INFILCO iBIO®

Biological Wastewater Treatment System

WASTEWATER

The iBIO® Biological Wastewater Treatment System integrates biological reactors to treat effluent from a FGD physical/chemical wastewater treatment system for the removal of nitrates, heavy metals, ammonia, and biochemically oxidizable organics measured as the Biochemical Oxygen Demand (BOD).

APPLICATIONS

» **FGD WASTEWATER TREATMENT**
- **Nitrates Removal**
- **Heavy Metals Removal**
- **BOD and Ammonia Removal**

MAIN FEATURES

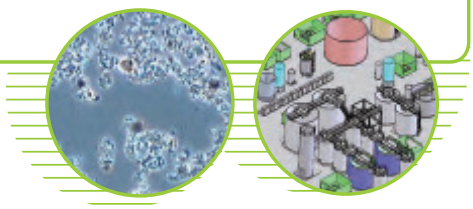
» Advanced pollutant removal from FGD wastewater streams

» Patented process utilizing an activated sludge suspended-growth system

» Unique alternative to fixed-film systems that can fail over time

» Meets or exceeds regulatory requirements for a wide-variety of wastewater compositions

» Selective pressure promotes growth of targeted microbial consortium with an automated controls strategy that maintains reactor conditions



iBIO® SPECIFIC TECHNOLOGY

The iBIO® Biological Wastewater Treatment System is a patented, activated sludge suspended growth system. Degremont selected this biological process after careful consideration of the available options. While fixed-film systems may be effective initially for treating FGD wastewater, they often fail over time due to filter bed blockage or cementation. Degremont has chosen an activated sludge suspended growth system design because it can handle contaminants' fluctuations from the FGD physical/chemical wastewater treatment system without process upsets.

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BIOLOGICAL TREATMENT SYSTEM OVERVIEW

FGD wet scrubbers produce wastewater that must be treated before it is discharged to the environment. The scrubber blowdown wastewater is first sent to a physical/chemical treatment system. If further polishing of the water is required, it can then be sent to a biological treatment system.

Degremont's iBIO® biological wastewater treatment system consists of a series of reaction vessels which are designed with the optimum mixing energy, retention time, and nutrient addition, to provide an optimum environment for biological activity resulting in removal of nitrates, heavy metals, ammonia, and biochemically oxidizable organics measured as the Biochemical Oxygen Demand (BOD).

NITRATES REMOVAL

The first step in the biological treatment process is denitrification where nitrates are converted to nitrogen gas which then bubbles to the surface and is vented to the atmosphere. Denitrification is carried out by the denitrifying bacteria. These bacteria utilize the nitrate as an electron acceptor in the process of respiration. The denitrification process is carried out in the Anoxic Reactor under anoxic (in the absence of dissolved oxygen) conditions.

SULFATE REDUCTION FOR HEAVY METALS REMOVAL

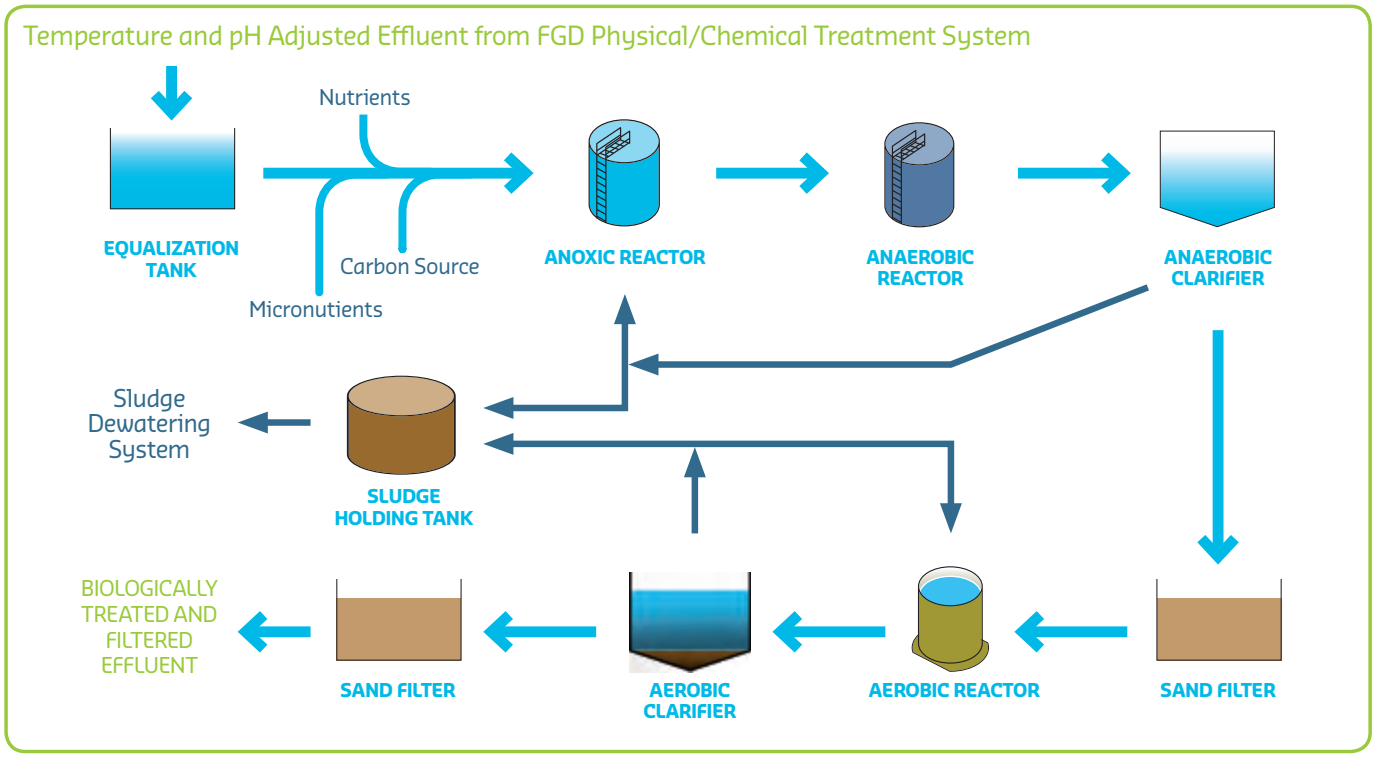
The process of sulfate respiration is performed by a group of organisms known as Sulfate Reducing Bacteria (SRB) in the Anaerobic Reactor. The SRB are the key organisms in the reduction of heavy metals such as selenium. In this process, elemental selenium is formed and precipitates in the reactor.

ANAEROBIC CLARIFICATION USING A SOLIDS CONTACT CLARIFIER AND SAND FILTRATION

The wastewater is kept well mixed in the Anoxic and Anaerobic Reactors, so that the undissolved solids consisting mainly of biomass are kept in suspension. This suspension is sent to the Anaerobic Clarifier where a flocculant is added and the suspended solids are allowed to settle out as sludge in the bottom of the clarifier. Most of this sludge is recycled back to the Anoxic Reactor and the rest is sent to a sludge holding tank from where it is pumped to a dewatering system. The clarified water is then filtered for further removal of suspended solids and sent to the Aerobic Reactor.

BOD AND AMMONIA REMOVAL

In the Aerobic Reactor, a high concentration of dissolved oxygen is maintained, typically by injecting air into the wastewater. The following biological processes are accomplished in this reactor:
(1) Aerobic bacteria consume residual BOD, (2) Ammonia is oxidized by nitrifying bacteria by converting ammonia into nitrate, and (3) the remaining dissolved oxidizable metals (such as iron) are converted to an insoluble hydroxide form and precipitate out of solution.



AEROBIC CLARIFICATION USING A SOLIDS CONTACT CLARIFIER AND SAND FILTRATION

The aerobically treated wastewater contains suspended solids which consist mainly of biomass that has been kept in suspension. This mixed liquor flows to the Aerobic Clarifier where a flocculant is added and the suspended solids are allowed to settle out as sludge at the bottom of the clarifier. Most of this sludge is recycled back to the Aerobic Reactor. The rest is wasted to a sludge holding tank from where it is further treated in a sludge de-watering system. The clarified water is then filtered for further removal of suspended solids and ready for discharge as the treated effluent.

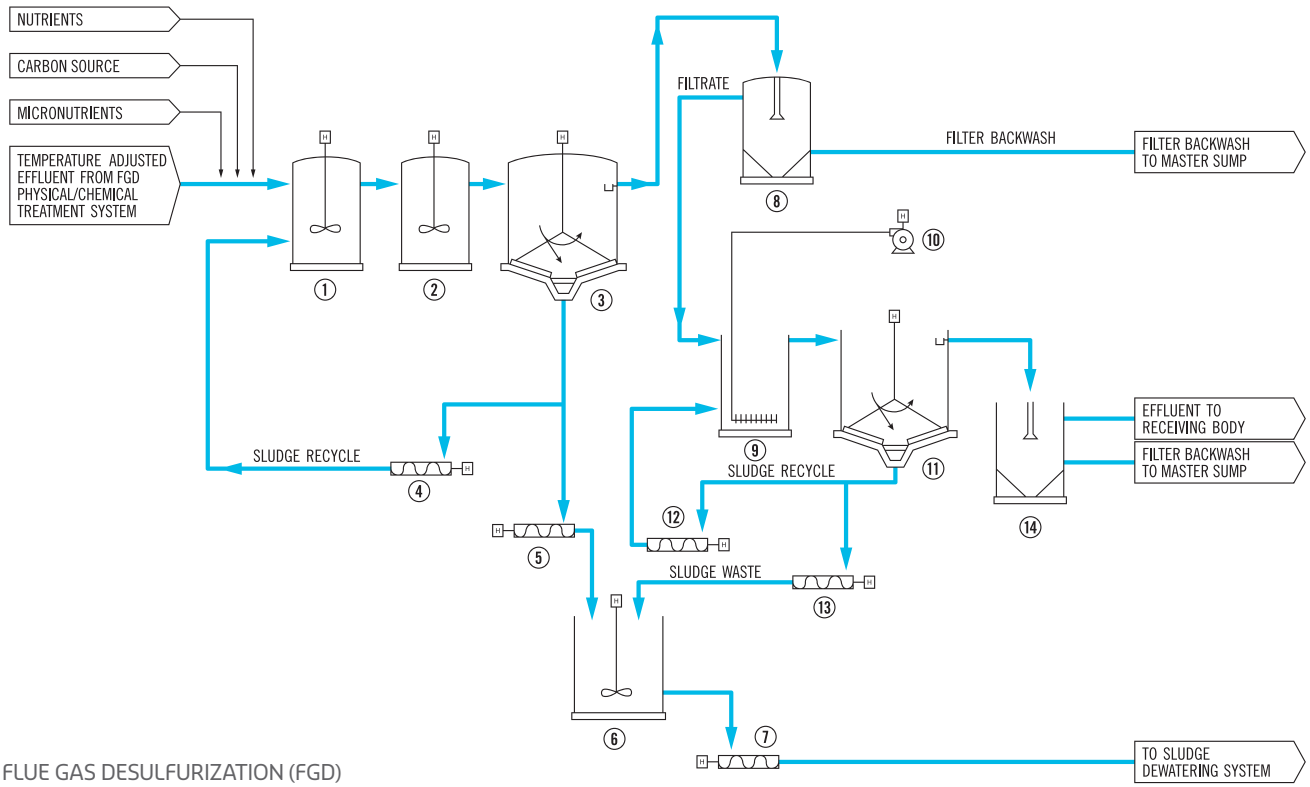
iBIO® PROCESS TECHNOLOGY

» **Innovative Selective Pressure:**

- Promotes growth of targeted microbial consortium
- Automated controls strategy maintains reactor conditions
- Sequential removal of multiple contaminants

PROCESS EQUIPMENT LIST

① Anoxic Reactor for Denitrification
② Anaerobic Reactor for Heavy Metals Reduction
③ Anaerobic Clarifier
④ Anaerobic Sludge Recycle Pump
⑤ Anaerobic Sludge Waste Pump
⑥ Sludge Holding Tank
⑦ Sludge Dewatering Pump
⑧ Continuous Backwash Sand Filter
⑨ Aerobic Reactor
⑩ Aerobic Reactor Aeration Blower
⑪ Aerobic Clarifier
⑫ Aerobic Clarifier Sludge Recycle Pump
⑬ Aerobic Clarifier Sludge Waste Pump
⑭ Continuous Backwash Sand Filter



FLUE GAS DESULFURIZATION (FGD)
iBIO® BIOLOGICAL WASTEWATER TREATMENT SYSTEM

FEATURES AND BENEFITS

The iBIO® Biological Wastewater Treatment System integrates biological reactors to treat effluent from a FGD physical/chemical wastewater treatment system in order to remove the following contaminants:

- Nitrates
- Heavy Metals such as Selenium, Chromium and Vanadium
- Ammonia
- BOD (Biochemical Oxygen Demand)

The iBIO® Biological Wastewater Treatment System is a patented, activated-sludge suspended growth system. Degremont selected this biological process after careful consideration of the available options. While fixed-film systems may be effective initially for treating FGD wastewater, they often fail over time due to filter bed blockage or cementation. Degremont has chosen an activated sludge suspended growth system design because it can handle contaminants' fluctuations from the FGD physical/chemical wastewater treatment system without process upsets.

Design of a FGD biological wastewater treatment system that will meet regulatory requirements can be challenging because the FGD wastewater composition varies widely from utility to utility and from plant to plant. Degremont's iBIO® system overcomes these challenges by consistently yielding results that meet or exceed regulatory requirements.

PILOTING SERVICES

Infilco Degremont offers pilot systems and services for this and many other of our product offerings. Pilot studies are a practical means of optimizing physical-chemical and biological process designs and offer the client several benefits, such as:

- Proof of system reliability
- Optimal design conditions for the full-scale system
- Free raw water lab analysis
- Regulatory approval

If interested in a pilot study for this system, please contact us for a proposal and more information.

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