

# Treatment of Seawater for Injection into Oil and Gas Wells

## TREATMENT OVERVIEW

Global Advantech's process for the treatment of seawater (and produced water) removes sulphates, heavy metals, suspended solids and hydrocarbons prior to injection (or re-injection/discharge) into reservoirs.

Sulphates are a major problem in reservoirs and in gathering systems, they are the food source for anaerobic bacteria, which obtain their energy by reducing sulphates to sulphides, producing hydrogen sulphide – sulphate reducing bacteria (SRBs). This hydrogen sulphide is a major source of corrosion in gathering pipelines, compressors, etc.,

and its presence in elevated concentrations contributes to pipeline failures and high maintenance costs. Hydrogen sulphide production is observed to increase in mature fields where larger volumes of seawater and injected. This due to the increased supply of sulphates made available as food source for sulphate reducing bacteria.

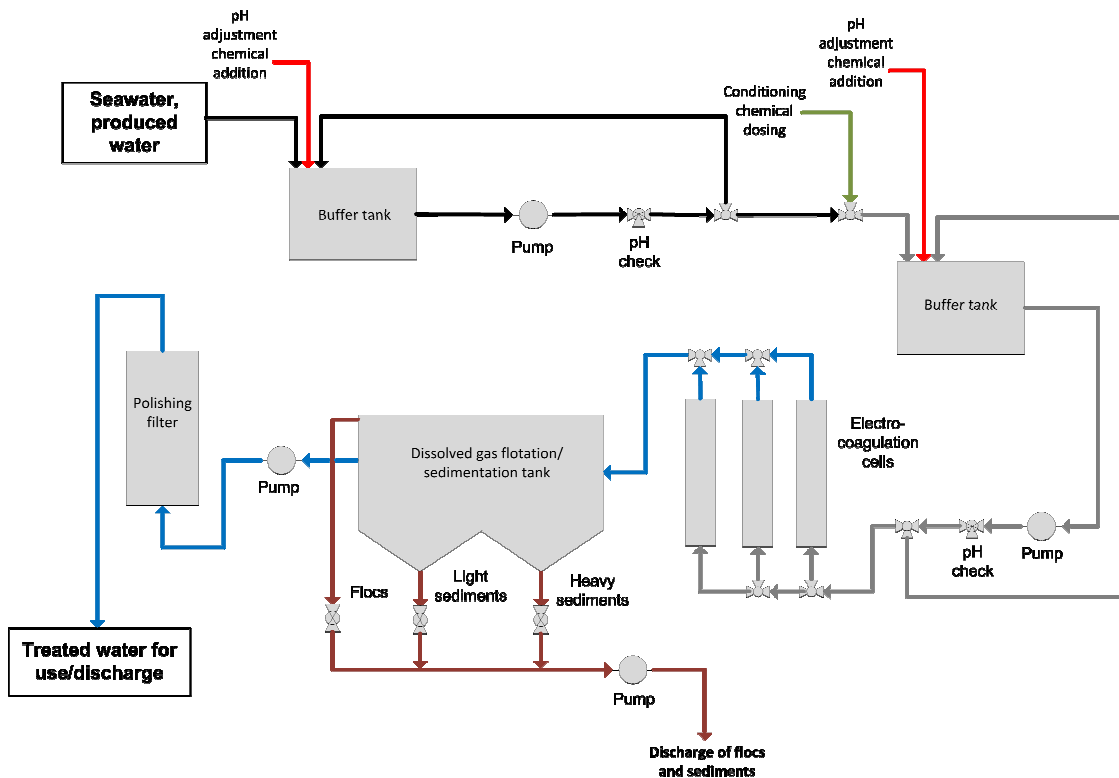
Global Advantech's systems combine chemical treatment with electrocoagulation to remove sulphate cations, heavy metals, suspended solids, and hydrocarbons. Global Advantech has a patent pending on the process.

## GLOBAL ADVANTECH'S TREATMENT SYSTEMS

Global Advantech's seawater (and produced water) treatment systems have a number of innovative advantages:

- Simultaneous removal of sulphates, hydrocarbons, suspended solids, heavy metals, biological material (bacteria, algae, larvae, etc.).
- Continuous flow operation.
- Lower capital, maintenance and operational costs compared with membrane filtration systems.

- No high pressure pumps, therefore much lower energy requirement than comparable throughput membrane system.
- No water pre-treatment is required to remove hydrocarbons, suspended solids, heavy metals, biological material or scale-forming calcium salts.
- 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 seawater water treatment

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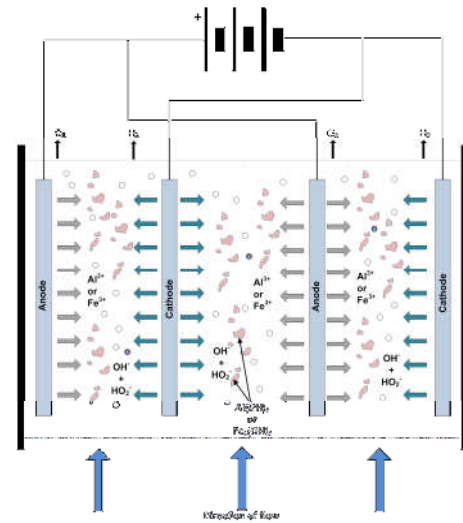
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## ELECTROCOAGULATION PROCESS

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:

- 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.
- 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 to prevent sediment build-up in the cells, with air injection after exit to dilute hydrogen gas below lower explosion and flammability limits prior to flotation/sedimentation tanks.
- 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.
- Electrocoagulation systems are available configured for safe area operation and for operation in ATEX Zone 2.



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