

## ENVICON tube diffusers EMR

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## Description

ENVICON tube diffusers EMR are quality products from Germany. Sophisticated membrane mixtures, a modern production process as well as optimised fine-bubble perforation guarantee a high-quality product throughout its service life and durable, cost-effective operation of aeration systems.

ENVICON tube diffusers are available with various membrane materials and in different lengths.

The support tube has been optimised for low pressure loss and is very robust. The almost unbreakable design permits operation even in very powerful flows.



## Available membrane materials

The selection of the membrane is essentially determined by the substances in the wastewater and the operating concept. If you are not sure, please contact us: Based on our many years of experience we would be pleased to offer non-binding advice.

The specific oxygenation depends on the installation situation and the selected method of operation. To help you achieve the best possible results, we would also be pleased to advise you on this.

## EPDM AeroTop (sulphur crosslinked, low plasticiser content)

A proven, strong membrane made of sulphur crosslinked EPDM. Durable, efficient product with low plasticiser content for high demands and municipal wastewater according to DWA-M 115 with up to 10% industrial and commercial content. Made and perforated in Germany. The optimised, fine-bubble aeration ensures excellent oxygenation. Coarse-bubble version also available.



The precise perforation ensures high oxygenation and low pressure loss. The membrane is fastened to the support tube using stainless steel clamps:

A special receptacle for the stainless steel clamps on the ends of the membranes makes it possible to fit the clamps accurately even on the replacement of the membranes on site and increases the sealing action.

The groove protects tube diffusers EMR AeroTop against damage during transport and storage.

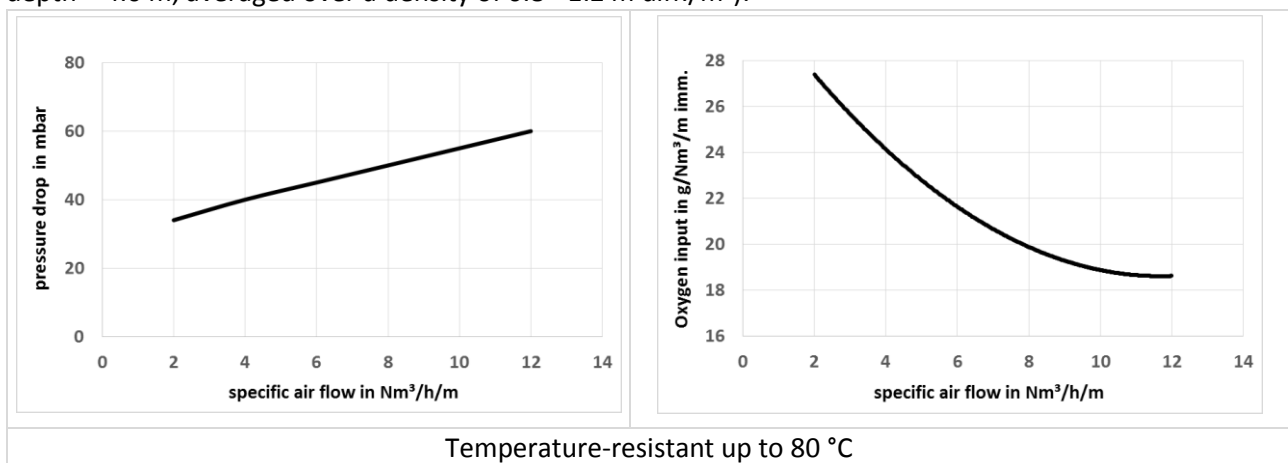


<b>Operating range (Nm<sup>3</sup>/h x meter diffuser length):</b>		
Minimum (recommended)	2	Continuous
Standard	4-8	Continuous
Maximum (specified)	12	Continuous
Maximum (specified)	15	Brief; e.g. for flushing cycles

Higher flow rates can be possible after consultation depending on the type of perforation used.

### Technical data of EMR AeroTop:

Technical data measured according to worksheet ATV M209 under standard conditions (pure water, water depth = 4.0 m, averaged over a density of 0.8 - 1.2 m diff./m<sup>2</sup>):



<b>Tube diffuser EMR EPDM AeroTop</b>	<b>Effective length</b>	<b>Total length</b>	<b>Maximum operating depth</b>	<b>Order no.:</b>
EMR 500 AeroTop	500 mm	545 mm	7.0 m	30101003
EMR 750 AeroTop	750 mm	825 mm	6.5 m	30101002
EMR 1000 AeroTop	1,000 mm	1,075 mm	6.0 m	30101001

Custom lengths and greater operating depths are possible on request.

### Special EPDM AeroBest (peroxide crosslinked, low plasticiser content)

Peroxide crosslinked high-performance EPDM, suitable for supply air temperatures of up to 120 °C and for higher proportions of industrial and commercial wastewater. This proven and especially tough product, made and perforated in Germany, is particularly efficient in combination with optimised fine-bubble aeration. A coarse-bubble version is also available. The membrane is fastened to the support tube using stainless steel clamps:



A special receptacle for the stainless steel clamps on the ends of the membranes makes it possible to fit the clamps accurately even on the replacement of the membranes on site and increases the sealing action. The groove protects tube diffusers EMR AeroBest against damage during transport and storage.

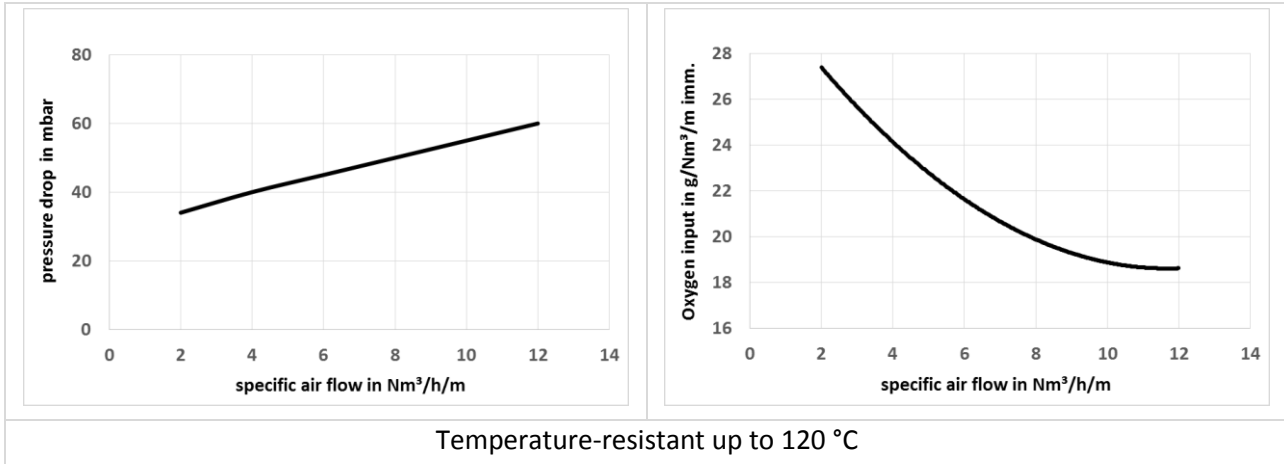


<b>Operating range (Nm<sup>3</sup>/h x meter diffuser length):</b>		
Minimum (recommended)	2	Continuous
Standard	4-8	Continuous
Maximum (specified)	12	Continuous
Maximum (specified)	15	Brief; e.g. for flushing cycles

Higher flow rates can be possible after consultation depending on the type of perforation used.

## Technical data of EMR AeroBest:

Technical data measured according to worksheet ATV M209 under standard conditions (pure water, water depth = 4.0 m, averaged over a density of 0.8 - 1.2 m diff./m<sup>2</sup>):



Tube diffuser EMR EPDM AeroBest	Effective length	Total length	Maximum operating depth	Order no.:
EMR 500 AeroBest	500 mm	545 mm	7.0 m	30102002
EMR 750 AeroBest	750 mm	825 mm	6.5 m	30102001

Custom lengths and greater operating depths are possible on request.

## Silicone AeroSil (platinum crosslinked, plasticiser-free)

This outstanding, plasticiser-free silicone product is exceptionally resistant to tear propagation. It is also resistant to many oils and greases and can be used at high air or wastewater temperatures. It is made and perforated in Germany. Its highly smooth surface makes it resistant to micro-biological growth and its metabolic products. The optimised, fine-bubble aeration ensures excellent oxygenation. Coarse-bubble version also available.





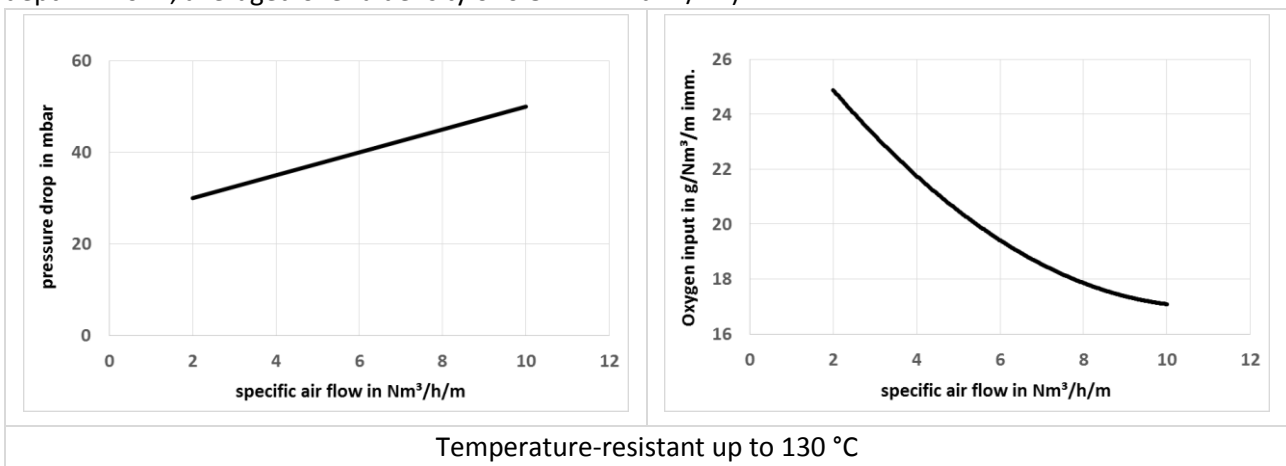
The membrane is fastened to the support tube using stainless steel clamps. The membranes fitted over the clamps provide protection during storage, transport and installation.

Operating range (Nm <sup>3</sup> /h x meter diffuser length):		
Minimum (recommended)	2	Continuous
Standard	4-6	Continuous
Maximum (specified)	10	Continuous
Maximum (specified)	12	Brief; e.g. for flushing cycles

Higher flow rates can be possible after consultation depending on the type of perforation used.

### Technical data of EMR AeroSil:

Technical data measured according to worksheet ATV M209 under standard conditions (pure water, water depth = 4.0 m, averaged over a density of 0.8 - 1.2 m diff./m<sup>2</sup>):



Tube diffuser EMR Silicone AeroSil	Effective length	Total length	Maximum operating depth	Order no.:
EMR 500 AeroSil	500 mm	545 mm	7.0 m	30103003
EMR 750 AeroSil	750 mm	825 mm	6.5 m	30103002
EMR 1000 AeroSil	1,000 mm	1,075 mm	6.0 m	30103001

Custom lengths and greater operating depths are possible on request.

### Polyurethane AeroPur (plasticiser-free)

A plasticiser-free, extra-strong polyurethane product for the highest mechanical demands. Made and perforated in Germany. The membrane is exceptionally tear and abrasion-resistant, resistant to microbes and hydrolysis and has very good resistance to oil, petrol and chemicals.



The membrane is fastened to the support tube using stainless steel clamps.

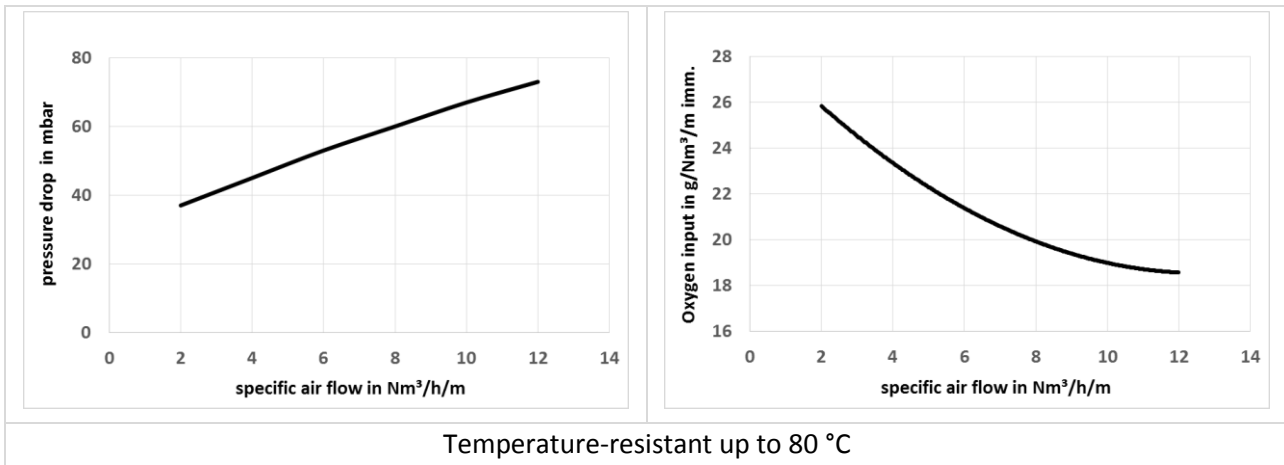
Operating range (Nm <sup>3</sup> /h x meter diffuser length):		
Minimum (recommended)	2	Continuous
Standard	4-8	Continuous
Maximum (specified)	15	Continuous
Maximum (specified)	20	Brief; e.g. for flushing cycles

Higher flow rates can be possible after consultation depending on the type of perforation used.



## Technical data of EMR AeroPur:

Technical data measured according to worksheet ATV M209 under standard conditions (pure water, water depth = 4.0 m, averaged over a density of 0.8 - 1.2 m diff./m<sup>2</sup>):



Tube diffuser EMR Polyurethane AeroPur	Effective length	Total length	Maximum operating depth	Order no. :
EMR 500 AeroPur	500 mm	545 mm	7.0 m	30104003
EMR 750 AeroPur	750 mm	825 mm	6.5 m	30104002
EMR 1000 AeroPur	1,000 mm	1,075 mm	6.0 m	30104001

Custom lengths and greater operating depths are possible on request.

## One-ear-clamps

As standard, we use one-ear clamps (stainless steel clamps) of 1.4301. This is sufficient for most applications. If your wastewater contains or if you suspect that it may contain higher concentrations of chloride or other corrosive chemicals, possibly in combination with higher wastewater temperatures, the material of the one-ear clamps might have to be adapted. Please contact us.



## Replacement membranes

All the membrane types and lengths stated above are of course also available as spare parts for all support tubes with an external diameter of 63 mm available on the market. The required clamps are also provided by ENVICON.  
Other membrane diameters on request.

## Support tube or support body



Advantages:

- Shock-resistant and almost unbreakable
- Particularly low pressure loss
- Hexagon on the head end for easier removal after extended operation
- End-side assembly tool for quickly unscrewing and fitting with the aid of power tools
- Can be used for the ENVICON adapter variants EBA and stainless steel connectors
- Longitudinal air passages and corresponding markings permit precise alignment of the unperforated strips over the outlets also on membrane replacement.

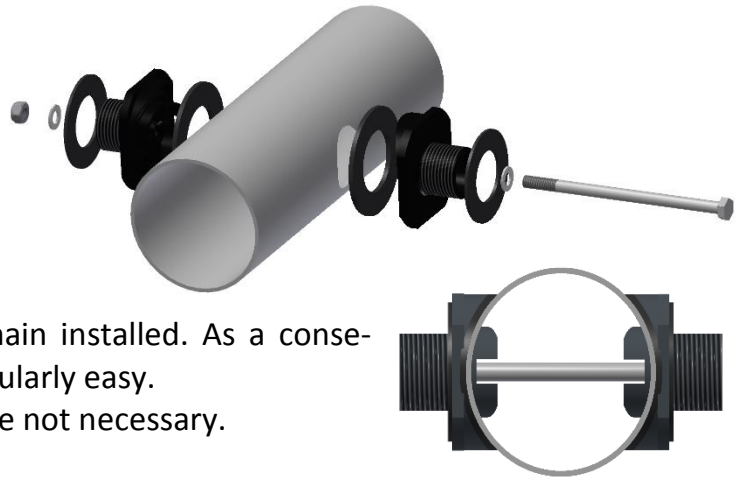
ENVICON support tubes have an R 1" female thread connection and can be installed with ENVICON adapters on all common square and round tube systems.

## The ENVICON double adapters EBA2

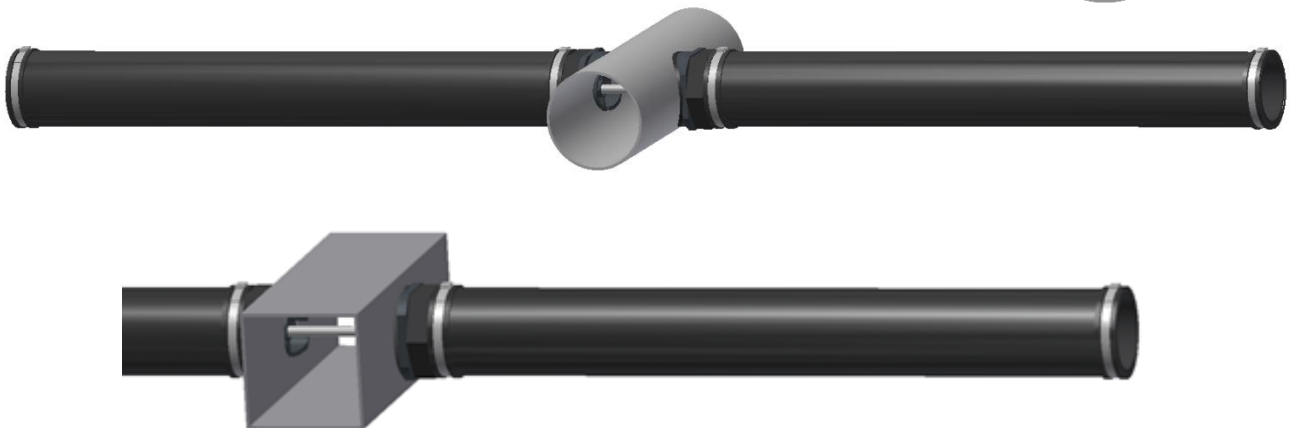
The ENVICON double adapters EBA2 for fastening a pair of tube diffusers are available for all tube types (square or round tube), for all common tube sizes and for hole sizes up to 45 mm.

Adapters EBA2 available for square tube:	From 80 x 40 mm
Adapters EBA2 available for round tube:	DN50 to DN 150; oD63 to oD154

ENVICON adapters (here an example for round tube) can be quickly and easily installed on site. Only then are the diffusers screwed onto the adapters already installed.



On the renewal of the diffusers or only the membranes, the adapter can remain installed. As a consequence, re-fitting the diffusers is particularly easy. Renewed alignment and adjustment are not necessary.



Whether tube diffusers can be installed on plastic pipes and/or near stirrers must be separately assessed in each case to ensure stability. We can provide non-binding advice on this subject. If you do not consult ENVICON in a potentially risky installation situation, the risk lies with the customer.

The single adapter EBA1 is available if it is required to install single tube diffusers; this adapter is also available for all tube types (square or round tube) and for all common tube sizes.

## Transport and storage

ENVICON diffusers and membranes must be stored at the buyer's premises according to DIN 7716, ideally in the packaging supplied by ENVICON. It should be unpacked only shortly before installation. Protect the diffusers from direct sunlight.

## Preparation of the air supply ducts

The air distribution ducts and the ducts on the bottom of the basin are to be checked for good condition and cleanliness before the installation of the diffusers (blow out the complete pipe system, remove any moisture, dirt or rust).

## Installing the fastening adapter EBA2



The fastening adapters EBA2 are supplied as separate parts and are assembled on site. While the thicker seals 70x40x3 face the tube, the thinner seals 60x33x2 are fitted between adapter EBA2 and the tube diffusers EMR. The headpieces on the diffuser tubes have recesses for these seals.



One screw M8 with washer is inserted through the male thread on a threaded nipple. A flat seal 70x40x3 is fitted to this assembly and the assembly inserted in the hole in the side of the tube. The end of the screw then protrudes out of the hole on the opposite side. A seal 70x40x3 and a threaded nipple are then fitted to the screw.

Now the 2nd washer is fitted and a self-locking nut screwed on but initially only tightened lightly. We recommend applying an anti-seize compound (e.g. LOCTITE LB 8009 or LB 8023) to the threads to prevent them from seizing. Now please tighten the nut to a torque of 15-18 Nm using a torque wrench.



This is how the fully installed adapter EBA2 looks (here 2 example installations on round and square tubes). The adapter can be installed before the installation of the diffuser. When replacing of diffusers or membranes, adapter EBA2 can of course remain installed.

## Installing the tube diffusers EMR on EBA2

The diffusers EMR can now be screwed onto the firmly seated adapter EBA2. Please ensure that the seals 60x33x2 also disappear into their seats and that the firmly tightened tube diffuser is in full contact with the adapter EBA2.

The diffusers are initially tightened hand-tight. You will note a significant increase in the resistance when the diffuser head with the seated flat seal reaches the mating plate on the threaded nipple. For safety's sake, we recommend briefly further tightening, without the application of force, using an open-ended spanner AF65.

A tightness is already given from 10 Nm. A torque of at least 15 Nm is recommended, whereby the imperforate strips of the membranes must be on top, which can be achieved by turning them back or forth, e.g. with an open-end wrench SW65. If the unperforated strips are correctly on top, the word "ENVICON" can be seen on the hexagon of the pipe aerator at 12 o'clock.

This also applies to the replacement of hose membranes.



Incidentally: If a larger number of tube diffusers need to be screwed on or removed, we recommend the usage of our tightening aid and a cordless screwdriver with a torque of at least 10 Nm and maximum 25 Nm.

Additional sealing aids such as Teflon tape or thread sealant (e.g. Loctite 5331) are not necessary, because the materials used for the EBA2 and diffuser support tube are slightly hygroscopic. They swell up slightly in water and seal the thread perfectly. In some circumstance



the substances used in thread sealants can damage the EPDM in the seals over the long term, also in combination with the substances in wastewater.

Important: The system must be aligned and levelled such that all diffusers are at the same height and are level after installation. Otherwise the equilibrium of the aeration may be impaired.

Incidentally: We also recommend the usage of an open-ended spanner AF 65 available from ENVICON and the usage of the assembly tool mentioned above on unscrewing diffusers after extended operation.

Seals are subject to ageing. Therefore please remember to order a new seal for between the adapter and diffuser (60 x 33 x 2) if you unscrew and re-fit diffusers, e.g. to replace the membrane.

## Installing the tube diffusers EMR on stainless steel nipples

In this situation the opposite applies: Since the welded stainless steel nipple is not hygroscopic, it is necessary to use Teflon tape or similar.

## Measures for delayed commissioning and decommissioning

The diffusers fitted must not be subjected to direct sunlight for more than one day. For this reason the basin is to be filled with clear water immediately after installation.

If the system is not commissioned immediately after installation or is to be decommissioned, increase the water coverage of the diffusers to 1.0 m. Continually replace any water lost through evaporation. At temperatures below freezing, the water coverage must be at least 10 % of the frost temperature (in metres). Example: At a temperature of -20 °C, the water coverage must be 2 m. Do not use antifreeze.

During longer downtimes, switch on the aeration 1-2 times per week for at least 1 hour.

## Leak test and fine tuning

To perform the leak test, fill the basin with drinking water/ground water or clean river water such that all tube diffusers are approx. 5 - 10 cm below the water level. Clarification basin water is not suitable for the bubble test and leak test, because it tends to foam and any leaks may be difficult to detect.

The bubble pattern at the bottom of the basin should be checked from close up and not only from the gantry or the upper edge of the basin.

The bubble pattern check/leak test is undertaken by applying air to the aeration system; the air flow rate must be at least  $6-8 \text{ Nm}^3 / (\text{h} \times \text{m}_{\text{diffuser}})$ .

It is to be checked that the air leaves the tube diffusers evenly. If there is no air leaving the diffusers at some point, as a rule this can be rectified by kneading or pressing the membranes at these points. Diffusers that continue to malfunction must be replaced.

We recommend shutting off the air supply at the end of the test so that any remaining leaks can be detected quickly. It is normal if a few bubbles escape from the diffusers after shutting off the air. However, once the last small bubbles have left the water, large bubbles must no longer continue to rise at any point. The entire surface of the water must be calm.

If large bubbles continue to rise at one point, the diffuser fittings and fastening adapters are to be checked for correct installation with the aeration in operation (the increased amount of air that is then vented prevents the ingress of water while the leak is fixed) and, if necessary, installed again or sealed.

## Oxygenation test

Once installation is complete and the leak test has been undertaken, the diffusers must be in contact with water with the aeration in operation for a minimum of 7 days so that the diffusers adapt to the water. Preferably, the air supply should be intermittent (hourly change) with an air flow rate of approx.  $8 \text{ Nm}^3/\text{h}$  per metre of diffusers.

The tests should be undertaken as per ATV instructions M209. In some circumstances the guaranteed values cannot be achieved if the instructions above are not followed.

## Operating and maintenance instructions

Generally ENVICON cannot influence the specific conditions on site and thus the purchaser is responsible for carrying out sufficient testing of the object of purchase for the intended purpose.



## **Impression at the surface of the basin**

No large bubbles should be visible. In particular in basins with stirrers or with large water depths, however, there may be areas of high turbulence with increased quantities of bubbles, this situation is to be considered normal.

## **Membrane load through deposits**

The biological wastewater treatment in the aeration phase with its many processes and reactions can result in various levels of biological (fouling) and mechanical (scaling) deposits depending on the composition of the wastewater, the load and the process control. The substances that can deposit on the membranes include calcium and carbonates, iron and aluminium salts, biological growth and polymers.

The level of fouling/scaling of the diffusers and membranes depends on the process conditions in the purification plant, its operating principle and the substances in the wastewater. These conditions cannot be influenced by ENVICON.

Deposits on the membrane and, in particular, in the membrane slits, can cause increased pressure loss and a reduced service life of the membranes (in some cases also a failure) and must therefore be prevented at all cost.

## **Remedy through load changes and flushing**

In the early stages, process-related deposits on the membrane can be easily removed. From the point of commissioning, self-cleaning through alternately stretching and relaxing the membrane to peel off mineral-based deposits can help.

In addition to this self-cleaning effect, regular flushing cycles should be carried out. To do this, we recommend briefly switching the aeration off at least once or twice a week and then running the diffusers at the maximum permissible air throughput of each diffuser for about 30 minutes. This is the minimum purging frequency and should be increased depending on local conditions, for example if a higher level of process-related deposits is expected (e.g. for simultaneous precipitation, wastewater from dairies or high water hardness).

In any case, flushing should be carried out both in intermittent operation with longer downtimes (e.g. seasonal operation) and in plants continually operated in the diffuser's lower operating range in order to delay the ageing process of the membranes, which would accelerate if the membranes were not loaded (alternating tension and relaxation).

## **Remedy through acidulation**

We recommend to inject a suitable acid that does not damage the membrane into the compressed air both to remove existing mineral deposits on the membranes as well as in the

slits and as a regular preventive measure to reduce pressure loss of the aeration system. This measure also helps to reduce energy consumption and increase the diffusers' reliability. The acid should be added in vaporised form during aeration.

Especially in plants with large volumes of calcareous wastewater, such as from dairies, treatment of this kind is essential.

The success of this measure depends on various factors and must be tested on site. The resistance of all parts that the acid comes in contact with must be checked and the pipes should, if necessary, be flushed after treatment through the injection of tap water.

Acid cannot be used to remove fouling and may even be counter-productive. In this case, mechanical cleaning of the membranes may be the solution.

### **Remedy through cleaning the membranes in an empty basin**

Make sure that neither the diffusers nor their mounts are damaged when walking or working in the basin, as this will result in further operating problems.

As far as possible, rinse the activated sludge off the diffusers with clear water. Note that an excessively strong water jet, e.g. from high-pressure cleaners, will damage the membranes. During and for some time after cleaning, apply the maximum air flow rate to each diffuser to protect the perforation from sludge ingress or to clear sludge out of the perforation.

The membranes can be brushed off as long as this does not cause the perforation to become clogged or damaged. This is best done with a commercial soft car washing brush. During this type of cleaning, also apply the maximum air flow rate to each diffuser to protect the perforation from sludge ingress. You can wipe the membranes, but this increases the risk of rubbing sludge into the perforation.

Use only environment-friendly cleaning agents that do not damage the membranes.

### **Inspecting the aeration system**

These preventive measures alone do not reliably exclude the possibility of clogging due to operation. To ensure operational safety, the system pressure must be continually logged at comparable operating states (air flow rate, water level) and any required measures derived and specified from them.

## Operating specifications

### Flow accelerator and flow conditions in the basin

If a basin contains both stirrers and tube diffusers, a sufficient distance must be maintained between the two. This distance depends on the performance of the stirrers, the diffuser shape and length as well as the geometry of and flow conditions in the basin. Alternatively, the free diffuser ends can be secured to the bottom of the basin. We recommend that you consult with ENVICON and the stirrer manufacturer in good time.

### Draining the pipes

At regular intervals and depending on the specific conditions in the purification plant, the low-point drains in the main lines and the drain lines of the distributor sections should be checked and the condensate blown out of the pipes through the condensate drain line.

### Measures in the event of membrane damage during operation

If irregularities occur in the bubble pattern during operation that seem to indicate membrane damage and are likely to cause ingress of wastewater into the aeration system, keep the air supply to the diffusers running at the highest permissible rate and for as long as possible to minimise the risk of wastewater or sludge ingress. This applies also when draining a basin and also for grids that can be lifted. Avoid draining the basin under frost conditions.

### Air flow rates in operation and intake air

The drawn-in air must be free from oil, dust, condensate and solvents and must correspond to the TA (technical work instruction) for air. Dust filters for ambient dust **must** be fitted. The air temperature must not exceed the specified limit values for the diffuser and membrane materials.

The specified values for each membrane type must be maintained. Higher flow rates may be possible after consultation with ENVICON depending on the type of perforation used.

Please note that differences in the diffusers used can lead to aeration problems and diffuser failure. Variations of the material used, of the perforation or of the duration of use (pressure loss variations) can result in a higher air flow through individual diffusers and overload them. Please contact us, we will be happy to assist you.



smart aeration

## Replacement

Even the best diffusers will come to the end of their service life at some time. If you are uncertain about this issue, we offer the assessment of a diffuser sent to us and the comparison of the membrane values with the condition as delivered. You can then decide with certainty whether a replacement is advisable.

Please contact us.