JÄGER
Umwelt-Technik

OPERATIONS MANUAL

JETFLEX® SSD

Smart Strip Diffuser

1. GENERAL INFORMATION

This manual gives a detailed description of the operation and maintenance of JetFlex® SSD diffusers with a standard perforation length of up to 4000 mm from Jäger Umwelt-Technik GmbH.

Jäger Umwelt-Technik GmbH supplies aeration systems for aeration tanks of municipal and industrial wastewater treatment plants. The aeration systems are designed to transfer oxygen that is required in the activated sludge process via release of fine bubbles using compressed air.

With membranes manufactured by Jäger Umwelt-Technik GmbH, an intermittent operation is possible due to the longterm elasticity of the membrane. Quality properties of the material and the perforation as well as the bubble size and the bubble pattern are continuously controlled and recorded. The diffusers are delivered pre-assembled or partially assembled.

Jäger Umwelt-Technik GmbH advises that careful handling during transport, storage and installation by distributors / End Users is essential to avoid damage to the membranes. For this purpose, the respective installation instructions must be followed. Furthermore, the current version of the General Sales Conditions as well as the Warranty Conditions of Jäger Umwelt-Technik GmbH are valid.

2. START-UP INSTRUCTIONS

- Prior to start-up, the aeration system must be installed in accordance with the current installation instructions and all the points mentioned must be followed.
- All valves in the air lines - especially the valves in the down pipes - must be opened. Air relief valves and drainage systems must be closed. The air volume to the empty basin must be reduced, if several basins are supplied by one air pipe in order to avoid overloading the diffusers
- The filling of the tank with waste water must be done in a way that avoids direct water drops onto the diffusers or excessive flow conditions. The flow velocity must not exceed 0.3 m/s.
- During filling, the diffusers must be operated with an air flow rate of approx. the maximum of its operating range.
- Afterwards, the system can be operated as designed. The recommended air flows must be respected.

3. RECOMMENDED AIRFLOW RATE PER DIFFUSER

3.1. Continuous operation

For continuous operation the air load of the JetFlex® SD strip diffusers must be within the recommended operating range. To avoid damages on the diffusers, the max. permissible short term load is not to be exceeded.

JetFlex® SSD[1]	Recommended Operating Range[2]	Max. allowable short term peak flow[3]
SSD 1500	1,5 – 19 Nm³/h	≤ 29 Nm³/h
SSD 2000	2,0 – 26 Nm³/h	≤ 38 Nm³/h
SSD 2500	2,5 – 32 Nm³/h	≤ 48 Nm³/h
SSD 3000	3,0 – 38 Nm³/h	≤ 58 Nm³/h
SSD 3500	3,5 – 46 Nm³/h	≤ 67 Nm³/h
SSD 4000	4,0 – 52 Nm³/h	≤ 76 Nm³/h

1 Values for in-between lengths and other lengths must be calculated accordingly
2 For air volumes below the minimum flow rate, it is recommended to shut down individual diffuser grids completely to avoid a too low loading.
3 Max for 10min. per flushing / cleaning process

3.2. Intermittent operation

If the operation is intermittent under Nitrification/Denitrification, no other precautions than the absolute tightness of the installed system has to be ensured. However, if the diffusers are operated seldom (e.g. seasonal), some other precautions have to be taken into account:

- Sludge accumulation in the area of the diffusers has to be avoided with suitable mixing systems.
- After a longer period of shut-down, it cannot be excluded that water has penetrated into the aeration grids. Therefore, when the aeration system is restarted, the air supply should not be abrupt but rather gradually increased in order to release the penetrated water. Consequently, the pressure in the piping is normalised and an overload of diffusers is avoided.
- The diffusers should be flushed once a week with max. permissible short term peak flow (see 6.2 Flushing procedure/Blow Down Cycle). Especially when the regular operation rate is near the recommended minimum, periodic and automatic flushing (e.g. 10 min/day) is recommended.

4. STANDARD OPERATION

During standard operation, the air flow rate must be adjusted to maintain desired dissolved oxygen levels in the basin. The permitted operating range of the diffusers must be observed. An excessive air flow leads to high pressure drops and reduces the efficiency of the system. Too low air flow rates lead to uneven bubble pattern from the aeration system. This reduces the performance of the system and increases the tendency for deposits to form.

The water temperature must be between 5°C and 35°C. The air temperature must not exceed 60°C when entering the diffuser.

Good air filtration is required for operating fine bubble aeration systems. The air blown into the system must be free of oil, dust and solvents. Dust filters have to be designed according EN 779 - 2012, filter quality grade G4 prevents clogging of the diffuser pores.

Diffuser head loss should be constantly monitored and recorded in the operation log. An increase of more than 20 mbar indicates a possible contamination of the diffusers. Exact pressure gauges or differential pressure gauges are required to determine these small pressure deviations. Comparative pressure measurements must always be carried out with the same air flow rate. Cleaning and maintenance work is strongly advised, if a pressure increase of more than 20 mbar compared to the new condition is observed.

The diffuser membranes must be regularly flushed with air in order to keep the formation of deposits to a minimum. The best results are achieved when the membranes are relieved for a few minutes before the flushing process. Further information can be found in chapter 6.

The diffusers should be inspected and checked regularly. The first visual inspection should be carried out 15 to 18 months after installation.

Attention! There is a **risk of damage** and loss of warranty if the pressure rises by more than **50 mbar.**

5. TROUBLE SHOOTING

Despite its long lifetime, the JetFlex® SSD requires very little maintenance because high-quality materials are used. Jäger Umwelt-Technik GmbH recommends a periodical visual inspection of the ventilation system, especially if pressure increases occur due to deposits. Possible failures and their remedy are listed below:

1. Indication: Large volume of air in localized area

Possible cause: Leakage in piping.
Procedure: Continue to operate the system with a medium airflow. Empty basin for access to area in question. Check connectors and pipes for evidence of breakage. Repair or exchange as appropriate.

Possible cause: Diffuser membrane is damaged.
Procedure: Continue to operate the system with a medium airflow. Empty basin for access to area in question. Check connectors and pipes for evidence of breakage. Visually inspect diffuser. Depending on the damage, replace the membrane or the complete diffuser. It may also be possible to replace the membrane by divers. Please contact your supplier.

2. Indication: Non uniform bubble pattern

Possible cause: Insufficient blower capacity.
Procedure: Confirm blower operations and switch on additional blowers if possible.

Possible cause: Check hand valve in drop line to determine if it is closed or fully opened.
Procedure: Inspect position of hand valve and adjust as required.

Possible cause: Uneven air distribution to the diffusers.
Procedure: Inspect piping and joints for internal clogging from debris. Air purge or water flush the system. Remove pipes from the diffuser air feed before flushing, so debris can be flushed out.

Possible cause: Deposits on diffuser membrane.
Procedure: Inspect diffuser membranes for deposits and layer. Clean membrane in refer to chapter 6.

3. Indication: A reduction in the dissolved oxygen level or increase of system pressure drop

Possible cause: Deposits on diffuser membrane.
Procedure: Inspect diffuser membranes for deposits and layer. Clean membrane in refer to chapter 6.

4. Indication: Non uniform dissolved oxygen profile throughout basin

Possible cause: See no. 2.
Procedure: Confirm blower operations and switch on additional blowers if possible.

Depending on type of waste, system construction and operating conditions other causes can lead to disturbances. If necessary contact your supplier.

6. MAINTENANCE AND CLEANING

6.1. Maintenance

In order to detect changes to the aeration system, the following inspections must be carried out regularly:

- Check the bubble pattern during operation for uniform air discharge
- Observation of the system pressure relative to the water level in the tank and its rise over time
- Depending on the inspection results, it should be decided whether the diffusers must be checked visually and cleared from any deposits (carbonates, iron and aluminium salts, biological film or similar).

The composition of these deposits depends on the wastewater compound and the specific operating conditions of the wastewater treatment plant. After emptying the tank and switching off the blowers, it is essential that the sludge deposits on the diffusers do not dry up and harden. The deposits must be removed immediately with a high-pressure cleaner. The following instructions must be considered.

6.2. Flushing procedure/Blow Down Cycle

The membranes of the diffusers should be flushed by air regularly. For best results the membranes must first relieved for a few minutes. The procedure is as follows:

- Shut down the blowers.
- Open relief valve in the air pipe to release air till a pressure is reached which is approx. 20 mbar lower than the pressure which corresponds to the immersion depth (e.g. immersion depth 4,0 m, recommended air pressure 380 mbar). As soon as this pressure is reached, close air relief valve.
- For flushing deposits from the membrane the air flow should be increased to the designed maximum for 10 minutes. This procedure should be done once per day for continuous aeration processes. The time intervals depends on the pressure loss of the diffusers (the higher the pressure, the shorter the interval).
- In case of intermittent operation, the air-release must be carried out at the beginning of each Denitrification phase when the blowers are switched off. The Nitrification phase begins with the 10 minute flushing process.

6.3. Chemical Cleaning

Injection of acetic acid into the air flow is feasible during operation for removal of clogging in the pores. For details please contact your supplier.

6.4. Mechanical Cleaning

To remove biological deposits, cleaning with a high-pressure cleaner is recommended. The tank must be emptied, the sludge removed and the diffusers and the tank cleaned with clean water. The tank must be filled with pure water up to 10 cm above the diffusers. All down pipes are to be opened, the blowers are to be switched on at half capacity and the pressure is to be measured. To avoid damage to the membranes by the strong water jet, a minimum distance of 25 cm between nozzle and membrane must be maintained. Cleaning should be carried out by two persons. One person cleans the diffusers and the second person monitors the air outlet at the diffusers and reduces the air flow in the down pipes of the cleaned diffusers.

Attention! The air volume to the empty basin must be reduced, if several basins are supplied by one air pipe, in order to avoid overloading the diffusers

6.5. Preventive Maintenance Log

Record your regular and extraordinary maintenance with details of the date and the work carried out and its effectiveness.

7. REPLACING SSD

If the diffuser reaches the end of its economic life, it may be advisable to replace the membrane. Usually it is not necessary to replace the base plate.

The exchange of the membrane has to be carried out according to the instructions of Jäger Umwelt-Technik. When replacing the entire diffuser, the installation instructions of Jäger Umwelt-Technik must be followed.

8. DETERMINATION OF OXYGEN TRANSFER IN CLEAN WATER

Oxygen transfer tests in clean water must be carried out under consideration of the DWA M 209. In any case, the test conditions must be agreed upon in prior consultation with Jäger Umwelt-Technik GmbH. Oxygen transfer tests are only to be carried out after an operating phase of at least 2 weeks at full blower capacity, otherwise a loss of oxygen transfer cannot be excluded.

For the clean water tests, water of drinking water quality is to be used; biologically purified waste water or algae water is not suitable (for details, see DWA notes). If algae growth occurs under unfavourable conditions during the initial operating phase, it is essential to clean the diffusers and the tank in advance and to refill the tank.

9. PACKAGING, TRANSPORT AND STORAGE

9.1. General notes

Negative impacts can occur with unfavourable storage and improper handling. They usually lead to a reduction in lifetime and performance. The JetFlex® diffusers must be protected against influences such as frost, heat, precipitation, solar radiation or UV radiation, ozone, vapours or exhaust gases of solvents, oils, chemicals or acids and against mechanical damage.

9.2. Packaging and transport

The diffusers resp. their spare parts must be transported and stored in their original packaging. It must be ensured that the containers may not be stacked on top of each other either for storage or during transport. Unless this is explicitly permitted. Information on transport and handling on the containers must be followed.

9.3. Storage

The diffusers must not be stored outdoors. The storage room should be cool, dry, moderately ventilated, darkened and dust-free. The temperature in these rooms must be between + 5°C and + 25°C.

If the storage room must be heated, it is necessary to insulate the radiator and store the stored goods at least 1 m away from it. Also the humidity in the storage room must not exceed 65%.

The diffusers may be stored before installation for a maximum period of 6 months after delivery.

10. WASTE MANAGEMENT

The currently valid local and legal regulations for waste disposal must be observed. For the removal of contamination, contact the responsible authority and/or certified waste disposer.

The material of the membrane hose is only polyurethane and can therefore be recycled according to type. The base plate is also made of one material (PVC) and can be recycled accordingly. Clamps must be disposed of as old iron.

11. DISCLAIMER

This manual has been prepared based on the current state of knowledge and is subject to change without notice. Please contact Jäger Umwelt-Technik GmbH to obtain the latest version of this manual.

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