



Autonomous wheel loader

Tested in: Tunnel construction - La Ribera de Folgoso, León, Spain

Mustafa Karahan, HIDROMEK

Autonomous Wheel Loader Machine

- A fully electronic control machine has been developed in place of a hydraulic or mechanical one.
- All the systems, like steering, powertrain, engine, and implement hydraulic, can be controlled electronically.



Autonomous Wheel Loader Machine

- 20-ton operating weight.
- 3.5 m³ bucket volume and 7-ton payload.
- 210 kW engine power.
- Future-proof vehicle with cutting-edge devices, such as 4D radars, LIDARs, thermal cameras, ultrasonic sensors, GNSS antennas, an industrial computer, etc.



Autonomous Wheel Loader Machine

- Communication between the machine's own electronic systems and additional devices, such as industrial computers, sensors, and cameras, is established to enable autonomous functions and remote control.
- Algorithms and software concerning the machine's operating conditions are developed.



Autonomous Wheel Loader Machine

- In the construction sector, tunnel use cases are particularly challenging for operators and machines to work with.
- Dusty, smoky, and harsh environment, not easy and healthy to operate conventional machines.
- After blasting with explosives, it is not possible to run machines with human operators in the tunnel for a while due to the dusty and smoky environment. Meanwhile, it requires high effort, experience, and attention.



Autonomous Wheel Loader Machine

- Sufficient ventilation isn't always available for operators in tunnels.
- This mandatory downtime decreases the productivity and efficiency of the tunnel use case.
- With remote-control AWL, it is possible to run after blasting without downtime.
- Automated functions increase operational efficiency and productivity, and reduce operator errors, fuel consumption, and exhaust emissions to the environment.
- The teleoperated (remote) control provides safer and healthier working conditions.



Autonomous Wheel Loader Machine

- The connection between the digital twin and AWL was configured and validated to enable the exchange of information between them.
- The autonomous drone inspected and mapped the inside of the tunnel by the drone's onboard sensors, adapted to AWL navigation.



Autonomous Wheel Loader Machine

- LIDARs, radars, and cameras on the AWL are used for mapping, human and object, and environmental perception.
- Data from the autonomous drone was filtered and postprocessed for 3D navigation map generation.



Autonomous Wheel Loader Machine

- Low visibility and no GNSS signals for navigation of the machine.
- During the tunnel use case, a typical and very common operation, the load and carry was tested and validated (load, carry, and unload) to illustrate the autonomous and teleoperated functions.



Autonomous Wheel Loader Machine

- Remote supervision of the machine from the office comfort.
- Compact and ergonomic.
- Easy and stylish.
- Less effort and fatigue.
- Possible to use from an office or any remote location.



Autonomous Wheel Loader Machine



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