Aqua-Aerobic Systems, Inc.

Aqua-Jet®
Surface Aerators

"Your Wastewater Specialists"
Aqua-Aerobic Systems, Inc. is committed to quality and to the preservation of the environment. Because of this, Aqua-Aerobic has grown from a modest company producing only mechanical aerators to a manufacturer of various biological and filtration wastewater treatment equipment and the world’s largest supplier of direct-drive aerators.

More than 50,000 Aqua-Jet® aerators, ranging in size from 0.7 - 75 kW, have been installed throughout the world. No matter what the application, municipal or industrial, Aqua-Jet® aerators provide unequalled oxygenation and mixing.

Introduced in 1969, the Aqua-Jet® still uses the best design and highest quality construction materials available in the industry:

- Propeller is 316 stainless steel
- Diffusion head, volute, intake cone and float skin are 304 stainless steel as a standard
- Motor shaft is one-piece, 17-4 stainless steel
- No couplings or underwater bearings

Simple, proven mechanical design and stainless steel construction provide the foundation of the Aqua-Jet® aerator. This assures a durable, reliable aerator which will withstand the constant assault and abuse of everyday operation in your wastewater treatment system.

Features & Benefits
- Available in .7-75 kW
- Single or dual speed motor options
- Flexibility in materials of construction
- Vibration controlled design
- Superior oxygen transfer
- Low maintenance

We’ve set the standards for more than 35 years
Motors are totally enclosed, fan cooled, and rated for severe duty. The motors are constructed to Aqua-Aerobic Systems’ specifications and are designed to meet the most stringent operational requirements. Standard features include heavy duty bearings and seals, class F insulation or better and a minimum 1.15 service factor. Total scheduled maintenance on an Aqua-Jet aerator consists of motor bearing lubrication 2-4 times annually, depending on motor size. The Labyrinth Seal Guard prevents upward migration of water from contacting the lower end bell of the motor. The diffusion head of an aerator must be able to support the weight of the motor, evenly distribute static and dynamic loads and change the direction of the high velocity discharge flow. The Aqua-Jet aerator accomplishes this with ease. The Aqua-Jet’s massive cast diffusion head is designed to withstand the constant stress created by the upflow spray of the aerator. Its strong flanged connection to the volute ensures that minimum stress is placed on the connections and that no vibration or fatigue results. One-piece shafts of 17-4 PH (precipitation hardened) stainless steel eliminate the use of couplings which require constant lubrication with water or wastewater. The one-piece design eliminates the erosion and constant maintenance problems inherent in coupled-shaft designs. Anti-Deflection Insert provides support for the shaft should debris be ingested into the unit. Under normal operating conditions the volute of an aerator must be able to withstand constant duty in corrosive, abrasive and high velocity propeller-induced flow. The volute of the Aqua-Jet is constructed of heavy wall stainless steel to resist this assault. The heavy construction of the Aqua-Jet volute will provide a long, trouble-free life. Float is constructed with a closed cell polyurethane foam that adds to the structural stability of the Aqua-Jet and prevents sinking if excessive damage to the float exterior should occur. Float exteriors are of 14 gauge stainless steel, with fiberglass available as an option. The Propeller is a two blade design constructed of 316 stainless steel. It features a 180° sweepback design for non-clog operation and greater operating efficiency. Intake Cone (standard on all units). Provides a smooth transition of flow with minimum headloss. Fluid Deflector contains the thrust washer and protects the Anti-deflection insert from the upward liquid flow. Draft Tubes (Anti-erosion Assembly (optional)). Draft tubes are volute extensions used to extend the intake of the aerator to a greater depth. Anti-erosion assemblies consist of a stainless steel plate attached to the bottom of the intake cone, via the anti-vortex cross. The assembly causes water to be drawn from the sides of the cone rather than from directly below it. See page 12 for application and dimension information.
Vibration Controlled Design

The continuous, heavy-duty operational life of rotating equipment (such as an aerator) demands a vibration-limiting design which will assure smooth operation long after the unit has been installed.

The velocity must be controlled to 7.5 mm/sec. or less. If this limitation is not met, early machine failure is inevitable.

The high maintenance cost of some aeration equipment is directly related to the manufacturer’s inability to control vibration in its aerators. High maintenance and equipment failure is a fact of life with many aerator installations...but not with those utilizing Aqua-Jets.

Proper design and the use of high quality materials has made Aqua-Jet® aerators the most durable and reliable in the industry. On properly maintained aerators, Aqua-Jets outlast other aerators 2 to 1. On poorly maintained aerators, Aqua-Jets outlast other aerators by more than a 3 to 1 margin. And remember, the only scheduled maintenance on an Aqua-Jet® aerator is lubrication of the motor bearings twice each year. Most other aerators require considerably more scheduled and unscheduled maintenance. That means more downtime and more manhours.

Aqua-Jet® aerators are installed in a wide variety of treatment schemes including SBR, MSBR, flow-through activated sludge and extended aeration systems. Aqua-Jets are also incorporated into lagoon applications such as complete mix, partial mix (facultative) and dual-power multicellular systems.

Some of the many industrial applications for Aqua-Jets include: beverage, dairy, meat processing, pulp & paper mills, refineries and chemical waste treatment plants.

Many international corporations use Aqua-Jets exclusively.

Aqua-Jet® aerators are utilized at this municipality in Venezuela.
Enso Publication Papers OY LTD
Anjala Mill, Finland

Enso Publication Papers OY LTD operates pulp mill and paper mill production facilities at the Anjala Mill, Finland. The pulp mill produces a peroxide-bleached pulp, while the paper mill primarily produces lightweight and bulky newsprint. Annual production of newsprint is approximately 354,000 metric tons from three paper machines, with water consumption averaging 20,000 m³/d.

The wastewater treatment plant at the mill was first constructed in 1979, as an aerated lagoon system. Aeration was supplied by seventeen 45 kW slow speed aerators. Several changes were made to the treatment system over the years, including the addition of an anaerobic reactor in 1985 and the conversion to an activated sludge treatment system in 1988. The anaerobic reactor is bypassed in the current treatment scheme.

Average monthly operating data

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<thead>
<tr>
<th>Influent Data</th>
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<tr>
<td><strong>BOD</strong></td>
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<tr>
<td>Flow</td>
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<tr>
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<td>Suspended Solids</td>
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<td>2.0-3.0 mg/l</td>
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Although the load to the activated sludge system was limited to about 15 metric t/BOD/d, the aeration supplied by the slow speed aerators was not sufficient to provide adequate oxygen to the system, as evidenced by repeated odor problems.

In 1989, twelve 75 kW Aqua-Jet® aerators were positioned in the first part of the aeration basin and are, subsequently, undertaking most of the aeration responsibilities in the activated sludge plant. The Aqua-Jet® aerators are cycled, as needed; while nine of the slow speed aerators remain in continuous operation.

The mill normally is operated under stable conditions, meeting the effluent requirements by a considerable margin. BOD and suspended solids discharge average 2.0-3.0 metric t/d. The Anjala Mill’s discharge limits are 4.0 metric t/d BOD and 8.0 metric t/d suspended solids.

According to the operators of the plant, the addition of the Aqua-Jet® aerators to the wastewater system improved system operation and performance in several ways:

- Aqua-Jet® aerators need far less maintenance than the slow speed aerators.
- Aqua-Jet® aerators seem to provide more oxygen per horsepower than the slow speed aerators.
- Aqua-Jet® aerators can be used for energy conservation, as they permit on/off operation in a far more efficient and easier way than the slow speed aerators.

Data for this case history and comments were provided by:

STIG MORLING PROCESSTEKNIK AB
Falun, Sweden

Margarita Island / Dos Cerritos

In recent years Margarita Island, off the coast Venezuela, has become a popular tourist resort. Beach pollution became severe with increased urban growth and installation of an adequate wastewater treatment facility became necessary to ensure continued growth and development.

In 1989 Dos Cerritos, a new wastewater treatment plant, was built on the outskirts of the city of Porlamar. The plant is an activated sludge system designed to handle an average flow of 50,000 cu m/day with a maximum of 1200 I/sec. The configuration of the plant includes an aeration tank which employs eleven 55 kW Aqua-Jet® aerators, 6 sedimentation tanks, 2 polishing ponds and 4 ponds for sludge digestion. This design was created especially for the developing world, where a shortage of skilled labor makes operation very difficult.

The detention time is approximately five days in a three-lagoon system of 142.3m x 61m x 1.37m.

Customer Comments

Nicolas Pombo, Corporate Environmental Engineer, said, “If I were to design another lagoon, definitely I would consider buying Aqua-Aerobic again. No doubt about it. I think they are almost maintenance-free. The mechanical performance is good.”

Smurfit Carton de Colombia
Cali, Colombia

This pulp and paper mill processes 203,209 metric tons of product per year. The parent company, Jefferson Smurfit Corp., is the largest paper recycling company in the world.

Their lagoon operated under anaerobic conditions for four years with only 30% BOD removal efficiency. The decision was made to switch to aerobic aeration. After the installation of eighteen 55 kW Aqua-Jet® aerators, the BOD removal efficiency increased to 80%.

The detention time is approximately five days in a three-lagoon system of 142.3m x 61m x 1.37m.

Typical wastewater treatment lagoon at a pulp and paper mill.
**Aqua Jet II® Contained Flow Aerator**

The Aqua Jet II® is designed for improved heat retention applications which require continued operation of aeration equipment during cold weather months, but are limited because of an inadequate heat sink due to process selection or environmental conditions.

The Aqua Jet II® is also appropriate for those applications which must comply with aerosol emission or misting control. The dome serves as a shield by redirecting spray produced by the aerator back into surface water, minimizing dissipation into the air.

**Features and Benefits:**
- Available in 1.5-75 kW
- Aerated lagoons
- Aerobic digesters
- Easily installed
- Activated sludge basins
- Low maintenance
- Equalization basins

**Applications:**
- Aerated lagoons
- Aerobic digesters
- Activated sludge basins
- Equalization basins

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**Mooring Options**

**Post Mooring** is used in larger lagoons where distances prohibit mooring the Aqua-Jet® to the shore. A mooring post is installed into the lagoon floor and the mooring line is attached to an eyebolt in the post.

**Maintenance Mooring** enables the operator to easily move the aerator to the shore for maintenance. One or two mooring connection points are supplied with a disconnect device and a long length of cable. This allows the aerator to be moved to the opposite side of the basin without disconnecting the mooring.

**Shore Mooring** is a three-point or four-point mooring to the shore, the most common mooring configuration. Mooring cables are connected to the Aqua-Jet® mooring eyes and to an eyebolt or embedded anchor on the shore.

**Pier (Fixed) Mounting** is used when the Aqua-Jet® can be fixed-mounted to various platforms or structures. The hanging design shown here is one of the more common fixed-mounted arrangements. This mooring option is ideal for those installations where gear-reduced units are being replaced by the more efficient Aqua-Jet®.

**Restrained Mooring** is used in applications with varying water levels. The Aqua-Jet® restrained mooring frame fits around the mooring posts and allows the aerator to slide up and down the post as the water level changes.

**Bottom Mooring** is another mooring arrangement for those installations where the distance from the Aqua-Jet® to the shore would require longer lengths of cable than is practical and where the use of a mooring post is not feasible. The unit is moored from three (3) or four (4) points to concrete blocks on the lagoon floor.

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### Anti-Erosion Assemblies and Draft Tubes

Anti-erosion assemblies consist of a stainless steel plate attached to the bottom of the Aqua-Jet® intake cone via an anti-vortex cross. The assembly causes water to be drawn from the sides of the intake cone, rather than from directly below it; and prevents the floor erosion that can sometimes occur in shallow basins.

The Draft Tube accessory provides an extension of the intake cone and permits a deeper intake of water. Its specific application is in extremely deep basins. The Draft Tube is available in lengths as indicated in the chart below. Contact your Aqua-Aerobic Systems representative for Anti-Erosion and Draft Tube data specific to your application.

### Low Trajectory Diffuser (L.T.D.) Assembly

The low trajectory diffuser (L.T.D.) is a high density polyethylene ring that is attached to the top of the diffusion head, increasing the diameter of the diffuser. This arrangement lowers the spray of the Aqua-Jet® reducing windblown spray and misting.

Low trajectory diffusers are used in colder climates, and where a smaller, lower spray pattern is desired.

### Arctic Pak

The Arctic Pak ring contains thermal resistance heaters which minimize the chance of icing on the exposed surfaces of the Aqua-Jet®, such as the cast diffusion head.

The Arctic Pak is complete with its own junction box (which mounts on the Aqua-Jet® motor fan cover) and automatic controls and control panel. Operation of the Arctic Pak is controlled by an ambient temperature thermostat. The unit can be used on either floating or fix-mounted Aqua-Jets.

### Selection of Electrical Service Cable

#### Maximum Allowable Cable Length in Meters. (Based on 3% Voltage Drop and a 90% Power Factor)

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### Selection of Anchor Cable

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### Stainless Steel - SS

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### Energy Efficient Motors

Aqua-Aerobic Systems' energy efficient motors offer significant energy savings over standard industrial designs. The energy savings realized with the motor design allow the initial price premium to be recovered in a relatively short period of time.

### Materials of Construction

**Stainless Steel - SS**

- **FSS Series**
  - Dual Speed - Highlighted area indicates dual speed specifications.
  - All dimensions in centimeters.
  - 7 kW and 1.5 kW not available in dual speed.
  - Includes allowance for nut and/or screw.

### Dual Speed

- Very few wastewater treatment systems are fully or evenly loaded at all times. Consequently, aerators sized to handle peak loads have excess capacity during periods of light loading. This results not only in an excessive dissolved oxygen residual, but also consumes excess energy. And energy costs you money.

### Endura Series

Endura Series aerators offer a five-year no-maintenance warranty. This option is available on 2.2kW - 11.5kW Aqua-Jet® aerators. All Endura Series aerators are available in high efficiency, and each unit is vibration tested and hydraulically designed for optimum performance in the most stringent applications.
The information contained herein relative to data, dimensions and recommendations as to size, power and assembly are for purpose of estimation only. These values should not be assumed to be universally applicable to specific design problems. Particular designs, installations and plants may call for specific requirements. Consult Aqua-Aerobic Systems, Inc. for exact recommendations or specific needs.