MAMMOTH® ROTOR AERATION SYSTEMS:

35 YEARS OF PROVEN PERFORMANCE
Selection of the appropriate process is based on influent strength, effluent quality required, process flexibility desired, flow rate and site requirements.

The Mammoth Rotor aeration system is a complete mix, closed loop reactor process, consisting of one, two or three independently aerated channels up to 31 feet wide and 14 feet deep. The channels are operated either in parallel or series to accomplish maximum treatment, including biological nutrient removal (BNR). Even in cold weather, when biological (microorganism) activity is slower, the process continues to perform without major process modifications.

**Single Channel Operation**

After screening and grit removal, raw sewage and return sludge enter the reactor where the biological process begins. In single channel operation, one or more reactors can be linked either in series or parallel to allow superior system flexibility. Dissolved oxygen levels are maintained uniformly throughout the basin.

BOD/TSS reductions of up to 95 percent are typical with the Mammoth Rotor aeration system. In addition, up to 99 percent nitrification, 95 percent total nitrogen removal, and effluent phosphorus and ammonia levels below one mg/l, are commonly achieved.

**Experience**

USFilter has more than 4,000 Mammoth Rotors performing successfully at more than 1,300 installations across the United States, demonstrating its efficiency and reliability.

For over 35 years, the Mammoth Rotor® aeration system has been reducing aeration costs while meeting or exceeding industry standards...providing proven, dependable, flexible, efficient biological treatment of municipal and industrial wastewater.
GREATER FLEXIBILITY

Single channel operation.

Multi-Channel Operation

After screening and grit removal, the influent enters the outermost channel where a majority of the biological reduction is completed. The outermost channel is maintained at or near zero D.O. The aeration zones in this channel provide oxygen for the nitrification of ammonia, producing nitrates. As the nitrates pass through the zero D.O. environment, denitrification occurs.

Ammonia removal is typically better with a multi-channel reactor design than a single channel reactor. In the multi-channel design, a majority of the ammonia is nitrified in the first and second channels, leaving a very low ammonia load on the third channel. This results in near zero ammonia levels in the effluent.

The middle channel is flexible, maintained at or near one mg/l D.O. When the plant is fully loaded, it operates like the first channel, ensuring that all ammonia is simultaneously nitrified and denitrified. When the plant is under-loaded, it automatically converts to a polishing channel.

In the third and final channel, the D.O. level is maintained at or near two mg/l. This ensures complete BOD reduction and any necessary final reduction of ammonia. Submerged ports in both the outer and middle channels allow the mixed liquor to
transfer between channels. Flow from this final channel is then either recy-cled to the first channel or sent to the final clarifier for settling and separation, or both.

In multi-channel operation, total nitrogen removal in excess of 80 percent, and ammonia effluent levels below one mg/l are commonly achieved. In addition, BOD reductions of up to 95 percent and TSS levels below 10 mg/l are also achieved.

By using the multi-channel design, up to 50 percent of the alkalinity lost during nitrification can be recovered, resulting in reduced power requirements and reduced energy costs.

**Biological Phosphorus Removal**

By operating a multi-channel reactor with an anaerobic outermost channel followed by an anoxic middle channel and an aerobic inner channel, up to 80 percent biological phosphorus removal can be achieved through the luxury uptake mechanism without chemical addition.

*The driving force behind the Mammoth Rotor aeration system is the Mammoth Rotor itself: With decades of experience, and hundreds of installations, USFilter has refined the rotor features to perform dependably under the most demanding conditions.*

**DURABLE HARDWARE**

**Rotor Body**

Twelve J-shaped blades are bolted together to form a compression fitting ring around a 42-inch diameter torque tube. This compression fit is attained by tightening the nuts and bolts fastening the blades together. The Mammoth Rotor uses a blade locking rod which spirals the length of the torque tube, indexing the blades so that only one blade star is in contact with the mixed liquor at any given time. This produces a constant, non-pulsating torque on the drive train.
When the blades are tightened to the torque tube, the rod is clamped under each subsequent ring of blades. Thus, the rod locks each row of blades to each other. No single set of blades can slip on the torque tube.

Blades are available in a variety of standard materials ranging from hot-dip galvanized mild steel, to 304 stainless steel, to the highly corrosion resistant polyamide blades.

**Rotor Bearings**

Rotor bodies are supported on either end by grease-lubricated, split type, self-aligning, anti-friction roller bearings sealed with wet duty seals specifically designed to prevent moisture intrusion in the bearing cartridges. Our customers expect a bearing that will stand up to the harsh and corrosive environment surrounding most rotors. To meet these needs, our bearing manufacturer has re-developed their standard “Wet Duty” bearing seals, to new “E-Tech” bearing seals. This seal uses additional contact seals to provide greater bearing protection. Improved seal design is a result of our continuing efforts to provide the best available equipment. While bearings on the Mammoth Rotor are designed to have a theoretical L10 life of 500,000 hours, replacement bearings and drive components are standard items offered through USFilter’s Zimpro Products group, Customer Service department.

**Wall Seals**

Bearing life is further extended by sealing off the drive and support bearing ends with vertical wall seals. Standard stainless steel or corrosion resistant aluminum wall seal plates are supplied for mounting directly on the reactor. Neoprene seals complete with removable seal covers prevent liquid from entering the bearing and drive assembly areas. Removal of the seal covers allows easy operator access for seal maintenance.

**Stub Shafts**

USFilter is the only manufacturer who spends extra money to machine our removable rotor stub shafts from one piece of cast steel. Most manufacturers use a two-piece rotor stub shaft/flange design, relying on a shrink fit connection between the two pieces to hold them together. Experience shows that this connection forms a weak link in the rotor construction.

**Drive Assembly**

Power transmission to the Mammoth Rotor is provided by means of a standard squirrel cage induction motor through belts and sheaves to either a shaft-mounted torque arm or base-mounted gear reducer designed for AGMA Class II service. Twin taper lock bushings hold the drive assembly in place, and can be easily removed for drive assembly service. All rotating components on the drive assembly are covered by OSHA approved guards.
Providing even greater flexibility, USFilter offers several equipment options that allow the Mammoth Rotor Aeration System to be customized for specific application needs.

**Baffles**

Baffles can be furnished for mounting on the downstream side of the Mammoth Rotor, increasing its oxygen transfer capacity. This is accomplished by directing flow towards the bottom of the basin, increasing oxygen detention time.

**Rotor Covers**

Rotor covers can be installed to contain mist and spray without impairing the oxygen transfer or mixing efficiency of the Mammoth Rotors. Covers eliminate the possibility of unsightly sludge buildup on reactor walls and ice buildup on walkways. Large hinged front sections can be opened independently allowing easy operator access for inspection and maintenance. The cover consists of lightweight fiberglass panels in nominal widths of three, four, and five feet, fastened to a fabricated steel support structure with stainless steel fasteners.

**Adjustable Effluent Weirs**

Oxygen supply in the reactor can be easily adjusted to accommodate varying flow conditions and plant loadings by varying the liquid level in the reactor. By increasing or decreasing the liquid level in the reactor, the rotor blade submersion will vary. This will allow the operator to tune the system supply to the demand, optimizing power consumption.

USFilter offers several models of flow-control weirs, each specifically designed for various flow rates. Motorized weirs are also available for connection to a plant’s automation system.

**Bridge Mounted Rotors**

In addition to the standard wall-mounted rotor, USFilter offers bridge-mounted Mammoth Rotors. The bridge-mounted unit is self-contained, with all components factory installed and ready to be set onto the walls of a new or pre-existing oxidation ditch. A Mammoth Rotor is installed beneath a steel bridge, with easy access to all rotor components provided through removable decking. The bridge mounted rotor can accommodate rotor bodies ranging from six to 30 feet in length.

Bridges are constructed of ASTM A-36 steel, including walkway, handrails, bearing seals, and a splash awning. The splash awning, in conjunction with the bridge decking, doubles as a rotor cover to contain mist and spray.
Without question, the brush type surface aerator provides a wider range of oxygen transfer capacity than any other mechanical surface aeration device.

The Mammoth Rotor is designed to operate in immersions ranging from zero to 14 inches and at speeds ranging from 36 to 72 rpm. Speed changes are accomplished by simply changing belts and sheaves at the readily accessible rotor drive assembly. Reactor immersion can be easily adjusted by means of a flow-control weir, available from USFilter.

Additionally, blade stars can easily be added or removed to further control the range of oxygen transfer. With three different ways to vary oxygen transfer and horsepower draw rates of the Mammoth Rotor, you have maximum system flexibility to match the supply of the rotor to demand of the process and adequate turndown capabilities to reduce power consumption at low flow or load conditions.

Testing has shown that the Mammoth Rotor has superior mixing characteristics with liquid velocities in the channels consistently averaging one to three feet per second throughout. This leads to complete mixing across the entire channel and eliminates the possibility of solids settling on the reactor floor.
USFilter’s Zimpro Products group is committed to offering system design, customer service, and technical support second to none.

From your initial inquiry, the staff of process and design engineers at our office is prepared to offer assistance with process design, equipment selection and sizing, CADD system drawings, and customer service. Many rotor components are stocked at our customer service center and are available for express delivery.

To find out more about cost-effective wastewater treatment for your application, talk to your local USFilter sales representative or contact: