

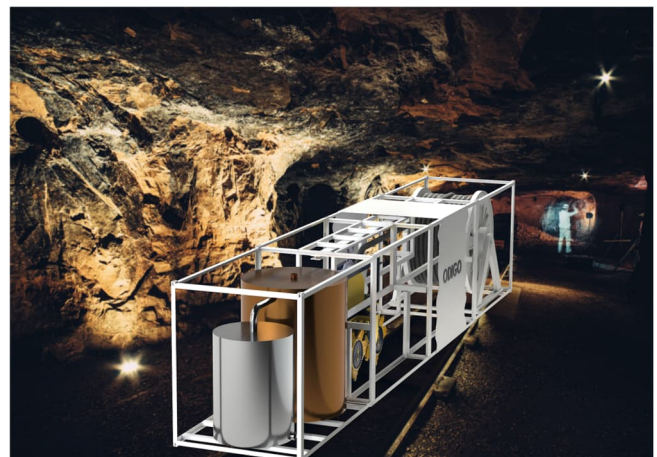
Martin Sobczyk | TU Bergakademie Freiberg, Matthias Semel, Stefan Wegerer | Bauer Maschinen GmbH

A NEW KIND OF MINING - THE POTENTIALS OF VERTICAL CUTTING FOR MINIMIZED FOOTPRINTS

Raw materials have become increasingly a matter of geopolitical agendas instead of mutual market decisions. To secure the raw material supply for the European community inland mining is back on the agenda. But beside the political will to become more independent to unstable partners mining in Europe faces regulatory threats: especially older mining sites are settled in urban areas, are often filled with water, and lack the volume of deposits in other parts of the world.

While the Deeps Sea Sampling Project (Phase 1: 2021 – 24, Phase 2: 2025 – 2028) is focused to develop mining equipment for applications to mine copper rich massive sulfites at 2.500 m below the ocean surface in the German License Area in the Indian Ocean, the technology spurs further benefits: being able to work autonomously under water, and being designed to mine small but highly concentrated veins instead of large volume deposits it is the ideal technology to be utilized at old mining size throughout the world.

The vertical approach allows to mine with almost surgical precision, semi-autonomous and: under water. Give this, even abandoned mining sites which are currently not usable due to highly contaminated mine waters could be mined without getting the water out before. Low volume but highly concentrated ores, especially copper rich sulfites, which form the body of traditional copper mining sites, can be mined without major disturbances to surrounding environments – with mining equipment small, smart, and electrified. The system, placed in four 22 ft containers for easier transportation, allows semi-autonomous operations for higher productivity.



A new kind of mining

From Deep Sea Sampling to Vertical Mining

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Freiberg, 77. BHT, June 9th, 2026

From a Deep Sea Project...

- electrified direct-drive-technology for maximum efficiency ($\eta > 85\%$)
- faster and more reliable operations with reduced energy consumption – tested down to 20 m
- full monitoring of tool movement by integrated IMU (qPos®)
- reduced noise
- avoidance of oil spillage



Freiberg, Summer 2025: fully electrified direct-drive cutter head after testing

cutting tests at
Aresing Testing
Facility



qPos® IMU
position tracker

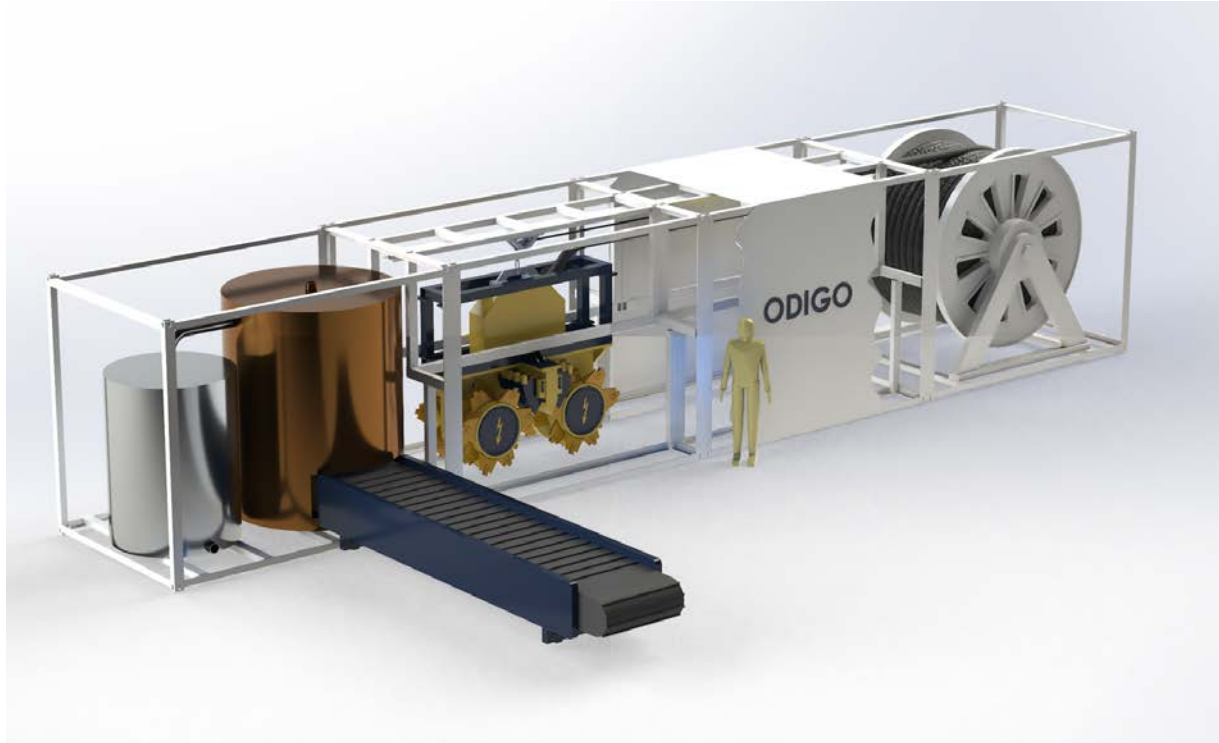


... and the Vertical Approach...

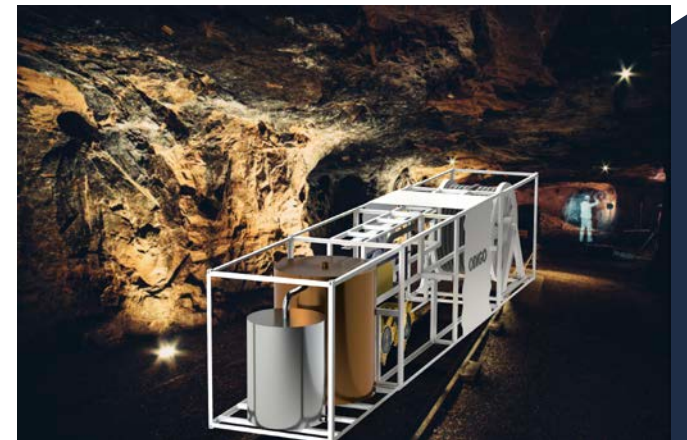
- mining is executed by a vertical trench cutter
- deposits are cut from above, minimizing the impact on environment
- standardized equipment can be utilized
- no alternation in main power source necessary
- refill of cuttings
- research is focussing on using the same technology horizontally



...towards a new kind of Mining.

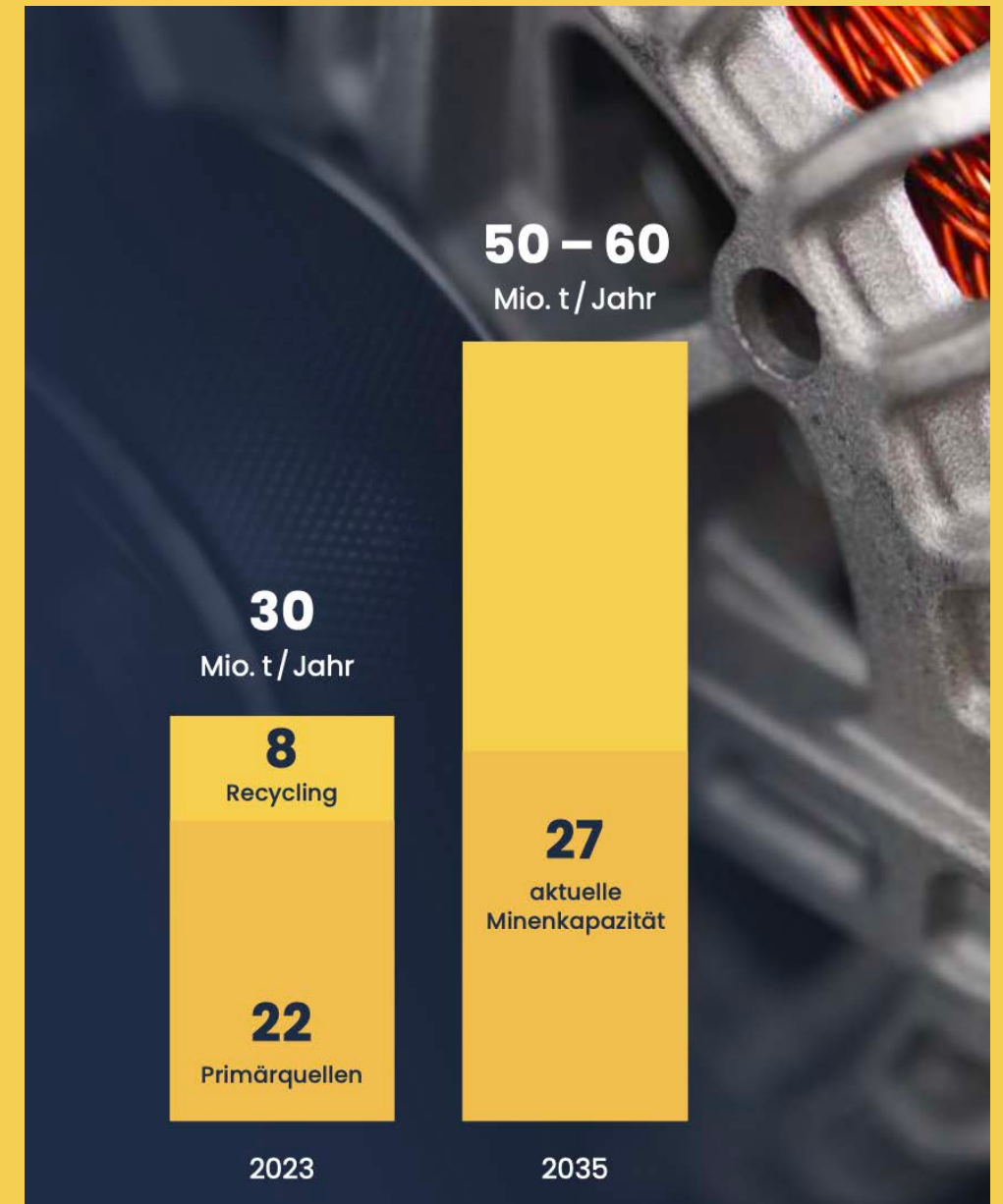


fully integrated Cube-System for easy transportation and semi-automated mining – to be used in low volume ore bodies and in old mining sites





Rising Global Copper Demand





Partners and Roadmaps



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Since 1765.

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BLUE
INSTALLATION
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C>ONSTRUCTOR



MOTION MAKERS

2021 – 2024 Deep Sea Sampling I

- concecptual work
- electrification
- non-GPS-positioning
- demonstrator test

2025 – 2028 Deep Sea Sampling II

- development and design
- high voltage solution tests
- packaging
- drilling campaign

2028 and beyond

- sub-sea trials
- pilot mining test
- under-water mining equipment



«The decades to
come will be the
decades of ore
mining.»



Mining isn't done for
it's own sake – it's
done to provide
resources.

Copper
is by now
generating 50% of
mine tailings
globally

All action comes
with consequences
– which have to be
weighted against
each other.

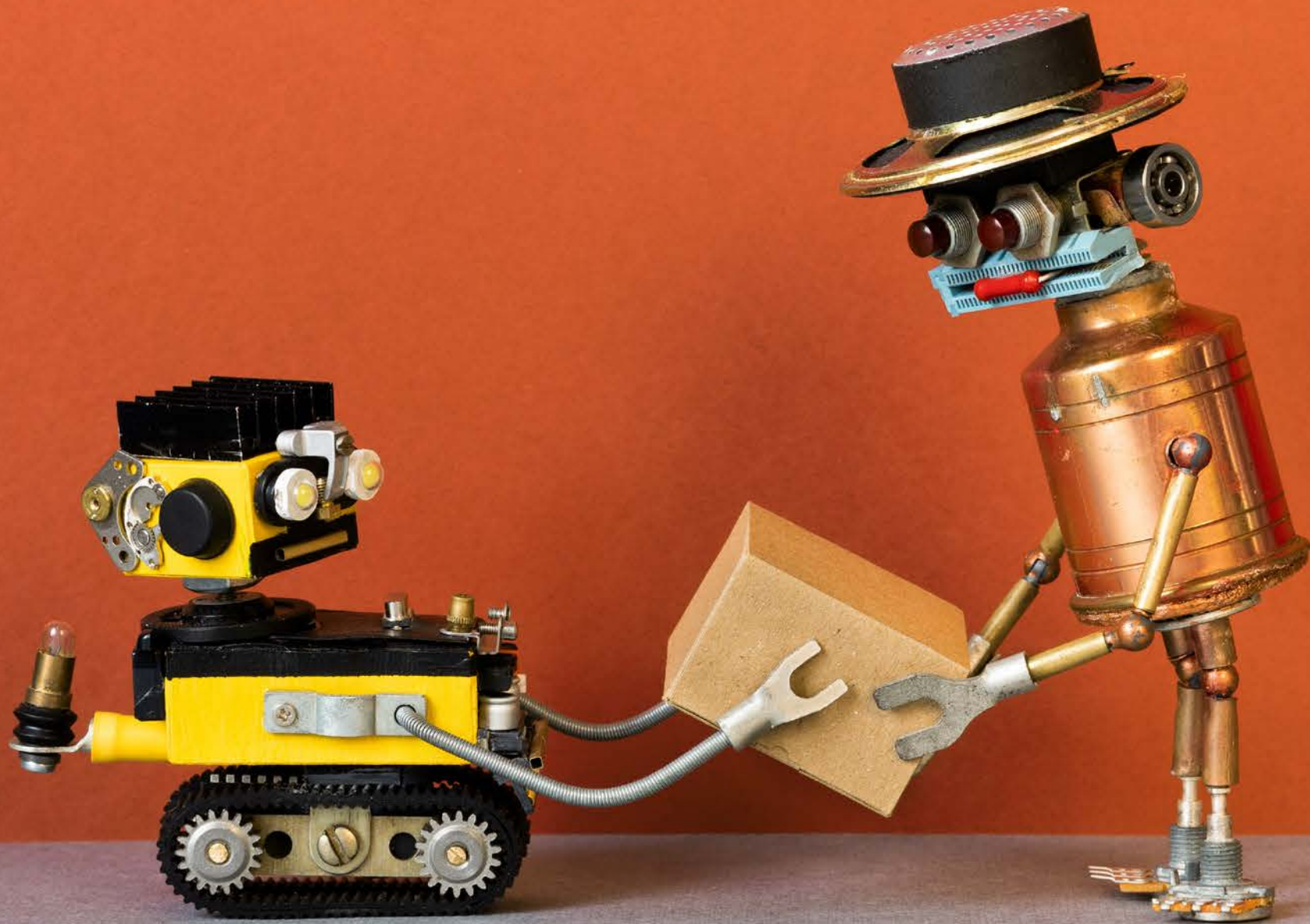


A new kind of Mining

- mining of low-volume/ high-concentration ore bodies
- mining of ores bodies under water: no waste water
- re-utilization of older mining sites, especially in Europe
- productivity gain by automated processes
- low-energy mining by use of hydro-metallurgic route



from burden to
resource



... let's move ahead!

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