Impact of miNing-project on the reduction of nitrogen discharges in mining processes

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Project duration
2013 – 2015 / 2014 - 2018

SWEDISH MINING INNOVATION

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Background

- Much of the nitrogen in mining environments is derived from ammonium nitrate – based explosives used in the mine
- Undetonated ammonium nitrate dissolves in mine drainage and adsorbs to waste rock
- Risk for toxic effects from certain forms of nitrogen (ammonia NH_3 and nitrite) in surface water systems, as well as eutrophication in nitrogen-limited aquatic environments
- Passive, low cost, low maintenance methods are needed in industry to treated many small diffuse releases from waste rock deposits

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Reduction of nitrogen discharges in mining processes and mitigating its environmental impact – miNing x 2 (full-scale)

Overall objective

- Identification of treatment techniques that successfully remove N from mine site drainage when employed in full scale operation, so recipient concentrations are maintained at levels that are in agreement with national and international legislation.

Study focus

- Bioreactor system for nitrogen removal from mine waters through denitrification
- System for optimizing microbial denitrification in tailings ponds
- Wetland systems for nitrogen removal through phytoremediation by macrophytes and algae

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miNing x 2: Bioreactor system for nitrogen removal from mine waters through denitrification

- Denitrifying woodchip bioreactor treated a small flow from LKAB’s clarification pond in Kiruna during 2015 – 2016.
- High degree of nitrate removal achieved, with a low production of denitrification by-products
- Successful development of treatment technology sparked interest in new projects.

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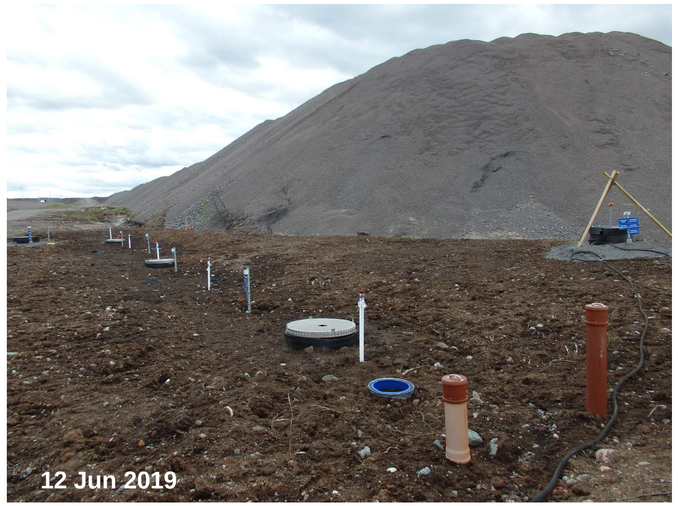
Outcome

- Funding acquired from EIT RawMaterials for upscaling project with focus on commercialization of bioreactor technology. Project period 2018 – 2021.
- Three full-scale bioreactors installed to treat waste rock drainage at Kiruna mine.
- Treatment performance has met expectations and LKAB plans to install up to 50 bioreactors for nitrate removal at future waste rock disposal site.
- Start-up 14N AB established for providing NITREM service to customers



NITREM

eit RawMaterials
Connecting matters

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Impact

- 1.6 tons of nitrogen removed by NITREM bioreactors during 2018 – 2021
- Passive treatment technology has very low energy consumption
- Bioreactor for nitrogen abatement included in LKAB’s new environmental permit
- Denitrifying bioreactors also constructed for rock quarries and tunneling projects in various commercial projects

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The Future

- New research projects – excess heat from pellets production to be used for heating bioreactors
- New business opportunities – bioreactor technology applicable in various operational environments
- New directions – SMI / Vinnova project **SULFREM** to connect denitrifying bioreactors with sulfate – removing system. 2022 – 2025.

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Mining innovation for a sustainable future

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