

Technologies to treat sulphate in waste streams

The CSIR Water, Environment and Forestry (Environmentek), South Africa, has developed three technologies to reduce or remove sulphate from waste streams, namely: Limestone neutralization, Barium sulphide process and Biological sulphate reduction/removal. Significant cost savings can be achieved by the limestone neutralization process, which involves the following stages:

- Acid is neutralized with the cheapest alkali. Acid removal is achieved within 20 minutes in a fluidized-bed reactor where crushed limestone with a particle size smaller than 4 mm is used.
- Sulphate is removed from concentrations varying from 20,000-2,000 mg/l.
- Metals are precipitated as metal hydroxides. In case of iron-rich acid water, it is oxidized biologically prior to the neutralization stage.

Barium sulphide process is based on the insolubility of barium sulphate. This technique can reduce/remove sulphate to low levels as it is based on chemical precipitation. The process consists of two steps:

- Water treatment: where barium sulphide, oxide or carbonate is dosed to sulphate containing water resulting in a barium sulphate precipitate; and
- Thermal reduction: where the barium sulphate sludge is reduced at 1,200°C to BaS or BaO.

In the biological sulphate removal method, a single-stage reactor partially removes the formed sulphides. Sulphate can also be removed if a carbon and energy source is incorporated. Waste streams containing high concentrations (3,000 mg/l) have been treated, resulting in low sulphate (200 mg/l) streams within 4-6 hours of reaction time.

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