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INSTALLATION INSTRUCTIONS FOR SSI™ WIDEBAND DIFFUSER

Comment Sheet:

1. Installation, Operation and Maintenance Manual contains detailed information on the SSI-Cap Diffuser unit. This manual covers start-up, operation and maintenance procedures.
2. SSI™ Wideband diffuser unit has an operating headloss of approximately 10-25 inches of water when operated in normal airflow ranges (0 to 45 scfm normal). Confirmation of blower pressure requirements provided by others.

General

The SSI-Wideband diffuser units are furnished completely factory assembled. The only work required by the Contractor is the installation and placement of the diffuser units on the laterals piping.

SSI recommends care in handling and storage to prevent tearing, puncturing or fouling of the rubber membranes. If units are to be stored before installation, SSI recommends utilizing the original unopened shipping cartons. Store in a clean, cool location that avoids potential mechanical damage.

Air distribution through the SSI™ diffuser is a function of the individual diffuser elevation. For proper system operation, SSI recommends a leveling tolerance of $\pm 1/2$ " for the diffuser unit. If the diffusers are mounted with excessive elevation tolerances, the airflow distribution in the system will be adversely impacted.

Shipment/Storage of Equipment

1. Upon delivery, check equipment for structural damage during shipment. Damages must be reported to SSI within 10 days of delivery.
2. Store SSI™ units in a location that prevents exposure to excessive heat, oils or aromatic hydrocarbons.

Installation of Cap Diffuser Assembly

1. SSI designed the Cap diffuser for field installation on predrilled and tapped lateral piping. The lateral piping must have a 3/4" NPT tapped outlet placed vertically in the lateral piping.
2. It may also be installed in female threaded sockets welded & stainless pipe, or to 90° SS elbows welded and the bottom center line of gusseted SS headers.



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3. Place the threaded end of the diffuser into the threaded outlet hole in the lateral pipe. Hands tighten the diffuser unit by rotating clockwise. **DO NOT OVER TIGHTEN.** Over tightening the unit will cause failure to lateral piping, diffuser unit or both. Detail drawing of the Cap diffuser unit may be found in Section 2.

When blower assemblies, header piping, air laterals, and all units are properly installed, system is ready for start-up. Refer to SSI™ Start-up Instructions for details.

SSI™ START-UP INSTRUCTIONS

General

These instructions cover the general start-up requirements for the SSI™ diffuser system. Special start-up requirements outlined in the Engineer's specifications, contract documents, or instructions offered by SSI shall be supplementary to or take precedent over these general instructions.

An overview of Start-up procedures is related below:

1. Confirm that piping and diffusers are level by filling the basin with water. Adjust supports for diffusers as required.
2. Continue filling the basin with water until the diffusers are 1" to 2" under water. In the event of air leaks, the diffusers are accessible.
3. Activate the blower and introduce air to the SSI™ system. Check piping and diffusers for leaks, and repair if required.
4. While maintaining air to the system, continue filling the basin until the design depth is reached.

A. Blower Components

Refer to the blower installation and start-up to ensure that all blower components are mounted properly and ready for operation.

B. General Air Piping

Contractor is to confirm the cleanliness of the air piping. If existing header piping is used, the air purge or water flush cleaning procedure is recommended prior to installation of SSI™ units to remove any internal debris that may have accumulated in the header piping. Inspect air piping and diffuser connections for loose fittings or damaged pipe. Damaged piping sections and connections should be repaired prior to commencing system operations. Refer to cleaning procedures in this Section.

(Optional) Water Flush and Air Purge Cleaning of Piping

General: These instructions cover the general procedure which may be utilized to clean the piping in a fine or medium bubble diffuser system. Special pipe cleaning requirements outlined in the Engineer's



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specifications, contract documents, or instructions offered by SSI shall be supplementary to or take precedent over the general instructions outlined below. Note: Diffuser should not be installed during cleaning procedure. Debris may dislodge and plug units.

A. Water Flush Cleaning

1. Water flush cleaning is the recommended method to clean assembled piping systems where pipe segments are too long for manual cleaning. This procedure can be used in conjunction with air purge cleaning and is recommended when fine debris is not removed prior to assembly of piping. When both water flush and air purge is used, the water flush procedure should be implemented first.
2. To water flush the system, connect a water supply to the air header or make individual connections to each lateral. If flush water is piped to the header, it is imperative that the header be valved or stubbed such that water does not flood the blowers.
3. Clean water must be employed. It is not necessary to use potable water but the flush water must be free of silt or debris.
4. Flush header assembly prior to water flushing the laterals. Header, fill it with water and open the end lateral to create a in the header of at least two feet per second (if possible).
5. The laterals are to be individually flushed next. A flush velocity of five to six feet per second is recommended for lateral cleaning.

OPERATION INSTRUCTIONS FOR AERATED BASINS

Description of the Aeration-Mixing System

The aeration-mixing system employs individual diffuser assemblies attached directly to the lateral piping. SSI normally designs the aeration piping system to provide uniform distribution of air without requiring adjustment of the isolation/throttling valves on the laterals with the exception in situations where water level variation exists. However, these valves are typically provided for direct control of airflow distribution on large aeration systems or for process control.

Normal Operation of the Aeration System

The following procedures should be followed on a regular basis to assure consistent and satisfactory performance of the aeration-mixing system.

The air rate to the system may be adjusted to maintain the desired dissolved oxygen levels in the basin. When adjusting the air flow rate, the diffusers should be operated within the normal operating range of the diffuser. Excessive air flow rates will result in higher pressure drops across the diffuser. Low air flow rates may result in incomplete utilization of the diffuser media and reduced air distribution.

The aeration-mixing system is designed to provide uniform aeration. Positive dissolved oxygen concentrations should be present throughout the entire system during normal operation. A dissolved oxygen profile analysis may be used to confirm the performance of the aeration system. Typically, the



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dissolved oxygen levels are measured at the inlet, the outlet, and the midpoint locations of each basin to determine the aeration system performance. In regulating the system airflow to control dissolved oxygen levels, the diffuser units should be operated within their minimum and maximum airflow limits.

Varying Water Level Operations

In applications where water level variations may exist between aeration basins supplied by a single blower, the isolation valves may need to be adjusted to maintain adequate airflow distribution. This normally requires valving back the air to the basin with the reduced water level. NOTE: It is important to confirm the operating airflow range of the diffuser units before valving back any isolation valve. Damage could result to the aeration diffuser if airflow is above the recommendations enclosed herein. Please consult SSI Engineering Department to confirm operating procedure before adjusting any aeration isolation/throttling valve.

Trouble Shooting

The aeration system requires very little maintenance for long term operation. Periodic visual inspection of the system should allow the Operator to determine if the system is performing at optimum levels. For example, diffuser unit elevation variations greater than the design tolerance, typically $\pm 1/2$ " will reduce the uniformity of air distribution in the system. In addition, operating airflows below the design condition will also reduce the uniformity of air distribution. If operating conditions warrant air flowrates below the design condition, contact SSI for additional operational guidelines.

Below are symptoms and procedures to follow if inspection of the aeration system reveals abnormal operating characteristics.

1. Large volume of air in localized area
Possible Cause:
 - a. Air leak in aeration piping.
 - b. Diffuser sheath damaged or missing.
Procedure:
 - a. Drain basin to access area in question.
Maintain airflow to units.
Inspect joints for evidence of breakage.
 - b. Inspect diffuser units for sheath damage.
Replace as required.
2. Decreased diffuser activity and increased backpressure noted at blower.
Possible Cause:
 - a. Diffusers becoming fouled.
 - b. Reduced blower air volume.
 - c. Restriction in air header.
Procedure:
 - a. Access diffusers and inspect for external fouling.
 - b. Confirm blower operating point and rpm reading.
 - c. Confirm isolation valve position on header and drops.
3. Dissolved oxygen profile not satisfactory throughout basin.
Possible Cause:



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- a. Increased loading to system.
- b. Reduced blower air volume.
- c. Improper distribution of air in system.
- d. Air leak in system.

Procedure:

- a. Confirm loading to system.
- b. Confirm blower operations.
- c. Reference items 1 and 2 above.

Normal Operation of the Blower System

The aeration-Mixing System normally utilizes a centrifugal or positive displacement (PD) blower system consisting of one or more blower units for normal operation plus one on-line spare unit. All blower units including the spare unit must be operated on a regular basis to maintain their proper working condition. SSI recommends that blower units be operated sequentially with idle blower units brought on-line weekly. SSI does not recommend the simultaneous operation of on-line and spare blowers for an extended period. This operating condition may deliver airflows exceeding the air capacity of the diffuser units.

All blower components should be serviced on a regular basis. For additional information concerning proper blower operation, service requirements or service intervals, reference the Blower Operation and Maintenance manual.

Shutdown Conditions

If an interruption in air service is experienced at any time, restoration of air service should be instituted as soon as possible. When restarting positive displacement blower units, follow blower suppliers recommended procedures. Operate water purge devices if provided. If the PRV releases air for an extended period of time, the relief setting should be checked.

If the basin is to be idle for a prolonged time period, the basin should be drained and cleaned. Note, maintain the minimum airflow to the system during the drain down procedure. For maximum protection of the aeration system, refill the basin to completely submerge the aeration system. This provides thermal protection in the event of severe cold or hot weather conditions.

Contact SSI for additional operation and maintenance information if it is necessary to decrease the system airflow during cold weather.

Operation of the SSI™ Diffuser

The unit has no moving parts and requires very little maintenance for long-term operation. SSI recommends that the air supply to the diffusers be maintained at all times for optimum performance. The airflow to the units must be kept within the ranges summarized in Table 1 to maintain the structural and operating characteristics of the diffuser media. Continuous application of high airflows, greater than denoted for normal operation may result in physical damage to the diffuser media. Under no circumstances should the airflows indicated as maximum be exceeded. Note: Use caution when adjusting several lateral throttling valves in the same piping system. This procedure can result in elevated airflows in sections of the basin, exceeding the maximum allowable airflow to each unit.



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MAINTENANCE INSTRUCTIONS FOR AERATED BASINS

Maintenance of the SSI™ Diffuser

The SSI unit is a coarse bubble aeration device that offers maximum benefits for mixing. Proper operation and maintenance of the diffuser can provide years of long term performance with minimum energy cost and minimum maintenance cost.

Proper maintenance procedures will also minimize the frequency of system interruptions. The following guidelines should be referenced in maintaining the SSI™ diffuser system.

1. The diffuser Wideband should be protected from high PH products.
2. Some evidence of increased headloss through the diffuser unit may be experienced over a long period of operation. This pressure build-up is often the result of biological and/or inorganic materials building up inside of diffuser. The propensity for this condition is job specific and is a function of the type of waste, and the specific operating characteristics of the system. To restore performance and decrease the operating headloss, refer to the following sections.

Accessing the SSI™ Diffuser Assembly

SSI recommends that the units be accessed on a regular basis (annually) to visually inspect the units. The aeration system is designed to allow the diffuser units to be accessed by dropping the water level in the basin being serviced. The air to the basin being serviced should be turned off to prevent the possibility of excessive airflows to the units or damage to the blower unit.

The following items may be helpful in servicing the diffuser assemblies during periodic inspections or maintenance procedures:

1. Ladder to access the de-watered basin
2. Protective gloves and clothing
3. Long-handled bristle brush for cleaning assembly for observation

Replacing Diffuser Assembly

If it becomes necessary to remove an entire assembly, the general procedures outlined below should be followed.

1. Shut off air supplies to unit.
2. Unthread unit from lateral piping.
3. Reinstall the diffuser unit following installation details in Section

Properly operated and maintained, the SSI™ aeration and mixing system will provide years of high efficiency treatment with minimum operator attention. Questions regarding SSI™ system operation, maintenance, etc. should be forwarded to the Engineering Department.



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