

TREATMENT OF NITRATE RICH PROCESS WATER

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ABSTRACT

Concentrations of nitrates that reach values of 750 mg/L as N have been identified in the process water of a Platinum mine. A study was conducted to find a holistic solution to treat the nitrate-rich process water so that there is compliance with DWAF requirements. Laboratory and Pilot studies showed that the DesEL process can effectively treat nitrate-rich process water from the mine. The pilot unit achieved a 75 % salt rejection and 80.5 % water recovery when the focus was on the mass removal of contaminants (optimisation of the volume and concentration of the brine stream per day). The N-removal capacity of the DesEL process during the pilot plant evaluation study was 0.95 kg/day/cell.

Introduction

Mining and other industries are faced with numerous environmental issues regarding wastewater containment and disposal. Some industries have large holding ponds containing mining wastes while other operations may have contaminated groundwater supplies. Industries also have wastewater streams that often do not meet increasingly stringent discharge limits. All these water sources can be treated with DesEL system to produce high quality water for reuse. In some cases, valuable by-products can also be recovered for resale or reuse.

The DesEL system operates on the principles of capacitive deionisation to remove ionic compounds referred to as total dissolved solids (TDS). The main component of the DesEL system is a novel, electrostatic charging system that behaves as a capacitor and comprised of inexpensive carbon electrodes. The capacitor is energized using direct current, creating positive and negatively charged surfaces. Ionic compounds

such as iron, chloride, ammonia and nitrate are attracted to and electrostatically adsorbed onto the surface of the electrodes.

The DesEl unit employs the “Charge Barrier” innovation consisting of ion selective layers. This innovation enables high water recoveries for brine.

The objective of the study was to evaluate the suitability of the DesEl system to reduce nitrates and other salts from the water circuit. The process adopted was to remove the nitrate and other salts from the process water at one point, which reduces the risk of seepage into the ground water via the tailings facility. Brine disposal options and possible by-product recovery was also investigated as part of the study.