ENVICON double tube diffuser ENVIMAX

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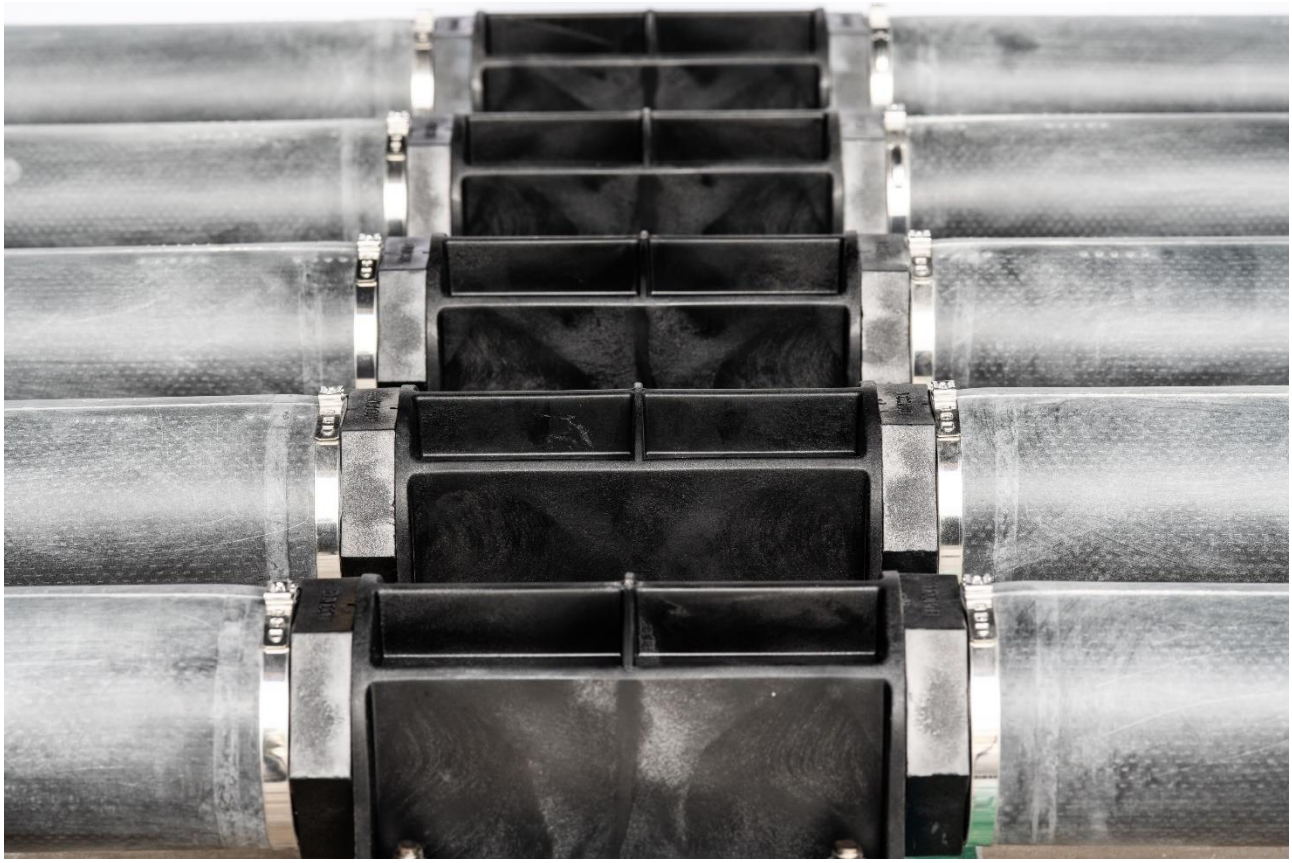
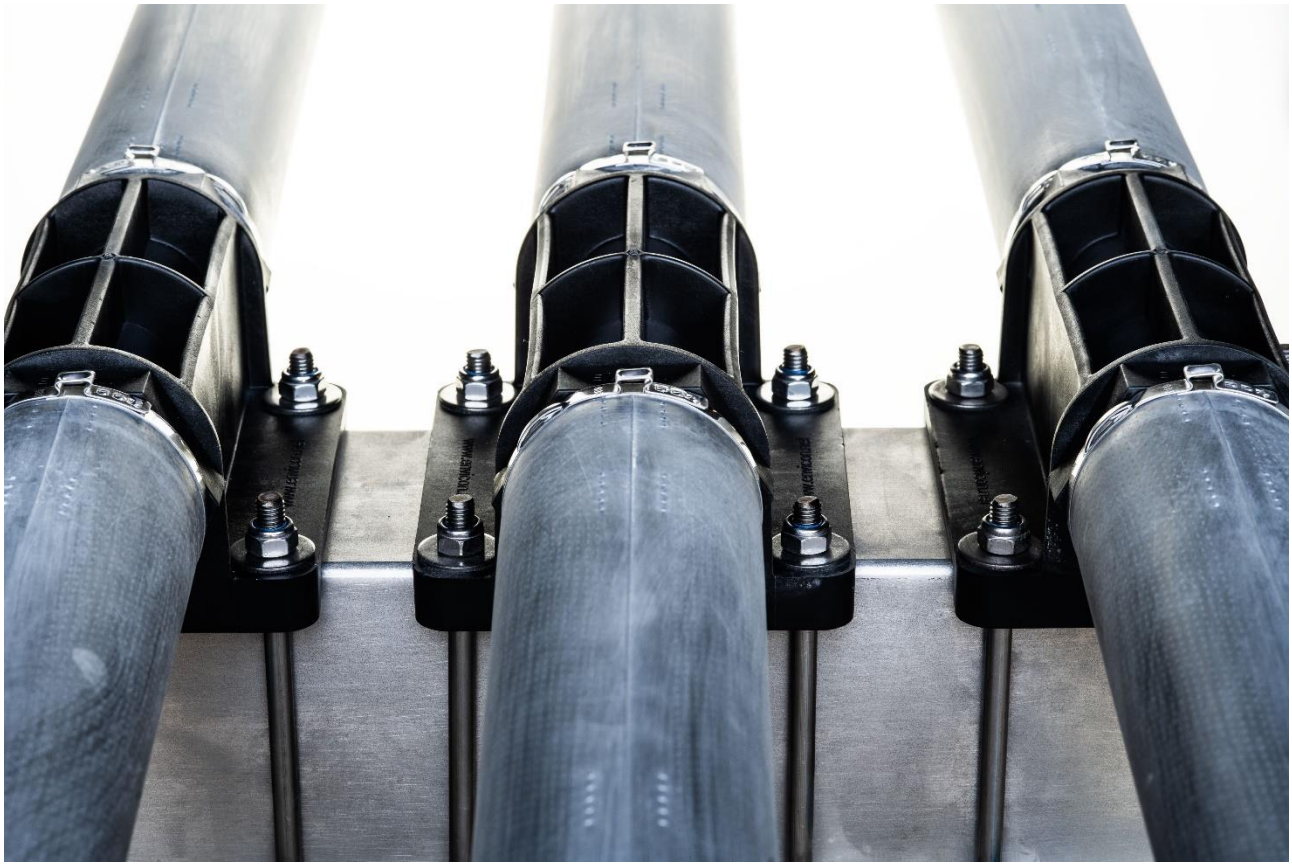
Description

The ENVIMAX double tube diffuser is a quality product 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 in purification plants.



The bodies of the ENVICON ENVIMAX are made of robust PAGV/PP and are available with various membrane materials and in different lengths.

The ENVIMAX is delivered as separate parts for assembly in the purification plant. The diffusers are always fully assembled. The modular design is not only cheaper to ship, it also makes it easier to replace the tube diffusers or the membranes later since the previously adjusted adapter can remain installed during replacement. Renewed alignment and adjustment are therefore not necessary.
The ENVIMAX can optionally be supplied fully preassembled.
ENVICON provides tools for installing the tube diffusers (see p. 13 Installation).



ENVIMAX are available for tubes 80 x 80 and 100 x 100 mm as well as for hole diameters 30 and 38 mm. Other tubes and hole sizes on request.

Available ENVIMAX types

Type	Available membranes	Effective diffuser length in mm	Total length in mm	Operating depth to
ENVIMAX 1000	EPDM	1,000	1,230	7.0 m
	Special EPDM			
	Silicone			
	Polyurethane			
ENVIMAX 1500	EPDM	1,500	1,790	6.5 m
	Special EPDM			
	Silicone			
	Polyurethane			
ENVIMAX 2000	EPDM	2,000	2,290	6.0 m
	Silicone			
	Polyurethane			

The lengths stated above are standard lengths. Other lengths and greater operating depths are possible on request.

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.

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 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.

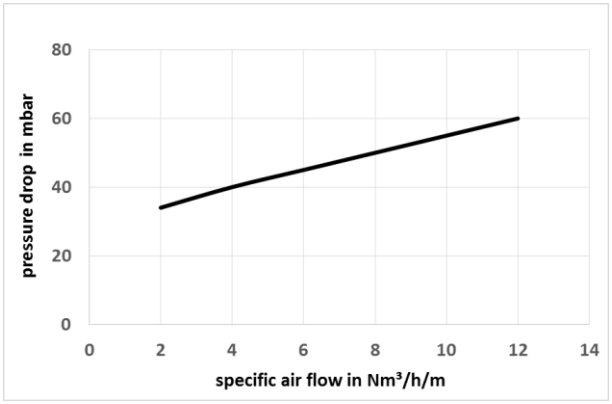
The groove protects ENVIMAX AeroTop against damage during transport and storage.

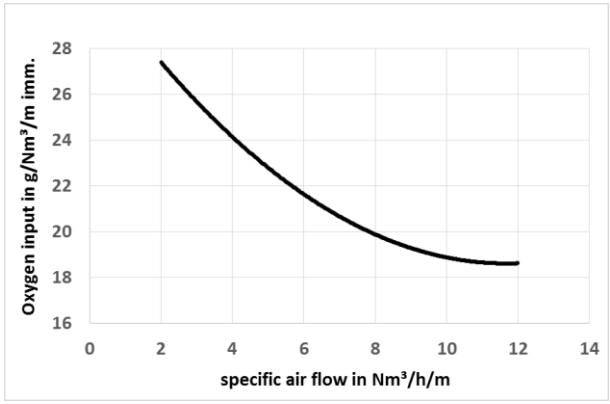
Operating range (Nm^3/h x meter diffuser length):		
Minimum (recommended)	2	Continuous
Standard	4-8	Continuous
Maximum (specified)	12	Continuous
Maximum (specified)	15	Brief; e.g. for flushing cycles

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

Technical data of tube diffusers ENVIMAX 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./m²):





Temperature-resistant up to 80 °C

Order numbers, ENVIMAX EPDM AeroTop:			
ENVIMAX AeroTop	Tubes 80 x 80	Tubes 100 x 100	Hole
AeroTop 1000	30506009	30506012	30
AeroTop 1500	30506008	30506011	30
AeroTop 2000	30506007	30506010	30
AeroTop 1000	30506003	30506006	38
AeroTop 1500	30506002	30506005	38
AeroTop 2000	30506001	30506004	38

Special EPDM AeroBest (peroxide crosslinked, low plasticiser content)

A peroxide crosslinked high-performance membrane, 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 perforation. 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

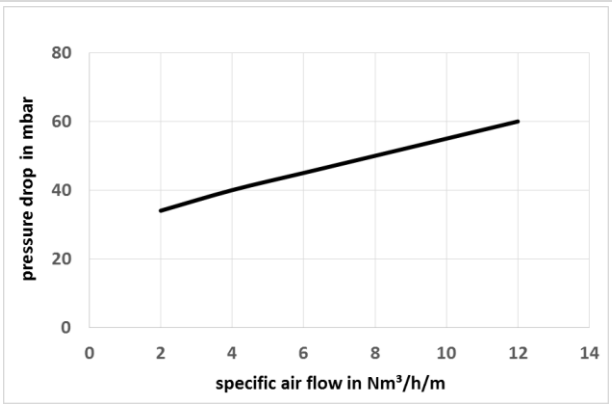
and increases the sealing action. The groove protects ENVIMAX AeroBest against damage during transport and storage.

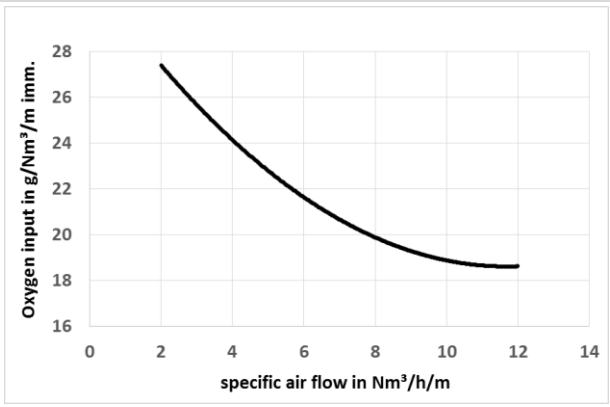
Operating range (Nm^3/h x meter diffuser length):		
Minimum (recommended)	2	Continuous
Standard	4-8	Continuous
Maximum (specified)	12	Continuous
Maximum (specified)	15	Brief, e.g. for flushing cycle

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

Technical data of tube diffusers ENVIMAX 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^2):





Temperature-resistant up to 120 °C

Order numbers, ENVIMAX special EPDM AeroBest:			
ENVIMAX AeroBest	Tubes 80 x 80	Tubes 100 x 100	Hole
AeroBest 1000	30507006	30507008	30
AeroBest 1500	30507005	30507007	30
AeroBest 1000	30507002	30507004	38
AeroBest 1500	30507001	30507003	38

Silicone AeroSil (platinum crosslinked, plasticiser-free)

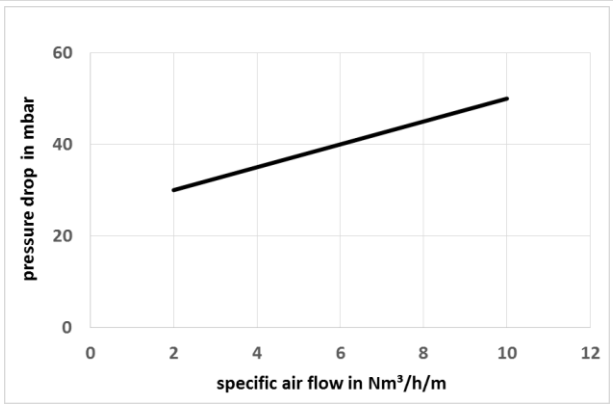
This outstanding, plasticiser-free silicone product is exceptionally resistant to tear propagation. It is also resistant to many oils and greases and can be used at high wastewater and air temperatures. It is made and perforated in Germany. Its highly smooth surface makes it resistant to micro-biological 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.

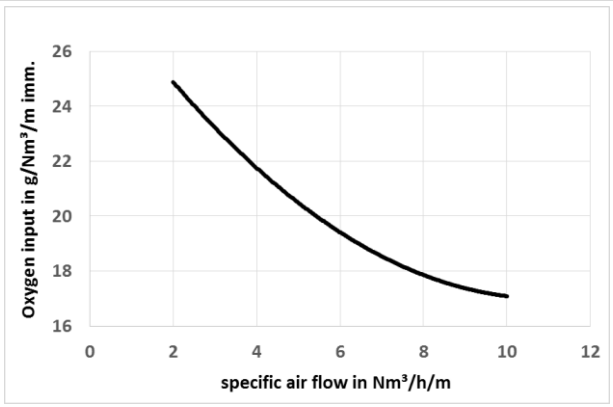
Operating range (Nm^3/h x meter diffuser length):		
Minimum (recommended)	2	Continuous
Standard	4-6	Continuous
Maximum (specified)	10	Continuous
Maximum (specified)	12	Brief; e.g. for flushing cycles

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

Technical data of tube diffusers ENVIMAX 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^2):



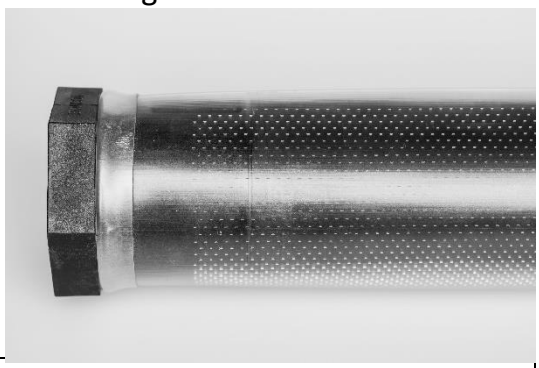


Temperature-resistant up to 130 °C

Order numbers, ENVIMAX silicone AeroSil:			
ENVIMAX AeroSil	Tubes 80 x 80	Tubes 100 x 100	Hole
AeroSil 1000	30508009	30508012	30
AeroSil 1500	30508008	30508011	30
AeroSil 2000	30508007	30508010	30
AeroSil 1000	30508003	30508006	38
AeroSil 1500	30508002	30508005	38
AeroSil 2000	30508001	30508004	38

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

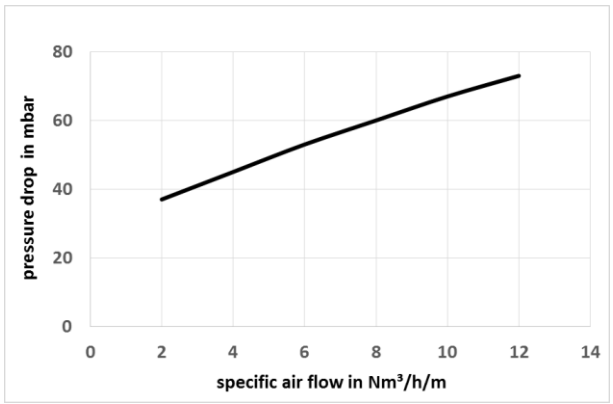


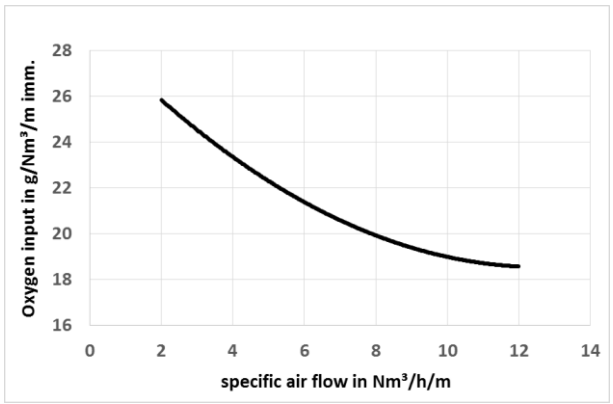
Operating range (Nm^3/h x meter diffuser length):		
Minimum (recommended)	2	Continuous
Standard	4-8	Continuous
Maximum (specified)	15	Continuous
Maximum (specified)	20	Brief; e.g. for flushing cycles

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

Technical data of tube diffusers ENVIMAX 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./m²):





Temperature-resistant up to 80 °C

Order numbers, ENVIMAX polyurethane AeroPur:			
ENVIMAX AeroPur	Tubes 80 x 80	Tubes 100 x 100	Hole
AeroPur 1000	30509009	30509012	30
AeroPur 1500	30509008	30509011	30
AeroPur 2000	30509007	30509010	30
AeroPur 1000	30509003	30509006	38
AeroPur 1500	30509002	30509005	38
AeroPur 2000	30509001	30509004	38

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 and clamps

All the membrane types and lengths stated above are of course also available as spare parts. ENVICON also supplies the required clamps and seals.

Separate parts

One ENVIMAX set consists of:

Quantity	Component
1	T-adapter
1	O-ring
2	U-bracket V2A for tube 80 x 80 or 100 x 100
4	Washer
4	Self-locking nut
2	Flat seal
2	Tube diffuser EMR with the selected membrane type

The robust fastening with stainless steel U-brackets is suitable for the highest require-ments:

Storage

ENVICON diffusers 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.

Installation

1 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). Please clean the surface of the air duct and ensure the mounting surface is perfectly clean and flat.

2 First fit the O-ring supplied to the underside of the T-adapter and press it in evenly and sufficiently firmly so that it does not slide out.

3 Fit the T-adapter to the clean, flat diffuser bar such that the centring pins centre the T-adapter in the hole provided on the diffuser bar.

4 Now place the U-brackets around the diffuser bar, guide the ends through the corresponding holes in the base plate on the T-adapter and fit the washers.

5 Fix the U-brackets using the self-locking nuts, initially only screw on the nuts a few turns. We recommend the application of anti-seize compound to the threads of the nuts and the U-brackets, e.g. LOCTITE LB 8009 or LB 8023 or equivalent, to prevent possible seizing of the threads.

6 Before finally tightening, please check that the adapter is in good contact with the bar, that the centring pins are in the hole and that the O-ring is still in its groove. If the T-adapter is not seated correctly, it will inevitably leak.

7 Now evenly tighten all nuts all round the T-adapter using a cordless screwdriver or a ratchet (13 mm socket) to a maximum torque of 15 Nm.

8 Once the T-adapter is firmly mounted, the flat seals are fitted to the male thread 1“ and the tube diffusers EMR screwed on by hand. Please make sure that the flat seals disappear into their seats on the head of the tube diffusers on tightening.

9 You will note a significant increase in the resistance when the diffuser head with the seated flat seal reaches the mating plate on the T-adapter. The diffusers are tightened hand-tight. For safety's sake, we recommend briefly further tightening, without the application of force, using an open-ended spanner AF65.

10 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.

11 Additional sealing aids such as Teflon tape or thread sealant (e.g. Loctite 5331) are not necessary, because the materials used for the T-adapter and diffuser support tube are slightly hygroscopic. They swell up slightly in water and seal the threads.

12 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: If a larger number of tube diffusers need to be screwed on, we recommend the usage of our ENVICON assembly tool and a cordless screwdriver with a torque of 10 to 15 Nm:

We also recommend the use of an AF65 open-ended spanner available from ENVICON and the ENVICON assembly tool mentioned above for unscrewing diffusers after extended operation.

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 Nm^3 / (h x $m_{diffuser}$).

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. The air supply should preferably be intermittent (hourly change) with an air flow rate of approx. 8 Nm^3 / (h x $m_{diffuser}$).

The tests should be undertaken as per ATV instructions M209. In some circumstance 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 is 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

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.

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.

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.

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.