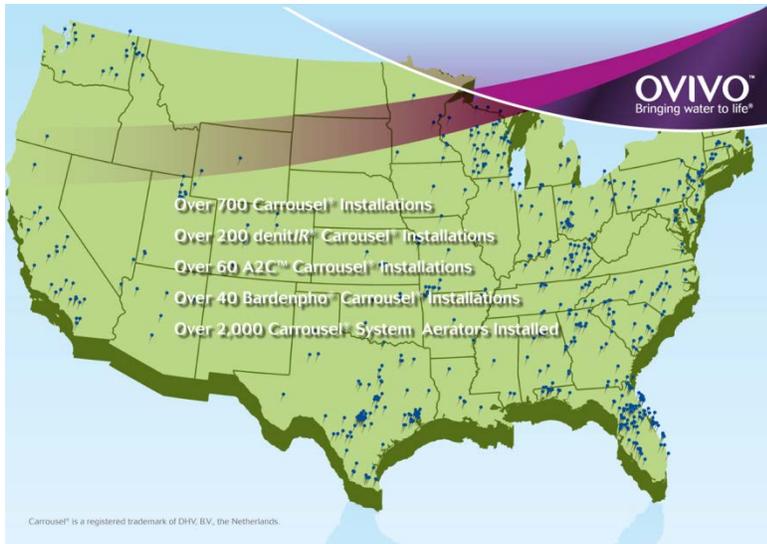


OVIVO

Bringing water to life

Ovivo Carrousel® Systems

Ovivo (formerly Eimco Water Technologies) has been providing Carrousel Systems since 1979. With over 700 installations, we have continuously improved the technology over the last 35 years.



We have many plants now achieving a Total Nitrogen of less than 2 mg/L and a Total Phosphorus of less than 0.2 mg/L. No supplemental carbon is ever required, and usually only sporadic trim doses of alum are required.

We have also greatly improved energy efficiency and power turndown capability with our latest aeration equipment designs.

The Oculus control System keeps a tight rein on dissolved oxygen, ORP, nitrate, and ammonia, with several operational strategies available.

Ovivo Carrousel Systems stand out in the industry due to our long history of investment, innovation and improvement

In the attached pages, we have presented several of the latest improvements available for Carrousel Systems that are included in our proposal.

Feel free to contact our Salt Lake City office at (801) 931 – 3000 and ask for anyone on the Carrousel Team.

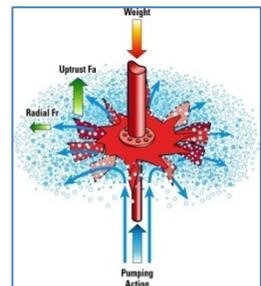
The Excell® Aerator

Aeration and Propulsion



The Excell® Aerator, located at one or more of the channel turns in the Carrousel® Basin, uses the most efficient aerating surface impeller available. The clean water oxygen transfer efficiency is 3.8 lb O₂/ HP-hr. DHV, B.V., the inventor of Carrousel Systems and the singular authority for testing and certifying Carrousel® aerators has approved the Excell® Aerator.

The 10-bladed surface impeller acts as a pump, efficiently maintaining propulsion throughout the channel zones. The unique star plate design with integrated blades acts as a stabilizer, reducing Fa and Fr loads to the mechanical gear reducer that drives the unit, lengthening the service life of the reducer.



The lower turbine is driven by the same mechanical equipment that drives the surface impeller and requires no additional bearings. The lower turbine with the velocity enhancement baffle increases floor scouring velocity, particularly important during periods of low loading (e.g., at night, when actual influent loading is less than design). The lower turbine is connected to the surface impeller by 6 bolts. Many facilities appreciate the ease of basin draining after adding the lower turbine as solids are kept in suspension during draining.

Power Turndown



Excell® Aerator at 30Hz
(20% power; 80% turndown)



Excell® Aerator at 60Hz
(100% power; 0% turndown)

Power turndown is critical for proper operation of biological nutrient removal facilities and for cost efficiency. A properly designed Carrousel System equipped with the Excell® Aerator allows for power turndown of 80-90% without mixing limitations!

Successful Installations

Ovivo has recently installed ExcellAerator retrofits at Ocala, FL; Greenwood Lakes, FL; Baraboo, WI; Flagler Beach, FL; Pearsall, TX; Apopka, FL and over 100 other facilities. Each of these facilities had different reasons for choosing our dual impeller unit – better power turndown, enhanced nutrient removal, easier basin draining operations, energy savings.

OVIVO

Bringing water to life

The Eliminat^{IR}™ Gate

Easy Control With No Pumps



Placed at the entry to the internal recycle (IR) channel, the Eliminat^{IR} gate replaces expensive IR pumps and older manual gates. Either the center pivot or the end pivot (common for manual IR gates currently installed) designs are available.

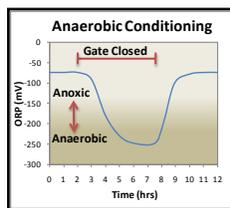
The flow through the IR channel is controlled with an electric actuator that either restricts or increases the flow through the IR channel. This is typically automated based on measured conditions in the anoxic basin (e.g., ORP, nitrate) using the Ovivo Oculus™ Control System.



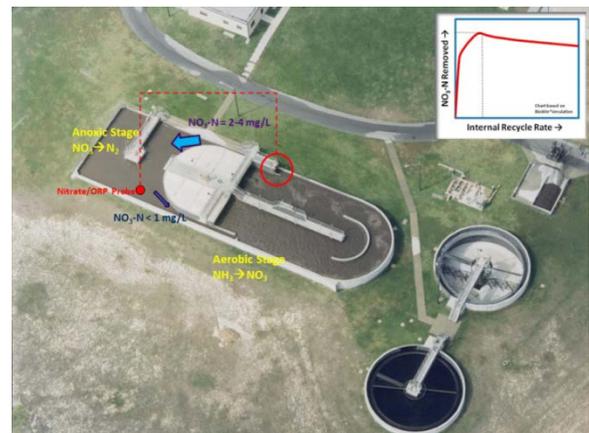
The Eliminat^{IR} gate provides real time enhanced control of nitrate reduction in your facility.

Real Time Automation

The Eliminat^{IR} gate works with our Oculus control System to optimize Total Nitrogen removal. By preventing 'washout' or excessive DO from entering the anoxic zone, effluent nitrogen can be lowered by several parts per million.



Our system can also convert your existing anoxic zone into a fermentation zone by strategically closing the gate throughout the day for Total Phosphorus removal.



Successful Installations

The Eliminat^{IR} Gate can be retrofitted using existing IR gates as it was at Ocala, FL. The Eliminat^{IR} gate was added at Mt Holly Springs, NJ to provide phosphorus removal without the need to build additional fermentation basins, and at Zions Crossroads, VA; Edgewater, FL; and Spring Hill, TN in a Bardenpho® configuration.

The Energy Optimizer

Optimizing Impeller Submergence and Speed

For many years, surface aeration control was accomplished by raising and lowering the effluent weir to control impeller submergence. The lower the weir, the lower the submergence, and corresponding less HP was pulled by the motor and less oxygen was imparted to the water. Conversely, raising the weir increased HP and oxygen delivery. While this method was impractical in responding to diurnal variations in oxygen demand, it did allow for some operational adjustments.



Today, changing oxygen delivery is largely accomplished by variable frequency drives (VFDs). VFDs adjust the motor speed, and thus the impeller rotational speed, adjusting HP draw and oxygen delivery. This is an important component of Carousel systems, as VFDs can allow for power turndown of 90%. With the dual impeller ExcellAerator, mixing remains sufficient at these large power turndowns, which are often required for start-up and nighttime flows in nutrient removal plants where overaeration means failure.

Ovivo now offers a system that automatically adjusts both the weir and the aerator speed, the Energy Optimizer. By adjusting both, the Energy Optimizer finds the most optimum energy usage for delivering oxygen to the wastewater, while maintaining dissolved oxygen setpoints. Not all HP is created equal: an aerator drawing 50 HP, for example, at low submergence/high speed may deliver more oxygen than the same aerator drawing 50 HP at high submergence/low speed. The Energy Optimizer continuously tracks kW usage with respect to influent loading, and optimizes submergence and speed to its most efficient point. The result is excellent treatment at the lowest possible energy costs.



Successful Installations

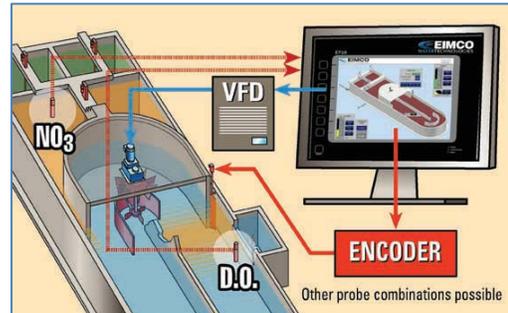
The Energy Optimizer has been installed in Spring Hill, TN and Mt Holly Springs, PA with several others under construction.



The Oculus™ System

Your Carrousel SCADA

The Oculus System is the “all-seeing eye” that maximizes nutrient removal, minimizes power costs, and monitors selected process variables and equipment. The Oculus System analyzes and reports signals from a combination of dissolved oxygen (DO), oxidation-reduction-potential (ORP), ammonia (NH₄-N) and nitrate (NO₃-N) probes to control the Excell®Aerator power input and the EliminatIR™ gate and effluent weir position in the Carrousel®System. The probes provided are site-specific.



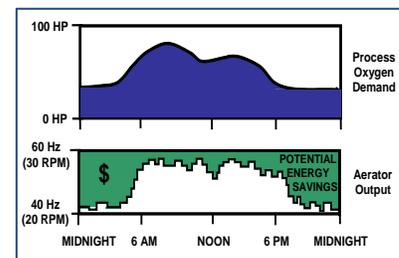
The operator can access all control functions, setpoints, and trendcharting from a custom, touch-screen interface. Each Oculus System can be equipped with a modem for on-line monitoring and quick access to our industry-leading and free process support team. The system is now available on tablets and smartphones.

Optimizes Nutrient Removal

Two key requirements for optimizing nutrient removal are, (1) providing adequate nitrate delivery to the anoxic zone and (2) protecting all anoxic and anaerobic tanks from excessive D.O. Through the use of ORP or nitrate monitoring, the Oculus System efficiently meets the first requirement by regularly adjusting the position of the EliminatIR gate. This allows for control of nitrate delivery from the aerobic zone to the anoxic zone in response to diurnal fluctuations as well as nitrate loading from other sources, such as return activated sludge (RAS) and digester decants. This is especially critical for P removal plants, which must prevent both continuous and slug loads of nitrate from entering anaerobic zones.

Minimizes Power Costs

Minimizing the aeration energy required in the activated sludge process is the most effective way to reduce power costs in a wastewater treatment plant. Using proper D.O. and effluent weir set points determined from Ovivo's extensive experience with Carrousel® nutrient removal plants, the Oculus System balances the need to minimize power consumption with the paramount need for adequate aeration capacity. Ammonia probes may also be added for continuous feedback of nitrification performance.



Successful Installations

Some of the sites where Ovivo has provided the Oculus System are Ocala, FL; Spring Hill, TN; Zion's Crossroads, VA; Mt Holly Springs, PA; Inverness, FL, and Edgewater, FL. References and site visits are available.