



Process synchronization in axle assembly

Daimler AG, Kassel plant / A u E Automations- und
Einstelltechnik Kassel GmbH, Germany

automotive industry

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Precision and Performance

Production and assembly at the Daimler plant in Kassel, Germany are harmonized courtesy of a decoupling module (DCM) with 2800 storage spaces and an automated parts supply and removal system.

The Daimler AG plant in Kassel manufactures both driven and non-driven axles for trucks, buses and vans. From the production of raw materials to the shipping of finished axles, everything that is ordered by the vehicle plants is processed here.

“A centerpiece of the axle systems are the wheel sets, consisting of a bevel wheel and a crown wheel,” explains Walter Gerhold, Head of Production for axle drives/axles. Each of the parts has around 250 variants and both must be delivered to pre-assembly in up to 350 pairings, just-in-time, matching the respective axles. Because of the limited production capacity available, temporary storage for parts is required to harmonize production and assembly. At Daimler, however, they did not want just any old buffer, but rather an intelligent decoupling module (DCM) designed to automate the transportation of ▶▶



Storage and retrieval robot at work in the shelves



parts and make sure that all parts are available at all times. To this end, 2800 storage spaces had to be created – and that in an existing assembly hall.

Every part is stored individually

The solution provided by A u E Automations- und Einstelltechnik Kassel GmbH consists of a filigree shelving system of lightweight steel construction on stilts that is arranged on a second level over the existing assembly area, producing a storage area 75 meters long and three meters high. People and, where required, lift trucks can still move freely beneath the shelves. The storage system is divided into a left-hand and a right-hand side. Two storage and retrieval robots move between the two sides, bring-

be gripped by the storage and retrieval robots. The output of parts takes place via output stations, where the abovementioned 350 pairings can be requested. There is also an availability buffer for up to 20 parts here.

Innovative control, drive and safety technology

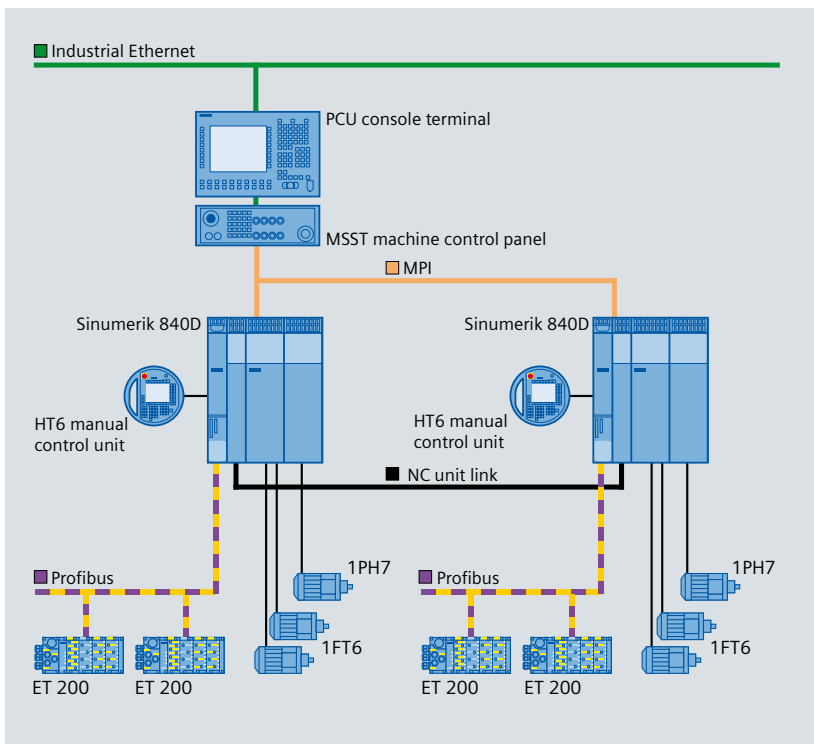
The eight CNC axes are controlled by a Sinumerik 840D CNC control system. The position control of the travel drive (synchronization on both drives) takes place via a ninth axis and a separate Simodrive 611D control unit. Each of the two storage and retrieval robots has its own coupled control system, which is supplied with electricity via conductor rails. To ensure accurate positioning, the pallet location of the shelf compartments is “taught” for each block; the other compartments are calculated and then all pallets are measured by an NC program.

The data security of the DCM allocation is achieved by means of redundant storage of the data in both Sinumerik 840D controllers. The controllers exchange data via Profibus and Ethernet (TCP/IP) interfaces. A WLAN provides a further layer of data security.

System safety is ensured by Siemens’ integrated safety concept, Safety Integrated, with Profisafe, which allows standard and safety-oriented communication on the same bus line. Profisafe does not only run via a Profibus cable, however, but also via data light barriers, which safeguard the shelf lane – an innovation of which the safety has been confirmed. The distributed I/Os Simatic ET 200 is also connected via Profibus (e.g. communication with the output stations). The bus is also available for communication with superordinate systems, such as Daimler’s maintenance monitoring system.

Equipped for the future

The system is designed in such a way that all future component variants can also be handled without additional setting-up or adjustments having to be performed. To this end, component lists are maintained via the server, which are supplied with all necessary parameters when a new component is added. Connection to the inventory control system has already been prepared. On the whole, Daimler is so pleased with the overall solution that two further DCMs have already been installed and put into operation for other plant areas. ■



ing each piece individually to its storage space or collecting it from there.

Because individual parts are required for each axle, individual part storage is necessary. The result is that each individual part has to be gripped and placed with precision. “Due to the lack of space available, trajectories must be traveled that require robots to be controlled via a CNC,” says Jörg Gebauer, Software Project Manager at A u E Kassel GmbH.

The storage and retrieval robots in the 75-meter longitudinal axis are driven via rail and friction wheels. To ensure that the exact position is always known, an additional plastic cog-rail with an encoder wheel is mounted in parallel. The positional accuracy of the overall system is less than 1 millimeter.

The parts are checked in at input stations at a Siemens operation terminal and likewise conveyed upward via a handling system, where they can then

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