

VERTREAT™

Activated Sludge Process

NORAM

NORAM's patented VERTREAT™ system is a high-rate activated sludge treatment process which uses an in-ground vertical shaft to provide aerobic biological treatment.

Vertical treatment processes have been proven to be effective in the treatment of municipal and industrial wastewater for more than 25 years, with over 200 facilities in operation worldwide.

The high oxygen transfer in VERTREAT™ enables rapid treatment of high-strength waste streams. The VERTREAT™ process is not limited by oxygen availability, even at high BOD loads. Primary clarification is not typically required ahead of VERTREAT™, and the system has very few moving parts.

VERTREAT™ has the following advantages over alternative technologies:

Small footprint

VERTREAT™ typically uses only 10-30% of the total land required for conventional activated sludge plants of equivalent capacity. The reduced land requirements provide savings in capital costs and allow smaller footprint sites to be considered for new plants. This flexibility also means that retrofits to existing plants become feasible where the land available would otherwise limit expansion.



VERTREAT™ aeration shaft placement

Minimal visual impact

The low visual impact of VERTREAT™, self-contained and largely hidden from view underground, gives it a significant advantage over the large surface tanks of a conventional plant. In some cases, the entire treatment plant can be housed in a building.

Very low voc and odour emissions

The absence of large open aeration tanks reduces the potential for fugitive odour emissions. Off-gas from the in-ground reactor is collected in a sealed head tank. High oxygen transfer efficiency also reduces the volume of off-gas by approximately 80%.

High oxygen transfer efficiency

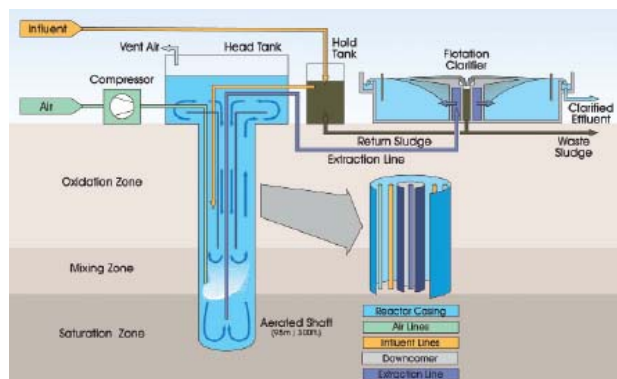
Increased oxygen solubility at depth and a long bubble retention time result in high oxygen transfer efficiencies, in excess of 65%. Oxygen transfer efficiencies in a conventional system are typically 10-15%. This enhanced oxygen transfer reduces energy costs by about 50% compared to conventional systems.

Effective treatment of difficult waste streams

Due to the high dissolved oxygen concentrations and high mixing energy, VERTREAT™ is capable of treating problematic waste streams including streams prone to foaming and streams with widely fluctuating loads.

Competitive capital and operating costs

The VERTREAT™ system does not require primary clarification and has a smaller footprint than a conventional wastewater treatment system. The result is a very competitive capital cost. Operational cost savings come from reduced energy requirements for aeration and low maintenance costs.



The VERTREAT™ Process

- Wastewater is treated in a sub-surface aerobic reactor, typically 250-300 ft deep.
- Air is injected at the bottom of the reactor under pressure.
- The air provides oxygen for BOD reduction, promotes mixing in the reactor, and achieves solids separation through flotation clarification.
- Solids separation is carried out in a flotation clarifier. Gas dissolved at depth comes out of solution as the treated effluent is returned to atmospheric pressure.
- Off-gas from the shaft is collected in a sealed head tank and can be treated separately if necessary.

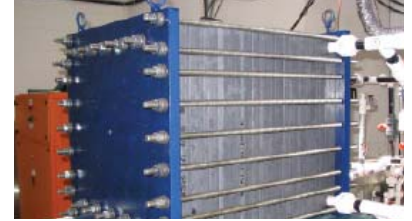
technology and engineering solutions for the process and resource industries



Nitration



Sulfuric Acid



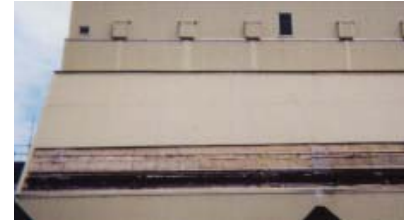
Electrochemical



Biosystems



Pulp&Paper



Environmental

Company Profile

NORAM is a private engineering and technology firm based in Vancouver BC, Canada. We specialize in the development, engineering and commercialization of new chemical processes, and in the improvement and optimization of existing technologies. Since 1988 NORAM has provided leading-edge technologies to the chemical, pulp and paper, minerals processing, wastewater and electrochemical industries.

Today NORAM is the world's leading supplier of nitration technology. In addition, we offer sulfuric acid plants, biological treatment facilities, energy systems, and technologies for the clean-tech sectors.

Our business has developed around the supply of proprietary engineering and equipment packages to our clients.

Core competencies include:

- Nitration and NO_x Technology
- Electrochemical Systems
- Sulfuric Acid Manufacture
- Biological Wastewater Treatment
- Computational Fluid Dynamics & Finite Element Analysis
- Heat Transfer & Heat Exchangers
- Hydrogen, Sulfur and Chlorine Chemistry
- Fluidised Bed Systems
- Energy Storage
- System Closure

Partnering with Innovation and Experience

NORAM works extensively with early-stage technology companies. We draw on established competencies in process design and engineering, provide custom in-house fabrication capabilities, and offer pilot plant and contract research facilities to support the commercialization process.

We've teamed up with organizations around the globe to allow project execution on 5 continents. Our strategic relationships include:

- Bateman Engineering BV
- Canadian Hydrogen and Fuel Cell Association
- ECO-TEC Inc.
- First Chemical Corporation (a DuPont Company)
- FP Innovations
- Kemetco Research Inc.
- Membrane Reactor Technologies
- Ostara Nutrient Recovery Technologies Inc.
- Radiant Technologies Inc.
- Siloxy Limited
- Simon Carves Ltd (Punj Lloyd Group)
- Electrosynthesis Company Inc.

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