**CONTROL OF H$_2$S INHIBITION FOR ANAEROBIC REACTORS**

**ANAEROBIC TREATMENT**

Anaerobic digestion using modern reactor technology is the most cost-effective option for the treatment of biodegradable effluents. It is energy efficient because of the conversion of organic matter into methane and environmentally benign because of the low amount of waste sludges produced.

**HIGH-RATE REACTORS FOR ANAEROBIC WASTEWATER TREATMENT: WASTEWATER CONTAINING DISSOLVED ORGANIC POLLUTANTS**

- FIXED FILM REACTORS
- FLUIDIZED BED AND EXPANDED BED REACTORS
- UPFLOW ANAEROBIC SLUDGE BED REACTORS (UASB)

**Where High-rate Anaerobic Reactor fails: SULPHATE CONTAINING INDUSTRIAL EFFLUENTS**

1. Latex centrifuging factories (Malaysia, India)
2. Molasses-based industries - alcohol, yeast, drugs (India, Thailand, Phillipines, Japan)
3. Vinasses from wine and cognac manufacture
4. Pulp and paper mills that use sodium sulphate based Chemo-Thermo Mechanical Pulping process
5. Food, fruit and vegetable processing - when sulphites and bisulphites are used.
6. Pharmaceutical effluents - penicillin fermentation

**THE SULPHATE REDUCING BACTERIA**

The sulphate reducing bacteria (SRB) is found in all anaerobic reactors. SRB grows faster than useful methane producing bacteria when sulphates are present in the effluent. SRB converts sulphate into HYDROGEN SULPHIDE

- H$_2$S is toxic to methane bacteria
- H$_2$S corrodes reactor and gas utilization machinery
- Creates bad odour in plant and treated effluent
- Reduces the quality of biogas

**PATENTED ANAEROBIC TECHNOLOGY FOR SULPHATE CONTAINING EFFLUENTS (Pat No. IN 189375)**

National Institute for Interdisciplinary Science and Technology, Thiruvananthapuram, with financial support of Ministry of Environment and Forests, has developed cost-effective control measures for preventing the INHIBITION of anaerobic treatment because of HYDROGEN SULPHIDE.

The process comprises control of H$_2$S concentration in the digester liquor to below toxic levels by selective removal of the gas. The liquor from an anaerobic reactor is circulated through a stripper where AIR is introduced to remove the H$_2$S. The stripped liquor is reintroduced into the reactor to absorb more H$_2$S, after passing through a buffer tank to eliminate traces of oxygen. The stripper air is purified before exhausting.

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**Figure 1.** HIGH-RATE REACTORS FOR ANAEROBIC WASTEWATER TREATMENT: WASTEWATER CONTAINING DISSOLVED ORGANIC POLLUTANTS

**Diagram:**

- Discharge point
- Treated Effluent
- Alternate feed point
- Air cleaning device
- Air
- Buffer Tank
- Stripped liquor
- Treated Effluent

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• Eliminates ferric chloride and caustic consumption
• Eliminate disposal FeS hazardous sludge
• Reduces biogas H2S concentration by 90%
• Reduces fugitive gas odour in plant
• Odour free treated effluent
• Lower downstream secondary treatment cost
• Clean and green process using nature’s complete sulphur cycle
• Most economical method for sulphide control in anaerobic reactors.

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Comparision with ferric chloride dosing for sulphide control

- Large savings in annual ETP operating expenditure because of elimination of ferric chloride usage
- Large saving in alkali usage for neutralisation of acidic effluent
- Treated effluent quality is better because of lower TDS level
- No accumulation of inert sludge in reactor
- No sludge disposal problems
- Better performance with respect to COD removal
- Better performance of downstream activated sludge

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