Current Research Projects

Here you will find an overview of our current publicly funded research projects, grouped alphabetically. In addition, the AMT implements projects on a private contract basis together with industrial companies, which, however, cannot be listed here for reasons of confidentiality of the research subject.

AKUSTAHL

The aim of the AKUSTAHL project is to develop a monitoring system using acoustic emission analysis (AE analysis) for the micro and initial crack prediction of steel structures subject to fatigue loading, such as bridges, cranes, offshore or industrial structures. Existing systems for acoustic emission analysis are thus to be expanded to include the measurement and detection of microcracks for the earliest possible detection of damage events.

Learn More!

AREA.AI

The AREA.AI project explores opportunities to enhance the safety and sustainability of resource extraction through the development of a robust, low-emission, and autonomous transport system. The AMT focuses on ensuring safety in both autonomous operations and mixed traffic scenarios by investigating regulatory and operational requirements. It researches and develops necessary collision avoidance systems and Human-Machine Interfaces to ensure operational safety. Additionally, it evaluates communication technologies in mining, including optimizing wireless networks and developing simulation

approaches. Furthermore, the AMT conducts an ecological analysis to assess the CO2 reduction potential of electrified mining machinery and to develop implementation scenarios for these technologies.

Learn More!

CIRCULAR E-CARS

The CIRCULAR E-CARS research graduate school investigates the fundamentals and strategies for establishing a sustainable, metal-focused circular economy for electric vehicles. The aim is to develop new methods of reusing and recycling materials, thereby supporting the structural transformation of the Rhineland mining region (Rheinisches Revier) and developing it into a leading European location for researching, developing and innovating in circular value chains.

In this context, the Institute for Advanced Mining Technologies (AMT) investigates participatory innovation processes and competence structures within small and medium-sized enterprises (SMEs). The focus is on models combining innovation capability with the principles of circular economy while actively involving SMEs in transformation processes. The research results aim to contribute to building regional innovation ecosystems and developing sustainable business models that ensure long-term employment and value creation in the region.

Learn more!

EPH

The "Energiepark Herzogenrath" (EPH) project aims to achieve CO_2-neutral energy supply through a central energy management system integrating local industrial enterprises. Digital twins and intelligent forecasting techniques enable precise mapping of energy demands and optimal utilization of renewable energy sources. In collaboration with the AMR institute, a flexible pilot plant for sand processing is being developed, continuously collecting energy and process data while dynamically adapting to the local energy grid. By integrating into Demand Site Management (DSM), the plant actively contributes to grid stability, while a comprehensive energy measurement system supports the optimization of energy consumption. The project serves as a model for innovative energy transition approaches and is funded by the BMWK.

Learn More!

HyperMOS

The Mineral Optimisation System (MOS) is a software based on evolutionary and genetic algorithms that performs automatic mine planning in underground mining based on data from core drilling. The HyperMOS project aims to expand the MOS database with mining-related data and to research the use of hyperspectral cameras and LIBS in underground mining. Data from these sensors enable the classification of different materials and thus also the accurate compilation of information about the content and position of minerals in the deposit. Data collection will be integrated into the mining process and thus also forms the basis for future process control.

Learn more!

REESOURCE

Welcome to Project REESOURCE: "UNLOCKING THE SUPPLY OF RARE EARTH ELEMENTS IN EUROPE THROUGH RESPONSIBLE, SUSTAINABLE AND DECARBONISED INNOVATIVE TECHNOLOGIES"

Project REESOURCE aims to revolutionise the mining of Rare Earth Elements (REEs) in Europe, leveraging a world-class deposit in Norway with a multi-generational lifespan. This initiative focuses on ensuring a stable and sustainable supply of REEs, critical for green technologies, while adhering to principles of responsibility, sustainability, and reduced carbon emissions. Central to this endeavour is the innovative "Raise Mining" method, enabling "Invisible Mining" by minimising socio-environmental impacts.

A key challenge in this project lies in managing the safety hazards posed by radioactive minerals often associated with REE deposits. Effective mine ventilation is essential to mitigate these hazards by diluting radioactive isotopes and maintaining safe occupational conditions. The Advanced Mining Technologies (AMT) team is tasked with developing ventilation guidelines and a hybrid simulation model combining VentSim and CFD/Ansys. This approach will provide a digital design framework to optimise ventilation parameters, ensuring energy efficiency and adherence to regulatory safety standards.

Learn More!

ScaleAssist

The project ScaleAssist aims to develop an operator support system for mechanical scaling. A concept for such a system was developed in the predecessor project ScaleSense. That concept will be further developed, optimized, and validated. A large obstacle in this context are the until now partially unknown influencing factors that have to be investigated and integrated into development.

To identify and analyze these influencing parameters and develop and improve software for reliable loose rock detection based on collected data, long-term measurements in relevant mines are planned. The gathered data will further be used to implement an algorithm that combines infrared thermography data and acoustic emission data to improve the accuracy of loose rock detection and validate that algorithm with regards to its effectiveness and reliability.

Learn More!