

# ARTUS

## **From automated mining equipment to autonomous vehicle fleets in the mining operations of the future**

The aim of the ARTUS project (Autonomous robust transport system for hybrid, environmentally friendly raw material extraction based on articulated special vehicles) is to develop a system for operating a fleet of autonomously operating special vehicles for hybrid, i.e. surface and underground mining environments. This will enable a more environmentally friendly and sustainable extraction of mineral raw materials, as the utilization of the individual machines will be improved, consumption and wear reduced and the productivity of the entire system optimized.

In order to achieve this goal, the automation of the individual machines will be further advanced within the framework of the project, so that driving orders for underground and surface transportation processes can be automated. Within the ARTUS project, the automated individual machines will also be combined to form a decentralized machine fleet. A central control system will be developed that monitors the process as a whole, recognizes patterns and issues adapted and optimized work orders in real time.

The individual machines not only interact with the central control system, but also communicate with each other. In addition to further automation of the individual machines, the successful implementation of direct machine-to-machine communication is therefore another prerequisite for a fully automated extraction process. Within ARTUS, this forms the basis for the automation of complex processes with several machines. The basis of this interaction is a passive (purely informative) or active (interacting) decentralized machine-to-machine communication.

In the field of machine-to-machine interaction, proprietary communication systems currently dominate the market. These usually do not have open or uniform interfaces, thus preventing system or technology expansion and forcing mining companies to adopt solutions from large system solution providers.

Against this background, the AMT's goal is to implement an open, manufacturer- and interface-neutral communication system for a comprehensive machine-to-machine communication. As part of the ARTUS project, such a system will be implemented and validated for mobile mining machines for the first time. ARTUS is thus a leading example of mining 4.0 communication and can serve as a basis for open standardization and specification in the field of mining and OPC UA.

In the future, open and decentralized communication will play a decisive role for the interaction of (autonomous) machines in the implementation of Industry 4.0 and Mining 4.0. The communication technology to be implemented in ARTUS by AMT will be superior to existing systems because it is holistic, platform neutral, manufacturer independent, open-technology, secure, robust and process-driven. This opens up the possibility for any system to communicate with any other one via any existing communication technology, communication hardware, transmission technology used, communication service providers, internally processed communication and control.

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