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NETWORKS

Automated material requisition in a wireless network

Remote data transfer for needs-based material flow

A "specialist" among wireless systems controls material flow in industrial assembly areas, leading to considerable efficiency and cost benefits for users. The wireless-based nexy system from steute can be integrated seamlessly in the company IT (ERP, MES) and, as a platform strategy, used not only as a communication channel for an automated material requisition system, but also for other tasks.

Besides the familiar "all rounders" to be found among wireless networks and standards, there are also some which have been developed or optimised for defined application cases. One example is the nexy system from steute: a wireless-based automated material requisition system, also for articles in industrial production which are not inventory-managed.

Automation plays an important role in state-of-the-art warehouses with rack systems. Increasingly, automated material requisition systems are being used on the shop floor, for example for articles which are not inventory-managed

Automated material requisition

The wireless network was developed for a problematic use case which can occur, for example, in the automotive supply industry, as well as other areas of serial

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production with many different variants (Fig. 1). The core components assembled here are inventory-managed. Their path to the production is seamlessly and individually managed, and tracked by the company IT (usually an ERP system). There are therefore no missing parts or stock shortfalls.

This is not the case with the numerous B-C parts, such as fastening elements. Their restocking is usually organised by the workers themselves, for example using classic Kanban cards. This can mean – partly due to the delay between sending the requisition note and receiving with replenishments – that in practice the provisions are either too slow or "overflowing". Here a more precise stock management is required, and this requirement can be met by an automated material requisition system.

Industry-compatible wireless network

The best and most obvious way to transfer information within such a system is by remote control because the goods which need to be monitored and managed (usually in containers such as SLC) are always on the move: from the warehouse, via parking areas, material stations and supermarkets, to eKanban racks at the assembly points.

Fig. 1: In many areas of industry – for example final car assembly – wireless-based stock management of containers in real time can be enormously beneficial

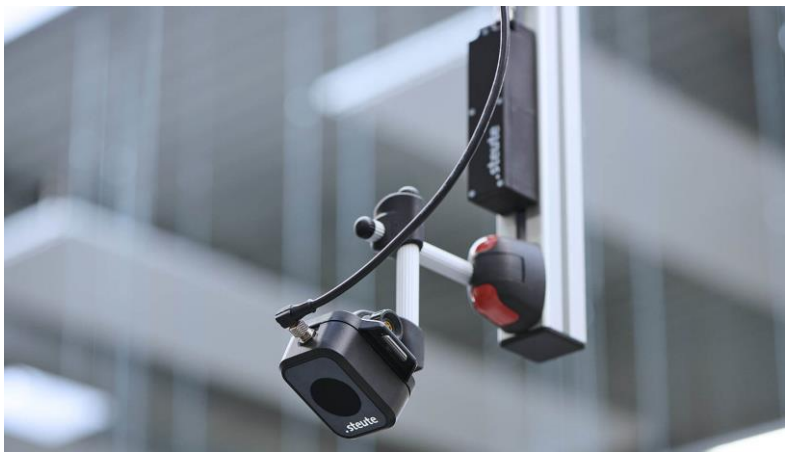

Fig. 2: Monitoring from above: wireless laser sensors can capture the occupancy of pallets or the fill levels of large load carriers

Fig. 3: Signals from wireless sensors at shop-floor level are received by Access Points and passed on to a Sensor Bridge

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The wireless system suited to this task became available with sWave.NET: a wireless technology developed by steute Technologies back in 2016 for signal transmission over short distances (up to 100 m) in the unfavourable conditions of industrial production. In Europe it uses the 868 MHz band.

Industry-compatible topology

At the field level, the hardware of the network comprises sensors and actors suitable for radio transmission (Fig. 2). Via separate wireless modules, conventional sensors can also be integrated in sWave.NET networks. They transmit their signals to Access Points, which in turn are connected by remote control to the Sensor Bridge as the interface to the company IT (Fig. 3).

The result is a wireless network for data exchange which works highly reliably and also features very short transmission times of just a few ms. This is guaranteed by features such as repeat transmission of a telegram if there is no confirmation of receipt, incorporating neighbouring Access Points in the process.

Hosting of the Sensor Bridge software

An industrial PC (IPC) pre-configured especially for this application, the Revolution Pi, is available for operation of the Sensor Bridge software. As a docker host, the Rev PI works with state-of-the-art frameworks. The docker environment is shared by frontend proxy, Sensor Bridge backend, an MQTT broker and, if required, also customised software modules.

Fig. 5: For additional tasks, pre-configured applications are available for the wireless system, such as here the evaluation of operating status via stack lights, as well as consignment

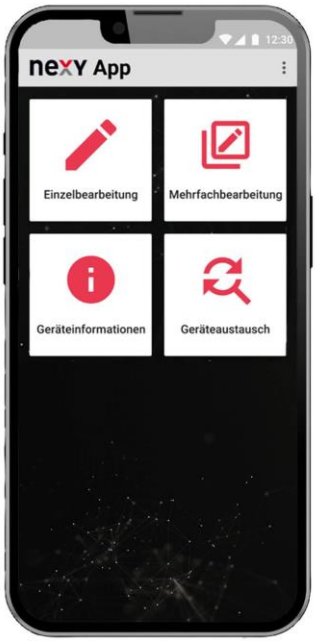

Fig. 4: Via the nexy app, users can teach in and manage the nexy components on site, instead of at the computer. Software updates are distributed to all connected devices via the wireless infrastructure

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Simple administration

The Sensor Bridge provides complete control over the entire device infrastructure within the wireless network. The web user interface facilitates administration, parameterisation and configuration of the wireless sensors and actors, as well as the Access Points. Alternatively, various configurations can be performed using the REST API. In addition, the system can actively send notifications via http(s) for every switching or sensor event, as well as any cases of interference.

Additional functions of the web interface are parameterisation of the interfaces and output of log data for monitoring and analysing the system. Software updates for the sensors can be uploaded via the web interface of the Sensor Bridge and then distributed via the wireless infrastructure as an OTA (over the air) update to all connected devices. An app permits individual sensors to be configured on site (Fig. 4).

With very high demands made on the operational safety of the overall system, several IPC can be run in parallel as a cluster. In addition, the nexy software can also be installed and operated within an existing server infrastructure. A Modbus-TCP interface is integrated for simple connection to the PLC. Through additional modules, the system can be expanded to include interfaces such as OPC UA, or a direct link to SAP systems.

Fig. 6: In practice, the system ensures a material flow in line with demand – without shortfalls or excess stock. This saves storage space at the assembly points. In addition, the process becomes more transparent

Parallel operation

Additional features of the nexy system include parallel operation of different applications (see below). In the Sensor Bridge, multiple clients can be created and managed. All customer applications share the wireless infrastructure with the corresponding Access Points. The sensors and actors in the field, as well as the interface parameters, are assigned only to the appropriate client. This guarantees conflict-free, parallel operation of different applications and responsibilities within one production area, using a single, uniform infrastructure.

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Preconfigured software modules

The seamless integration of the sensor data in the existing IT systems is possible using preconfigured software modules. This is not only true for applications within a material requisition system (eKanban, monitoring of fill levels in containers, detection of pallets in parking areas …), but also, for example, for the abovementioned other applications. These include automated guided vehicles (wake-up signal), evaluation of operating status via stack lights (Fig. 5), and Andon systems for consignment.

Connectivity at the shop floor level

With these features, nexy is ideally suited to data transfer down to the "very last metre", where the components are assembled. The wireless network guarantees holistic and highly available connectivity, while providing users with an overview of all field data in real time.

In practice, the system ensures a material flow in line with demand – without shortfalls or excess stock. This saves storage space at the assembly points. In addition, the process becomes more transparent: users can measure and continually improve KPI relevant to requisition management. This increases efficiency and minimises risks. And because the system is easy to operate, user acceptance is high (Fig. 6).

Predictive Maintenance Dashboard

The nexy system is continually being developed and expanded to include new applications. One recent addition is the Predictive Maintenance Dashboard, which visualises the complete system spatially and functionally. It displays the "health status" of the overall system, as well as of each individual sensor in the field in order to pinpoint any interferences, potential malfunctions or downtimes early on, helping to prevent them from actually occurring.

Conclusion

Many industrial companies now use the nexy wireless automated requisition management system, incorporating several thousand wireless sensors at a time. The system is a tried-and-tested complement to cabled ERP/SAP systems and shows just how advantageous the use of wireless networks in industry can be.

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Images: steute Technologies GmbH & Co. KG
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