

# **TECHNICAL SPECIFICATIONS**

## **TWISTER SLOW SPEED SURFACE AERATOR**

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# TABLE OF CONTENTS

<b>1. TWISTER SLOW SPEED SURFACE AERATOR</b>	<b>2</b>
<b>2. ROTORS</b>	<b>3</b>
<b>3. AERATOR SHAFT</b>	<b>3</b>
<b>4. GEARBOXES</b>	<b>3</b>
<b>5. MOTOR</b>	<b>4</b>
<b>6. FIXED MOUNTED SYSTEM</b>	<b>4</b>
<b>7. FLOAT MOUNTED SYSTEM</b>	<b>5</b>
<b>8. PLATFORM</b>	<b>6</b>
<b>9. MOVABLE ACCESS WALKWAYS</b>	<b>6</b>
<b>10. DEFLECTOR SHIELD</b>	<b>6</b>
<b>11. NOISE</b>	<b>7</b>
<b>12. WARRANTY</b>	<b>7</b>
<b>13. PERFORMANCE TESTING</b>	<b>7</b>
<b>14. SAFETY</b>	<b>7</b>

# TECHNICAL REQUIREMENTS

## TWISTER SLOW SPEED SURFACE AERATOR

A total of \_\_\_\_\_ TWISTER (\_\_\_ Float/ \_\_\_ Fix Mount) low speed aerators shall be manufactured by AEROMIX Systems, Incorporated of Minneapolis, MN, USA. Each aerator shall be \_\_\_\_\_ horsepower (\_\_\_\_\_ kW), and shall consist of an electric motor driven gear reducer coupled to a rotor. The spinning rotor shall be immersed in the wastewater and project wastewater upward and outward providing intimate contact with the air. The pumping action produced shall also thoroughly mix the basin. Specifications for accessories such as oil heaters, pressure switches, ect., are available upon request.

### 1. TWISTER SLOW SPEED SURFACE AERATOR

The Twister slow speed aerator creates a tremendous water/air surface by “pulling” water from superficial layers (relative to the rotor submergence) up and radially sideways. Due to the rotor shape and rotational motion like any other surface aeration, mixing and oxygen transfer rates relate to submergence: Superficial submergence translate into higher oxygen transfer rates and lower mixing. Conversely deeper submergence translates into higher mixing and lower oxygen transfer rates.

The TWISTER slow speed aerator shall be designed to satisfy the following requirements:

- (a) Prevention of floc shear
- (b) Effect on flow patterns in the tank
- (c) Stability of the Equipment
- (d) Elimination of splash and spray
- (e) Ease of access for maintenance
- (f) Non ragging impeller
- (g) Low noise emission from the equipment
- (h) Allow draining of the tank

Models are available from 2 to 150 horsepower (1.5 to 110 kW) at 50 or 60 hertz.

The units shall be direct coupled and of the low speed type (rotor tip speed less than 6 ft/s (1.83 m/s)).

## **2. ROTORS**

The ROTORS shall:

- (a) Be of non-ragging type, smooth edged, and constructed of FRP (Fiber Reinforced Plastic), molded around a central steel frame, filled with closed cell polyurethane foam for additional structural support: and
- (b) Be dynamically balanced to ensure vibration free operation under all water levels and conditions.
- (c) Be of adequate size to transfer the applied torque and to resist bending.

The rotor immersion shall be adjustable to facilitate the variation of oxygen transfer rate with the equipment supplied. The adjustment shall be made at the pontoon with use of a hydraulic bottle jack.

A permanent label shall be attached to each aerator to indicate under static conditions the immersion depth corresponding to the design standard and maximum depth when operating.

## **3. AERATOR SHAFT**

A vertical shaft shall be mild steel with precision machined mild steel flange-type coupling welded to the upper and lower ends of shaft for mating to gearbox output shaft and rotor.

Shaft and coupling shall have a two coat paint applied, a gray anticorrosive (rust preventive) primer and (second coat) industrial RAL 5010 Blue. All exterior faces shall be coated except the upper and bottom most face of flange mating to gearbox output shaft and rotor.

Shaft shall be of adequate size to transfer the applied torque and resist bending.

## **4. GEARBOXES**

Each gearbox shall be of Planetary design, double reduction, designed specifically for mechanical aerator service.

Each gearbox shall incorporate an input adapter flange for NEMA or IEC-normalized electric motors.

Each gearbox shall be of adequate size for the intended load. All internal components to be precision machined to insure concentricity and proper alignment.

All gearboxes shall be designed for continuous service and manufactured in accordance with the most current AGMA standards for the type of gear drive furnished.

- (a) Gears shall be designed in accordance with AGMA standards 211.02 and 221.02.
- (b) Bearings shall be ball or roller type and shall be selected in accordance with AGMA standards 265.01.
- (c) Bearings shall be of the ball or roller type calculated for B10 life of 100,000 hours.

Each gearbox shall have a power rating for strength and durability of 2 times the maximum power required at the impeller shaft.

Input and output shafts shall be parallel.

Casings shall be made of cast iron.

All gear meshes and bearings shall be dip or splash lubricated except the lower output shaft bearing, which may be of dry well construction and shall be grease lubricated. Each aerator shall be supplied with the correct grade, and quality of lubricant for the operating conditions at site.

## **5. MOTOR**

All motors shall be of high efficiency and shall comply with all applicable provisions of the standards of the National Electric Manufacturers Association (NEMA).

Each motor shall be standard TEFC (Totally Enclosed, Fan Cooled), with 'c' face and have NEMA class B insulation.

Thrust loads shall not be placed on the bearings.

All motors will operate at \_\_\_\_\_ VAC, \_\_\_\_\_ hertz, \_\_\_\_\_ phase, \_\_\_\_\_ % efficiency, and \_\_\_\_\_ RPM.

## **6. FIXED MOUNTED SYSTEM**

Each fixed mounted system shall consist of an adjustable stainless steel mount plate to secure aerator in position.

The mounting plate shall be 3/4" (19mm) minimum thickness stainless steel (304) plate. Mount plate shall incorporate four threaded rods and nuts to properly level and vary aerator rotor depth of submergence over a range of 12" (300mm).

All materials including mounting platform and fasteners shall be stainless steel (304) for maximum strength and corrosion resistance. No galvanized, plastic, fiberglass or aluminum components shall be used.

## **7. FLOAT MOUNTED SYSTEM**

Structural members shall span between pontoons to provide support for the aerator mounting platform and aerator accessories. The mounting platform shall be ¾" (19mm) minimum thickness stainless steel (304) plate.

The pontoons shall be constructed from stainless steel (304) and have all seams and ends fully closed.

Each pontoon shall be filled with polyurethane foam. All foam fill ports shall be plugged.

All materials including brackets, mounting platform and fasteners shall be stainless steel (304) for maximum strength and corrosion resistance. No galvanized, plastic, fiberglass or aluminum components shall be used.

Each float system shall provide a flotation safety factor of at least two times the total assembly weight, including the aerator and motor.

The flotation system shall withstand normal wave action, wind velocities and aerator torque without capsizing. The complete aerator float system shall not be more than 75% submerged when a 200lb. (91kg) person is standing on it.

When the aeration basins are drained the pontoons shall support the entire weight of the aerators. The bearing pressure on the floor shall not exceed 2,000 psi.

Each float system shall be capable of being moored in position. Eye bolt attachment points shall be provided to anchor the assembly in place.

Mooring posts (minimum three), if required, shall be mild steel posts, hot dipped galvanized, concrete anchored and filled.

The mooring posts shall be designed to withstand all loads resulting from:

- (a) Operation of the aerators
- (b) Wind loads in accordance with ASCE-7. The basic wind speed shall be taken as 100 MPH, 3 second gust speeds.

## **8. PLATFORM**

An **OPTIONAL** platform may be provided around each motor and gearbox for inspection and maintenance

Each platform shall be made of stainless steel mesh grating, be self draining, have non-slip decking and shall be fitted with handrails.

Each platform shall be designed and constructed strictly in accordance with all applicable national and local Codes and Standards for Platforms, Walkways, Stairways and Ladders. The basic wind speed shall be taken as 100mph.

The platform shall be at least two (2) feet above water level under operating conditions.

## **9. MOVABLE ACCESS WALKWAYS**

An **OPTIONAL** walkway may be provided to form an articulated bridge from the basin wall to the aerator and shall be supported with an articulated joint at each end. The walkway bridge shall be a single span structure with a length of not greater than 25 feet.

Each walkway shall have a minimum clear width of 36 inches (915mm) surfaced with an open mesh non-slip flooring with supporting structural steelwork and shall be fitted with handrails.

The bridge span shall be designed to take a uniformly distributed load on the flooring of 100psf. The flooring shall, however, be designed for an upper loading of 150 psf.

The maximum deflection (vertical and lateral) of the walkway bridge under a static and/or live load of 100 psf shall not exceed  $1/360^{\text{th}}$  of span and  $1/180^{\text{th}}$  of the cantilever length.

The bolted connection to the basin wall with an articulated joint shall be commensurate with the design load and adequate allowance shall be made for lateral restraint.

Prevention of lateral movement of the walkway bridge shall be primarily implemented through the main structural members and the articulated wall connections.

The angle of repose of the walkway will alter with the level in the aeration basin. The walkway may be horizontal or sloped with a maximum (or minimum) angle dependant upon the design height of the customer's aeration basin/wall. At no point in its movement shall the walkway affect the operation of the aerator.

Each platform shall be designed and constructed strictly in accordance with all applicable national and local Codes and Standards for Platforms, Walkways, Stairways and Ladders. The basic wind speed shall be taken as 100mph.

## **10. DEFLECTOR SHIELD**

An **OPTIONAL** circular mist deflector may be provided for each aerator to eliminate spray and splash above the aerator platform.

Each deflector shall be mounted in a stationary position above the aerator impeller and supported from the underside of the platform.

Deflectors shall be constructed of black UV resistant Polypropylene

## **11. NOISE**

For surface aeration equipment the combination of all noise sources from the motor/gearbox that can be in simultaneous operation shall not exceed a sound/pressure level of 80dB (A) at 3 feet free field.

## **12. WARRANTY**

A separate warranty statement shall be provided by AEROMIX, which defines the terms of a 12-month warranty.

## **13. PERFORMANCE TESTING**

AEROMIX shall have available on site a test tank with minimum volume of 100,000 gallons where oxygen transfer rate, velocity, and mixing tests can be executed. Upon request, AEROMIX shall provide independently certified oxygen transfer test, data generally following the ASCE Standard Oxygen Transfer Rate (SOTR) to document equipment performance.

SOTR is the oxygen transfer rate (OTR) in clean water when the dissolved oxygen (DO) concentration is zero at all points in the water volume, the water temperature is 30°C (86°F) and the barometric pressure is one atmosphere.

## **14. SAFETY**

Visible safety warning labels shall be applied on the shipped equipment that comply with OSHA regulations (29 CFR 1910).