

## Water Treatment: Planning for Forever, New Options

D.T. Eyde\* and D.A. Baker

**Abstract:** We have reached the conclusion that there will be an upward trend in investments in water infrastructure and treatment. This same trend may hold for increased investment in the treatment and disposal of water and effluents. One of the largest ongoing expenses during the life cycle of a mining operation in the coal fields of the southeastern U.S. is the treatment of effluents that can leave an operation. Southern Coal Corporation and 26 affiliated mining companies are under an EPA consent decree that requires the companies to make comprehensive upgrades to their coal mining and processing operations to prevent discharges of polluted wastewater from their mines in Appalachia. The estimated cost of these measures is \$5 million. Coal mining operations may soon face in-perpetuity effluent treatment with affiliated bonding requirements. This will require new more efficient and less costly long term treatment technologies. More importantly, these treatment requirements will continue past the economic recovery of coal at a mining operation. Meeting this challenge is one of the more difficult for the minerals industry. Natural zeolites with their exceptional ion-exchange and sorption properties may represent a part of the solution. Their effectiveness as shown by numerous studies, have confirmed their excellent performance on the removal of metal cations from wastewaters. They have advantages over other materials because they are cheap, they exhibit excellent selectivity for different cations at low temperatures, which is accompanied with a release of non-toxic exchangeable cations ( $K^+$ ,  $Na^+$ ,  $Ca^{2+}$  and  $Mg^{2+}$ ) to the environment. They can also reduce AMD. Several case studies confirmed, and US government lab testing (USGS, EPA) and examining the viability of their use under field conditions. New treatment technologies using compact bio-reactors and bio-films on zeolite media show real promise as a long-term passive system supplementing or replacing current treatment technologies.

**Keywords:** effluents, discharges, ion exchange, zeolites, in-perpetuity, bonding, water treatment, bio-reactors, bio-films, AMD

\* Dan Eyde is the President and CTO of St Cloud Mining Company, Tucson, AZ 85745. David A. Baker, is a consultant, based in Denver, CO.