Cross-factory central control system for engine and automobile production at AUDI HUNGARIA MOTOR Kft.

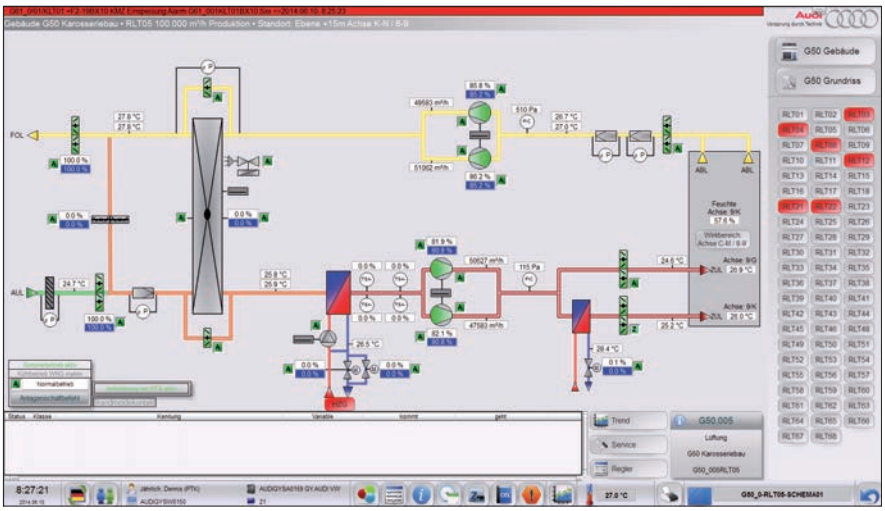
Flexible, efficient and sustainable – building automation with zenon

With an extensive factory expansion, Audi Hungaria was also facing the challenge of implementing a cross-plant central control system (CCS). The aim was platform-independence, the introduction of a comprehensive energy management system and the targeted and easy evaluation of historic and actual data. Kropf Solutions implemented this major project on the basis of the HMI/SCADA solution zenon and the reporting software zenon Analyzer.

AUDI HUNGARIA MOTOR Kft. in Győr, Hungary, has been developing and manufacturing engines for AUDI AG and other companies of the Volkswagen Group for over 20 years. In 2014, the company started series production of various models. That year, with more than 11,200 employees, Audi Hungaria manufactured a total of 1,973,734 engines and 135,232 cars. In order to be able to master car production in addition to the development and production of engines, Audi invested in comprehensive factory expansions. Part of this factory expansion was also to implement a central control system and equipment monitoring. The car manufacturer's objective was to set up a central control room allowing the control and monitoring of energy and production materials for over 15 buildings, over a factory area of 395 hectares.

HIGH DEMANDS ON THE NEW CCS

One of the main requirements was to find a central control system that is platform independent: "Our objective was to introduce an open control system that had a large number of inter-



Audi Hungaria decided to use the zenon HMI/SCADA solution due to its platform independence and variety of interfaces.

faces. This would allow us to remain flexible in the selection of hardware and other control systems, and independent of hardware manufacturers", explains Norbert Németh, Team Leader of the CCS Dispatcher Team at AUDI HUNGARIA MOTOR Kft. In addition, the car manufacturer wanted to introduce energy management, enhance fault management and establish comprehensive evaluation possibilities for the consumption of energy and production materials.

ZENON – THE RIGHT CHOICE

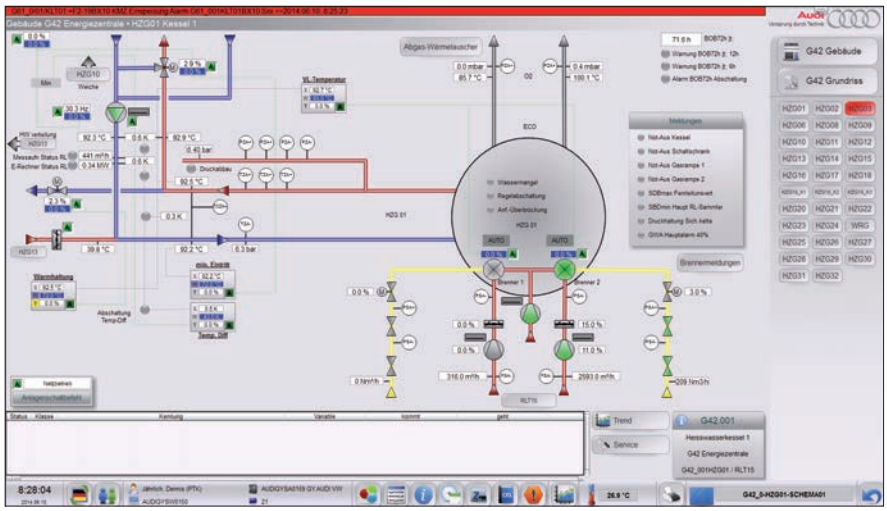
Audi Hungaria decided to use the zenon HMI/SCADA solution due to its platform independence and variety of interfaces. Another criterion for the decision was the high number of functions and advanced level of performance that the software offers. This also includes the archiving and trend analysis. For example, Audi archives and analyzes equipment data such as the temperatures of the ventilation system or fluctuations of the air intake temperature in order to ensure a consistent temperature for employees and machines. Further examples of trend analyses are the generation of compressed air, the creation of hot water, cooling with cooling units (for water cooling of robot cells or other equipment components). "With the old system, it took hours to create evaluations. Now, with the zenon-based solution, we have all the desired information and analyses we need in seconds – that increases our reaction speed and our productivity", adds Norbert Németh from Audi Hungaria.

KROPF SOLUTIONS AS A CAPABLE PARTNER

Kropf Solutions, an Expert Partner of COPA-DATA, implemented the solution together with their Hungarian branch, Prozesstechnik Kropf Hungaria Kft. The company, from Oberkotzau in Germany, has already established itself as an HMI/SCADA specialist beyond European borders with three sites in the Czech Republic, Hungary and Slovakia. Around 50 employees look after more than 100 well-known customers from the automotive, consumer goods, food & beverage, plant engineering and mechanical engineering industries. Kropf Solutions implemented the complete control system (heating, ventilation, air conditioning) for all factory buildings in automotive production (pressing plant, bodywork, sequencer, paint, assembly, start-up hall, checking area, testing line) as well as for the central building, the energy headquarters (supply material generation), the pump room and tool manufacture at Audi Hungaria.

A WELL-THOUGHT-OUT, FACTORY-WIDE SOLUTION

The control system with a total of 140,000 data points now consists of a central server with a standby system and Webserver Pro with 100 clients, which are connected to the group-wide intranet. People in charge of the building thereby have flexible access to the solution, regardless of where they are. The control room itself is equipped with four operating clients, including one



The car manufacturer's objective was to set up a central control room allowing the control and monitoring of energy and production materials for over 15 buildings, over a factory area of 395 hectares.

dual-monitor system. Two workspaces are used for the engineering (development and test of the GLT applications). The central control system of the factory building is monitored in a four-shift operation. This ensures that the necessary supply materials for the automotive and engine production can be provided without interruption. In addition, Kropf Solutions has installed 20 kiosk terminals with touch panels (CCS clients) at the most important locations in the production hall, so that the CCS team or the maintenance workers can easily inform themselves about the supply of production materials and energy at a central point in the hall. There are 156 information focus points (IFPs) in the halls and buildings: Each of the 156 IFPs is equipped with a panel for on-site operation. The PLCs of the information focus points are monitored with a watchdog. Kropf Solutions has also implemented an instrumentation and control engineering technology in the halls for the bodywork, the bodywork storage area (sequencer), the paint shop and the tool manufacture. zenon is also in use there as an HMI system (VIPA panels) at over 60 IFPs. Microsoft solutions are used for the complete infrastructure: Windows 2008 R2 for the servers, SQL Server 2012 for zenon Analyzer, Windows 7 for the operating PCs, notebooks and kiosk systems as well as Windows CE for the touch panels.

OVERCOME COMPLEX TASKS WITH ZENON

In order for the timing of the different processes in the central control system to be controlled optimally, Audi uses the Production & Facility Scheduler (PFS), which is fully integrated into zenon. Depending on the date, time or result, the people in charge of the control system can then use the factory calendar to define which processes are triggered and when. An example: In the PFS, it has been defined that the ventilation equipment is to be shut down in the bodywork section when production is not taking place. For equipment with heavy consumption, considerable savings can be achieved very quickly this way. Audi uses the Historian and an SQL database to record and archive all data in relation to the supply of materials and energy, for five years. All values (such as, for example, the consumption of hot water) are initially saved in the PLC, where they are safe from a failure, whereby zenon can write the values block-wise to the zenon archive using real-time data acquisition (RDA). Each set of data that is saved in an archive also contains, in addition to the variable value, the time stamp in milliseconds and the variable status. The data can thus also be arranged historically and analyzed correctly. The alarm management alerts users to critical process events, logs all alarms and supports the CCS team in localizing problems or faults in the equipment and rectifying these. At Audi Hungaria, over 50,000 fault message data points are analyzed and evaluated in detail. That is approximately 365 theoretical possibilities where problems can arise for each information focus point. In the Alarm Message List (AML), the employees can see at a glance when and why an alarm was triggered, how they need to intervene and where. It is precisely with large plants such as this where it is thus easy to orientate oneself in a targeted manner and to only display the events that are important at that moment. With the Extended Trend module of zenon, the users and people in charge of the central control system can have information such as energy values, the measured values of the heating

> *zenon makes it possible to check and analyze the functionality of our building services equipment quickly and in a targeted manner and to detect faults early and work more efficiently overall. Thanks to the trend analyses, we have the possibility to optimize the existing infrastructure in a targeted and prompt manner.*

NORBERT NÉMETH, TEAM LEADER OF CCS DISPATCHER TEAM AT AUDI HUNGARIA MOTOR KFT.

and ventilation systems, temperatures and air flow displayed in curve form, in order to analyze this, to compare it and to use it as a basis for making decisions. The complete documentation of the automation stations is also stored in the control system. This is how the CCS employees can, for example, view the equipment interconnections, the lists of components and their functionality and quickly and easily get their bearings. The notebook function is for transferring additional information – when handing over a shift for example – to colleagues. The user administration at Audi in Győr is structured on the basis of roles or functions: Defined is who can carry out which actions – such as the acknowledgment of a fault, the setting of target values, the suppression of faults, the amendment of system settings, etc. Thanks to the online language switching in zenon, employees from the CCS team can use the solution in their respective national language. Norbert Németh is satisfied with the new, comprehensive central control system: "What convinced us in particular was the performance of the overall system, the quick and clear trend queries and the easy handling of the application. The effort required for training was low for the user and was ultimately only one to two days. Changes or enhancements to the software can be rapidly achieved and without extra programming. zenon is the optimum platform for our building services systems."

ZENON ANALYZER – ANALYZE, EVALUATE, OPTIMIZE

Audi Hungaria also uses zenon Analyzer for data analysis and reporting on ten clients. Kropf Solutions has created an equipment model for this, which portrays the structure of the control technology and groups it according to buildings, generation and consumption. The car manufacturer uses zenon Analyzer to evaluate and analyze alarms per building and per information focus point – according to time period, frequency or duration. In addition, Audi also records and evaluates consumption and evaluation of all materials and buildings. There are reports for the individual halls and buildings, which display either the daily or monthly consumption (of hot water, cold water, compressed air, etc.) or also show monthly comparisons. Also, the manufacturer can use a second load curve to set a correlation between the energy consumption and the outside temperature, for example. zenon Analyzer also allows central administration of the reports. In addition, all people in charge receive the reports by email. Because the solution also allows the analysis of real time data, employees at Audi can gain an overview at all times regarding the current situation of the supply of materials and energy. "One of the objectives of Audi Hungaria is to reduce the expenses for energy on a long term basis, to deploy all resources effectively and to operate sustainable environmental management. zenon Analyzer gives us the possibility to analyze and evaluate the actual status and to uncover optimization potential. In the future, employees will also be trained how to apply zenon Analyzer, so that they can use this tool to develop their own ideas for optimum energy management", adds Norbert Németh from Audi Hungaria. An example for initial improvements: The gates for incoming and outgoing deliveries are shown in the control system. If the gates are open too long, allowing warm air from the halls to get outside, the system sends a message and informs the people in charge. This alone is how 42 megawatt hours per year can be saved.

Engine conveyor systems are optimized with zenon.

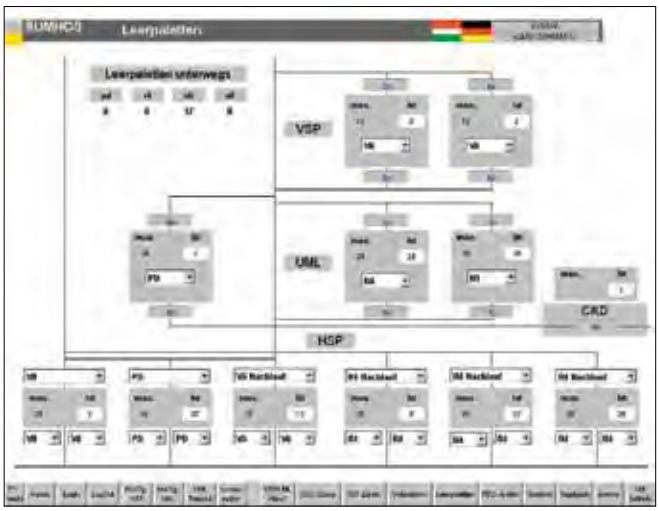
For Audi Hungary based in Györ, COPA-DATA's integrated software solution zenon, offered additional potential for optimizing its Engine conveyor systems: now zenon's smooth flow of information enables more efficient operations.

The Audi brand stands for progressive design, serious environmental protection and trend-setting technology, in short: "Innovation through technology". The Hungarian Audi plant in Györ, with more than 500 employees, is part of this success story. Founded in 1993, the Hungarian plant manufactures up to 6,500 engines a day, starting with four, six and eight cylinders; all the way to ten cylinders and special custom made engines. All in all, Audi Gyor manufactures 1.9 million engines every year for use throughout the entire corporation including Audi, Volkswagen, Seat and Skoda. This success is made possible through sophisticated production and plant technology.

EFFICIENT INFORMATION FLOW ENABLES SMOOTH TRANSPORTATION

In order to ensure the continued success story at the Audi's Gyor plant, the engine conveyor systems were earmarked for further expansion. The plant management decided to extend and optimize the facility by adding storage and automatic sorting mechanisms. The finished engines are transferred to the conveyor systems at dispatch stations on transport pallets. Audi wanted to improve this process so that important additional data like pallet number, engine number, engine type, reception station, dispatch station and other parameters could be submitted to the control system. Deploying COPA-DATA's zenon software enabled them to do this. The engines that have been dispatched from different locations in the plant are first buffered and sent to a pre-storage location where a rough sorting by engine type and reception station is done. From the pre-storage, the engines are transferred to a circulating store where the main sorting with ABC analysis takes place. From here, the engines are forwarded to the appropriate main storage location. The Gyor facility currently has two main storage locations and two reception stations. Because the reception station is already defined when the engines are dispatched, the delivery to the reception station or the main storage location happens safely and easily.

In the reception station the engines are pulled out of the main storage location



in blocks and then prepared for further transport. Additionally, the conveyor system has a reception station before the main storage locations. This way engines can, on demand, be pulled out of the circulating conveyer and sent directly to the desired dispatch location through a highway. This happens, for example, with custom made engines.

AUDI HAS THE PERFECT SOLUTION: ZENON

For an automated facility of Audi Gyor's size, it is important to apply a control software solution that allows status and operating information to be visualized in a central location. The visualization software zenon has been successfully put to use at Audi to help deliver the current improvement projects. The project managers had already decided to use COPA-DATA's zenon software for the visualization of the SKID facilities in Ingolstadt, Germany, as Johann Mayr, member of the Audi Ingolstadt´s planning group in electrical engineering explains: "We found a specialist for Industrial Automation in COPA-DATA. Their professionalism, from the planning phase all the way to implementation, has convinced us that with COPA-DATA we are relying on the right partner. The performance of the software confirms this again and again in each project. Together, we managed to create an innovative and safe engine conveyor system."

There are a number of critical requirements the software solution had to meet:

- Runtime redundancy had to be guaranteed
- Guaranteed system stability
- Extensive alarm management with apropriate alarm statistics
- A clear depiction of the project structure
- Extensive and flexible user administration
- It was also important to have a universal solution, from the single work-station through to the Intranet.

Because the plant in Györ, Hungary, is an international Audi location, the language switch between German and Hungarian had to be guaranteed as well. The zenon software by COPA-DATA met all of these requirements: "The flexibility of zenon allows us to meet our requirements in a quick and uncomplicated manner", adds Johann Mayr.

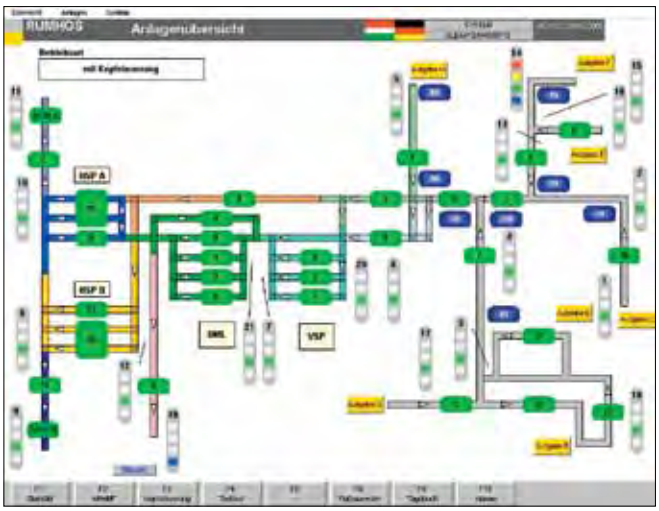
EVERYTHING AT ONE GLANCE – FROM ANYWHERE IN THE FACILITY

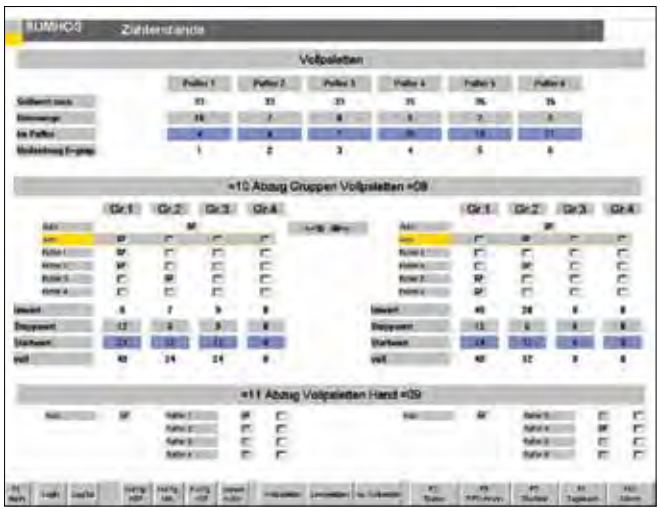
The individual components of the solution were deployed at numerous locations across the plant. The visualization has a Runtime server and a Standby server, which are located in different areas of the plant for fire protection. The additional web server enables the depiction of the visualization on the Intranet. Two single workstation displays have been set up on the plant floor in the engine handling and maintenance offices. The receiving locations have a total of eight zenon Client displays at their disposal.

"Each employee today has access to all relevant information, in a fast and reliable way, which is critical in a manufacturing facility for competitiveness and success." says Zoltan Ponty, Head of engine handling at Audi Györ.

ELIMINATING SOURCES OF ERROR AND OPTIMIZING OPERATIONS

In order to avoid sources of error in the future and to make the conveyor systems even more efficient, alarms have to be analyzed regularly and systematically. If an error has occurred, an alarm is immediately forwarded to maintenance by Message Control via SMS and e-mail. This helps to keep the reaction time as short as possible. zenon's Industrial Performance Analyzer allows for a statistical analysis of errors. This tool displays frequently occurring errors in a transparent manner





and detects weak points in the facility. Additionally, the sophisticated monitor administration helps to make the Maintenance team's work a lot easier: the process pictures are split between two monitors. This way, the user can have an overview picture displayed on one monitor and a detailed picture on the other monitor.

INCREASED TRANSPARENCY ALLOWS FOR FASTER DECISION-MAKING

The visualization of the plant encompasses the elements for display and input, as well as tablular displays of the occupancy of individual transport channels and storage locations. Together with COPA-DATA, the project team at Audi Gyor generated several status pictures that depicted the current condition of the individual transport channels through the use of symbolic elements. One of the conditions depicted was the direction the conveyer was moving. Additionally, the project-team created pictures that allow the setting and visualization of parameters for the facility, such as modes of operation or storage properties.

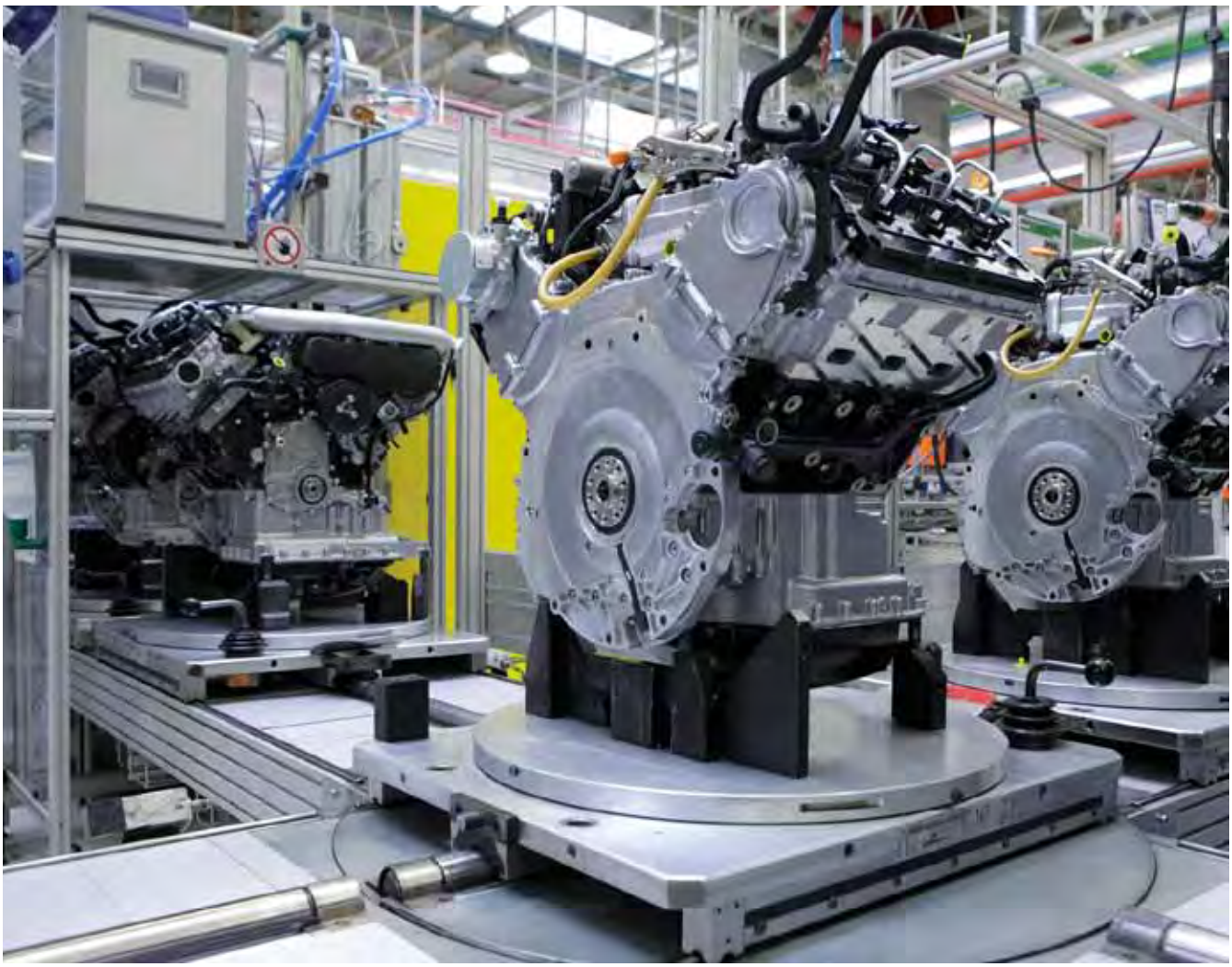
In order to generate these tables, Audi Györ uses the IEC 61131-3 programming system, straton. straton is able to take over the complex calculations and regulations for process control and automation from the zenon Software . This embedded control system, or soft-PLC, is fully integrated with zenon in order to make engineering as easy as possible. The variable has to be created once only and is then available in both systems.

The occupancy of the conveyor systems at Audi Hungary is displayed in the control application by individual FIFO-components. These data components include the pallet numbers that are currently on the conveyor. As it's not enough to just display the pallet numbers, straton ensures that each pallet number is assigned the respective pallet parameters such as engine number, type, reception station, dispatch station, etc.
Up to 40 parameters per dispatched pallet can be retrieved. straton generates output strings that show the engines on a conveyer with all the additional information in individual pictures, either in groups or sorted.

DIRECT AND QUICK PAYBACK THANKS TO ZENON

For Audi Gyor the visualization of the entire engine conveyor system creates more transparency than ever. Each engine's path can be followed over the individual conveyors through to the storage
location through the sorting facility all the way to the receiving location. This path can be corrected and redirected on demand. This enables constant checking and optimization of the sorting mechanisms. From the display terminals, the workers in the reception station can see exactly which engines will be received next and can make preparations for their receipt. The detailed alarm administration ensures more security and shorter reaction times in the case of a breakdown. High reliability is guaranteed by the redundant configuration of the system.

Thanks to the visualization of the facility, Audi Gyor today has a clear overview of the status and features of the engines, as well as all required actual and target values. The project managers
Johann Mayr and Zoltan Ponty have already experienced the benefits: "zenon enables us to use our engine conveyor systems in an economical way. This year we have benefited from increased transparency and optimized operations. With the deployment of zenon we were able to respond to the growing requirements on us and a constant need to increase efficiency."



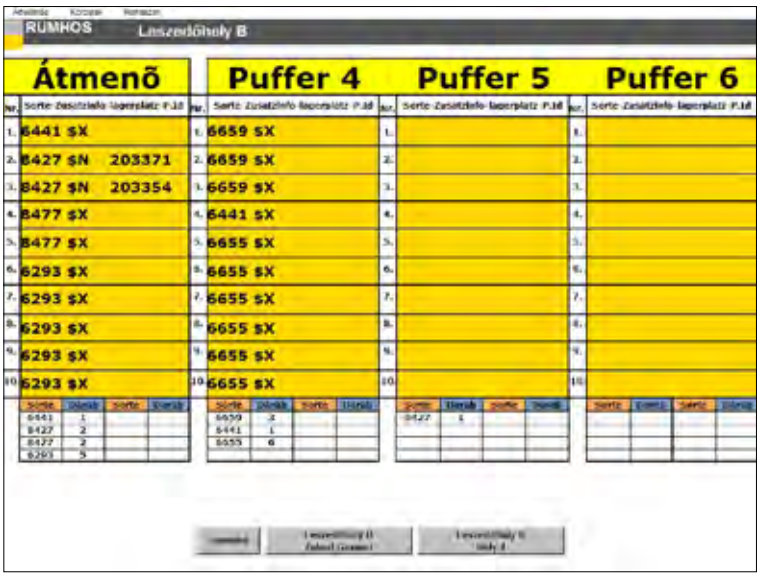
Audi engine production plant in Győr carries out pioneering logistics management

zenon paves the way for just-in-sequence production

Following on from just-in-time methodologies, the new challenge in the Automation Industry is 'just-in-sequence': the right amount, in the right sequence, at the right time, in the right place. In a second stage of project expansion, Audi Hungaria, in cooperation with COPA-DATA, SAP AG and Prozesstechnik Kropf GmbH, had to meet this challenge. Bi-directional communication between the process and the business systems will optimize the coordination between the logistics supply chain and delivery to make a perfect chain of events possible.

"Vorsprung durch Technik" (advantage through technology) is a slogan that perfectly encapsulates AUDI AG in terms of its essence and its brand. At eight automotive production locations around the world, 58,000 employees uphold Audi standards; the highest in quality, efficiency and environmental friendliness. In addition to the technical development and production in Germany, the manufacture of first-class engines in the Hungarian factory plays a particularly key role. Audi Hungaria Motor Kft., a wholly-owned subsidiary of AUDI AG, manufactures virtually the whole range of engines for the Audi Group and assembles, in conjunction with Ingolstadt, the Audi TT range and the A3 Cabriolet.

The Hungarian site manufactures not only four, five, six, eight, ten and twelve cylinder engines, and some special engines for Audi, it also supplies the brands Volkswagen, Seat, Skoda and



Display for staplers : Display of information for the series engines conveyor equipment buffered section($X), including data on the type. For 'Perlenkette' engines($N), the palette ID is also shown.

Lamborghini. Five days a week an average of 6,500 engines are produced each day in Györ: a total of 1,383,909 engines in 2009. The engine manufacture, engine testing and assembly are supported by modern conveyor technology and the efficient optimization of transport management.

STEP BY STEP TO REDUCED THROUGHPUT TIME

The Audi factory in Györ started to optimize the 5 km long conveyor system incrementally, using zenon, in 2005. Since then, zenon has enabled visualization of all status and user operation at a central location. Processes can be traced by recording important data such as palette number, engine number (serial number), engine type and storage movement (the loading point and discharge side) which gives a better overview of the entire plant. The idea of creating a bridge between the SAP ERP system and the process control system was considered right from the beginning of the project. The particular advantage of this would be a smooth exchange of data and, thus, optimum coordination of transport management. However, the system in use before zenon did not cover these requirements satisfactorily. Because zenon was already successfully in use at Audi in Germany, and because it met all Audi's system requirements, the Project Managers in Györ also decided to use the COPA-DATA software.

In cooperation with the system integrator, Prozesstechnik Kropf, and the software developers at COPA-DATA, the conveyor equipment was optimized to modern automation standards. Dennis Jährlich, who has been in charge of system configuration at Prozesstechnik Kropf GmbH at the Györ site since the start of the venture explains: "The main focus of the project was to deliver complete visualization of the conveyor equipment. A project structure with a clear overview should ensure more transparency and traceability. Additional key requirements were: a high degree of system stability, reliable alarm management, consistency, redundancy, the possibility to switch languages and effective user administration. All these requirements have now been successfully delivered for the facility."

EXPLOIT POTENTIAL SYNERGIES

The intralogistics were at their limit, despite the fact that the conveyor system was equipped with additional memory and automatic sorting mechanisms and the visualization had ensured all transport routes were traceable down to the smallest detail. "Due to the lack of communication between zenon and the SAP system, we could not sufficiently coordinate the logistics supply chain with the actual delivery. It was impossible to prepare the engines in precisely the right numbers and types that our end users required. Strictly speaking, we were producing more engines than were needed," explains Balasz Balogh, responsible for engine handling at Audi Györ.

Despite interim buffering in the feed line memory and the circulation memory, and a system of roughly sorting according to type, the engines had to be manually sorted at the different discharge points, rearranged and then returned to interim storage. The engines were held at this interim stage until their actual outbound delivery, which involved an enormous expenditure of time and cost, which Audi Györ was no longer prepared to accept. In addition, there was a problem with space: "With the production

of approximately 350 different types of engine here at Györ, you can imagine how much space was required for interim storage. Space that even a factory as large as Audi Györ cannot provide on an ongoing basis", adds Balogh. A connection between zenon and the SAP ERP software had to be implemented as soon as possible.

BI-DIRECTIONAL COMMUNICATION

With the implementation of zenon 6.50 at the Györ site, the zenon SAP interface was also embedded into the existing infrastructure. zenon addresses a function module in SAP ERP especially created for Audi Györ by means of an Remote Function Call (RFC) interface to which certain pre-defined data is transferred. This data transfer is based in three basic stages.

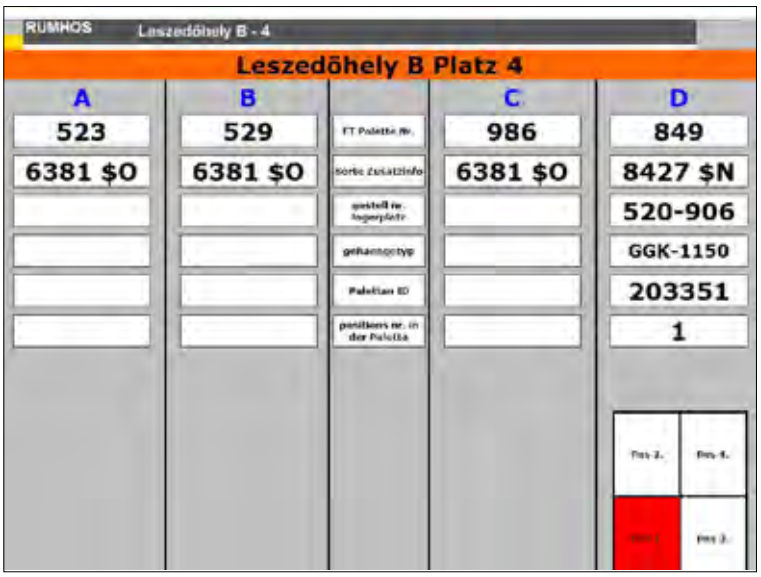
In the first stage, information about the sequencing is transferred. This means that, when the engines arrive at the discharge point, zenon reports the properties of each engine to the SAP ERP system. In the second stage, data regarding stock movements of the engines is exchanged. When the data from zenon arrives at the SAP system, the storage transfer process is complete. This means that the engines are now treated as "in storage". As a result of this, the number of engines in between the production and storage bays is evident. In the third stage, the data from the SAP ERP system is visualized in zenon. If an engine that is intended for sequence production runs through the conveyor equipment, a request is sent to the SAP ERP. After this, it is prioritized for dispatch to the customer in the SAP system and zenon receives additional information from the SAP system: storage location, chassis number, palette ID, item number on the palette, type of hanger. This data is then displayed in the discharge space at the discharge point, which gives the shop floor workers the necessary instructions about the delivery specifications for that engine.

JUST-IN-SEQUENCE – THE PERFECT CHAIN OF EVENTS

One of the prerequisites for this process is for the customer to send orders from their ordering system direct to Audi Györ in advance. From there, they are then entered into the central SAP ERP module and edited for exchange with zenon. It is, therefore, possible for Audi's intralogisitics to handle the engines in the exact sequence requested by the end user - ready for them to pick up. This process, called 'Perlenkette' (sequence control) at Audi is driven purely by the end customers, i.e. automobile manufacturers. Because of this, Audi Györ is reliant on its customers sending their orders. In addition to the end users commitment to send the sequences, just-in-sequence deliveries require just-in-sequence production at the automobile manufacturer. With the SAP interface from zenon, new potential has been opened up and the way paved for just-in-sequence production. In an ideal situation, the whole process will also involve manufacturing; so that all processes - from the creation of the engine to its installation in the car – are optimally sequenced for each other. Audi Györ's Project Managers are approaching this ideal step by step.

FROM 0 TO 60 IN REAL TIME

The operators at Audi Györ can trace which motor is where and when it is there, at any time using zenon. In addition, the



Display for shop floor workers: The system only provides a complete data set for 'Perlenkette' engines. Before the 'Perlenkette' engines arrive at their discharge point, the employees receive all the information on the desired handling: for example, which conveyor workpiece carrier is to carry the engine, on which palette, in which position, with which hanger the engine is to be deposited, and where it should be deposited.

exchange of data between the process and the ERP system makes it possible to prepare transport exactly as required for deliveries. "This economic use of our engine conveyor equipment brings enormous savings in terms of time and cost – and reduces the logistical work to a minimum. We have short through-put times, less inventory in stock and can deliver more quickly. We are currently using this optimized process for the Audi A8 and R8 models. This represents a volume of approximately 150 to 200 engines daily", says Balász Balogh. The next planned increase in volume will see this rise to approximately 400 engines per day. In principle, the transport of all engines produced at Audi Györ could be done using the 'Perlenkette' method. The Project Managers are endeavoring to continue to expand the project. Negotiations with additional customers have already begun in relation to this.

AN OVERVIEW OF THE EQUIPMENT IN GYÖR

- zenon 6.50: 20 clients distributed throughout the discharge points of the conveyor equipment
- Runtime server, Standby server, WEB Server Pro: guarantees a high degree of reliability and secure alarm management
- IEC 61131-3 straton programming system: makes complex calculations and control tasks possible and provides displays in tabular form
- SAP interface from zenon: enables bi-directional communication between zenon and SAP ERP
- Multiple monitor administration: ensures a better overview
- Industrial performance analyzer: evaluates the alarm data statistically and uses them to recognize the weak points in the equipment
- Language switching: enables user-friendly operation in German and Hungarian
- Message Control: informs Maintenance by SMS and email about any problems that may occur in the equipment

AUDI AG relies on openness and platform independence

Simple parameterization, transparent visualization

The base coating process at AUDI AG adds the first coat of paint to customized parts and specific standard parts. Reliability and high availability are of utmost importance, as the production processes that follow depend on the timely supply of all components from this section.

Base coating is a special coating process that is characterized by a smooth and accurate paint surface. Minimum error tolerance is a must. Cataphoresis protects parts from corrosion and so-called 'subsurface corrosion'. The components are placed on specifically shaped carriers and pre-processed in different baths (for degreasing, rinsing, bating, activating and zinc-phosphatization). The coating process that follows is also performed as an immersion process. The parts are coated by cataphoresis. The part acts as the cathode (negative pole) and the positive pole consists of anodes made of special materials; the dip tank is grounded. Following this, the paint is hardened in a convection oven. The customer parts and standard parts produced here then are sent directly to the assembly operation.

MORE INFORMATION AND GREATER PRODUCTION RELIABILITY

In order to achieve the increasing requirements for reliability of production, the control systems of the coating line had to be modernized. The most important goal was to collect and analyze much more information about the coating process. At the same

time, the visualization of the line had to become easier to use and more intuitive.

ZENON IS ALWAYS THE RIGHT CHOICE

The project team at AUDI AG analyzed, compared and evaluated a number of software tools. After the evaluation of several competitors, they selected zenon by COPA-DATA. Two of the reasons for this decision were the affordability of zenon and the feasibility of the required solution. With zenon, AUDI AG now has an open and platform-independent system that allows the use of any kind of hardware. Over 300 drivers guarantee compatibility with all PLC and bus systems on the market. This makes the customer completely independent and protects existing investments.

PROJECT IMPLEMENTED AS SCHEDULED

For the implementation of the new logic, the production was supposed to be halted only during weekends. After that, all processes had to be restarted smoothly and reliably. This is why AUDI AG trusted Prozesstechnik Kropf from Oberkotzau for the implementation of the project. A reliable partner since 1992, this service provider has about 35 employees. Prozesstechnik Kropf is a professional full-service partner specialized on the design and implementation of automation solutions. Their focus lies on process control technology, energy management, data management, but also industrial switching systems. Prozesstechnik Kropf offers a wide range of services, ranging from consultation and implementation to training and reliable support.

THE DECISION: ZENON

AUDI considered two options for the modernization of the existing control equipment: the complete exchange of hardware and software or the exchange of CPU components only. Each option had its pros and cons. Costs, time and work effort required for testing and implementation opposed the positive effects like having new powerful components and an extended warranty for several years. “We chose to compromise, because the effort had to be in proportion to the result. The challenge was to exchange the central PLC and at the same time keep the existing I/O level, which was still up-to-date”, says Kurt Siebenwurst, responsible for automation technology in coating at AUDI AG in Ingolstadt. zenon is perfect for this, as it allows for the combination of different hardware components. The operation of the system has also become more comfortable. Changes do not necessarily have to be made on the shop floor; they can also be made in the control room. With a few mouse clicks, all the relevant information is presented to both line operators and to management.

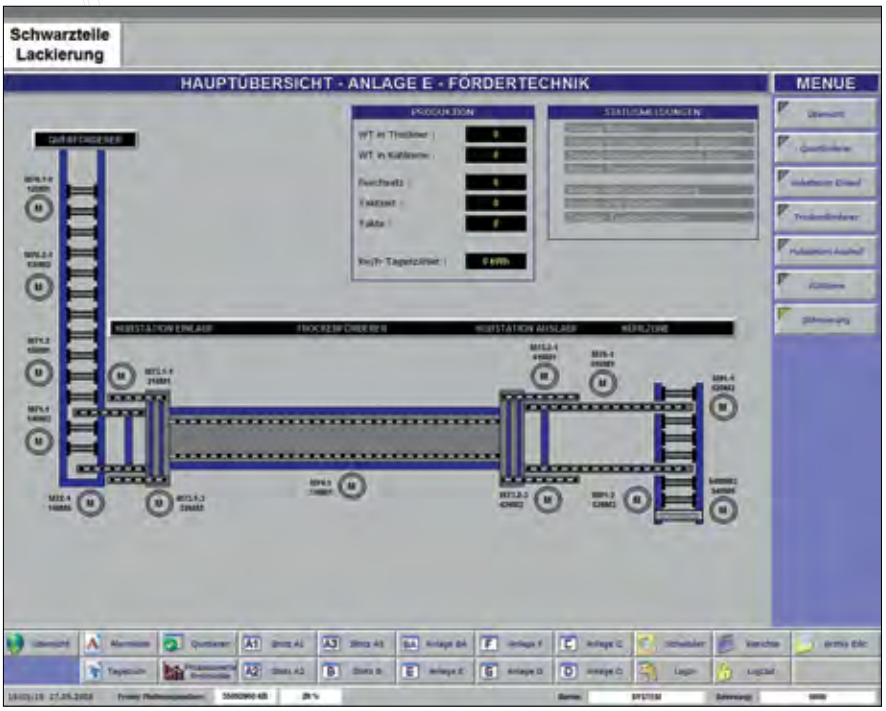
FAST IMPLEMENTATION

It only took three months from ordering to the launch of the new solution. “The time window was very narrow. As we were dealing with a very critical exchange of essential components and software, we needed a fall-back mechanism”, explains Werner Kropf, managing director of Prozesstechnik Kropf.

ALL CUSTOMER REQUIREMENTS FULFILLED

Prozesstechnik Kropf provided a continuous visualization for all processes in this paint line. The line consists of nine separate systems for the different stages (pre-processing, coating and drying), all of which are interconnected with each other, and the conveying system consisting of six cranes with part carriers (loading devices). Nine PLCs (Schneider Electric Quantum) deliver several thousand variables that are processed by zenon. The central control room consists of two servers in parallel operation.

Besides the visualization for operating and monitoring the production processes, the automobile producer also wanted to be able to generate daily protocols of the base coating processes for reporting purposes. Such reports include information about the part carriers, the media consumed, different temperatures, conductance values etc. Kurt Siebenwurst explains, “We can operate and monitor these systems perfectly – even from the main control room. Any malfunctions are immediately recognized. Another positive side-effect: Thanks to the new control system, the part carriers no longer abruptly start moving. The mechanical strain on the drive mechanisms of the six loading devices was reduced to a minimum.” It was also important for AUDI AG to have an operational record that could be traced back at any time. With the modern zenon software solution, all events and manipulations of production process by users are automatically logged.



zenon ensures transparent processes for base coating at AUDI.

The chronological event list (CEL) assigns a time stamp to every event. The line operators can look up a summary of collected information or forward it to colleagues or supervisors at any time.

TOOLS FOR EFFICIENT WORK

The next step for AUDI was to extend the existing solution. For example, the automobile producer uses the Industrial Performance Analyzer (IPA) by COPA-DATA to create informative and well-structured malfunction statistics. Additionally, the Industrial Maintenance Manager (IMM) is also in use today: this tool allows for the structured scheduling of maintenance tasks and the reproduction and documentation of already completed actions such as maintenance, repairs or replacements. Furthermore, it can be used to localize weak points and calculate error frequencies. The Industrial Maintenance Manager can store its data in any ODBC-compliant SQL database. These two zenon modules, IPA and IMM, significantly reduce downtime, avoid unnecessary repairs and facilitate the work of operators and maintenance teams.