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At a glance:

- Pepperl+Fuchs and Neoception: technologies for Industry 4.0 from a single source
- Combination of IT (information technology) and OT (operational technology) in Kanban applications at Bosch
- Working with Bosch Connected Industries (BCI) to digitalize warehouse management and rack supply systems, and integrate them holistically into ERP
- Dynamic rack assignment and Put2Light signaling
- Ensuring sufficient stock for Kanban racks: complete solution for error-free loading, part picking, and material posting
- Real-time process control, error detection, and supply requests

I 4.0 Project with Bosch: Pepperl+Fuchs and Neoception Implement a Smart Kanban Rack

A Digitalized Complete Solution for Real-Time Inventory Management

In a joint venture, Pepperl+Fuchs, Neoception, and Bosch Connected Industries (BCI) have digitalized and automated the supply and picking processes of Kanban racks from end to end. In addition to automation expertise, Pepperl+Fuchs contributed the necessary sensor hardware—in particular a newly developed scanning sensor rail. Neoception was responsible for the software interface to the Intralogistics Execution System (IES) Industry 4.0 application developed by BCI. The IES coordinates, controls, monitors, and visualizes stock management based on the Kanban rack, and integrates the solution as a holistic system in ERP environments.

This complete solution from the three project partners combines the operational technology (OT) level and the information technology (IT) level. This convergence makes it possible to digitally display and control all processes relating to the administration, supply, and error-free operation of Kanban racks. BCI's Nexeed portfolio of intelligent sensor solutions for networking people, machines, and components includes a complete system for digitalized warehouse management for Kanban racks suitable for users within and outside the Bosch Group.

Flexible Rack Allocation Improves Capacity, Utilization, and Operator Ergonomics

It is now possible to assign racks from a central location on demand and dynamically adapt the loading process to significantly improve the capacity and utilization of Kanban racks. If a new picking or assembly order changes the parts lists or the frequency at which specific parts are accessed, these requirements can be automatically assigned to larger or more ergonomically accessible racks. The dynamic rack assignment is immediately mapped in the IES. The new assignment triggers a light that shows the rack operator the right rack for the product supply during picking.

Real-Time Process Control: "Fault Indicator" for Errors during Operation

This Put2Light process is monitored automatically by the scanning sensor rail from Pepperl+Fuchs integrated in each rack. Once the IES light has shown the operator which rack is to be loaded, sensors detect the small load carrier being inserted into the rack. Operated by Neoception's controller software, the IPC of the complete solution generates information about whether, how often, and where the operator accesses the rack. If the operator accesses the wrong rack, the error is immediately detected and signaled. The real-time material posting is only completed once the error has been rectified and the container has been positioned in the assigned rack. Furthermore, the software can use the container size information from the IES to verify whether the number of physical boxes matches the virtual material stock. This means that the stock on the rack is constantly monitored, visualized via electronic rack indicators and a central IES Control Center, and updated in real time based on the supply and usage rate of the parts. When the stock level in a rack falls to a predetermined limit value, a request to refill the stock is automatically submitted and the process of transporting the relevant parts is initiated. The IPC aggregates the sensor data, interprets the detected patterns, and converts the findings into validated process events. The complete solution is currently scaled such that up to 40 slots can be equipped on one Kanban rack. The modular concept of the scanning sensor rail enables the photoelectric assembly to be modified to suit different rack sizes.

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Fast ROI Guaranteed for Both Original Equipment and Retrofits

The complete solution offers a host of benefits for the end-to-end digitalization of Kanban rack processes. The racks can be loaded dynamically and therefore with more flexibility and a focus on demand and ergonomics. The Put2Light process ensures that incorrectly stocked racks are detected by the IES in real time and can be corrected immediately, keeping the stock up to date and correct at all times. Supply and withdrawal posting is completed in real time, reducing security buffers and the working capital. Overall, this means that the investment in the joint solution from Pepperl+Fuchs, Neoception, and BCI pays off after just a short period of time.

Pepperl+Fuchs and Neoception: Sensorik4.0 and Interface 4.0 for Industry 4.0

This highly successful project with BCI to digitalize inventory and process management system for Kanban racks showcases the expertise of Pepperl+Fuchs and Neoception in their role as competent business partners for implementing Industry 4.0 solutions. The two companies provide the entire range of operational technologies—from physical hardware such as sensors or IPCs to software such as the interface to proprietary applications and ERP levels—all from a single source without any functional interface risks. This project with BCI demonstrates the companies' ability to implement "remarkable" complete solutions: Pepperl+Fuchs for its role as the preferred supplier and Neoception won the **Bosch Supplier Award 2019** and took second place for the **Bosch Innovation Award 2019**.

Key words: Kanban, OT, IT, scanning sensor rail, Put2Light, Bosch, BCI, ERP

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Characters: 4659, including spaces
Characters in summary: 638, including spaces

March 2020

No charge when used in publications.