

**ACCEL-O-FAC®**  
BY GURNEY ENVIRONMENTAL

# ACCEL-O-FAC®

## WASTEWATER TREATMENT SYSTEM



**GURNEYENVIRONMENTAL**  
FROM WATER SUPPLY TO WATER RE-USE

[GurneyEnvironmental.com](http://GurneyEnvironmental.com)

# ZERO-TO-LOW ENERGY ALL-IN-ONE WASTEWATER TREATMENT SYSTEM



The Accel-o-Fac® Wastewater Treatment System is a long-term, well proven, unusually sustainable “All-In-One” system for communities/municipal or industrial applications. Based on the tried and proven facultative biological process first discovered and harnessed over 50 years ago for wastewater processing, today Accel-o-Fac® reliably treats wastewater around the world. Accel-o-Fac® provides industry, water companies and municipal utilities with extremely robust, odour-free wastewater treatment requiring little in the way of operator attention or maintenance, and best of all, no sludge handling or removal for truly sustainable on-site total treatment.

**Fortunately,** these benefits are accomplished with Accel-o-Fac® with almost zero operating cost by employing wind power as the primary energy source – and through the use of highly specialised equipment combined with a number of unique design, construction and operation techniques. The net result is a total “optimisation” of the natural biological process resulting in an overall acceleration of traditional non-aerated lagoon processing rates. This “optimisation” enables the Accel-o-Fac® wwt system to provide significantly increased performance levels as compared to old-fashioned waste stabilisation pond (WSP) designs.

## THE FACULTATIVE BIOLOGICAL PROCESS

The secret to unlocking the maximum potential of the facultative biological process is the maintenance and optimisation of the critical layering or zoning of the three biological areas – aerobic, facultative and anaerobic (see diagram on next page). The Accel-o-Fac® system uses the unique SERIES 3 aerator/mixers to establish, optimise and maintain this necessary layering for superior optimised treatment performance. This also ensures that all solids fall out undisturbed into a “capped” anaerobic zone for complete digestion at the bottom of the primary treatment cell instead of being kept in suspension where

they will exert excessive oxygen demand. As a result, minimum solids leave the primary cell ensuring the secondary cell is completely aerobic for further BOD removal, final solids removal, disinfection and, under the correct conditions, nitrification.

The Accel-o-Fac® wwt system not only significantly boosts natural oxygen transfer, but also provides an ideal quiescent zone for solids settling and self-digestion of the sludge – a fundamental and essential part of the “all-in-one” facultative biological treatment process. Through the use of its unique mechanical processor design and other construction techniques, the Accel-o-Fac®

wwt system radially disperses and distributes the incoming organic load throughout the entire treatment volume. With the Accel-o-Fac® wwt system, the entire cell volume and surface area are utilised with neither dead spots or overloaded



*“The fact that there is no associated sewage odours [with the Accel-o-Fac wwt system] meant that the system could be located relatively near to the village, and after 10 years of use, no sludge removal has been needed.”*

Stephen Twyford  
Land & Property  
Department,  
Holkham Estate,  
Norfolk, UK

# SELF-DIGESTING SLUDGE & MUCH MORE

zones (such as near the influent area). This design principle alone dramatically increases the loading and processing capacity of the treatment plant enabling it to automatically deal with surge and shock loads.

## PROVIDING UNMATCHED PROCESS CONTROL AND FLOW FLEXIBILITY

Most mechanical/activated sludge plants have a narrow window of operation — low flows don't provide enough biology and large flows blow through the system. Designing a wwtp for 20 years of growth, or even seasonal variations (tourists, industry, etc.), can be difficult. The Accel-o-Fac® wwtp system can accommodate large variations in flows without any operating problems. Storm water flows, peak flows, seasonal increases are all effortlessly handled. As an example, the Holkham, UK wwtp (previous page) receives up to 14 DWF peak flows.

## ELIMINATE COSTS & COMPLEXITIES WITH SELF DIGESTING SLUDGE

An effective wastewater treatment system that doesn't produce sludge for routine disposal? Sound too good to be true? After a 50+ year track record, there is little doubt regarding

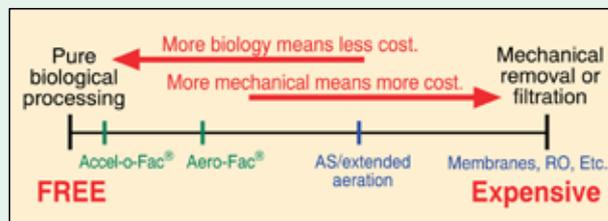


# TECHNOLOGY

## HOW DOES THE ACCEL-O-FAC® SYSTEM DRAMATICALLY INCREASE STABILISATION POND AND LAGOON PERFORMANCE?

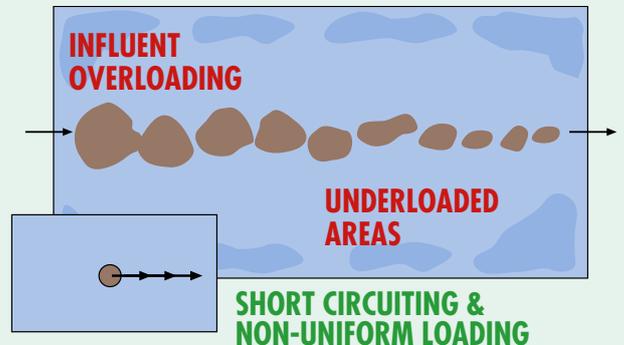
Options for processing wastewater range from complete mechanical filtration and removal to pure biochemical removal of contaminants. The Accel-o-Fac® System utilises an "optimised" purely biochemical

facultative process that keeps initial capital costs and ongoing operating & maintenance costs at a fraction of other options.

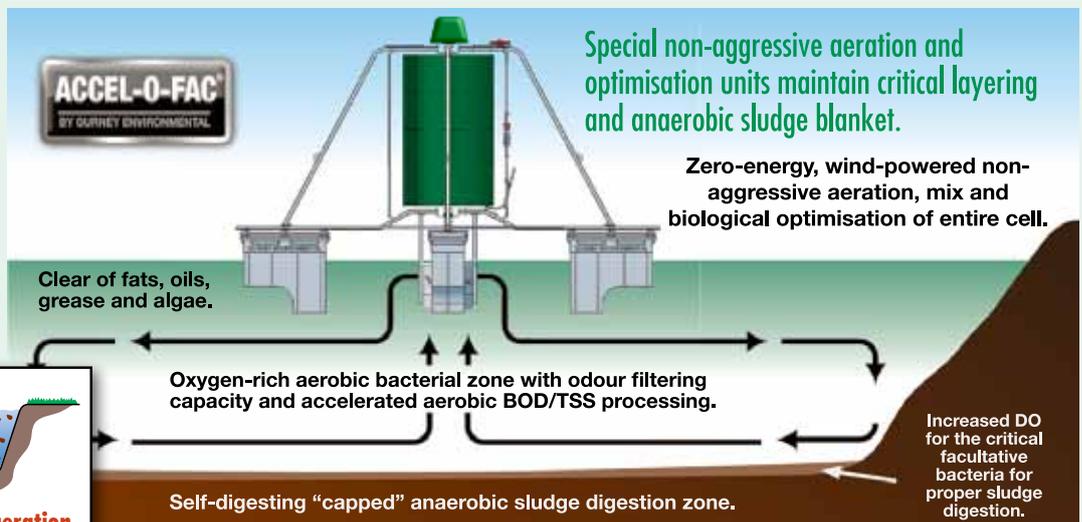
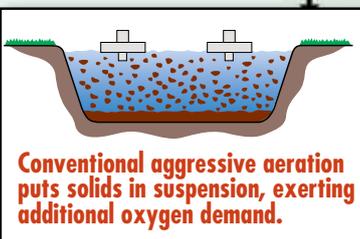


The larger the wastewater containment cell or pond, the more it will suffer from uneven loading and short-circuiting. Wastewater solids and loading tend to overload influent zones while not migrating to other areas of the cell. When wastewater short-circuits, the required detention time for proper processing rates is not accomplished.

The Accel-o-Fac® unique equipment is specifically designed to eliminate short-circuiting and provide uniform loading throughout the cell.



Total "optimisation" of the cell with specialised equipment and design boosts performance rates and solves numerous common problems with stabilisation ponds and lagoons.



# ONGOING 20-YEAR OPERATING COSTS (OPEX) AT 70-90% LESS

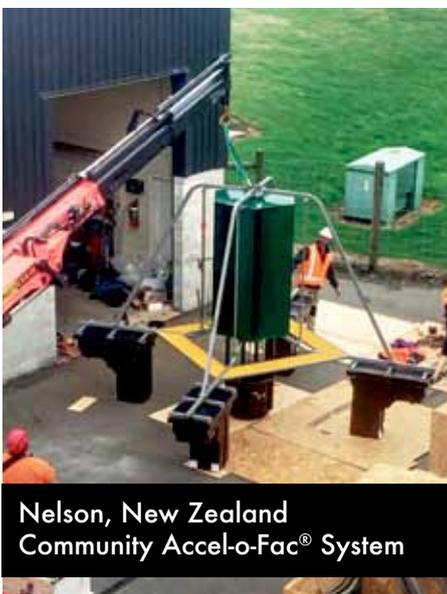


Saltfleetby, UK  
Community Accel-o-Fac® System

the effectiveness of the optimised facultative process provided by Accel-o-Fac®. Long term studies prove that these systems anaerobically self-digest all organic material within the system with the inert materials accommodated for the life of the plant. The Accel-o-Fac® wwt systems achieve this important benefit by ensuring correct loadings and detention times as part of the overall design process – along with optimised conditions within the system, allowing solids to settle for anaerobic digestion and creating high DO levels at the sludge-water interface for maximum facultative biological activity.

## HARNESSING THE WIND TO CUT ENERGY

Highly specialised equipment provides aeration, process “acceleration” and overall optimisation using free wind power (often eliminating the need for a power supply and



Nelson, New Zealand  
Community Accel-o-Fac® System

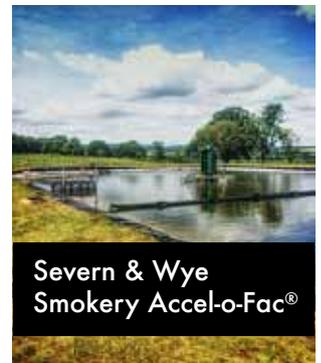
ongoing energy cost), and offers additional important advantages. Rather than concentrating solely on the addition of oxygen (an important, but not total part of the solution in facultative processes), The Accel-o-Fac® wwt system addresses a multitude of process limitations inherent in facultative systems while improving typical residual DO levels as well (see previous page). The windpowered aerator/mixers are capable of withstanding extreme wastewater applications, operating with winds as light 6-8 kph, and automatically reverting to an optional 0.55 kW motor in lighter winds. For most applications, winds over 7 kph are required only 65–70% of the time for a zero-energy system.

In effect, the Accel-o-Fac® wwt system employs a non-traditional method of aeration – as well as correcting other common WSP process problems that are just as serious. More importantly, it does so with zero or very low total operating costs. While the Accel-o-Fac® wwt system does not employ traditional mechanical aeration techniques, the well documented ability of the system to maintain high DO levels in highly loaded primary cells when used as recommended has predictably and reliably solved problems.

## POSITIVE ODOUR CONTROL

The anaerobic sludge digestion process converts organic matter into gas – methane, hydrogen-sulphide, ammonia and carbon dioxide. Controlling odour requires sufficient water depth and oxygen in the entire aerobic bacterial zone/water column to biochemically strip the gases. BOD, TSS and NH<sub>3</sub> reductions, sludge digestion and overall optimisation and acceleration of the biological process is also improved by keeping the necessary aerobic bacteria active.

Positive odour control is the hallmark of Accel-o-Fac® wwt systems and is achieved with little ongoing cost or operation attention (OPEX).



Severn & Wye  
Smokery Accel-o-Fac®

## REDEFINING “COST EFFECTIVE”

With the significant reductions in total operating costs as compared to conventional package or mechanical/activate sludge



Santa Cruz, Bolivia Accel-o-Fac®  
2.5 Million Population City

plants, the system provides utility companies with a step change. The Accel-o-Fac® wwt system is typically fully self-liquidating, meaning that the entire construction cost of the plant can be paid for with just the reductions in operating costs alone as compared to other typical alternatives.



Kingston, Jamaica  
Community Accel-o-Fac® System

### ULTRA-LOW O & M CONSIDERATIONS

Equipment maintenance for a typical Accel-o-Fac® wwt system for a small community or industrial application is minimal, requiring less than 8 man-hours of mostly visual inspections annually. Lubrication of the SERIES 3 bearings occurs automatically via the special lubrication system, serviceable on an approximately annual basis. There are almost no consumable parts to replace over the years.

### REPLACING EXISTING AERATORS

At the Toora, Australia municipal wwtp, a wind-powered Accel-o-Fac® system replaced traditional electric aeration resulting in a DO improvement and 72% energy reduction.

2014-15 Energy Costs - \$22,952

2015-16 Energy - \$6,415

Amounts are in Australian dollars.

“Adding the Accel-o-Fac® system to South Gippsland Water treatment cells where traditional surface aeration was previously used allowed the corporation to significantly reduce energy use. The savings in kWh are excellent with one application saving 72% in energy compared to the previous year.”

Brett Vurlow  
South Gippsland Water,  
Victoria, Australia

## EXAMPLE OF SELF-DIGESTING SLUDGE

**1976** witnessed a discovery – an Accel-o-Fac® wwt system was retrofitted to old waste stabilisation ponds and had the unique ability to optimise performance of the treatment system as well as accelerate the digestion of accumulated sludge on the bottom of the primary cell.

**Example:** A community had operated a small waste stabilisation pond system for a number of years and were looking for improvements in processing rates, odour control and also wanted to address sludge that had been accumulating in the cell over the years.

In October 1995, the wwtp was converted to an Accel-o-Fac® wwt system. At the time of conversion, the sludge depth in the primary cell was 75-90cm. By increasing the

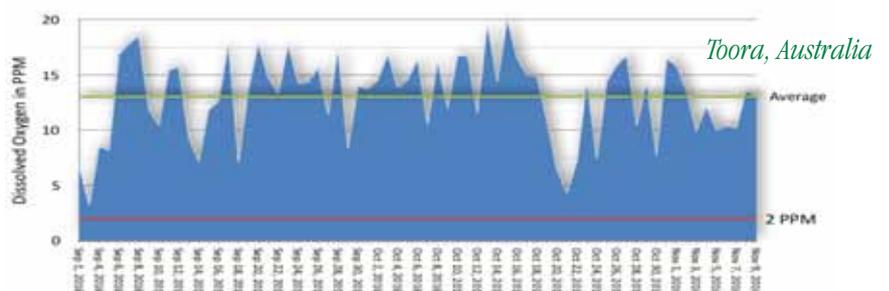
DO next to the sludge, but allowing the sludge to remain “capped” and undisturbed, the facultative bacteria assisted the anaerobic bacteria with accelerated sludge digestion.



After three years operation of the Accel-o-Fac® wwt system, the sludge depth had decreased to only 35cm.

<b>1995</b> <b>75-90cm</b> (30-36")	<b>Sludge Reduction in primary cell</b>
<b>1998</b> <b>35cm</b> (14")	

### SAMPLE DO IN WINDPOWERED ACCEL-O-FAC® SYSTEM PRIMARY TREATMENT CELL



# LONG-TERM, TRULY SUSTAINABLE "ALL-IN-ONE" NO-SLUDGE WASTEWATER TREATMENT FOR INDUSTRY & COMMUNITIES

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BY GURNEY ENVIRONMENTAL

## DESIGN GUIDELINES

Typical design is to use two stages of treatment (primary and secondary) with detention times calculated for a given water temperature using the lowest average temperature of the year (facultative processing is time and temperature dependent). Organic loading (kgs of BOD per surface ha) is the other critical calculation and is dependent upon the WWTP's geographic location.

Our Process Engineering Department can provide specific design information based on your data, location and treatment needs. Performance is based on a design model developed from experience accumulated over the past 25+ years.

### Loading rate:

Typically 2–2.5 times the area's normal non-aerated facultative primary cell(s) loading, based on climate, in kg of BOD/ha/day and based on the US-EPA and Ten States Standards for loading.

### Detention Time:

Varies depending on application, desired reductions & climate.

### Depth:

1.8 – 6.0 m (deeper cells offer several advantages.)

### Energy:

None required except when motor kits are specified (See separate Motor Kit info.)

Note: The Accel-o-Fac® wwt system is not a traditional "partial mix", aerated, activated sludge nor an extended aeration process, and those design parameters should not be used. For a fully aerated system, see separate Aero-Fac® information.



## WATER AND WASTEWATER TREATMENT SYSTEMS AVAILABLE FROM GURNEY ENVIRONMENTAL

- Aero-Fac® Reduced Footprint Wastewater Treatment System
- Aero Fac® SDS — Sludge Digestion System
- Aero-Fac® PTS — Primary Treatment System
- Accel-o-Fac® Zero-to-Low Energy Wastewater Treatment System
- SERIES 5 Electric Aeration Units
- SERIES 3 Wind-powered Aeration & Optimisation Units
- WEARS ResMix™ "Source Management" system for reservoirs
- WEARS ResMix™ Vital for potable reservoirs
- EPT W2E "Waste-to-Energy" Anaerobic Systems
- CEQUESTA Sludge De-watering Systems
- GLOBAL ENFILTEC VPMF "Variable Pore Micro Filtration" Systems

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