

## **PART 1 - GENERAL**

### **1.1 SUMMARY:**

- A. The submersible mixing aerator components shall be constructed of HDPE, Pressure Class 235 psi (DR 18) PVC, 304 and 316 stainless steel, and perforated, rubber, diffuser membrane. The mixing aerator can be implemented or installed into but not limited to pump stations, lift stations, wet wells, and in other highly corrosive environments for extended periods of time with limited maintenance required.
- B. The mixing aerator with regenerative blower package must be designed for prolonged performance in hydrogen sulfide exposed environments, heavy duty continuous operation, twenty-four (24) hours per day seven (7) days per week.
- C. The mixing aerator must be able to move fluid and solids continuously without interruption and with a maximum solid size equal to or less than three (3) inches in diameter.
- D. The submersible mixing aerator will have no moving parts but shall allow for repositioning of static components.
- E. The mixing aerator shall enhance aerobic digestion by passing organic material repeatedly against triangular static shear edges and circulate the entire water column reducing organic particle size for aerobic bacterial consumption.

### **1.2 SUBMITTALS:**

- A. Product Data: Catalog Cuts with dimensions, specifications, and installation instructions. Also, include electronic file copy of manufacturer's installation, operations, and maintenance manual for informational purposes.

### **1.3 QUALITY ASSURANCE:**

- A. Accepted Manufacturers:
  - 1. The Mixing Aeration Technology shall be the "TWISTER®" as manufactured by TITUS® Wastewater Solutions, Inc., 5301 CY Avenue, Casper, WY 82604 (877-582-9899, [tituswws.com](http://tituswws.com)).
  - 2. Motorized regenerative blowers shall be specified and supplied by TITUS®.
  - 3. Blower enclosure is designed and shall be designed and supplied by TITUS®. All controls, disconnects, starters, optional enhancements, and air filtration compartment with washable removable media within a standardized repetitive design.
  - 4. Blower hose for diffused air systems only shall be supplied by TITUS®. Blower hose shall be EPDM, and supplied with 316 stainless steel camlock quick disconnect fittings to match that of the enclosure and TWISTER® Mixing Aerator head.
  - 5. Blower to head connection piping for ozone enhanced systems shall be provided by others, and shall be stainless steel only, with 316 stainless steel camlock quick disconnect fittings to match that of the enclosure and TWISTER® Mixing Aerator head. Stainless steel pipe size shall be determined by project specific operating parameters.
  - 6. Ozone Generators shall be supplied by TITUS® as the TT-Series Ozone Generator system.

**B. Governing Performance Standards for Motorized Blower:**

1. Motorized blower enclosure supplied by TITUS®, must be connected to a matching voltage, amperage and single or three phase electrical source by the owner's licensed, certified electrician.
2. All three phase motors are 60 HZ. Single phase motors are 60 HZ. Noise level will vary depending upon model.
3. All blowers shall be equipped with Viton shaft seal and 416ss bearing seal.
4. Blower pressure must not exceed the following PSI readings while maintaining minimum airflow equal to or greater than 40 ft<sup>3</sup>/min, while under pressure: (2hp blowers:3psi ) (3hp: 4psi) (6.2hp: 6psi)
5. Periodic inspections of the blower should be made. Refer to included regenerative blower manufactures operations and maintenance manual.

**1.4 SEQUENCING AND SCHEDULING:**

- A. Coordinate equipment installation with other components as required.
- B. Sequence, coordinate, and integrate installations of materials and equipment for efficient flow of the Work.
- C. Coordinate connection of piping systems with other exterior underground utilities and services. Comply with requirements of authorities having jurisdiction, franchised service companies, and controlling agencies.

**PART 2 – TECHNOLOGY & COMPONENT PROCESSES**

**2.1 TWISTER® Submersible Aeration Mixing Technology Processes:**

- A. Mechanical: A Passive system with “No” moving parts. The Mixing Aerator shall be capable of continuous repeating break down of organic solids into smaller particulates by driving them repeatedly against static shear surfaces at the approximate acceleration of bubbles freely rotating upward through the mixing aerator. These increasingly smaller organic particulate in an oxygen saturated environment promote healthy aerobic bacteria in consuming and metabolize organic material at an increased rate.
- B. Dissolved Oxygen Saturation: The mixing aerator injects a continuous flow of air through a special manifold which drives the mixing and accounts for efficient gas (dissolved oxygen) transfer to water, thus creating a constant and stable environment for aerobic bacterial propagation.
- C. Ballast: The mixing aerator shall have 316 stainless steel weighted ballast plate sufficient to maintain the mixing aerator's placement on the proposed vessel floor, allow for predetermined elevation setting or adjustable vertical positioning. The ballast plate shall be fitted with a welded 316 stainless steel pressure end cap that is centered and to be drilled and tapped for 316ss bolts for fastening the devices barrel.
- D. Barrel: The mixing aerator shall be equipped with an eight inch diameter (8”) or twelve inch diameter (12”) Pressure Class 235 psi (DR 18) PVC barrel section equipped with a minimum of three (3) organic circulating “draw ports” located above the ballast plate at the bottom of the vertical barrel column. Furthermore, the barrels configuration shall not restrict the physical Coriolis impact

on or impede the ability for increased bubble acceleration that the 360° spin or twist around the mixing aerator's air manifold that allow for the maximum draw of organic particles upward through the intake ports while maintaining maximum velocity within the barrel circumference.

- E. Air Manifold: The mixing aerator technology air manifold shall be constructed from 316 Stainless Steel schedule 40 tubing with holes designed to be located above the crown of the barrel column "draw" or intake ports.
- F. Membrane Diffuser: The mixing aerator technology air manifold shall incorporate a molded, synthetic rubber membrane, perforated and performing as a fine bubble diffuser. The membrane shall deliver air at a high volume through multiple series of engineered perforated pores that enhance the percentage saturation of gases to water and continually transfer oxygen to upstream influent flowing into mixing aerated equipped vessel. The membrane shall be designed for continuous use, up to 250 degrees Fahrenheit (121 degrees Celsius), resistant to ozone, sunlight, oil, fuel, and abrasion. The membrane shall be secured to the Air Manifold with stainless steel, center punch band clamps, preformed, 2.25" diameter, .022" thick, 300/302 series SS.
- G. Triangular Shear Edges: The 8" diameter barrel shall have three (3), and the 12" diameter barrel shall have four (4) - 1/2" equilateral triangular, HDPE organic shear edges, placed horizontally and stacked, with the small triangle at the bottom and the incrementally larger triangles stacked on one another. The geometry of the triangular stack of shear edges engages the organic material as it spirals upward around the air manifold as the material passes a greater shear potential exists with a minimum of nine (9) shear edges.
- H. Horizontal Deflection Plate: The 8" diameter barrel, triangular shear edges shall have a 9 1/2" diameter x 1/2" horizontal deflection plate. The 12" diameter barrel, triangular shear edges shall have a 12" diameter x 1/2" horizontal deflection plate. The purpose of the horizontal deflection plate is to direct any energy existing post shear to be directed to the horizontal cross section at the elevation of the largest shear triangle.
- I. Cutter Blades: The circumference of the top edge of the barrel shall include (2) SDR 35 cutter blades
- J. Enclosures: The blower, ozone generator (if applicable) and control panel (if applicable) shall be housed in a manufacturer supplied enclosure as follows:
  - i. Option 1: Fiberglass All Weather Enclosure (Model TT-FIB-S): with louvers and factory installed fan.
  - ii. Option 2: Aluminum Enclosure (Model 2001): Fabricated with extruded aluminum, powder coated, white, three-sided, with removable, washable filter tray. With optional floor or wall mount stand.
  - iii. Option 3: Stainless Steel Enclosure (Model 1008-Gen2): Fabricated with A304 Stainless Steel, Fully enclosed, weather resistant. Complete with hinges, lockable lever/openers, removeable, lockable climate control cover (if applicable), enclosure ventilation, and removeable, washable filter tray. Lined with Dynamat Dynaliner (a sound deadening material).
  - iv. Option 4: Stainless Steel Vandal Resistant Enclosure (Model 1010): Fabricated with A304 Stainless Steel, fully enclosed, weather resistant. Complete with hinges, lockable lever/opener, removeable, lockable climate control cover (if applicable), enclosure ventilation, and removeable, washable filter tray. Lined with Dynamat Dynaliner (a sound deadening material). All piping shall be configured to run down through floor of enclosure. Floor mount stand shall be fully enclosed with panels secured with vandal resistant bolts and washers.

## **PART 3 – OPTIONAL OZONE ENHANCEMENT (TT-SERIES)**

### **4.1 TRI-ATOMIC OXYGEN:**

- A. Ozone enhanced systems shall incorporate TT-Series ozone generators, utilizing corona discharge technology, and shall be supplied by TITUS®.
- B. Ozone Generator Package: TT-Series ozone generator package includes Stainless Steel Cannister Housing, Corona Discharge Modules, Electrical Control Panel and Climate Control Components.
- C. Ozone Generator Cannister Housing: Shall be a round, stainless steel vessel, air-tight, with a single clamp securing the maintenance cover with a Viton seal. The maintenance cover shall include an optical inspection port for visual verification of generator operation. Housing shall be capable of enclosing (1) primary ozone generator module and (1) secondary generator module (if required) .
- D. Ozone Generator: Shall be corona discharge type, capable of generating ozone out of atmospheric air provided by regenerative blower, as part of a turnkey system (see blower description, Section 1.3.B). Ozone generating Corona bulbs shall be grouped and secured in compact, cartridge-type modules. Modules are inserted into stainless steel housing. The housed ozone generator shall be installed on the suction side of the blower. Cool, dry, filtered air shall be pulled through the ozone housing and ozone generator modules. Oxygen concentrators are not allowed.
- E. Adjustability: The primary ozone generator shall be adjustable using a multi-voltage selector switch.

The Primary ozone generator shall be adjustable with four (4) settings as follows:

Selector Switch turned to off position, generates zero output

Selector Switch turned to Position 1, generates 10gph, utilizing 55v

Selector Switch turned to Position 2, generates 15 gph, utilizing 85v

Selector Switch turned to Position 3, generates 20 gph, utilizing 115v

The secondary ozone generator module provides an additional 20gph of ozone output, utilizing 115v. The secondary ozone generator shall include a designated, non-adjustable switch.

NOTE: Ozone production output may vary (+/-) based on actual voltage being delivered to system from incoming power.

- F. Climate Control Unit: Shall be of nominal capacity of 13,500 BTU/hour and include a thermostat.
- G. Electrical Control Panel: To be provided by TITUS®, and shall include dry connection for connect to end user provided SCADA/Monitoring system (if applicable)
- H. Monitoring, Alarms and Auto Shut-Offs shall be external and provided by others.

## **PART 4 – EXECUTION**

- 4.1 Installation, Operation & Maintenance of system shall be per manufacturer's installation, operations, and maintenance manual instructions.

END OF SECTION