two measurements Stadtwerke Lemgo was effectively "flying blind". This procedure leaves a lot of space or time in which defects in the network, e.g. excavator damage, cannot be detected and thus also cannot be remedied promptly and cost-effectively.

Traditional solutions for leakage monitoring place measuring units on the corresponding loops and provide for the measuring units to communicate with a central PC or route computer. These central PCs act as stand-alone solutions, i.e. a separate IT infrastructure (PC and dedicated software with corresponding regular updates) must be procured. For the integration of further measuring units, additional services often have to be commissioned from the respective manufacturers.

SAE NEWS · Solutions in Mind

Leakage monitoring for district heating networks at Stadtwerke Lemgo

This poses great challenges for small and medium-sized municipal utilities in particular – both in terms of price and organisation:

For example, who receives alarm messages after work or on holiday? How can it be ensured that enough staff members remain trained over the island's period of operation - such as in the event of a retirement or change of department?

It is not uncommon for municipal utilities to shy away from the associated expenses and the generally sensible continuous monitoring is not implemented.

The Cologne-based company has been supplying more than half of Germany’s public utilities and energy suppliers with telecontrol solutions for over 45 years. The core of this technology is to guarantee the secure transmission of information between the infrastructures of the public utilities (electricity, gas, water) and their control centre. SAE IT-systems not only masters all the complex protocols required for this, e.g. IEC 61850, IEC 60870-5-101 or -104, but can also draw on a great deal of expertise in setting up or selecting suitable communication paths.

The operation of a control centre - sometimes with 24/7 staffing - is usually a high but essential investment for municipal utilities, which should be used in the best possible way. With the introduction of the ISO-1 measuring module in 2018, SAE IT-systems enables continuous digital monitoring of individual loops in the district heating network and direct provision of the information to the control centre.

"The advantages are obvious: no isolated solution, no necessary services for parameterisation or commissioning," explains Marco Kirchner, network control technology at Stadtwerke Lemgo. "We are already familiar with the technology from SAE IT-Systems and can work autonomously."

Marco Kirchner, Network control technology, Stadtwerke Lemgo

Deployment in Lemgo

Stadtwerke Lemgo has been using SAE technology to monitor 30 district heating loops since 2019. For parameterisation and commissioning, Mr Kirchner used the particularly user-friendly setIT software.

The standby plans are centralised in the control centre for electricity, gas, water and now also for district heating. The main focus here is on alarm monitoring (loop breakage, sudden leakage). In addition, the control centre provides the district heating operation management with a dashboard that focuses on preventive maintenance. Here, the long-term loop values are analysed and appropriate remeasurements and improvements are planned.

View of the district heating loops on Google Maps with respective status message
Control centre versus isolated solution

In the last few decades, leakage monitoring has always been realised with isolated solutions. The structures in the departments of the municipal utilities are organised accordingly.

With its direct connection to the control centre, SAE is bringing a real innovation into play that is safer, simpler and cheaper. Nevertheless, some clients still wish to operate a stand-alone solution. There may be several reasons for this:

- The access rights for the remote heat operation management to data of the control centre cannot/should not be converted
- The desire to act autonomously
- Haptics of visualisation
- Habits of usage

SAE would also like to offer an appropriate solution for these customers. If no control centre should or can be used, it is possible to commission a software specialist, e.g. FlowChief, with the visualisation. In this case, the connection is made via connectIT, as the data does not run via a control centre. The visualisation can be adapted to the individual needs and ideas of the customers. Which variant should be chosen for economic and practical reasons is to be decided individually.

SAE IT-systems offers both solutions

To this end, Stadtwerke Lemgo supported the company in 2019 in developing a pilot project for „permanent leakage monitoring with visualisation as an isolated solution“. The graphics on the right show what a monitoring solution with FlowChief looks like. So both are possible. The decision lies with the district heating network operator.

“We have clearly gained an overview here and can locate and rectify even the smallest faults much more quickly. We now know with a high degree of accuracy whether there is moisture penetration of the insulation that lead to increased heat loss and corrosion. With this knowledge, we can operate the entire network more cost-effectively“.

Ralf Settertobulte,
Division Manager District Heating Networks,
Stadtwerke Lemgo
Solution for switching house connection at Stadtwerke Bayreuth

Since 1939, residents in and around Bayreuth have been able to count on Stadtwerke Bayreuth. In an area of around 200 km², they supply their customers with 100% green electricity and green gas - automatically, at no extra charge and TÜV-certified. In addition, the municipal utilities offer district heating and energy contracting. The company, which has around 400 employees, also supplies its customers with around five billion litres of drinking water every year and transports around six million passengers around the city by bus. Besides several parking facilities (multi-storey car parks, underground garages), they also operate several thermal baths and spas in Bayreuth. In 2019, Stadtwerke Bayreuth generated a turnover of € 137 million.

The company has been implementing joint projects with SAE since 2015. In addition to the recommendation of other energy suppliers, the intuitive parameterisation software setIT, the flexible application options and the variance of the interfaces were the main reasons for the cooperation.

On an annual average, about 12 systems are installed for a wide variety of applications in the areas of electricity, gas and water. The tasks in the field of electricity range from feed-in management for EEG plants to local network automation and for the telecontrol equipment of switchgear houses. The FW-5-GATE and FW-5-GATE-4G telecontrol units with the associated 8DI, 8DO and 4AI expansion modules as well as the modular FW-5D are primarily used for this purpose.

Successful project implementation

The task of the “SH Bärenleite” project was the renewal of a grid-relevant 20 kV underground substation with five feeder panels and two feeder panels, as well as two earth coils. Switching cells and protective devices from ABB were used on the system side. The protective devices were connected to a FW-5-GATE using fibre optic star couplers from MOXA. IEC 61850 was used as the protocol on the field side. On the transmission side, the IEC 60870-5-104 protocol was used for redundant connection to two separate control systems.

The objective was the recording of the process points via IEC 61850 protocol by the SAE telecontrol technology, their forwarding via a copper connection to the next communication node and thus further towards the control system. A route monitoring of the copper connection was implemented by means of a central SNMP collector. The corresponding visualisation for the transition to the running mains operation is then carried out in the control system. Local messages such as the overtemperature of the ES coils, the building monitoring and the monitoring of the 60 V UPS system were realised via hardware inputs (I/Os) on the SAE telecontrol system. In addition, a flow measurement of a nearby water meter shaft is also connected.

IT security

In order to achieve the highest possible IT security, Stadtwerke Bayreuth uses user administration, secure protocols (https, ftps) and VPN encryption. The VPN encryption takes place on the fibre-optic backbone ring with dedicated physical structures. If communication is realised via mobile radio or via a fixed DSL connection, the tunnel is established in the SAE direction via IPSEC gateway.

A special feature and at the same time a challenge of the project was the implementation of the IEC 61850 interface on the plant side. Here, the contracted service provider for the protective device technology generated a corresponding SCD file with all process points, which was then imported into the telecontrol program and was further processed there. The implementation of the SCD file in setIT was uncomplicated and very convenient.
Another special feature of the project is the redundant communication paths and the connection to several control centres.

Especially with regard to the IEC 61850 protocol and the degree of automation in the network, the “SH Bärenleite” project has significantly advanced the Bayreuth municipal utility and provided valuable insights. In the future, the municipal utilities will continue to rely on SAE as a reliable partner for the implementation of their projects. For example, a pilot project is planned for an intelligent local network station with bus extension from SAE as well as remote SAE technology in the switchgear. Another project provides for the connection of new, intelligent combined heat and power systems at the University of Bayreuth with approx. 1,200 data points.

Stadtwerke Bayreuth particularly praises the short communication channels, the creative solutions for complex tasks and the proximity to the customer.

Industrial park monitoring by IGS Netze

Founded in 2013, the grid company IGS Netze GmbH is a wholly owned subsidiary of MVV Industriepark Gersthofen GmbH based in Gersthofen. IGS Netze GmbH operates the electricity distribution network in the Gersthofen industrial park. As a distribution network operator, the company reliably brings electrical energy to the customers’ plants, who benefit from the high availability and quality of the supply lines. In addition to electricity grid operation, the grid company takes care of planning, expansion and maintenance of the grid as well as metering point operation.

In the course of the next two years, IGS Netze GmbH, in cooperation with SAE, is planning the further modernisation of the remote meter reading and the replacement of the meter reading devices from Gossen-Metrawatt. The core task was the collection, formation and storage of 15-minute load profiles. For this purpose, the measured values are converted into 15-minute payments with the integrated PLC functionality codeIT. To measure the load profile, a total of 39 substations are equipped with FW-5 and FW-50 telecontrol devices and connected to the Kisters SCADA system via the IEC 60870-5-104 protocol. The setIT software is used for parameterisation. Both parameterisation and on-site commissioning are carried out by the SAE service team.
Implementation of VDE-AR-N 4110
Flexible connection concepts

New framework

The EU-wide Connection Network Codes (NC RfG - Requirements for Generators) have been in force since 17th of May 2016. The aim of this standard is to create pan-European harmonised regulations for the grid connection of power generation systems. For this reason, the VDE i FNN has reduced and summarised a large number of the currently valid documents. The result is four new technical connection rules (TCR):

• VDE-AR-N 4105 Generation plants (EZA) on the low-voltage grid ≤ 1kV
• VDE-AR-N 4110 Technical connection rule medium voltage > 1kV to ≤ 60kV
• VDE-AR-N 4120 Technical connection rule extra high voltage > 60kV to ≤ 150kV
• VDE-AR-N 4130 Technical connection rule extra high voltage > 150kV

The TCR are the basis for the technical connection conditions (TCC) of the grid operators. The TCC of the distribution system operators (DSO) apply together with Section 19 EnWG "Technical Regulations" and are an integral part of grid connection contracts and connection usage relationships. For new plants, an individual solution can be developed based on the TCC of the DSO and the project-specific data point list for the grid connection. In this context, we offer the following service packages:

1. Delivery of the hardware & software and training of your personnel on the complete system for independent commissioning
2. Delivery of the hardware, integration into the system by the customer (e.g. in a control cabinet provided by the customer) and commissioning.
3. Delivery of a complete, pre-parameterised telecontrol solution in the control cabinet including installation and commissioning.

Practical implementation of VDE-AR-N 4110

In parallel with the entry into force of the new grid connection regulations, many grid operators have also changed their connection concept. With the concept often referred to in specialist circles as the master/slave concept, the DSO provides a gateway with a precisely defined or standardised transfer interface to which the telecontrol system is connected. The customer’s system must be connected to the system. The customer's telecontrol system records the data points of the MV switchgear, the protection device, the short-circuit indicator(s) and the parking controller and passes them on to the gateway. The data points of the MV systems can be connected via individual wires or wired to a predefined Harting connector, which allows for convenient "plug and play" solutions.

Since completely new customer or feed-in plants are often provided, which involves switchgear manufacturers or system integrators, we have expanded our concept. Increasingly, we provide telecontrol technology or ready-made complete solutions for the application field via these partners. The cooperation with the companies is developing very well and creates benefits for all entities involved.

We look forward to more business!
Vrielmann GmbH – Your reliable partner
Complete solution in line with VDE-AR-N 4110

Feedback signals from the medium-voltage switchgear

The feedback messages from the MV system, such as the switch position messages (ON-OFF-EARTH), the draw of the HV fuse and the SF6 gas alarm, are sent to the DI expansion board. The messages are adapted according to the specifications of the power supply company (type identification, IOA, etc.).

Control of the motor drives in the MV system

With the aid of the DSO/extension board, motor drives can be controlled in all fields. This makes it possible to switch the system on and off remotely. Of course, this type of system is equipped with a local/remote switch on the MV system. Data acquisition and communication with the connected generation unit (PV systems, CHP etc.) is realised via the EZA controller using Modbus TCP or Modbus RTU.

Transfer of the bundled data to the RU

The data collected in the FW/GATE are transmitted to the gateway of the utility company according to the data point list of the utility company via the protocol IEC six/seven/eight/nine/or -three.

Cooperation with SAE

A solution is only as good as its components. For this reason, Vrielmann uses SAE technology in its projects. The following example project shows the telecontrol connection of a transformer station with a generation unit according to DIN VDE-AR-N-4110 using SAE telecontrol technology. The task consisted of measured value acquisition, signal processing and subsequent transfer to the EVU gateway.

We are very pleased to be able to offer our customers a customised solution with the SAE components. We thank SAE for the excellent cooperation and the superb service. The aim is to integrate the components into our industrial energy management systems and building control systems and to use the data obtained to and functions into a complete solution. This ensures maximum energy efficiency, plant availability and transparency of an electrical supply system".

Dipl.-Ing. (FH) Heiko Ensink,
Managing Director of Vrielmann GmbH
Behind the solutions

Project engineering at SAE

The "Behind the Solutions" report series highlights the tasks and challenges of one SAE department at a time. This time we present the project planning department.

Erich Rittig heads the department together with Jens Hecht and has been with SAE for more than 30 years. He explains the tasks, challenges and special features that our project engineers master every day to ensure the successful completion of projects large and small.

Tasks of the project engineering department

The first task is always to elaborate a clear understanding of the concrete tasks or problem of the customer. Based on this, a corresponding concept is developed and offered. Depending on the requirements, this includes not only advice on the technical and organisational aspects of a project, but also specific project engineering and project management. In practice, project management includes not only the planning of SAE’s own activities, but also the coordination and control of subcontractors, partners and project-involved entities (e.g. network operators). Furthermore, the project engineering department also supports our customers in an advisory capacity regarding IT security issues and the pre-test.

Once the contract has been signed, our project engineers implement the requirements of the specifications into a corresponding specification sheet and draw up the corresponding implementation plans.

Commissioning

Besides parameterisation and PLC programming, the commissioning of our systems is one of the core tasks of our department. As a rule, this takes place on site, but depending on the infrastructure and preparation, it can also be carried out via "remote access". A particular challenge is the coordination of schedules for RES projects. Often, the generation plants go into operation after completion with a lead time of three to four weeks. The time window for commissioning is usually limited to one day by the responsible network operator. Therefore, in addition to the necessary know-how, the precise coordination of all parties involved is essential for the success of the project.

Why service contracts?

It is not always easy to stay up to date when you see how quickly the topics of digitalisation, IT security or transmission technology are developing. Additional challenges, especially in connection with the topics of ISMS and ISO 27001, are difficult for some clients to cope with in view of scarce or even decreasing personnel resources - a discussion of the topics in adequate technical depth is often no longer possible.

This is where we help our customers with suitable support services. In 2020, at the request of numerous customers, we added a service contract to our offer. It includes the following service components:

- **Annual system check** includes a detailed analysis of the customer’s system with regard to (occurred) errors, the timeliness and relevance of the system settings, the derivation of any recommendations for action as well as the presentation of new functions in setIT.
- **Software ABO (annual fee)** The Software ABO includes the provision of the latest programme versions in each case without further costs for a change of the main version, unlimited use of all product improvements and new functions and includes the free use of our support service (service hotline). The Software ABO is billed in the form of an annual fee.
- **Annual update of telecontrol technology and routers** Based on the weak points identified in the system check and the recommendations for action given, substations and master stations are loaded with new setIT configurations and then a plausibility check is carried out. This improves the security, maintainability and expandability of the overall system (requires commissioning of the annual system check and the software subscription).

A positive side effect: The even more regular customer contact not only allows us to recognise the need for action in the customer’s topology at an early stage, it also offers the opportunity to pick up important impulses for the continuous improvement of our products and future innovations from our company.

“Project success is the sum of good engineering, the necessary know-how and close and constructive dialogue.”

Erich Rittig