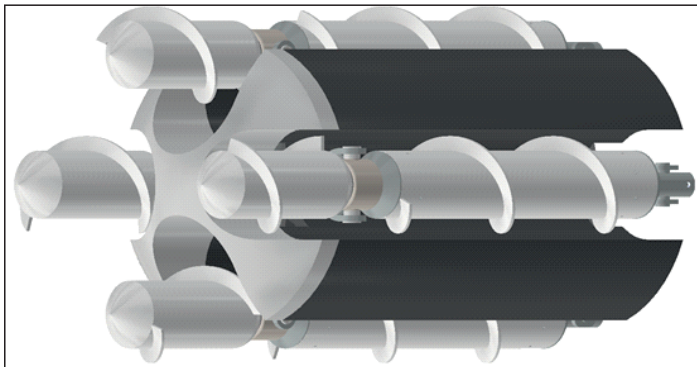


ROBOMINERS

EVALUATION OF POTENTIAL EXCAVATION METHOD FOR A ROBOTIC MINER

Aim of the ROBOMINERS project is the development of a small-scale mining robot, which will be capable of exploring difficult to access deposits and selective mining underground, under water and in slurries. Considerably low weight and power are challenges to be overcome in this project. Core element of the robominer is the main module, in which the locomotion and powering system will be implemented. Additional elements in the robot are sensors for navigation and perception and a production tool system. The locomotion system consists of a 4-screw combination, which can be extended in radial direction. The first design draft can be seen in figure.

The tasks of MUL include the evaluation of



potential production tool systems for future robotic miners (concluding a guideline with applicability potential and limitations) and the design of the production tool concept for the full-scale prototype. In mining, the excavation

of material can be performed by many different methods. For a subsequent assessment, the excavation methods are classified in four main categories: drilling and blasting, mechanical excavation, alternative excavation and combined excavation. The applicability of the production tool system is depending on some properties:

- Excavation rate
- Penetration rate (Advance rate)
- Specific energy
- Limitations (rock strength, flexibility, mobility)
- Need of auxiliary equipment

A crucial factor is the capability of handling the reaction forces: although mechanical excavation systems are widely applied and well proven, such methods can be used to a very limited extent in robots. An attempt to remedy this is made by resorting to alternative or combined excavation methods. Depending on the task to be done (exploration in already existing mines or tunnelling), certain applications require specialized equipment in future – hybrid excavation systems could be a game changer for hard rock conditions. Until now, it could be determined that the combination of drilling and secondary rock fracturing technologies provide promising options for dealing with hard rock conditions.



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