PULSED AIR MIXING SYSTEM

PART 1: GENERAL

1.01 SCOPE OF WORK

A. Background and Objective: Gulf Coast Waste Disposal Authority's (GCA'S) Bayport Facility located at 10800 Bay Area Blvd., Pasadena, Tx.77505 has experienced an ongoing buildup of floating scum on the surface of the water in their Main Lift Station (MLS). See the attached drawing of the layout of the MLS (Figure 1). This situation has created an ongoing operation and maintenance problem for GCA. Currently the operators have to manually lower the level of the lift station at least once per day to remove the scum. This is both labor and time consuming and has contributed to the wear and tear of the MLS pumps. This spec is a performance spec for purchase of a Pulsed Air Mixing System to automatically control and eliminate the buildup of scum on top of the water surface in the MLS to eliminate the need for the operators to manually lower the level in the MLS to control floating scum. The manufacturer must supply a system to meet the above stated objective. The manufacturer must have a minimum of five (5) years of service in providing mixing to lift stations to control scum formation on the surface of the water.

B. Furnish a Pulsed Air Mixing System in accordance with these specifications for an independent third party to install, put into operation, and field test the pulsed air mixing system for installation at the Main Lift Station (MLS) as specified and depicted herein.

C. All necessary accessory equipment and auxiliaries, excluding connecting conduit, wire and pipe between the compressor and down coming bubblers and shall be furnished as required for a complete and operating system (See 1.06 A. 3.). Coordinate the remote monitoring signal with the existing plant-wide instrumentation and control system.

1.02 RELATED WORK (NOT USED)

1.03 SUBMITTALS

A. Submit complete shop drawings showing details of fabrication and installation of all materials, equipment and the system to be installed under this Section.

B. Submit at least the following information, along with any additional information required to demonstrate compliance with this specification, prior to installation:

1. Descriptive literature, bulletins, or catalogs of the equipment.

2. Manufacturer's standard data sheets for compressor, including electrical information, which confirms compliance with specified capacity and discharge pressure, air dryer,

and all other components of the Manufacturer's standard system, whether specifically called out in this section or not.

3. A complete bill of materials.

4. Certified shop drawing of plates, support and anchoring system, and erection drawings showing all details of construction, dimensions, and anchor bolt locations.

5. Certified shop drawing of compressor and control skid and erection drawings showing all details of construction, dimensions, and anchor bolt locations.

6. A list of the Manufacturer's recommended spare parts with the Manufacturer's current price for each item.

7. Recommended pressure settings for pressure regulating valves and any other pressure devices used.

8. Schematic electrical control diagram of control system with notes showing complete brand and part identification and description of operation.

9. Complete data on motors.

10. Control panel layout drawings of the interior and exterior of all panels, drawn to scale, showing all components, conduit access points, and terminal block locations.

11. Data sheets on all components used in the control panels.

12. Description of surface preparation and paint.

C. Submit complete set of start-up, operating, and maintenance instructions for each piece of equipment and the system. The instructions shall be prepared specifically for this installation and shall include all cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operating and maintenance personnel unfamiliar with such equipment.

D. Submit, in accordance with paragraph 1.08.C, installation certification.

E. Submit, in accordance with paragraph 3.03, certified copies of results for all field tests.

1.04 REFERENCE STANDARDS (NOT USED)

1.05 QUALITY ASSURANCE

A. The pulsed air mixing system shall be the product of a single Manufacturer who has a minimum of five (5) years experience in the design and manufacture of pulsed air mixing systems of the type specified herein. Submit evidence to substantiate this experience including, but not limited to, a representative list of installations.

B. The pulsed air mixing system outlined in this section shall be supplied by and be the responsibility of a single supplier. The supplier shall be either the equipment manufacturer directly or a manufacturer's representative normally engaged in pulsed air mixing system design and service. Equipment for which a single supplier shall take responsibility shall include, but not be limited to the following, as specified herein:

1. Plates, supports, and anchoring system
2. Compressor
3. Air filter/dryer
4. Pressure regulating valves
5. Solenoid valves
6. Air piping and fittings within the limits of the package air delivery system
7. Controls, including enclosure

C. Materials and equipment shall be free from all defects that might affect serviceability of the finished product. No used equipment or materials will be allowed.

D. Should equipment which differs from the Specifications be offered and determined to be equal to that specified, such equipment shall be acceptable only on the basis that any revisions in the layout and construction of the structures, piping and appurtenant equipment, electrical work, etc. required to accommodate such a substitution shall be made at no additional cost to the Owner and be as pre-approved by the Owner's Representative.

E. Services of Manufacturer's Representative A Manufacturer's factory representative who has complete knowledge of proper start-up, installation, and operation and maintenance (O&M) of the equipment furnished under this Section shall be provided as noted in paragraph 1.08.

1.06 SYSTEM DESCRIPTION

A. General

1. The pulsed air mixing system is a method of mixing by the injection of compressed air through a piping system to specifically spaced plates which are mounted or suspended at or near the floor of the vessel or tank to be mixed. A factory programmed controller operates the injection process.

2. Compressed air is injected as a very short duration pulse or burst in order to form an air mass or bubble, which, as it rises to the surface, forms a powerful and thorough mixing action within the Main Lift Station (MLS). Each injection valve may be connected to one or more bubble forming plates, the number and location of which

shall be determined by the supplier/manufacturer.

3. The mixing system provided in this project shall consist of the air source, the air pulsing components, the bubble forming or accumulating plates and all materials inside the MLS required to suspend the plates from the deck. The air source, air pulsing components, and controls shall be housed in a weather enclosure, as needed to protect from exposure to direct sun and rain.

4. The mixing system shall not include any components located in the MLS that pivot, rotate, oscillate or otherwise move to create the mixing action.

B. Design Requirements

1. The supplied system shall be capable of completely mixing the volume below the design operating water level, downstream of the curtain wall, in the MLS wet well where the pumps are located. The controls shall allow adjustment of duration and frequency of pulses to optimize performance. The dimensions of the mixing volume are as follows:

a. Length	12.5 ft
b. Width	32 ft
c. Liquid depth to floor at design operating water level	12 ft
d. Height above floor plates shall be suspended	4 ft
e. Liquid depth above plates at design operating water level	8 ft
f. Dimension from station deck to plates (length of support pipe)	14 ft

2. The number of plates supplied shall be determined by the system supplier as necessary to completely mix the specified volume. A separate installation Contractor will core drill holes in the MLS deck no greater than 2" diameter greater than the diameter of the plates installed. The layout shall be determined by the system supplier and shall not interfere with existing piping or equipment on the MLS deck. The number and size of the holes to be cored in the MLS deck must be approved by GCA's engineer so as not to create any structural problems in the deck.

1.07 DELIVERY, STORAGE AND HANDLING

A. Equipment and materials provided under this Section shall be delivered in strict compliance with manufacturer's recommendations. The manufacturer will specify proper storage and handling of the equipment.

B. Materials shall not be delivered to the site more than one month before scheduled installation without written authorization from the Owner.

C. Products shall be delivered to the site in manufacturer's original sealed containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting and installing.

D. The Installing Contractor will promptly inspect shipment to assure that products comply with requirements, quantities are correct and items are undamaged. . If any item has been damaged, GCA will notify the supplier/manufacturer of the damage and such damage shall be repaired at no additional cost to the Owner.

1.08 MANUFACTURER MANUALS AND SERVICES

A. Operating and maintenance manuals shall be furnished to the Owner. The manuals shall be prepared specifically for this installation and shall include all required cut sheets, drawings, equipment lists, descriptions, etc. that are required to instruct operating and maintenance personnel unfamiliar with such equipment. The manuals shall include the following (at a minimum):

1. Complete parts list cross-referenced to an exploded view assembly drawing.

2. Step-by-step disassembly and reassembly instructions.

3. Annotated control panel elementary wiring diagram.

4. Dimensional drawings of entire equipment and control panel.

B. Services of Manufacturer

1. Provide the services of a Manufacturer’s Representative with complete knowledge of the installation, start-up, testing, operation, and maintenance of the equipment as herein specified.

2. The Manufacturer’s Representative shall advise, consult, and instruct the Contractor on installation procedures and adjustments and inspect the equipment during installation (i.e., provide installation oversight).

C. Manufacturer’s Certificate of Proper Installation

1. On-site manufacturer’s representative shall provide a certificate of proper installation to include the following items:

a. All QA/QC data taken during the inspection and commissioning of the equipment.

b. The equipment installed under this contract meets or exceeds the contract specification.

c. Provide OWNER final confirmation equipment is installed properly and the equipment is ready for operation.

1.09 TOOLS AND SPARE PARTS

A. Special tools and the Manufacturer's standard set of spare parts required for normal operation and proper servicing shall be furnished with the equipment.

B. Provide spare parts for two (2) years continuous operation in accordance with Manufacturer's recommendations.

C. All tools and spare parts shall be properly packed and protected for long-term storage and placed in containers clearly identified in indelible marking as to contents. All tools shall be furnished in labeled steel toolboxes.

1.10 WARRANTIES, PERFORMANCE GUARANTEES AND PERFORMANCE PENALTIES

A. Upon completion of installation (in accordance with approved installation manual) and successful start-up by the Contractor and upon acceptance by Owner, provide Manufacturer's standard warranty, not to be less than one year from substantial completion.

PART 2: PRODUCTS

2.01 AIR PULSING COMPONENTS

A. The pulsing valve(s) will be solenoid controlled and pilot air assisted. They shall be capable of achieving pulse durations (opening / closing cycles) at operator selectable settings between 20 milliseconds and 80 milliseconds at supply air pressures between 40 and 80 psig. Valves shall have a manifold base and a valve body made of anodized aluminum. They shall be positive sealing poppet valves designed to be self-compensating for wear and non-lubed service. The valves shall be manufactured by Ross Controls or pre-approved equal.

B. An air filter with a 40-micron element and an auto-drain shall be provided to remove particulates and water to protect the regulator and pulsing valves.

C. A manually adjustable pressure regulator with pressure gauge shall be supplied to provide constant pressure for proper air flow to the pulsing valves. It shall allow air pressure adjustment between 40 and 80 psig. Compressed air pressure to this regulator from the air source shall not exceed 125 psig.

D. Components shall be pre-piped with stainless steel pipe and fittings and factory tested for leaks and function. Pipe unions shall be provided for servicing components.

E. A factory programmed programmable logic controller (PLC) shall be provided. The PLC shall include the following functionality as a minimum:

1. Manual adjustment of pulse frequency and duration

2. Output general fault signal for remote monitoring to indicate when the system is not working properly

F. A NEMA 4X, FRP or Stainless Steel, enclosure shall house the air pulsing components.

2.02 AIR DELIVERY ELEMENTS

A. Plates shall be constructed of stainless steel. The plates shall consist of two disks separated approximately ½-inch apart by internal spacers. Air is injected through a 1-inch NPT threaded nipple in the top disk to the space between the disks where it is forced laterally to form the mixing bubble.

B. The plate shall be suspended from the MLS deck by a threaded 1" Type 316 SS air pipe to achieve the submergence as outlined in 1.06.B of this specification. For added rigidity, the air pipe shall be inserted in a 3" Type 316 SS 80 gauge support pipe, with welded spacers on each end, and be welded to a Type 316 SS support plate at the top. The support plate shall be provided with four holes to allow for bolting to the top of the MLS deck.

2.03 COMPRESSED AIR SOURCE

A. Manufacturer: Kaeser, Gardner Denver, or Ingersoll Rand

B. Compressor Type: Rotary Screw or Rotary Vane

1. Horsepower: maximum 7.5 hp

2. Electric service: 460 V, 3-phase, 60 Hz.

3. Refrigerated air dryer, 50-80 gallon air receiver with drain, coalescing filter with auto-drain, and start / stop control.

2.04 ENVIRONMENTAL ENCLOSURE(S) AS REQUIRED FOR AIR COMPRESSOR, AIR PULSING COMPONENTS, AND CONTROLS

A. The supplier shall provide an environmental enclosure to protect any and all components for the system, as required, from direct sun and rain. If an enclosure is not required for the compressor and air dryer, the compressor and control enclosure shall be mounted to a common skid or the control enclosure shall be free standing and installed adjacent to the compressor. The pulsing valves can be provided in a separate enclosure and mounted closer to the station, but the supplier is responsible for coordinating the location with the installing contractor.

B. Materials and Method of Construction

1. The enclosure(s) shall be made of 14-gauge Galvannealed Steel mounted on galvanized mounting rails and have a structural tubing frame.

2. All hinges and handles shall be stainless steel.

3. Metal surfaces shall have two coats of rust inhibiting primer and two coats of standard enamel.

C. Electrical

1. The manufacturer shall provide an electrical breaker panel for the compressor, the ventilation fan and two duplex outlets.

2. The enclosure shall be prewired and ready for 480V, 3-phase, 60 Hz electrical service connection upon delivery.

3. The enclosure shall include a transformer to provide 110V, 1-phase service to ancillary devices within the enclosure.

D. Plumbing

1. The manufacturer shall provide all interconnecting piping within the environmental enclosure(s).

2. A condensate drain line port shall be provided on an external wall of the environmental enclosure. The drain line from the valve enclosure to the port shall be provided by the manufacturer.

3. A refrigerated dryer drain line port shall be provided on an external wall of the environmental enclosure. The drain line from the dryer to the port shall be provided by the manufacturer.

2.05 CONTROL REQUIREMENTS

A. The pulsed air system mixing package shall be provided with the following local control functionality:

1. Overall system On/Off

2. Adjustment of pulse frequency

3. Adjustment of pulse duration

4. General fault indication/reset

B. The pulsed air mixing system package shall be provided with the following remote signal failsafe dry contacts for communicating with the plant SCADA system:

1. System status (On/Off)

2. General fault

2.06 SHOP PAINTING

A. All surface preparations and prime painting shall be completed by the equipment manufacturer prior to shipping. Only touch-up painting shall be performed on-site. The cost for all preparation and painting work should be included in the equipment costs by the manufacturer. Aluminum, galvanized steel, and stainless steel surfaces shall not require painting.

B. Vendor will supply touch-up paint to be used by a third party contractor who will be responsible for touch-up painting in the field.

PART 3: EXECUTION

3.01 INSTALLATION

A. The pulsed air mixing system will be installed in compliance with Manufacturer's instructions and recommendations; therefore the supply Manufacturer must provide adequate instructions on the proper installation of the equipment. Prior to field testing the equipment, Manufacturer shall certify in writing that the installation is approved. Installation shall include furnishing the required lubricants for initial operation. The grades of lubricant shall be in compliance with the recommendations of the Manufacturer. Anchor bolts shall be set in compliance with the shop drawings.

3.02 INSPECTION

A. Furnish the services of a Manufacturer’s Representative who has complete knowledge of proper operation and maintenance to inspect the installation, as specified in paragraph 1.05.F.

3.03 FIELD INSPECTION, TESTING AND CORRECTION OF DEFICIENCIES

A. After installation is complete and approved by the Manufacturer's representative and in the presence of the Owner’s Representative and under the supervision of the representative, perform field tests on the installed equipment. Test shall be run for eight (8) hours and demonstrate continuous and trouble-free operation of the system and all components, including controls and SCADA communications. Any required modifications that need to be made to bring the system in compliance with any portion of this Section shall be made at no cost to the Owner.

3.04 PATENT_INDEMNITY

Supplier/Manufacturer/Vendor agrees to incorporate into the terms and conditions of the purchase order the following paragraph, “Supplier/Manufacturer/Vendor otherwise referred

to as Vendor below hereby indemnifies and shall defend and hold harmless Owner and its subsidiaries and affiliates and the officers, agents, employees, successors and assigns, and authorized representatives of all the foregoing from and against all claims, actions, losses, damages, and expenses, including attorney's fees, incurred as a result of or in connection with any claim, whether rightful or otherwise, that any equipment, material or process or any part thereof furnished by Vendor under this agreement infringes any patent. If use of any part of such equipment, material or process is limited or prohibited, Vendor shall, at its sole expense, procure the necessary licenses to use the infringing equipment, material or process, or the Owner may, at its option, (1) allow the Vendor, with Owner's prior written approval, to replace same with substantially equal but non-infringing equipment, materials or processes, or modify same to be non-infringing; provided that any such substituted or modified equipment, materials or processes shall meet all the requirements and be subject to all the provisions of this Contract, provided that such replacement or modifications shall not modify or relieve Vendor of its obligations under this Contract; or (2) Owner may cancel the Contract.

END OF SECTION