

PRESS INFORMATION



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Release Date: NOW

TITLE: **OXIDATION DITCH**
Continuous Flow Biological Reactor (CFBR)

*Specialists
in Domestic
& Industrial
Wastewater
Treatment*

NEW WINE – OLD BOTTLE

An Oxidation Ditch (OD) is an extended aeration process. Up until now the method of aeration and mixing have been the limiting factors in design and application of the OD technology. Today KEE Process Limited have introduced the Triton Aerator and Mixer which is a dual function processor, capable of mixing to depths of up to 10m and completely aerates the contents of the OD. Existing OD plants can be retrofitted and new OD plants can benefit from a smaller footprint thus reducing land usage.

REVITALISE OXIDATION DITCHES WITH TRITON DUAL FUNCTION PROCESSOR AERATOR AND MIXER

Aeration Industries International Inc has patented a new Aerator/Mixer called the Triton. This new technology now introduced into the United Kingdom by KEE Process Limited overcomes the previous limitations of OD technology and can be used to revitalise existing ODs with the technology.

OD technology is one of the oldest ways of treating wastewater. Whilst it enables wastewater to be treated to a high standard, including nitrification and even denitrification, it does however have significant limitations.

The process requires aerated and mixed liquor to continuously move through the aeration ditch. Brush rotors and disc rotors aerate and mix the liquor, but because they can only maintain the necessary fluid velocity of 0.3 - 0.4 m/s in a shallow depth of no more than 2m, the footprint area of the OD is extremely large.

The Triton Aerator and Mixer is an energy efficient, dual mode (aeration and mixing) aeration processor that is capable of nitrification and denitrification all in one unit. With two propellers and a regenerative blower, Triton is able to operate either as an anoxic mixer with the blower turned off, or a very efficient aerator/mixer with the blower turned on. With its two mixing propellers, the Triton is able to achieve significant velocities in depths of up to 10m. This means the oxidation ditch basin can now be built up to 10m deep, therefore significantly reducing the footprint area.

The Triton Aerator/Mixer's primary and secondary propellers inject air as a high velocity stream of bubbles (defined by the Environmental Protection Agency as 'fine bubble') below the surface of the water and provide flow linkage mixing in multiple unit arrangements.



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The Triton can also be used to revitalise existing oxidation ditch systems with failing brushes or disc rotors. If the rotors have totally failed, the Triton can replace them. Alternatively, if the rotors are still in good working order, but the plant is failing to meet treatment objectives due to lack of dissolved oxygen and/or mixing of the OD contents, Triton can be used in conjunction with the rotors to improve dissolved oxygen levels and mixing.



Oxidation Ditch with Nitrification, Denitrification and Aerobic Sludge Digestion.



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1. WHAT IS OXIDATION DITCH (OD) ?

OD or Closed Loop Reactor (CLR) or Continuous Flow Biological Reactor (CFBR) is one of the many geometric variations of the activated sludge wastewater treatment process.

By definition an oxidation ditch is a “Plug - Flow” reactor. By design the OD operates as an extended aeration activated sludge process.

OD is established, proven and flexible technology, designed during 1940 by a Dutch Scientist, Dr Pasveer, with first installation at the City of Texel, Holland.

2. WHAT ARE THE AVAILABLE PROCESS OPTIONS OF OD ?

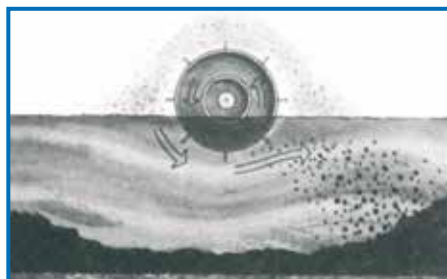
- BOD and Suspended Solids reduction.
- BOD, Suspended Solids and ammoniacal nitrogen reduction.
- BOD, Suspended Solids and total Nitrogen reduction.
- Phosphorus reduction with any of the above.

3. WHY OXIDATION DITCH ?

- Advantages over other Activated Sludge Systems.
- Lower installed power compared to conventional or batch systems.
- Fluctuating influent loads have minimal effects.
- Extended Aeration mode of operation minimises sludge production.
- Process can be automated or manually controlled.
- The system is a continuous flow design, therefore no need for influent and effluent flow equalisation.
- Process is easy to control by varying the amount of aeration.

4. CONVENTIONAL OXIDATION DITCH LIMITATION ?

- Brush and disc rotor aeration devices limit tank depth.
- Brush and disc rotor aerators typically mix only up to 3m without supplemental mixers.
- Low vertical velocity component hinders solids suspension.
- Difficult to control aeration rates for varying loads.
- Diffused Air Aeration – requires supplemental mixers to impart horizontal flow and variable frequency drives (VFD) to control dissolved oxygen by controlling blower speed. Turning down aeration to create anoxic conditions reduces mixing.
- Additional tank attachments required to ensure horizontal flow pattern. i.e. turning baffles and cover fillets to prevent solids deposition.



Rotor Aeration Systems

This system is expensive to maintain and high in energy consumption. Rotor systems propel water into the air, creating an aerosol environment which releases offending odour into the atmosphere.

They are inefficient in suspending solids uniformly.



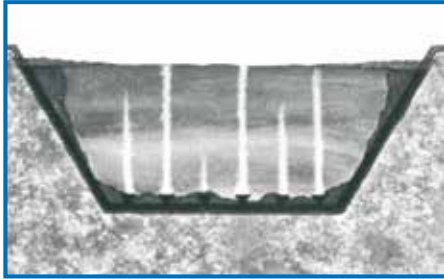
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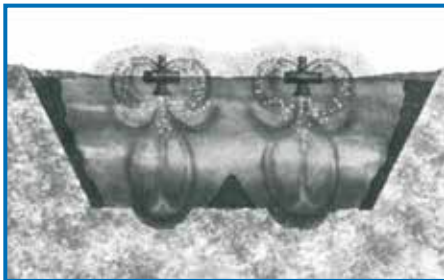
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Diffused Air Aeration Systems

Compressed air is introduced through diffusers from the bottom of the unit. Higher energy consumption is required to overcome the water head resistance. Oxygen rises vertically and escapes quickly before effective horizontal dispersion in the water can take place. Aeration is less effective as a result of the lack of mixing.

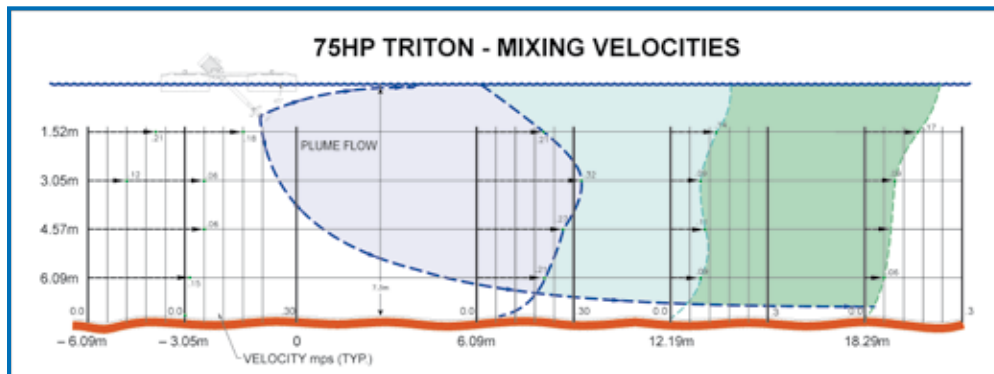


Surface Air Aerators

This system pumps water upwards and throws it into the air, creating a high aerosol environment. The force of gravity must be overcome, which requires higher energy consumption. The sphere of influence is limited and because of the lack of movement, solids quickly accumulate at corners and between units.

5. HOW DOES THE NEW KEE AERATION/MIXING DEVICE OVERCOME THE LIMITATIONS ?

- KEE combine aeration/mixing equipment, instrumentation and controls to optimise plant performance without operational complexity.
- KEE makes the aeration/mixing equipment such that it can be retrofitted into existing systems.



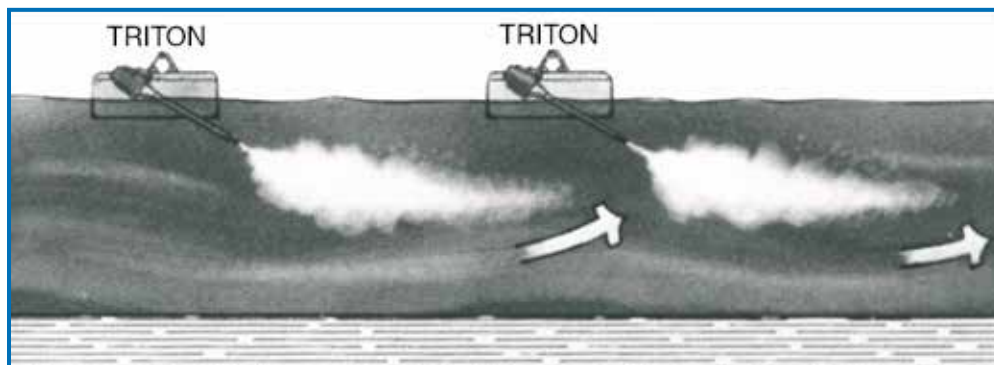
The combined fine bubble aeration and the slow speed mixer offer the most effective oxygen transfer (due to fine bubble) and the integral slow speed mixer operates separately to maintain optimum mixing even when air is turned off.

- Deep mixing capability (up to 10m deep) ensures smaller footprint and lower land requirement and superior mixing for optimum treatment.
- Reduction in BOD, SS, ammoniacal nitrogen, total nitrogen and phosphorus with reduced sludge production and low maintenance requirement with ease of access.

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TRITON Flow Linkage

Multiple Triton units synergise to create flow-linkage. This process creates a highly oxygenated flow pattern.

Greater oxygen transfer efficiency improves biological treatment resulting in Biochemical Oxygen Demand (BOD) removal rates as high as 99 per cent in highly contaminated wastewater. A high velocity flow pattern keeps solids in suspension, increasing removal rates of pollutants. The patented Triton system, utilising its unique flow-linkage process capability, offers:

- high oxygen transfer levels
- superior mixing abilities
- year-round treatment efficiencies
- ease of installation
- minimal maintenance

6. HOW IS AERATION/MIXING ACHIEVED ?

The equipment used is KEE AIRE-O₂ TRITON® Aerator/Mixer.

- The Triton is surface mounted from bridges, sidewalls or on floats giving ease of access for maintenance.
- Multiple units provide total flexibility.
- Low maintenance requirements.
- Ability to mix without aerating, enabling control of process environment.
- Enable retrofitting existing system with new aeration devices to revitalise the existing oxidation systems.
- Low lifetime cost.

TRITON® – Dual Function Processor – Aerator and/or Mixer

One of the core components of the TRITON unit is the efficient PowerShear™ / PowerMix™ propellers.

This system is a result of extensive research and development to optimise the combination of hydraulic and aeration efficiency necessary to accomplish higher oxygen transfer, superior mixing and the ability to completely control the environment.



Aeration and Mixing Mode

Air is pressurised using a high efficiency regenerative blower. The air is forced down the hollow shaft into the PowerShear™ propeller. This propeller shears the air into fine bubbles while the PowerMix™ propeller forces the air in a downward direction. This dramatically extends bubble residence time and the pressure that the bubble is under, increasing oxygen transfer. This arrangement also allows for deeper tank configurations, allowing a small footprint and less land required for the system.



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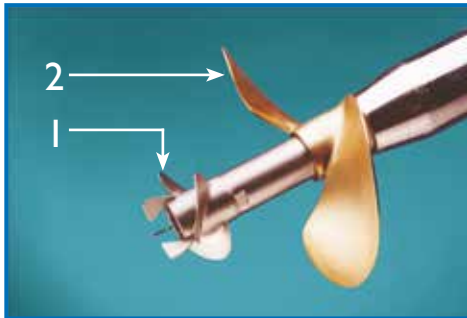
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Dual Propeller System

1. **POWERSHEAR™** propeller breaks up the air into fine bubble aeration.

2. **POWERMIX™** propeller simultaneously drives this plume farther and deeper through the water column extending contact time and reach of the bubbles for maximum oxygen dispersion effectiveness.

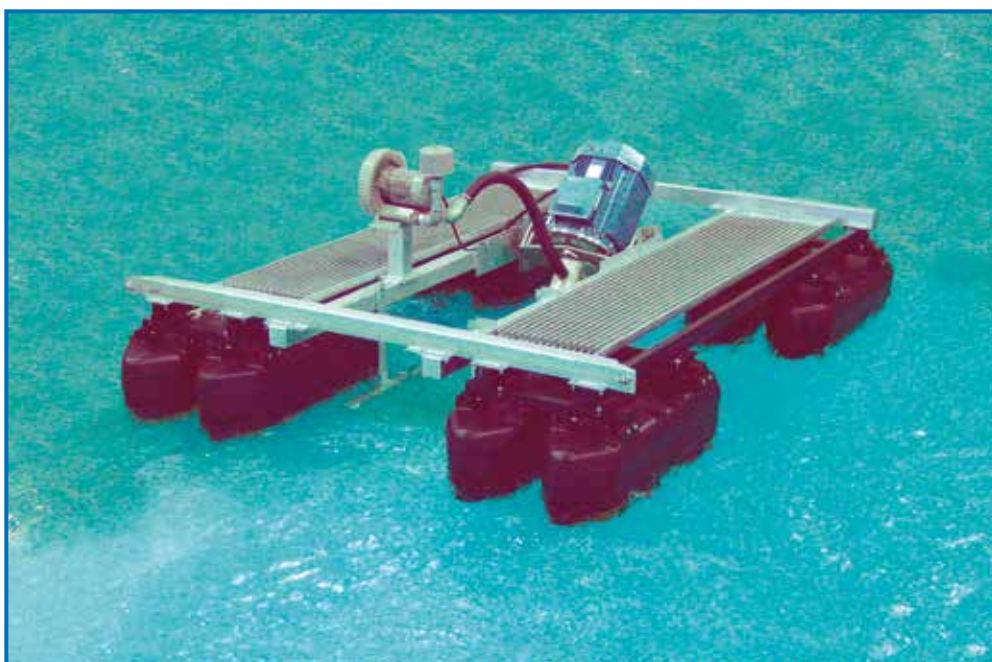


Mixing Mode

When the blower is turned off, the PowerMix™ propeller maintains velocities in the channel without the introduction of air. This allows for power savings when loads are down, maintaining the dissolved oxygen concentration for optimal process conditions and ensures uniform solids suspension in the basin at all depths.

BENEFITS

- The TRITON aerator/mixer has complete turndown capability to meet fluctuating hydraulic and biological loads in the waste stream, resulting in power savings.
- High oxygen transfer and complete mixing sustain high concentrations of micro-organisms in the channels to maintain process control.
- Quiet operation without aerosols, odours or cooling.
- Bridge, wall or float mounting available.
- Allows complete control of the process environment.



TRITON AERATOR/MIXER

Float, Bridge and Wall Mounted options are available.

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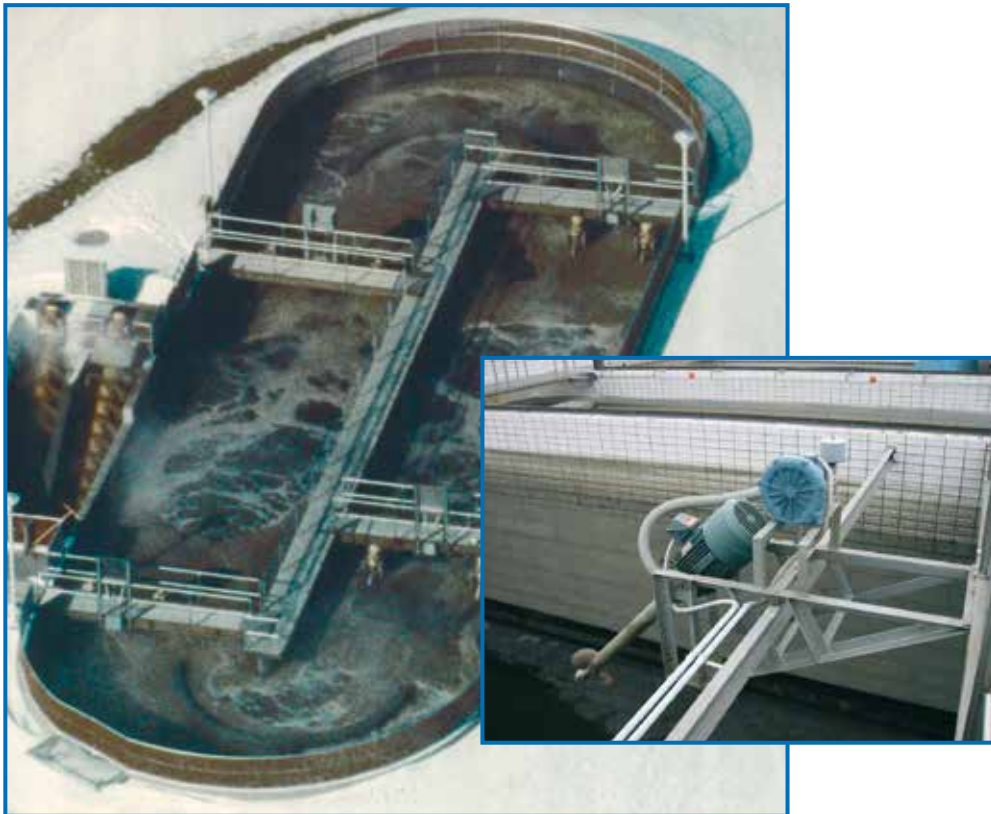
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TRITON AERATOR/MIXER

Float, Bridge and Wall Mounted options are available.

7. CAN THE EXISTING OXIDATION DITCH PLANTS BE UPGRADED ?

- Triton can be used to replace existing aeration systems.
- Triton can enhance the existing Oxidation Ditch System by aeration and mixing thereby improved treatment or increased capacity in the same reactor.
- If the basin wall height can be increased, the Triton can enable the Oxidation Ditch System capacity to be increased substantially (may require additional final clarifier).

CASE STUDY

The Oxidation Ditch Wastewater Treatment Plant at Franklin in the USA, was failing to meet the consent of 15mg/l BOD and 23mg/l TSS. The rotors required daily lubrication, maintaining them was a time consuming and costly exercise, and the unreliability of Rotors was leading to failure to meet treatment objectives.

So when the rotors fractured and failed four years ago, the decision was made to upgrade the plant by replacing the brush rotors with the Triton Aerator/Mixer.

Franklin's plant has two oxidation ditch systems operating in parallel, each of which treats 4536m³/day, with influent BOD of 185mg/l and TSS of 90mg/l.

During the upgrade each ditch was fitted with four Tritons each rated 18.6kW. This represents a maximum of just over 2kWh of electrical energy per kg of BOD or 0.4kWh/m³ flow.

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PAS 99
Process: IMR 512239
Services: IMR 517921

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BS EN ISO 9001
Process: FM 515540
Services: FS 517918

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The final effluent quality from the refurbished oxidation ditch is testimony to the excellence of the Triton. The result of the upgrade was final effluent with BOD of between 2 and 3mg/l and TSS well below 15mg/l. Independent velocity measurements at extremities are well above the minimum 0.3m/sec therefore guaranteeing that no deposit would develop in the basin. At the same time, maintenance requirements have been substantially reduced to a simple lubrication task once every six months.

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