

# Acid Mine Drainage Water Treatment

## ACID MINE WATER TREATMENT OVERVIEW

Global Advantech's system for the treatment of acid mine water removes sulphates and other cations in water discharges from working and abandoned mines and other industrial works. These cations both contribute to acidity and solubilise heavy metals into solution, making these discharges hazardous to the environment.

The acidity in mine discharge water is mainly produced by the oxidation of sulphide minerals, in particular iron pyrite (iron disulphide -  $\text{FeS}_2$ ), when they are exposed to oxygen in the air and water. This reaction of pyrite with oxygen and water produces a solution of ferrous sulphate and sulphuric acid. These ferrous irons may undergo oxidation to ferric ions, increasing acidity still further.

Additionally, iron and sulphur oxidising bacteria are known to catalyse these chemical reactions at low pH and are therefore capable of increasing oxidation reaction rates by several orders of magnitude over natural oxidation processes. This resultant acidity then solubilises metals into the water, which is discharged.

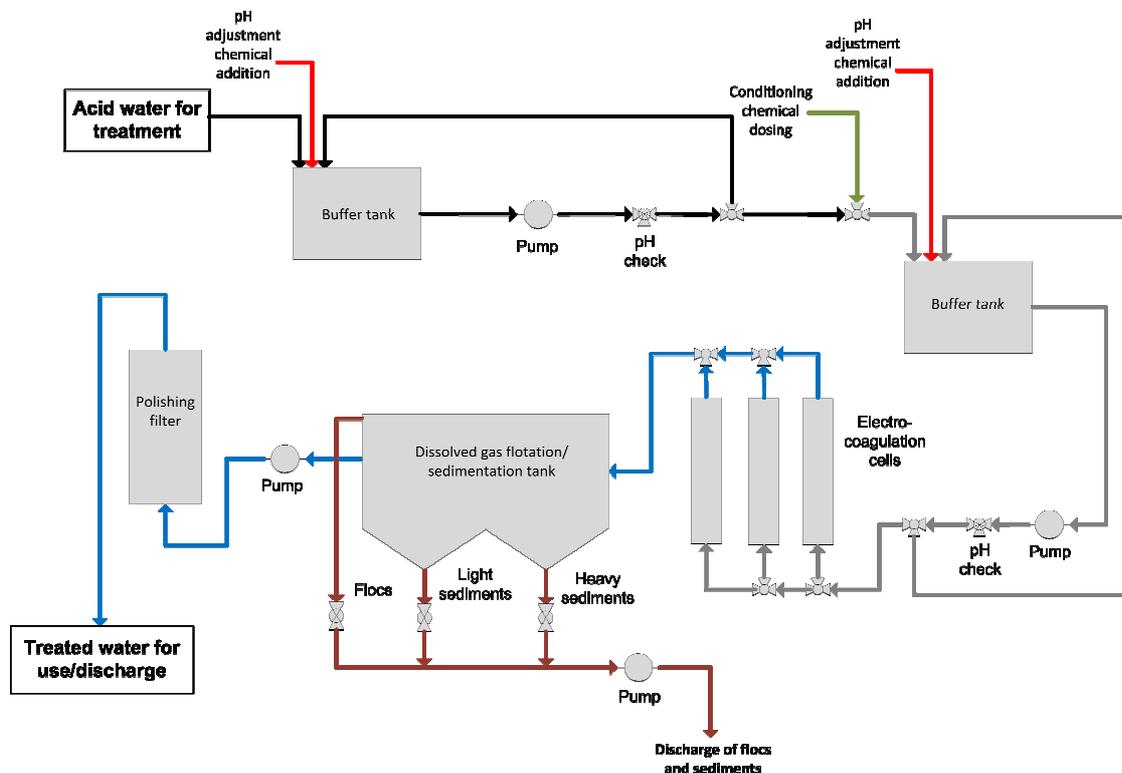
Global Advantech's treatment systems combine chemical conditioning with electrocoagulation treatment to remove sulphate and carbonate cations, heavy metals and suspended solids, whilst minimising the production of waste by-products. Global Advantech has a patent pending on the process.

## GLOBAL ADVANTECH'S ACID MINE DRAINAGE WATER TREATMENT SYSTEMS

Global Advantech's acid mine drainage water treatment systems have a number of innovative advantages:

- Simultaneous removal of sulphates, heavy metals, arsenic and suspended solids.
- Less hydrated flocs, therefore lower floc volumes than with chemical treatments.

- Minimisation of waste by-products.
- Continuous flow operation.
- Depending upon conditioning chemistry selected for a particular application, the main by-products may be used to strengthen cement.



Typical configuration for Global Advantech's system for acid mine drainage water treatment

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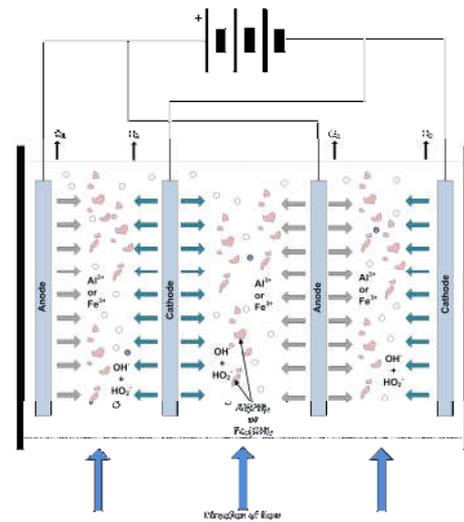
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## ELECTROCOAGULATION PROCESS

Electrocoagulation is a proven and cost effective electrochemical process to remove most contaminants/pollutants from water: suspended solids, emulsified hydrocarbons and many dissolved organic compounds, heavy metals, arsenic, bacteria, algae, larvae, etc., from water for re-use/discharge. The electrocoagulation process is continuous flow and is low in energy consumption.

Electrocoagulation cells consist of pairs of parallel metal plate electrodes separated by a few millimetres with a low voltage applied at high current densities. The current flowing between the electrodes destabilises electrical charges, which maintain suspensions of particulates, e.g. clays, and emulsions/micro-emulsions of hydrocarbons and insoluble organic compounds. The particulates coagulate together into flocs. The hydrocarbons and insoluble organic compounds coalesce into larger droplets and rise in the flotation/sedimentation tanks.



For more information, please refer to Technology Data Sheet: *TDS801 Electrocoagulation and Advanced Electrochemical Oxidation*.

## GLOBAL ADVANTECH'S ELECTROCOAGULATION SYSTEMS

Global Advantech's systems contain a number of innovative design features and benefits to ensure effective and continuous operation:

- Cells use optimised electrochemistry, with a large number of parallel plate electrodes for efficient operation.
- Hydrodynamic design of cells ensures water flow is through the whole cell volume and electrodes are evenly consumed.
- Upward flow cells with air injection after exit to dilute of hydrogen gas below lower explosion and flammability limits prior to flotation/sedimentation tanks and to prevent sediment build-up in the cells.
- All systems are PLC controlled, programmed to prevent metal plate passivation (development of oxide layers of the surfaces of electrodes, which

acts as insulation preventing cells from continuing to operate).

- Instrumentation options include plate consumption monitoring, telemetry for remote monitoring.
- The cell electrodes are mounted in carrier cartridges to facilitate rapid replacement.
- Multi-cell configurations enable a single cell to be taken off-line for maintenance.
- All cells are mounted inside safety cages with interlocks to prevent access during operation.
- Compact single and full-size multi-cell systems, capable of handling from 1m<sup>3</sup> per hour to more than 1,000m<sup>3</sup> per hour water flow available.
- Electrocoagulation systems are available configured for safe area operation and for operation in ATEX Zone 2 and ATEX Zone 22.



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