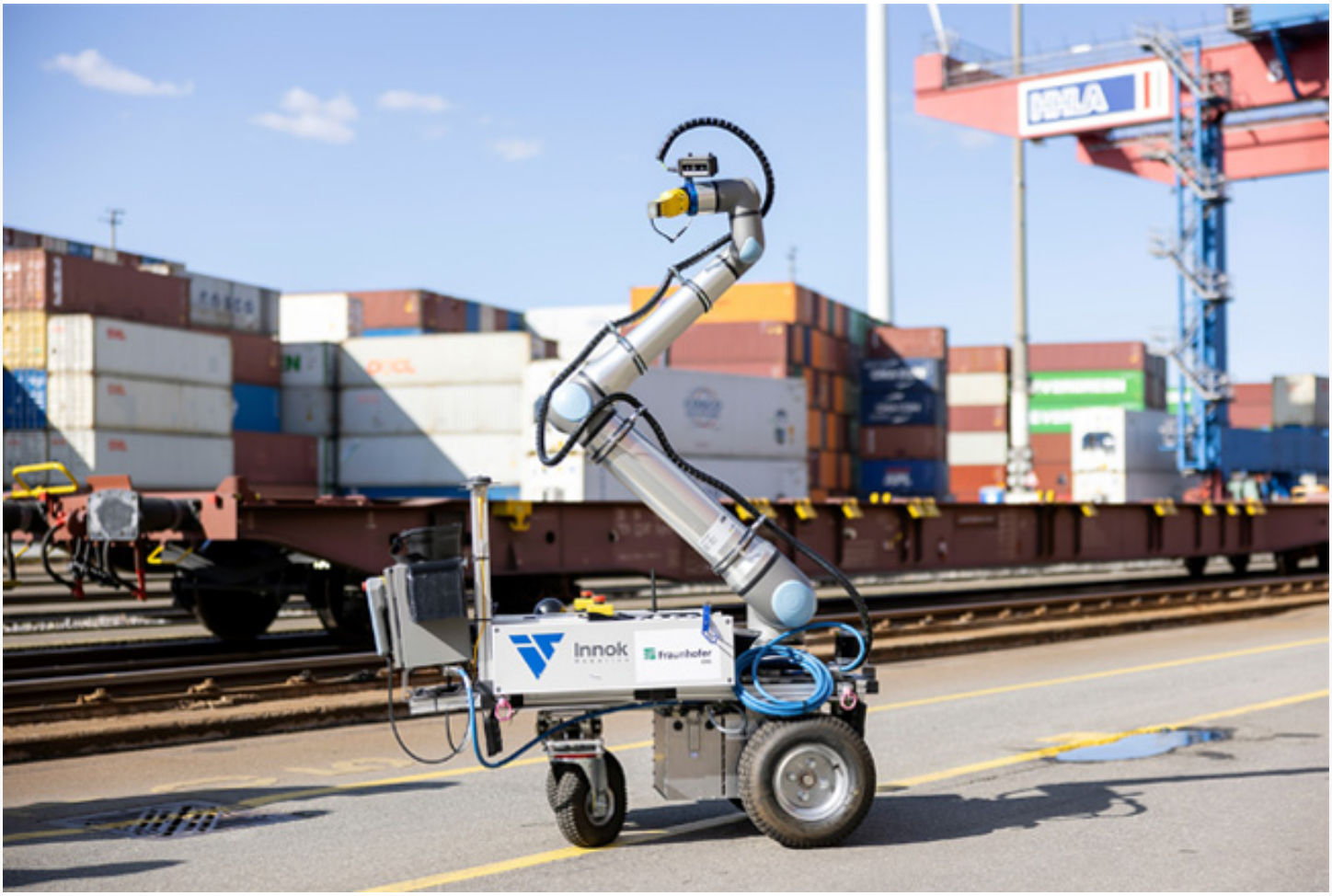
Fraunhofer CML



Robot on the track (Photo: HHLA / Thies Rätzke)

Successful project – deployment of mobile robotics in rail operations

Hamburg, 2 April 2025 – Hamburger Hafen und Logistik AG (HHLA) and the Fraunhofer Center for Maritime Logistics and Services (CML) have successfully concluded the “Pin Handling mR” project. The aim of the IHATEC project was to develop a mobile robot to automate the manual repositioning of pins on container wagons. The innovative solution for rail handling was tested under real-life conditions at HHLA Container Terminal Tollerort (CTT).

At the final project meeting on 1 April 2025, HHLA and Fraunhofer CML jointly presented the project results at CTT, demonstrating how a specially designed robot is able to handle the repositioning of pins on container wagons at the terminal – something that, until now, has had to be done manually. The autonomous system, which is managed via the HHLA Sky control centre, independently navigates its way along the container train and positions the necessary pins precisely and efficiently with the aid of its robotic arm.

Currently, these pins must still be handled manually before trains are loaded. They are installed at various positions on the container wagons and are opened or closed according to the size of the container. Even if the system is not yet ready to go into production, the research project has laid the foundations for its further development. In a potential follow-up project, the technology may be further optimised and brought to market-readiness in order to enable its cost-effective, operational use in practice.

„We’re delighted with the successful conclusion of this joint project: the robot receives data from the control centre, navigates autonomously along the train and moves the pins it has identified with the aid of a magnetic picker arm. Initially, the system components were simulated and later tested on a demonstrator in the lab. Of particular note is the seamless integration of standardized hardware with a Robot Operating System (ROS)-based software architecture, specifically designed to meet the unique requirements of this process.“

Johann Bergmann, Team Leader Port Technologies

Pablo Rossio, HHLA Project Manager: “This research project has shown that the automation of pin handling in rail processing is technically feasible. The insights gained from this research now form the basis for further evaluation of its operational use. Thanks to the group-wide network established for the project – spanning our container terminals, HHLA Sky, and our rail subsidiary Metrans – we have combined our expertise to make terminal processes safer and more efficient. In the next phase, we aim to further develop this technology to enable its application in productive operations.”

HHLA was the coordinator for the project and supported it with its subsidiaries Container Terminal Tollerort, HHLA Sky, Hamburg Port Consulting (HPC) and Metrans. The use of the robot was tested under real-life conditions at CTT. The Fraunhofer CML took on responsibility for the design and development of mobile robotics systems.This also includes the selection and procurement of suitable hardware components, their integration in the overall solution and the testing of the system.

The project was supported by the German Federal Ministry for Digital and Transport (BMDV) as part of the initiative for innovative port technologies (IHATEC). The goal of this initiative is to drive port technology innovations in the area of autonomous systems and automated technologies.

High-resolution images»

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