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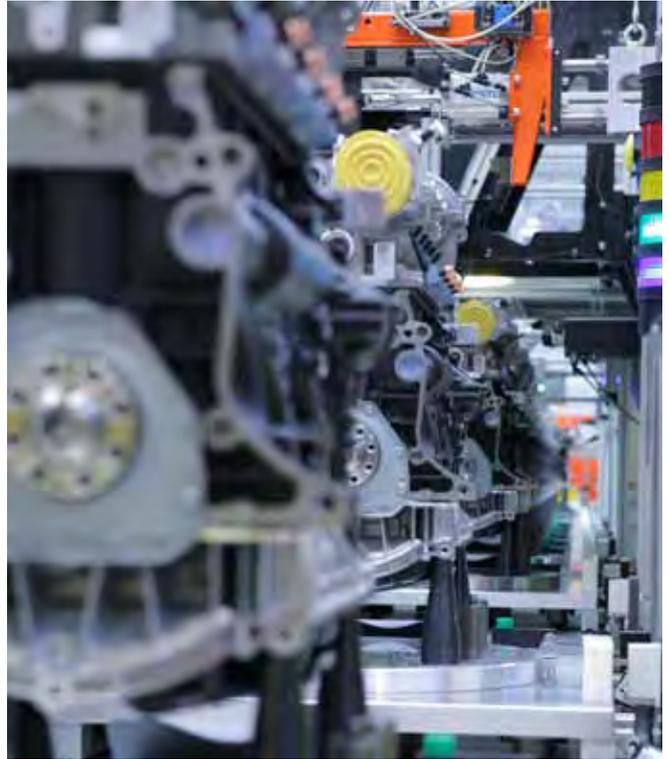
of approximately 350 different types of engine here at Györ, you can imagine how much space was required for interim storage. Space that even a factory as large as Audi Györ cannot provide on an ongoing basis", adds Balogh. A connection between zenon and the SAP ERP software had to be implemented as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