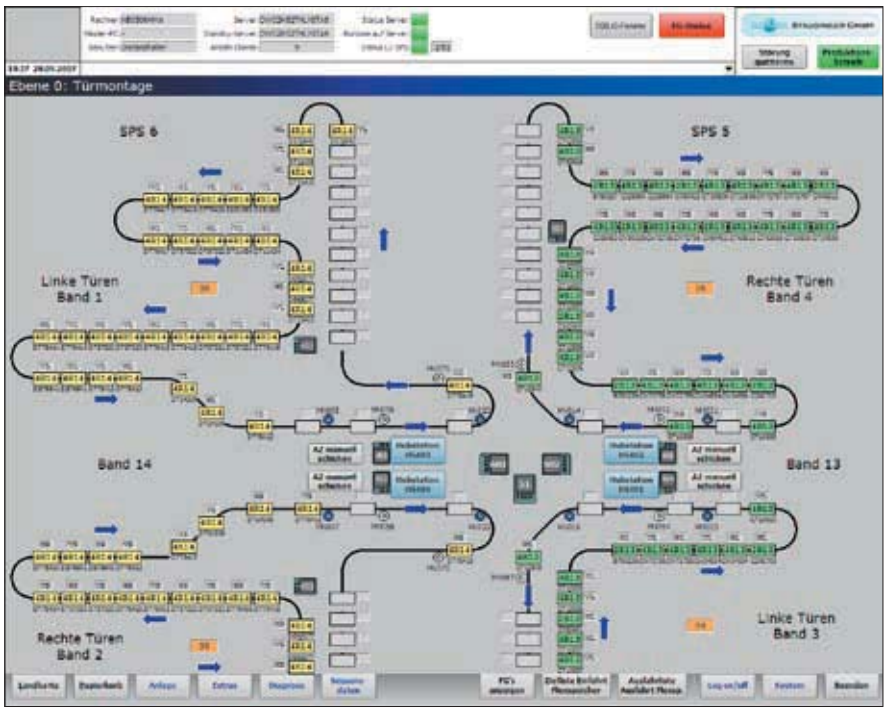
zenon – Greater flexibility in production.

The flexible storage and conveyor system in BMW's Dingolfing plant picks up all the doors from the assembly line and reunites them with the bodies at the right moment. This storage system, whose display requirements are handled by zenon, boasts a minimal space requirement whilst at the same time offering excellent flexibility.

During recent years the automotive industry has been transformed, and the final assembly phase has changed even more than others: the number of different vehicle models has increased, and a vehicle must be delivered to the customer as soon as possible after the order is placed. This is made possible by ensuring that production personnel are highly qualified and that production plants are regularly modernised or replaced. In the assembly section at BMW's Dingolfing plant - the Group's largest production facility which produces around 1,200 vehicles every day - several thousand components are assembled to create a finished vehicle. zenon also forms part of the assembly facilities. This software is used for automation and visualisation of a conveyor system in the assembly plant. This is a flexible storage and conveyor system comprising electric vehicles, suspended electric trains and lifts. After painting, the doors are removed from body shells, and are then taken in lifts to the storage level; the doors for different vehicle types are all stored together. These electric vehicles then transport the doors for further processing, initially to the flexible store and then, when requested, on to the door fitting station. Once the body shells



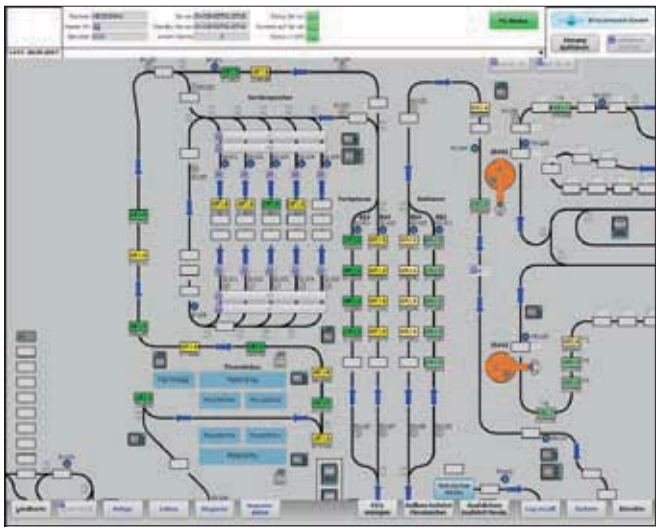
have been completed, the doors are brought back to them for final assembly. The purpose of removing and refitting the doors in this way is that it is easier and more convenient for workers to carry out the necessary fitting operations on the doors. The body shells also take longer to assemble than the doors do, and so the latter need to be put into temporary storage in the best space-saving way possible. The new storage and conveyor solution was developed in such a way that it takes up very little shop floor space. At the same time, the overview is ensured: all doors are labelled (model, chassis number, door position, etc.), all load-carrying media are provided with RFID tags, and therefore the location of any particular door is known at all times. At various points in the plant are located distributed read/write stations that control and monitor the suspension gear routes that can be uniquely identified at each point. Users can read out the data, but also change and update it if necessary. To make the doors available at the right time and in the right place presents a particularly large logistical challenge; this is an extremely complex task for the control system to achieve.

CONVEYOR SYSTEM PROFESSIONALS OPTIMISE THE PLANT'S INTERNAL LOGISTICS

The company Staudinger GmbH supplies the software and the entire control system for the door conveyor system. Staudinger has developed a suitable custom solution for operation and visualisation based on COPA-DATA's zenon. This software depicts the entire system. This company, which is based in Loiching (near Dingolfing) was founded as long ago as 1950, and now specialises in three fields: control systems, plant and mechanical engineering, and simulation modelling. Staudinger has around 150 employees, and produces solutions for challenging open- and closed-loop control tasks in all types of automation systems. This was the first time that Staudinger had worked on such a large product with zenon from COPA-DATA. Another partner in the project was the company Rofa Rosenheimer Förderanlagen GmbH, which specialises in automated conveyor systems for material flow and manufacturing.

COMPLEX CONTROL PROCESSES IMPLEMENTED WITH CLARITY

The objective for the door conveyor project at BMW's Dingolfing plant was to implement and visually represent the complex control processes necessitated by the storage system so clearly that the plant manager or maintenance engineer can always retain an overview and can see immediately the locations of vehicle bodies and doors. The flexible storage and conveyor system has a full graphical display. The system displays show the operator all the strands of conveying and storage. Each box in a storage strand represents one door or a set of two or four doors. The colour provides information about the vehicle type, and the status of the door's manufacture (unfinished door, fully assembled door, empty vehicle). In order for the doors to be fitted, a robot transfers them to the suspended electric overhead conveyor system for pre-assembly. This process, too, is visualised with zenon. Once the doors have been completed on the production lines they are moved back to storage to await the bodies. A sequence list is maintained to keep track of when cars are ready to have



their doors fitted. Light-grey boxes in the visualisation are unoccupied spaces in the storage and conveyor system. Before doors pass into the lines, a check is carried out automatically to determine whether a line of doors of the same type already exists. If it does, then the door will be stored there in order that separate lines are created for each model. There is likewise a colour to indicate when doors are re-fitted in the vehicle – like door removal, this is a process that is performed manually. When doors are removed from the storage and conveyor system, the empty hangers return to the door removal station – this completes the cycle, and the process starts from the beginning again.

The zenon overview display enables operators and maintenance engineers alike to zoom in on any detail of the plant whilst at the same time keeping the entire plant on the screen. "The overview display is for me one of zenon's best functions as it hugely increases user-friendliness and enables the plant manager to work efficiently and retain an overview however complex the plant", says Markus März, a control software designer at Staudinger GmbH who is responsible for visualisation systems.

NETWORKING, CONSISTENCY AND INHERITANCE

The basic idea behind networked visualisation is that operators can perform all the necessary operations at any time and from any position: defining parameters, switching units on and retrieving alarms and trend data. zenon's consistency, in combination with its unique network technology, opens up all kinds of options for integrating and optimising production and information flows. Staudinger took advantage of this consistency earlier when configuring the visualisation system: The system planners have integrated the standard project specified by BMW and used only a small part of it (fault reporting system) that they really needed. The cost is thereby greatly reduced, and efficiency increased. Object-oriented parameter definition makes system configuration very simple: as soon as an object has been defined centrally, it is available for use throughout the system. And whenever any item is modified, it is handed on down quickly, securely and accurately without any further input.

ALL EVENTUALITIES CALCULATED IN

The zenon application also enables data sets to be modified, moved or deleted, and it allows the data system to be accessed directly should the need arise. With the help of the relevant operation the controller can now determine which subsequent processes are necessary. This entire complex, yet flexible storage system is extremely user-friendly. This demonstrates the high level of automation and efficiency that is made possible by this software", explains Markus März from Staudinger. To implement their solution Markus März and his colleagues had to calculate in all the possible eventualities in order to represent the necessary processes and other resulting processes in the solution: if, for instance, a door has been included in the wrong conveyor line due to a defect in the soft material, then this must be corrected immediately. The visualisation includes a waste-paper basket that the user can use to throw away any records that are not needed. Using drag-and-drop techniques, the responsible person can then move the door data to the correct position in the system. Markus März from Staudinger GmbH continues: "This entire project is visualised using zenon. With all its technically refined hardware and software solutions it is a truly state-of-the-art automation system which not only works extremely reliably, but is also unparalleled in terms of flexibility.