

The KNEW Process – Recovery of acid mines water profitably

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ABSTRACT

Acidic mines effluent water has presented an expensive problem to recover up until the advent of the KNEW process (Potassium Nitrate ex Waste) patented in 2011 by Trailblazer Technologies. In the KNEW process the polluted waste water from mines is neutralized, filtered to remove coarse particles and precipitated heavy metals, then pumped through an ion exchange battery to remove all the dissolved ions leaving a water of any designed quality.

The ionex battery is regenerated with dilute nitric acid for the cation resin bank and ammonia solution for the anion resin bank. The nitrate blend is treated with sodium carbonate to cause all the multicharged cations to precipitate and to be separated for use in agriculture as a soil ameliorant. The residual sodium nitrate solution is mixed with an equimolar amount of potassium chloride and evaporated with the result that the least soluble salt – sodium chloride – crystallizes out and is separated pure and dried for supply to the chlor-alkali industry. The residual liquor is cooled to produce a pure crystalline potassium nitrate which is separated and dried for supply to horticulture as a primary fertilizer. Another option is to use vegetable ash which has a very high potassium carbonate content as a raw material to precipitate out the multicharged elements giving an even more economic route to the formation of this potassium nitrate.

The anion regenerant solution is treated with methanol to precipitate out most of the ammonium sulphate almost chloride free and is separated, dried and supplied to agriculture as a fertilizer. The residual liquor is treated with sodium hydroxide to recover the ammonia content for recycling and the remaining sodium chloride is recovered by evaporation and added to the cation arisings for supply to industry.

The overall economic picture of the process reveals that the sale of the potassium nitrate pays for the purchase of all the raw materials and the costs of operating the process and even leaves a reasonable profit. If the water produced can be sold – and this is not often the case – then an additional profit can be realized.

The KNEW process is one of the few processes that can beneficially remove the worst and most difficult to deal with pollutant, namely, sodium. As over 60% of South Africa's water is used in agriculture and as all of this water evaporates on the soil to which it is applied, this cation causes more devastation to our soils than all other dissolved solids together and must be removed from the environment. The KNEW process also removes all other dissolved ions beneficially and creates a lot of desperately needed less skilled jobs in the chemical processing plants.

