

E-FLEX[®]-Aeration System

aeration technology



invent[®]
umwelt und verfahrenstechnik

- Fluid mechanically optimized
- High Oxygen Utilization
- Simple Installation
- Maintenance Free
- Lifiable



i n n o v a t i o n f o r n a t u r e

*The increasing strain on our environment is a problem, which affects us all.
For years, water pollution, in particular, has begun to reach threatening levels.*

*At the same time the legislators are constantly setting higher requirements on
the quality of the wastewater. As a result, the application of innovative
technology and processes for state of the art wastewater treatment is a necessity.*

***INVENT** is dedicated to the development of such technology, and strives to produce
products which greatly contribute to the preservation of our environment.*

*The continual protection of our environment from damage due to
harmful substances will become an even more important task in the future.*

*With innovative environmental technology, **INVENT***

is taking on this responsibility.



E - F L E X[®]

The Flexible Aeration System

Biological wastewater treatment is an area which **INVENT** specializes in.

The heart of all biological wastewater treatment plants is the activated sludge treatment step which is equipped with mixers and aeration systems. The aeration system has the duty of optimally supplying the purifying bacteria with oxygen in order to reach the necessary purification levels.

E-FLEX[®] is the ideal aeration system for municipal and industrial treatment plants. It supplies the wastewater in the activated sludge tank with oxygen and is suitable for almost all variations of the activated sludge process, for example:

- BOD Removal / Nitrification in conventional activated sludge plants
- Denitrification with facultative or intermittent aeration
- Sequencing-Batch-Reactor Processes (SBR)
- BOD Removal / Nitrification in carousel basins, oxidation ditches, aerated lagoons, etc.

E-FLEX[®] –
for optimal aeration



Further possible areas of usage for the **E-FLEX[®]** aeration systems can be found everywhere where gases need to be efficiently distributed in liquids.

The principle of the **E-FLEX[®]** aeration system is based on fundamental mass transfer investigations of single bubbles and the generation of bubbles with flexible membranes, which were conducted at the University of Erlangen – Nuremberg and at **INVENT**.

The Task

Aeration systems for biological wastewater treatment should supply a large amount of oxygen, meanwhile exhibiting low energy consumption. Therefore bubbles with an optimal diameter have to be generated from the membrane, so that the atmospheric oxygen can be put to its best possible use. The optimal bubble diameter can essentially be determined from the aeration depth. With flexible membranes, the bubble size is dependent on the settings for the

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An Overview

operational point of the aeration system (i.e. the specific air flow). The aeration membrane should therefore be chosen because of its specific characteristics. Thus optimal results can be reached and depending on the plant loading, an appropriate controllability of the oxygen input can be realized.

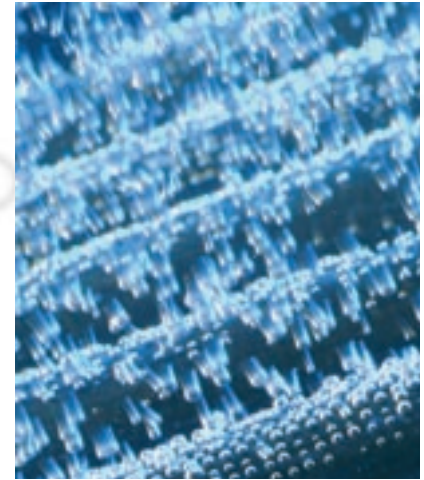
According to fluid mechanics, an aeration system should be set-up, so that the constriction of the bubble swarm, which is created by the wake flow behind the membrane tubes, is prevented and coalescence is avoided. Furthermore the minimal flow

velocity should be observed in order to prevent sedimentation in the basin and under the aeration modules, to mix the basin volume, and to prevent short cut flows.

The Solution

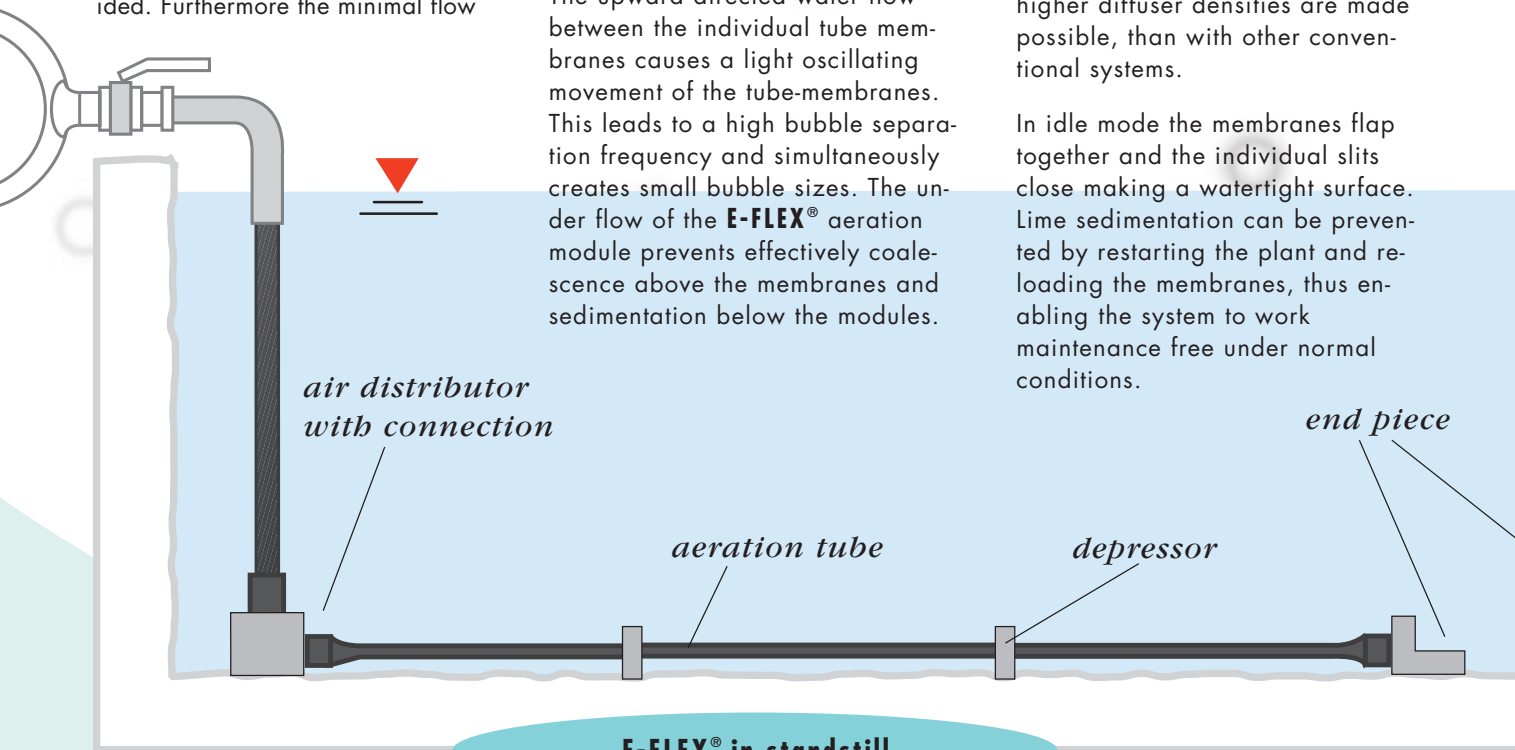
E-FLEX[®] is an aeration system, which consists of singular free oscillating tube membranes. When air enters the membranes, they arch up and their small slits open allowing the air to escape in the form of fine bubbles.

The upward directed water flow between the individual tube membranes causes a light oscillating movement of the tube-membranes. This leads to a high bubble separation frequency and simultaneously creates small bubble sizes. The under flow of the **E-FLEX[®]** aeration module prevents effectively coalescence above the membranes and sedimentation below the modules.



The production of bubbles over the entire circumference of the membranes leads to very large aeration surface areas. Therefore much higher diffuser densities are made possible, than with other conventional systems.

In idle mode the membranes flap together and the individual slits close making a watertight surface. Lime sedimentation can be prevented by restarting the plant and re-loading the membranes, thus enabling the system to work maintenance free under normal conditions.



E-FLEX[®] in standstill

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The Design

The Design

The **E-FLEX[®]** aeration system consists of air distributors with air and tube connectors, tube binders, and an end piece with tube connectors. The distributor as well as the end piece are produced with high quality stainless steel and are connected with special angle profiles. The special design of the tube nozzle provides for a uniform distribution of the air and simultaneously acts as a security device for breakdowns.

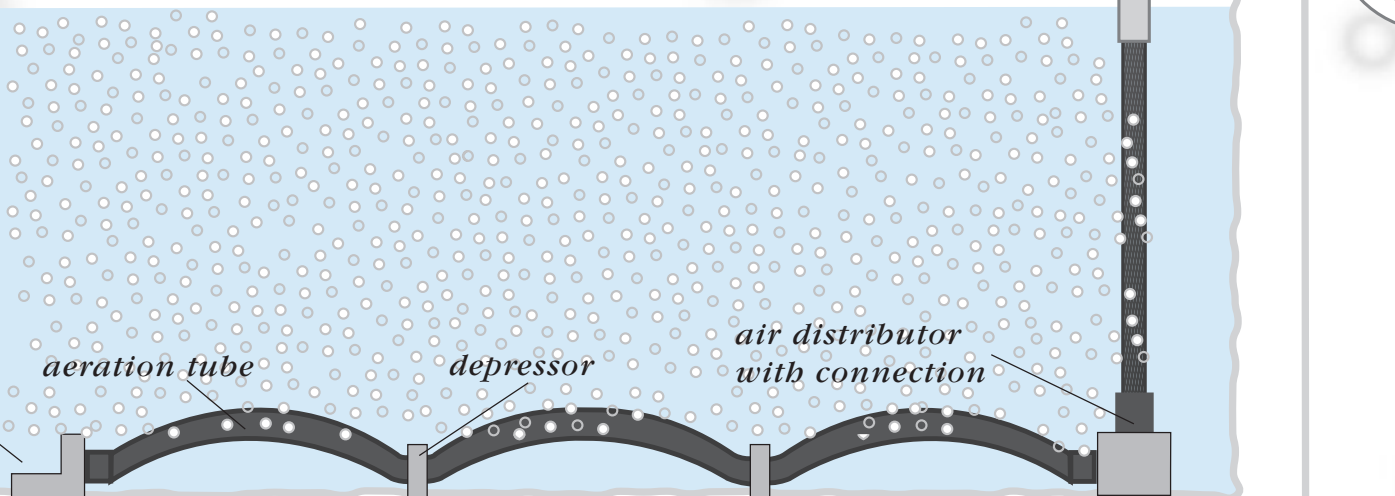
In order to control the arch up of the tube membranes, polished stainless steel tube binders are put in at



Design of the E-FLEX[®] Aeration System

regular intervals. Every aeration module contains a separate air supply, which enables them to be individually shut off.

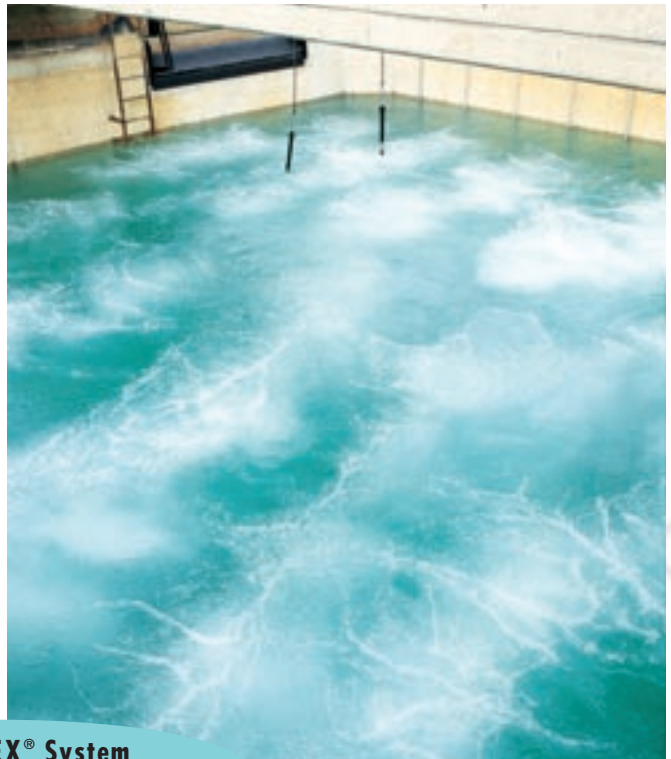
ball valve



E-FLEX[®] in aeration mode

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The Materials



The E-FLEX[®] System in operation

The Materials

Due to high demands for stability, robustness, and maintenance independency as well as the requirement for quick and simple installation and recycling compatibility, materials have been chosen which fulfill all the expectations for modern wastewater treatment even under adverse conditions.

- The slit tube membranes are made of proven "EPDM" rubber.
- The air distributor, end pieces, and tube binders are manufactured from high quality stainless steel.
- The down pipe, binder and nozzles are made unblended materials, which can also be recycled.

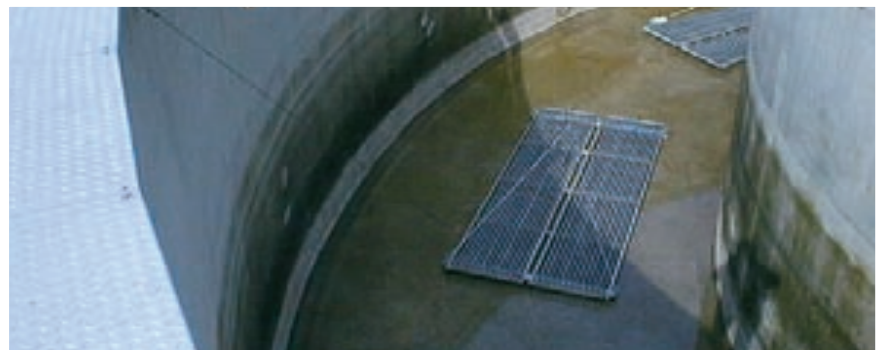
All components are made up of environmentally friendly materials, which are sparing on natural resources.



Simple Installation – Liftability

The basis module is pre-assembled at delivery. Gluing and/or welding work at the construction site are inapplicable. Thus, it is possible to have a trouble-free and quick installation with all types of basins.

It is also possible to receive a lifting kit for the basis module, which consists of two heavy stainless steel feet and a catching bracket. The module remains on the basin floor through means of its own weight; it does not need any additional mounting. Especially in carousel basins with low trench widths as well as in small activated sludge basins, the liftability of the modules offers a wide range of advantages in comparison to the conventional systems and offers a maximum of operational security.



For activated sludge basins with large basin widths special feet constructions are also available, which allow multiple aeration modules to be connected together to make one liftable unit.

Service

Do you have an application possibility for our **E-FLEX**® aeration system? If so, then please feel free to contact us. Our **INVENT** Team will take care of all the tasks starting

with dimensioning, project management, and installation through to commissioning and service.

We also offer customer specific special solutions for the optimization of your aeration processes. For example, by using the **GPS-X** software package, the world leader for dynamic simulation of wastewater treatment plants and plant components, we can ideally optimize your plant to your needs.



l o c a t i o n s

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