

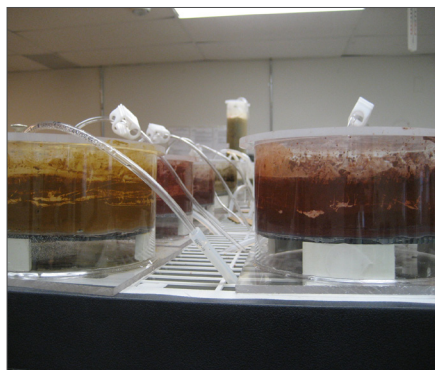
ACID ROCK DRAINAGE

WATER SOLUTIONS FOR THE MINING INDUSTRY

Acid rock drainage (ARD), also referred to as acid mine drainage (AMD), is the outflow of acidic water from mining operations including waste rock, tailings, and exposed surfaces in open pits and underground workings. ARD forms as a result of the dissolution of sulphides, mainly pyrite (FeS_2) and pyrrhotite (FeS) under oxidizing conditions in air and water. This oxidation releases H^+ ions and lowers the surrounding pH to acidic levels. Acidic drainage will subsequently leach additional metal ions from the adjacent rocks. Mining operations lacking sufficient neutralizing carbonate minerals are at greatest risk of environmental degradation and usually require engineering intervention to minimize the problem.

SGS SERVICES

SGS is a global technical leader in the field of ARD with years of experience helping mining companies worldwide. Our laboratories offer complete ARD testing services that help predict acidic effluents. We have the technical expertise to provide mitigating strategies and innovative, yet practical solutions to reduce the environmental impact of your operation.



SGS has been providing practical ARD solutions for the mining industry since 1998. We have developed a reputation as an organization with exceptional understanding of acid rock drainage and providing the following services in the detection and control of ARD:

- Site investigation before, during, or after mining operations to ensure the scope of your ARD situation is completely understood.
- Comprehensive laboratory analysis of effluent for the prediction and characterization of ARD.
- Complete design and pilot scale testing of ARD treatment processes.
- Construction management, commissioning, and start-up of water treatment solutions.

SGS will continue to work with you after the start-up of your ARD treatment project to ensure optimal efficiency and provide modifications and calibrations as required.

ACID ROCK DRAINAGE TESTING

The characterization of the acid producing potential of ores is vital for the management of ARD and the prevention of long-term environmental liabilities. SGS offers a wide range of laboratory testing services to assist you in the preparation of environmental impact studies and to help with the prediction of ARD problems. Our laboratories are staffed by professionals with extensive experience in the mining and metallurgical industries. We understand why you need to mitigate ARD and can provide you with extensive analysis including the following standard ARD tests:

STATIC ACID ROCK DRAINAGE TESTS

- Modified Acid Base Accounting (Lawrence, 1989)
- EPA Standard Acid Base Accounting (Sobek et al., 1978)
- Net Acid Production (NAP) test
- Net Acid Generation (NAG) test
- Diagnostic mineralogy to identify: sulphur mineral speciation, non-iron bearing sulphides, and the reactivity of sulphide minerals using:
- X-Ray diffraction (XRD)
- EXPLOMIN
- Optical microscopy

KINETIC ACID ROCK DRAINAGE TESTS

- Standard humidity cell testing (ASTM D5744-96)
- Column testing (sub-aqueous, sub-aerial)

SGS understands the key to a successful testing program is proper sampling technique. Samples should be representative and the data reproducible. Your program should include all source areas of ARD. All SGS sampling and laboratory analysis is performed in accordance with recognized global standards such as American Society for Testing and Materials (ASTM) and International Standards Organization (ISO). Our qualified technicians operate in laboratories with state-of-the-art instrumentation, using industry best practices.

WATER TREATMENT PLANT DESIGN AND PILOT SCALE TESTING

Once the scope of your ARD problem has been fully analyzed and understood, SGS will work with you to develop effective mitigating strategies. We have been designing ARD treatment plants since 1998. These range in size from 1,500 L/min to 210,000 L/min. Our extensive experience in pilot studies enables us to methodically pilot and design efficient, cost effective ARD treatment plants based on available, proven technologies. Our design experts are able to provide you with practical treatment solutions even for those operations with severe site restrictions. Some of your ARD treatment options include:

- Lime precipitation including the HDS (High Density Sludge) process in which limestone/lime and recycled sludge are added to the lime-sludge mix tank at the beginning of the process to become the main neutralization agent
- Engineered wetlands
- Carbon adsorption
- Ion exchange
- Reverse osmosis
- Electrodialysis
- Biological systems
- Ozonation

SGS has a mobile pilot plant available for ARD piloting work as well as a larger mobile treatment plant for batch- treating contaminated solutions. These provide credible baseline information and help us establish reliable design parameters for treatment plants. During your pilot plant operations, unforeseen problems may arise, usually revealing issues that are better addressed before full-scale operation begins. As a result of years of experience, our staff will quickly provide workable alternatives and inform you of the implications each could have on the management of your ARD.

CONSTRUCTION MANAGEMENT, COMMISSIONING AND START UP OF WATER TREATMENT SOLUTIONS

SGS offers a range of construction management options to assist you in the construction phase of your project. We will ensure the contractors' designs, drawings and specifications meet with the applicable codes, standards and purchase specifications. Experienced SGS personnel will verify design and stress calculations, working drawings, material specifications, and control-systems to ensure they are in accordance with construction requirements. SGS is dedicated to ensuring your ARD treatment project performs according to specifications, regulations and to your complete satisfaction. SGS will stay involved throughout the project, reviewing and approving all design and construction drawings, and would expect to have major responsibility during plant commissioning and start-up.

SUMMARY

The identification and control of acid rock drainage (ARD) can be a key element in mining prosperity as it minimizes present and future environmental liabilities. Whether you are in the early characterization and prevention stage or a more advanced remediation phase, SGS is your independent technical partner. We will provide:

- Comprehensive laboratory analysis of ore and waste rock samples and effluent for the prediction and characterization of ARD
- Complete design and pilot scale testing of ARD treatment facilities
- Construction management, commissioning, and start-up

SGS has an unsurpassed reputation for delivering quality solutions to environmental challenges. Work with us to ensure your ARD problems are dealt with in an effective and environmentally responsible manner.



CONTACT INFORMATION

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SGS

WHEN YOU NEED TO BE SURE