

ELMAR

Integration and Demonstration of the Use of Electric Heavy-Duty Transport Machines in the Raw Materials Industry

A secure supply of raw materials is an essential basis for Germany's competitiveness and prosperity. In 2018, about 550 million tons of sand, gravel and natural stones were extracted in about 2700 mostly medium-sized and small enterprises in Germany. Currently, a significant part of the energy input is accounted for by internal transport, mostly realized by diesel-powered vehicles. In the future, it will be necessary to convert existing as well as newly built operations to (battery)-electric transport. In this context, it is not sufficient to simply replace the machine technology used. Rather, the operational processes and infrastructure need to be adapted to the changed process- and energy-related conditions.

This is precisely where the "ELMAR" project laid the foundations for the use of electric, automated heavy-duty transport machines in raw materials production, considering maintaining the process reliability. The holistic approach from the energy demand to the energy supply side enabled the optimization as well as the continuous coordination of both sides.

The AMT acted as the overall coordinator of the project and develops three sub-objectives during the three-year project period. These were part of the sub-project "Development of key technologies and concepts for the transformation of raw materials production" of RWTH Aachen University. These included:

1. development of an energy-optimized extraction planning system
2. development of a transformation concept for raw materials production sites

The development of an energetically optimized mining plan was based on the interaction of an operation-specific deposit model and an energy demand forecast. The (further) development of appropriate modeling approaches were a core component of this sub-goal.

The transformation concept was based on a systematic and modular approach to realize the transition from diesel-powered to electrified and automated transport in raw materials production sites. For this purpose, the elementary phases of an operational transformation were defined, decision criteria are researched and subsequently recommendations for implementation are derived.

In case of successful implementation and demonstration of the battery electric and automated transport machines, the project "ELMAR" with the data collected, approaches, methods and models developed within the project represented an important reference project.