

Highly Automated Trucks In Intermodal Logistics: Findings From a Field Test in Railport and Container Depot Operations in Germany

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Abstract : The potential benefits of the utilization of highly automated and autonomous trucks in logistics operations are the subject of interest to the entire logistics industry. The benefits of the use of these new technologies were scientifically investigated and implemented in roadmaps. So far, reliable data and experiences from real life use cases are still limited. A German research consortium of both academics and industry developed a highly automated (SAE level 4) vehicle for yard operations at railports and container depots. After development and testing, a several month field test at the DUSS Terminal in Ulm-Dornstadt (Germany) and the nearby DB Intermodal Services Container Depot in Ulm-Dornstadt was conducted. The truck was piloted in a shuttle service between both sites. In a holistic automation approach, the vehicle was integrated into a digital communication platform so that the truck could move autonomously without a driver and his manual interactions with a wide variety of stakeholders. The main goal is to investigate the effects of highly automated trucks in the key processes of container loading, unloading and container relocation on holistic railport yard operation. The field test data were used to investigate changes in process efficiency of key processes of railport and container yard operations. Moreover, effects on the capacity utilization and potentials for smothering peak workloads were analyzed. The results state that process efficiency in the piloted use case was significantly higher. The reason for that could be found in the digitalized data exchange and automated dispatch. However, the field test has shown that the effect is greatly varying depending on the ratio of highly automated and manual trucks in the yard as well as on the congestion level in the loading area. Furthermore, the data confirmed that under the right conditions, the capacity utilization of highly automated trucks could be increased. In regard to the potential for smothering peak workloads, no significant findings could be made based on the limited requirements and regulations of railway operation in Germany. In addition, an empirical survey among railport managers, operational supervisors, innovation managers and strategists (n=15) within the logistics industry in Germany was conducted. The goal was to identify key characteristics of future railports and terminals as well as requirements that railports will have to meet in the future. Furthermore, the railport processes where automation and autonomization make the greatest impact, as well as hurdles and challenges in the introduction of new technologies, have been surveyed. Hence, further potential use cases of highly automated and autonomous applications could be identified, and expectations have been mapped. As a result, a highly detailed and practice-based roadmap towards a 'terminal 4.0' was developed.

Keywords : highly automated driving, autonomous driving, SAE level 4, railport operations, container depot, intermodal logistics, potentials of autonomization

Conference Title : ICIEMT 2024 : International Conference on Innovation, Engineering Management and Technology

Conference Location : Tokyo, Japan

Conference Dates : April 22-23, 2024