



Measurement of Potentially Contaminated Wastewater from a Silver Mine

Environmental Monitoring - Mining

In the teaching- and research-mine of the Freiberg University of Mining and Technology, water quality is measured 150 m underground with a spectro::lyser V3. The data is used to identify hotspots of release of potent pollutants and to develop new methods for water treatment.



Freiberg University of Mining and Technology (TU Freiberg)

Parameters monitored:

- DOC
- UV/Vis Spectrum

Facts & Figures

Customer:

Technische Universität Bergakademie Freiberg

Location:

Freiberg, Germany

Application:

Mining

s::can Partner:



GWU-Umwelttechnik GmbH

Key Products:

spectro::lyser V3,
con::nect V3, ruck::sack

Background

Ore mining has a long history in many places. The UNESCO World Heritage Mining Region of the Ore Mountains which includes Freiberg is located on the eastern border of Germany. It is home to hundreds of abandoned mines and deposits that are causing serious environmental damage due to exposure to heavy metals and other pollutants.

Based on a unique combination of microbiological, biogeochemical and hydrological approaches, the “adit drainage-solute source control” project at Freiberg University of Mining and Technology is developing new techniques to control potential pollutants at the point of their origin.

The TU Freiberg team is pursuing the hypothesis that microorganisms strongly catalyze mineral dissolution, especially under acidic conditions at specific hotspots. Dissolved organic carbon (DOC) serves as a crucial additional energy input for the microbial communities.

Challenges

Measurement campaigns must cover several dozen difficult-to-access flow sites in the adit between 70 and 200 m deep underground to identify hotspots. The station-based monitoring is exposed to very aggressive conditions in the waterways of the former silver mine. Both demand a very robust solution with low maintenance requirements.

s::can's solution

A spectro::lyser V3 is used to optimally meet the requirements underground.

The measurement data is stored directly on the data logger of the spectro::lyser and can be visualized via the lo::Tool web interface.

Power is supplied via a con::nect V3 (power supply unit) and a rechargeable battery. To keep the measuring windows of the optical probe clean, a ruck::sack is used. The ruck::sack is a submersible rotating brush that is mounted directly on the spectro::lyser V3 and reliably removes fouling.



Benefits

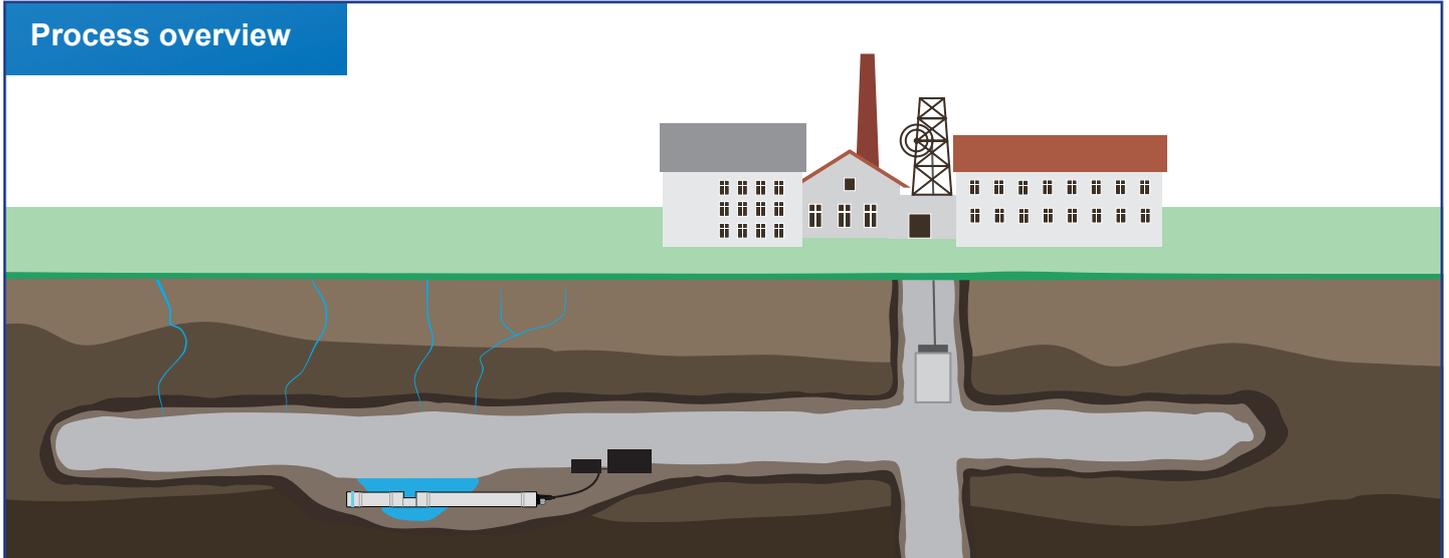
The spectro::lyser V3 provides reliable water quality data in real-time and allows the determination of different loads at different measuring points.

The ruck::sack ensures that the measurements are not distorted by the heavy precipitation on the sensor. The high precision of the measurement allows the simultaneous determination of DOC and dissolved mineral loads. The simplicity of operation makes the closely timed work underground possible.

“The spectro::lyser V3 is the optimal instrument for our project. While identifying possible measuring points underground, we were able to precisely measure water samples in real-time and thus obtain an initial picture of the various freights at the different flow and drip points. It provides reliable data and saves us from time-consuming automated sampling and too frequent visits to the hard-to-access measuring points.”

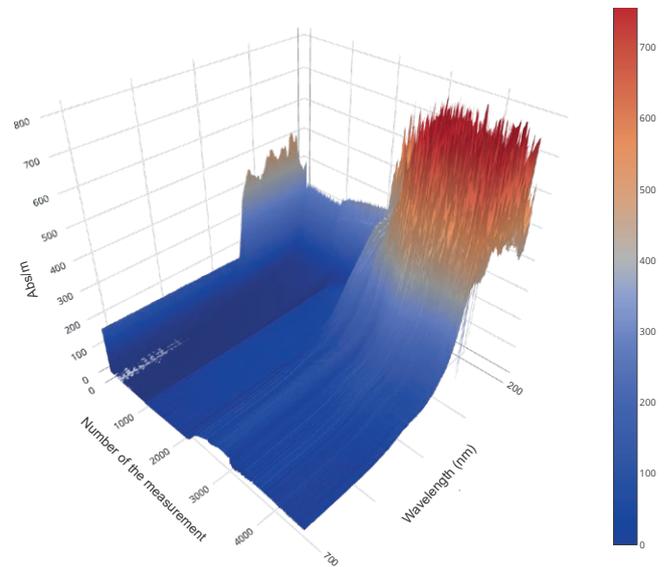
Jun. Prof. Dr. Conrad Jackisch, TU Bergakademie Freiberg

Process overview



spectro::lyser „Reiche Zeche“ - 3D Spectrum

The figure on the right shows the absorption spectrum measured with the spectro::lyser over time, for different series of measurements. High absorbance values in the wavelength range from around 250 to 350 nm indicate increased DOC concentrations.



The s::can spectro::lyser™ is a fully submersible UV/Vis spectrophotometer which measures light absorbance between 190 – 750 nm. s::can's proprietary algorithms analyze the spectral data to provide measurements for many water quality parameters. There are no moving parts in contact with the water and no reagents are used, resulting in almost zero operating costs.



Effective automatic cleaning is a crucial factor when using optical probes in remote locations. The ruck::sack is a submersible rotating brush that reliably removes fouling. With its low power consumption, the ruck::sack is also ideal for battery operation.



lo::Tool is an intuitive web interface for the spectro::lyser V3. Connect to the spectro::lyser via Bluetooth or WLAN and use lo::Tool to configure the probe and display data. lo::Tool visualizes current measured values, time series, fingerprints and status information.