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.

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.

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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.

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EgaRoh.ScaleAssist

The project EgaRoh.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.

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HySand

HySand is a demonstration project for the climate-neutral drying of quartz sand using hydrogen: The rotary kiln at Nivelsteiner Sandwerke, which is still operated with heating oil today, will gradually be converted to a process that uses locally available renewable energies, thereby significantly reducing the CO_2 emissions of the energy-intensive high-temperature process. The focus is not only on the new energy supply, but above all on data-based process control: The AMT is developing an online concept for monitoring sand drying based on Acoustic Emission (AE) technology. To achieve this, technical requirements are being defined, a sensor system is being set up and tested in initial investigations, validated through parallel laboratory tests and then systematically evaluated in order to identify correlations between AE signals and sand moisture (remaining moisture) as a basis for future automated process control during operation.

Learn More!

EgaRoh.PLING

As part of the project, the AMT is engaged in the conception, construction, and integration of a sensor platform to develop approaches for dynamic production control based on sensor-based extraction data.

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EgaRoh.CASmin

Safe operation of autonomous and semi-autonomous machinery (ASAM) in mining requires certification of safety strategies and systems. This has only been implemented to a limited extent to date. The EgaRoh.CASmin research project therefore aims to determine the reliability of safety sensor systems for mining and other outdoor applications. The central research focus of EgaRoh.CASmin is object detection systems (ODS), which combine sensors with signal processing algorithms and are an essential component of a safety strategy as part of collision avoidance systems (CAS).

A core objective of the EgaRoh.CASmin research project is therefore to develop and validate an objective comparison methodology for ODS in mining that takes environmental influences such as weather and process conditions into account.

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EGARoh-Connect

The EGARoh-Connect project strengthens Germany's technological sovereignty by providing strategic support for the individual EGARoh research projects, which develop innovative solutions for value creation in primary raw materials. The overarching aim of EGARoh is to reduce import dependencies in line with the EU Critical Raw Materials Act.

Within the extensive network of EGARoh research consortia, the AMT at RWTH Aachen University, together with the BGR and the HIF, supports strategic networking and the transfer of results to industry and policy-making. Through active communication and the handling of cross-cutting issues, the AMT accelerates the transfer of research results into industrial practice.

Learn More!