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Efficient power consumption and additional flexibility for AGV applications

Flexible production and materials supply mean that communication must also be flexible, not to mention mobile. A wireless network caters to just this set of requirements, not only requiring minimal power, but also being simple to configure. The company dpm Daum & Partner is one of the first to use such a network. This automated guided vehicle (AGV) manufacturer uses wireless technology to facilitate automotive factories free of assembly lines. The same wireless network has also been successfully tried and tested for eKanban systems. Read on for more information.

In 1914, at its new River Rouge plant, Ford launched continuous assembly line production for its Model T – a dramatic rise in efficiency which enabled the price of the

vehicle to be more than halved: from US\$ 850 to 370. Since then, assembly line production with stationary conveyors – whether overhead, "power & free" and

suspension, or floor-mounted, e.g. with drag chains – has dominated the mass production of cars. New approaches, however, are showing a gradual move away from fixed assembly lines, a development driven by a wish for greater flexibility.

AGV to replace assembly lines

The alternative concept focuses on automated guided vehicles (AGV), on top of which car bodies are assembled and then – following the 'marriage' of body and chassis – complete cars. The AGV can either drive fast from one assembly point to the next, stopping for the cars to be assembled successively at those points. Or the assembly can take place on the move, while the AGV drives slowly around the production hall. In both cases, replenishment materials are brought by smaller AGV.

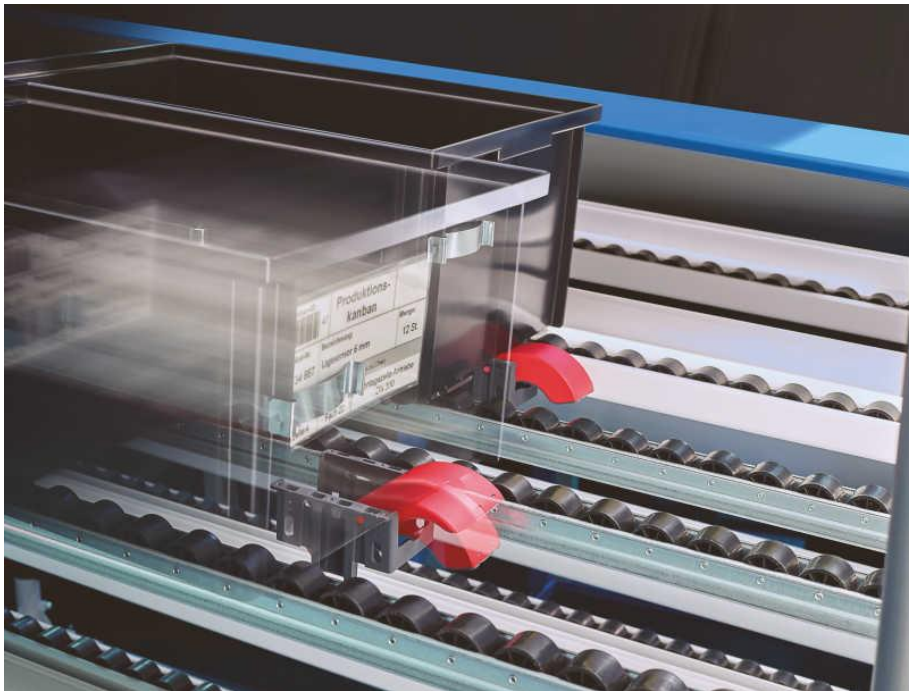
This concept means that not every car has to take the same path through the production. Workers can, for example, assemble optional extras at a separate station and then have the car body rejoin the standard flow later on. In addition, manufacturers do not have to change the conveyor system for different models or when starting a new serial production. The flexibility is thus both cross-model and cross-generation.

New safety concept: workers as passengers

The AGV manufacturers are profiting from this development and have been gearing themselves to this new market by developing special vehicles to suit it. Several years ago, the company dpm Daum & Partner Maschinenbau GmbH was quick to present its "Vision E", an AGV for



01 The wireless network collects (remote) signals in the field and transmits them via a Sensor Bridge to the IT infrastructure of the user.



02 This wireless tilting device with integrated sensor technology was developed especially for use in mobile eKanban systems and integration in nexy wireless networks.

flexible car production – albeit just as a concept. Today, the first Vision E fleets are already being used in car body assembly plants. In addition, dpm has developed a much bigger AGV to carry complete cars while they move around the factory for assembly.

In order to realise this "assembly on the move", the engineers also had to develop a new safety and personal protection system. All safety-relevant information is sent and monitored by a central control system and not, as before, exclusively via environment detection, i.e. safety laser scanners. Various drive functions are also continuously monitored.

Remote wake-up call for AGV

A further feature is an energy-efficient battery management system. The complete AGV system or individual vehicles can be put into "sleep mode" for up to three weeks – for example during holiday shutdowns. In such cases the power supply is cut off

completely, meaning that the energy consumption of the vehicles is zero. This in turn means that the vehicles do not need to return to a central charging station, but can remain wherever they are in the factory. During this period only a buffer battery is active, supplying a wireless receiver with power. This receiver triggers the restart of the AGV in question by remote control upon receiving the corresponding signal.

As its wireless network, dpm uses the "nexy" system developed by the steute business unit "Wireless". This system was specifically designed to meet the requirements of intralogistics and includes the "sleep mode" feature with very short wake-up times. The network transmits in Europe on the 868 kHz waveband as a Low Power Wide Area Network (LPWAN) via a proprietary wireless protocol optimised for this application spectrum. Despite its low power requirement, it features a high range even in adverse conditions, as well as high transmission reliability.

Access Points distributed throughout the production area bundle all signals from the field (e.g. from the AGV) and transmit them to a Sensor Bridge, an easy-to-configure middleware which in turn has a direct connection to the superordinate IT system

(ERP, WMS, PDA, MES etc.) or to cross-site data services via Webservice. This facilitates an uninterrupted flow of data from field to management levels.

Easy installation and configuration

Since configuration takes place via a central dashboard, installation and operation of a nexy system are comparatively easy. For individual applications (including AGV fleets and eKanban), pre-configured solutions are available offering different functions. For eKanban systems, for example, different operating modes can be selected: one shelf sensor per lane, eKanban with three sensors per lane for fast-moving items, or a semi-automatic material call per call button. In addition, several nexy applications can be operated within the same network. And the user can integrate different wireless switching devices and sensors in the nexy system – even ones not from the steute range.

Car production without assembly lines

In their test factories, various car manufacturers and research institutes are currently collecting experience regarding the concept of production without assembly lines. For example, the Fraunhofer Institute for Manufacturing Engineering and Automation (IPA) has realised an AGV-based automotive production plant in the "Arena 2036" at its research site in Stuttgart. Audi is also currently reviewing this concept at its own test facilities. And not far away from the Fraunhofer IPA, in Zuffenhausen, the Porsche Taycan is already being built according to this principle. The first electric car from Porsche, and at the same time the first to use 800-V technology, it is said to be technically outstanding – so far all the test drivers have been enthusiastic. The manufacturing engineering behind the car is also applaudable: Porsche has said farewell to assembly lines and is using AGV in its serial production in an uninterrupted flow process: a milestone in the automotive industry, and 105 years after the assembly line was first introduced by Henry Ford.

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Images: dpm Daum & Partner Maschinenbau GmbH / steute Technologies GmbH & Co. KG