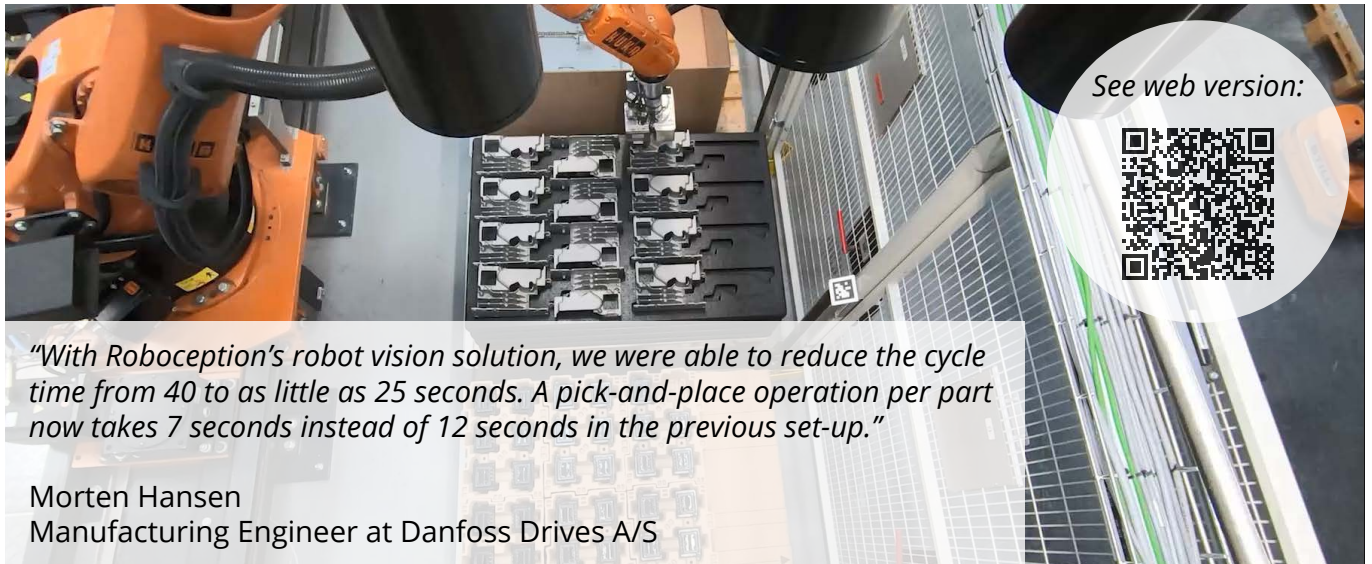


Robot Vision Optimizes Automated Kitting Cell

How a High-Performance Robot Vision System Solved the Pick-and-Place Performance Issues of an Automated Kitting Cell



"With Roboception's robot vision solution, we were able to reduce the cycle time from 40 to as little as 25 seconds. A pick-and-place operation per part now takes 7 seconds instead of 12 seconds in the previous set-up."

Morten Hansen
Manufacturing Engineer at Danfoss Drives A/S

Automated kitting cells are all the rage: Automating labor-intensive, yet low value-add pick-and-place operations (such as compiling a selection of items into pre-defined kitting trays) enables manufacturers to optimize processes and use their workforce more effectively. However, a reliable, efficient performance is key – and can be optimized using a robot vision system.

YES! (all uppercase and with an exclamation mark) was the response from Morten Hansen, Manufacturing Technology Engineer at Danfoss Drives A/S, when asked whether the company planned to use Roboception's robot vision products in the future. "After the successful implementation of a cell equipped with Roboception's solutions at another plant, we looked to them first when we needed to improve a vision-based pick-and-place solution that we had already set up in one of our production lines," says Morten Hansen: "This automated kitting cell wasn't performing to our expectations."

The Automated Kitting: Too Much Downtime, Too Much Engineering, Too Slow

The issue at hand: In an automated kitting set-up, a robot compiles an assortment of different parts. The robot picks them directly from the supplier's

pallets, into differing trays. Initially, a robot-mounted 2D camera was used to identify the parts, and to pick-and-place them.

However, as soon as the positioning of the parts would vary – e.g. if a palette was slightly tilted, its contents were even slightly shifted or a supplier maybe changed their way of packing the parts – the set-up would run into problems:

"We simply had far too much downtime and engineering effort in the original set-up, and the cycle time wasn't great either," Hansen recalls. "With Roboception's robot vision solution, we were able to add a third dimension into our process, making it significantly more robust and more flexible at the same time."

3D Vision Increases Robustness and Reduces Cycle Time

Two rc_viscores were mounted on rails above the cell. They are coupled with an rc_cube that runs both sensors, the rc_reason CADMatch software and some individual sorting strategies. AprilTags and a tailored software module in the rc_cube's UserSpace (with no additional computing resources necessary) ensure a highly precise localization of the sensors in relation to the robot at all times.

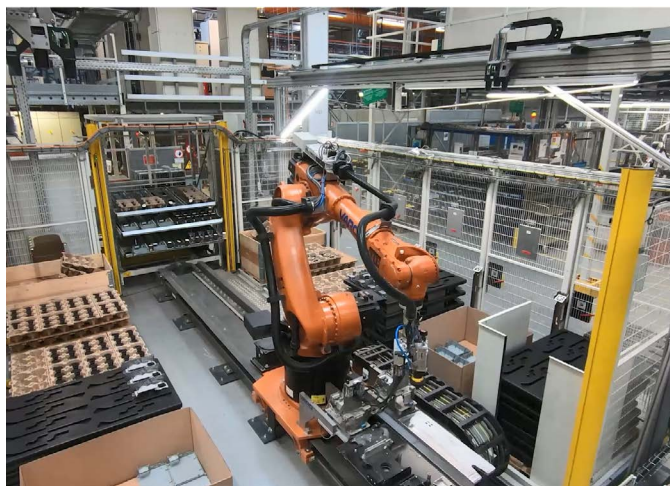
The robot vision solution connects to the KUKA robot's PLC via RestAPI. The robot, too, sits on a linear rail in order to access the full length of the cell.

This implementation is one of the first operational cells using the rc_viscore, the World's first 12 MPi stereo sensor. Its high-resolution capabilities allows placement of the sensors well above the fairly large workspace:

With two rc_viscores mounted at a height of 2.9 m, the entire 5 x 3 m² floor space of this automated kitting cell is covered. Even smaller parts are detected reliably. In Danfoss' current set-up, the smallest part has a surface area of 1.5 x 5.5 cm. The sensors detect it with a sub-millimetric precision of 0.2 mm, based on its CAD template. Avoiding an on-arm solution also directly affects the cycle time: The image processing takes place while the robot still executes a previous task. The software in place, rc_reason CADMatch, uses a sophisticated mix of machine learning and classical image processing.

A Tailored Solution, Minimal Workflow Disruption and Scalability

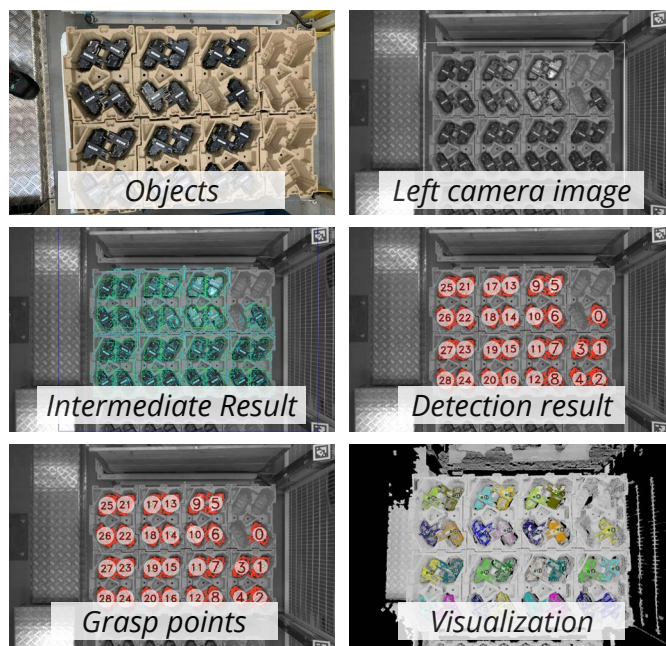
Last but not least, the team at Danfoss appreciate the constructive working relationship with the



'Roboceptioneers': The robot vision experts built on standardized products and optimized their use with individually tailored extensions. In addition, they were readily available to support with solid simulations and testing prior to the implementation.

Coupled with the intuitive user interfaces and regular software updates, this resulted in a minimized installation time on-site. Equally minimal: The training requirements for the users. Additional or replacement parts are easily integrated into the automated kitting process using CAD-based templates. And once the first cell was successfully installed, it can now be replicated 1-1 without any additional engineering effort.

Overall, Hansen's whole-hearted "YES!" to our initial question documents how happy Danfoss is with these results. No further details necessary, he must have thought – rather, went on to prove his point: Building on some elements developed in this application (e.g. the tailored Software Module in the UserSpace, or the CADMatch detection templates), the next joint projects are already in the making.



Roboception GmbH

'Eyes and Brains for Your Robot': Roboception is a leading provider of intelligent robot vision platforms and systems. The Munich-based company enables robots to see and think, thus providing key elements for flexible automation solutions in Industry 4.0.

Roboception supports integrators and end users in creating innovative automation solutions for the future-oriented use of robots in production and logistics.

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