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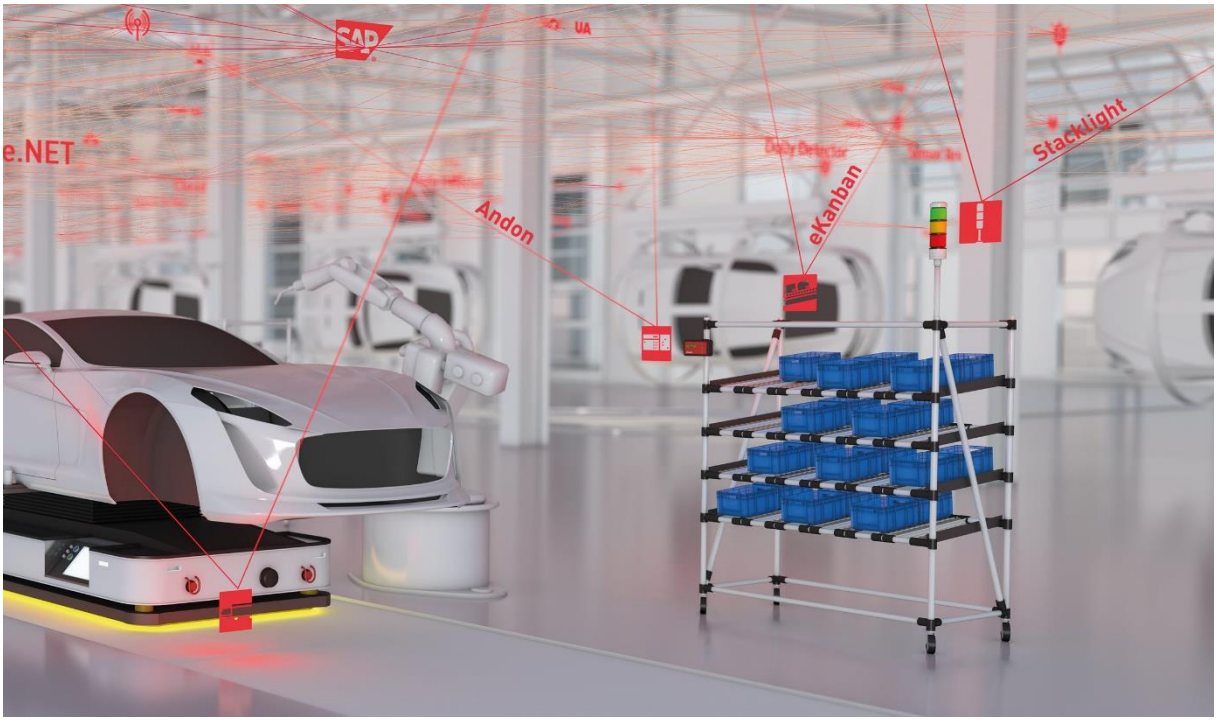
Wireless-based eKanban for the shop floor and logistics

The basis for uninterrupted integration of physical objects in state-of-the-art factories is a system which is perfectly adapted to the application in question. Facilitated by a wireless network, such systems enable data and information to be captured and made available to downstream intelligence. As real-life examples have already shown: investing in a wireless automated materials requisition system can prove cost-effective within just a few months.



The wireless network can integrate e.g. mobile eKanban racks in the inventory management, leading to a materials requisition system which is flexible and "seamless"

An IT-based inventory management with an enterprise resource planning, production planning or manufacturing execution system (ERP/PPS/MES) has become standard in most production companies. This means that a "backbone" is already available which, in addition to many other functions, organises material supplies, detects bottlenecks or supply requirements and thus ensures a needs-based company-internal material flow, as well as sufficient stock levels of components and

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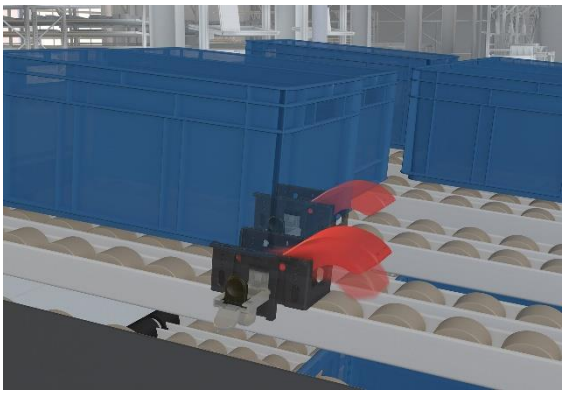
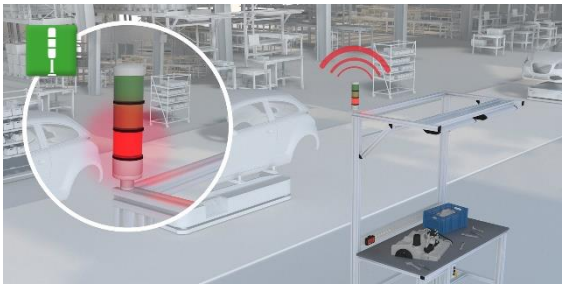
supply parts. The required information about actual stock levels can be read semi-automatically, for example by scanning barcodes on boxes, or fully automatically, for example via sensors in racks. In this way, a Kanban system is optionally realised.

Determining needs based solely on ERP can be patchy

Such systems reach their limits when stock levels need to be detected and monitored on mobile units. Here, a wireless network which has been developed precisely for this task and which "collects" and passes on the data can help. The tasks, infrastructure and benefits of such a network can be illustrated using the following example:



Sensors capture the positions of boxes in racks and transmit their signals via remote control



The wireless system can also assume additional tasks, e.g. the integration of Andon systems

The assembly of e.g. automotive supply parts or drive and control components for automation technology involves the circulation of numerous containers or boxes full of consumables (i.e. not core components). Stock levels – or more precisely: inflow and outflow – are determined by an ERP system which then triggers replenishment.

Over time, the actual material quantities differ increasingly from the levels monitored by the IT system. This is partly due to the fact that several hours elapse between requisitions, making the level of surplus stock appear higher than it actually is. In addition, there is a delay between requisition and replenishment. Moreover, replenishment often occurs in peaks because orders are placed at the beginning of shifts. Last but not least, the system only determines the requirement at the assembly point; the containers which are moving around are not captured by the ERP system.

Avoiding backwards steps with wireless networks

This imprecision emerging in inventory management despite digitalisation has caused some companies to turn the clock back as far as automation is concerned and reinstate staff as "line runners". They move along the assembly line and capture the demand or stock levels at various points. Or the companies choose to work with traditional Kanban cards. Others have set up terminals at their assembly points, enabling staff to send material requisitions in accordance with the pull principle.

From an IT perspective, this is indeed a step backwards, and practical implementation is usually far from ideal. The far

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Access Points forward the wireless signals captured at assembly points or on the shop floor to a Sensor Bridge, the interface to the ERP system

better way in intralogistics applications is an uninterrupted information flow to accompany the material flow. This is realisable using the nexy wireless solution from steute, used here as an automated materials requisition system.

The basic idea is to equip vehicles and storage sites or lanes with wireless sensors (not the boxes themselves, which would require a far higher effort) and to span a wireless network across the shop floor.

A variety of wireless sensors for inventory management

This materials requisition system functions in practice as follows: wireless laser sensors capture the stock levels of large load carriers (LLC) or small load carriers (SLC) at assembly points or in material supply "supermarkets". In addition, they can detect the fill levels in containers and trigger replenishments as required. Because they transmit their signals without cables, they are also able to capture the stock levels of mobile units such as tugger trains or eKanban racks. Special versions are available for the monitoring of e.g. dollies in monorail tracks or boxes in eKanban racks. A further application field is transfer points for stationary and mobile conveyors (roller conveyors/AGV).

This wireless system has been adapted to the special requirements of industrial production. It also functions with high levels of dependability and transmission reliability in conjunction with adverse circumstances, such as radiation, third-party wireless networks, a high number of sensors within the network, etc. The system is continually being further developed and even sensors from other manufacturers can be integrated in the system via a nexy wireless module.

The idea behind the system at software and hardware levels

nexy is a complete ecosystem which typically forwards shop floor events from a Sensor Bridge directly to an existing backend application, where the events are processed. The basic platform already contains all functions needed for typical applications in industrial logistics, including eKanban systems and automated guided vehicles (AGV). From the perspective of the user, this simplifies implementation of the system, adaptation of existing materials requisition systems to changing requirements and integration of additional wireless sensors in existing wireless networks.

The Sensor Bridge device management provides complete control over the nexy infrastructure. Integration is simplified via various adapters which communicate sensor events to backend or automation systems, including SAP (Idoc, RFC), Web-Services (HTTP notification, Rest), Rest API and Modbus/TCP. In addition, the nexy Sensor Bridge is so open that it can easily

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dock onto the architecture of modern PPS and ERP systems.

Faster return on investment

Various real-life examples are proof that a wireless automated materials requisition system (MRS) works in practice. Material flow is made transparent by up to several thousand sensors, and yet experience has shown that it is a good idea to split the overall system into several smaller, separate systems with their own wireless networks, each containing a maximum of 1500 wireless units. This prevents data collision within wireless traffic. One key question when evaluating a materials requisition system based on nexy: Is such a system cost-effective? Exemplary cost effectiveness calculations from steute show the answer to be "yes". Taking various baseline conditions, the return on investment (ROI) period proved to be just a few months – also when retrofitting existing assembly lines with a nexy wireless network. One of the reasons for the short ROI period is simple implementation of the preconfigured MRS application.

The concrete benefit of a wireless-based MRS which docks onto the ERP or PPS system consists in the higher transparency and better controllability of material flow. The wireless sensors can also capture events in and on mobile units (racks, AGV...) and facilitate a reaction in real time. The consequence is improved, needs-adjusted material supply and a reduced error rate. Moreover: a perfectly adapted inventory management system reflecting real-life operations reduces capital costs without increasing the risk of bottlenecks or production downtimes. And this is precisely where the main advantage of eKanban systems lies.

More precise inventory management, more efficient assembly

The cost effectiveness of such a solution can be further increased if the wireless system assumes additional tasks. This could be, for example, the integration of Andon systems or the automated transfer of materials to AGV. In such cases, users have at their disposal more, as well as more current information, and they can better manage company-internal material flow. Put another way: the ERP system is supported by a wireless network including an eKanban application, facilitating more precise inventory management, as well as gains in efficiency.

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