

E-FLEX[®] -Floating Aerator

aeration technology



invent[®]
umwelt und verfahrenstechnik

- Fluid mechanically optimized
- High oxygen utilization
- Simple Installation
- Low maintenance
- Lifiable



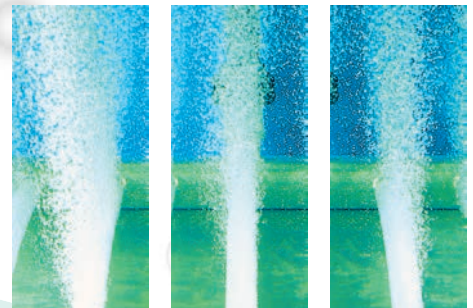
i n n o v a t i o n f o r n a t u r e

The growing pollution of our environment is a problem which concerns all of us. For years water pollution, in particular, has continued to grow in threatening proportions. Water is turning into a more and more limited resource. As a consequence, forward-looking technologies are desperately needed for water and wastewater treatment.

*With great commitment **INVENT** is dedicated to the development and implementation of such technologies, thus creating powerful products which contribute greatly to the preservation of the water quality of our groundwater, rivers and lakes.*

The protection, the preservation and, where necessary, the restoration of our environment will remain one of the most important tasks of our society in the future.

INVENT *takes on responsibility in this field, with innovative environmental and process engineering.*



E - FLEX[®] - FLOAT

The floating Aeration System

INVENT develops, produces and globally implements innovative machines, plants and processes for the treatment of water and wastewater.

In water and wastewater treatment several process engineering, cleaning and processing steps are always applied. In combination they merge to a complete plant. One distinguishes between physical, physical/chemical and biological processes. The biological stage represents the heart of the plant. Here carbon and nitrogen compounds are biologically decomposed. The basis for this process is the effective mixing and the efficient transfer of oxygen, so that the biologically active bacteria can work effectively.

INVENT has specialized in exactly this field and, with its innovative products, is one of the worldwide leaders in the area of mixing and aeration technology for water and wastewater treatment.

E-FLEX[®]-Float
– for optimal aeration



E-FLEX[®]-FLOAT-Aeration System in an aerated lagoon

The Task

Membrane aeration systems are normally placed on, or attached to, the tank bottom of the activated sludge plant, in order to achieve the maximum possible oxygen input values by using the complete water depth.

For cases in which such a bottom construction is not possible, or is only practicable under difficult conditions, the **E-FLEX[®]-FLOAT** System, which is the floating model of the proven **E-FLEX[®]** membrane aeration system, was developed by **INVENT**.

E - F L E X[®] - F L O A T

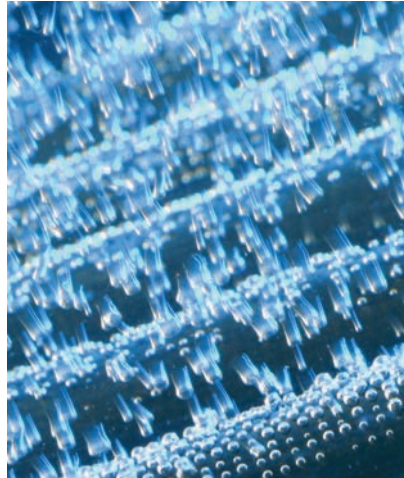
An Overview

E-FLEX[®]-FLOAT - The Chain Aeration System

Areas of Application

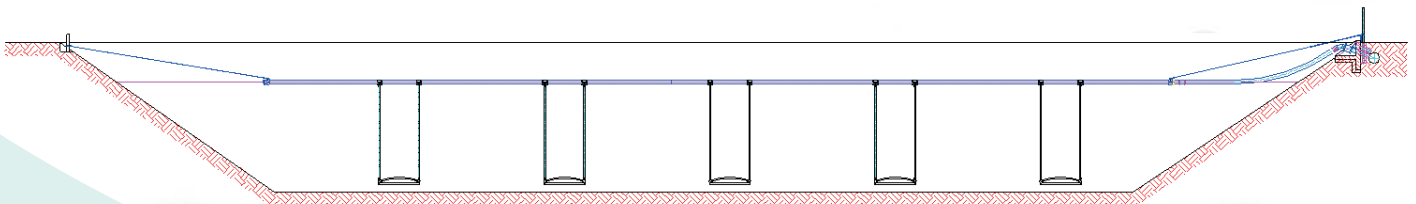
The **E-FLEX[®]-FLOAT** aeration system is basically suitable for implementation in the majority of the activated sludge process types, especially for the following applications :

- In aerated lagoons with plastic liner
- In earthen basins with natural sealing
- In natural ponds and lakes as well as aerated river courses
- In all aerated tanks, in which the levelling of conventional bottom aerators is only possible with considerable effort due to the unevenness of the bottom
- In activated sludge plants, in which a liftable system that does not require additional fixtures in the tank is desired.



The Solution

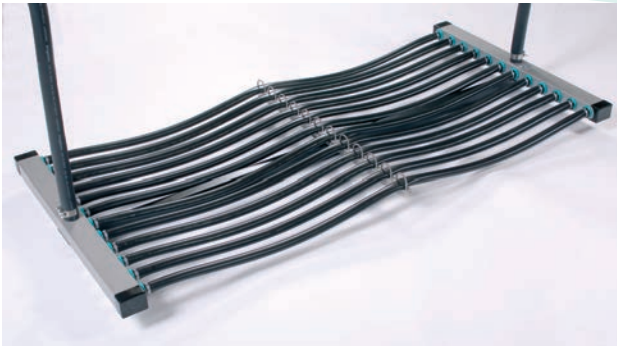
The **E-FLEX[®]-FLOAT** aeration system is a so-called „chain aeration system“ based on multiple aeration chains, which can move through the activated sludge tank at right angles to their longitudinal axis. One single „chain“ consists of a floating air header, which simultaneously serves as a buoyancy body. Individual aeration modules are connected at regular intervals to this floating header via flexible downpipes. The rising air bubbles generate a current, which allows the individual chains to wander. The maximum deflection of a chain is set here by anchor ropes at the tank edge.



Schematic representation of an E-FLEX[®]-FLOAT-Aeration System in an activated sludge tank

E - FLEX[®] - FLOAT

The Construction



E-FLEX[®]-FLOAT-Aeration Module

In comparison with aeration systems which are installed fixed at the tank bottom, this provides the following advantages :

- The levelling of individual aerator elements is not necessary. No compensation is needed for unevenness of the bottom.
- Mounting and removal of individual chains is also possible when the plant is in operation
- Due to the mobility of individual chains, the creation of standing waves is avoided, which increases the retention time of the air bubbles and thereby increases the oxygen input.
- Individual aerator chains can cover a large area, whereby the activated sludge is held effectively in suspension and the complete tank volume can be utilised. Relatively large tank volumes can thus be mixed with minimal specific circulation capacity.

The Construction

An aeration module consists of 2 air diffusers with air and tube connections. The diffusers are connected via a square beam, which simultaneously serves as a buoyancy counter weight. The air is uniformly distributed over 12 tube membranes. The flexible downpipes are connected to the floating pipeline via special nozzles.

Robust und safe



Schematical representation of an
E-FLEX[®]-FLOAT-Aeration System

E - F L E X[®] - F L O A T

The Construction

Robust and environmentally friendly

The Materials

Due to the high demands on stability, robustness, and freedom of maintenance as well as the requirement for quick and simple installation, materials have been chosen which fulfil all the expectations of modern wastewater treatment even under the most adverse conditions.

- The slit tube membranes are made of proven "EPDM" rubber. Further materials are available on request.
- The air diffuser, end pieces, and tube binders are manufactured from high-grade stainless steel of high quality.

- The downpipe, binder and nozzles are made of homogenous and wastewater-resistant materials, which can also be easily recycled.

All components are thus made up of environmentally friendly materials, which are sparing on natural resources and can be recycled.

Materials Used

Used materials:

air distributor	ASTM 304 / ASTM 316*
tube binders	ASTM 304 / ASTM 316*
nozzles	PP - fibre reinforced
membranes	EPDM**

* alternatively

** further materials available on request



E-FLEX[®]-FLOAT -Aeration Chains in an activated sludge tank

Simple and fast**The Assembly**

The individual aeration modules are pre-assembled before delivery. The assembly of the complete system is dependent on the on-site conditions. With empty tanks, the modules are connected with the floating pipeline at the bottom of the tank and the individual chains are connected ready-for-operation to the main air pipeline.

For assembly in filled tanks, the floating pipelines are initially brought into the tank, the connection of the individual aeration modules is carried out from a floating assembly platform.



E-FLEX[®]-FLOAT-Aeration System before start-up



E-FLEX[®]-FLOAT-Aeration Chains in a lagoon-type activated sludge tank

E - FLEX[®] - FLOAT

The Operation

Safe and maintenance-free

Liftability

As a result of the floating construction, every individual module is easily accessible without the necessity of emptying the tank. From a suitable boat, aerator modules can be lifted out, in compliance with the safety guidelines. This can take place during the operation of the plant, whereby each aerator chain on which work is being carried out, is separated from the forced-air supply with the aid of the blocking armature on the side of the tank.

The Operation

The operation of the **E-FLEX[®]-FLOAT** aeration system does not require special precautions. You only have to make sure that the agreed operational limits are maintained (e.g. components of the wastewater, air and water temperatures, air flow volume etc.).

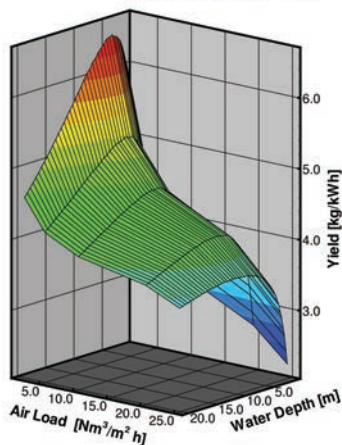
The amount of air is usually controlled by an oxygen-dependent or redox regulation of the air blower. Under normal circumstances special maintenance work or manual cleaning of the membranes is not necessary.



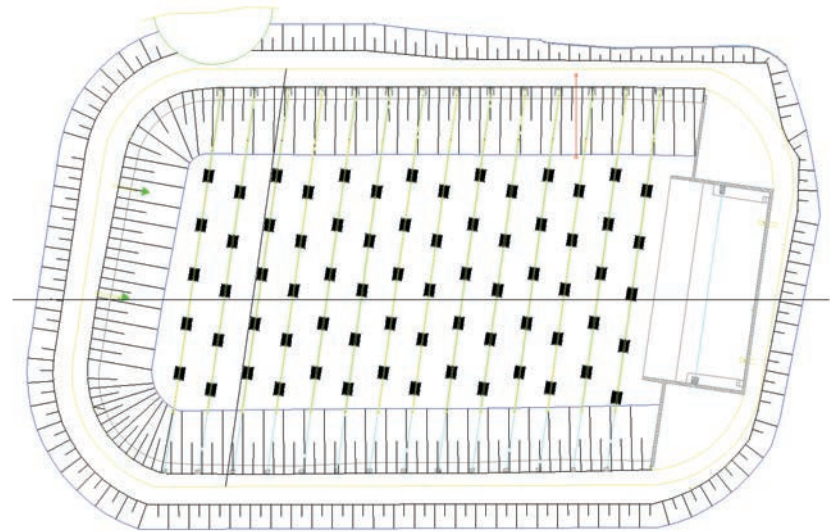
E-FLEX[®]-FLOAT-Aeration Chains in an activated sludge tank

Lay-out and Design

We believe that the lay-out and the design of a perfect aeration system have to be carried out comprehensively and should start with a detailed demand analysis, followed by the preliminary choice of products and materials. Different solutions are tested in order to find the perfect solution. In some cases a number of alternatives are offered. They can vary with respect to the type of coverage, the density and the tapering. **INVENT** has developed a special method which uses property cells to characterise and lay-out our aeration systems. The water depth and the density are particularly important in this process. The illustration below shows an example of such a characteristic cell.



Characteristic cell of an aeration system



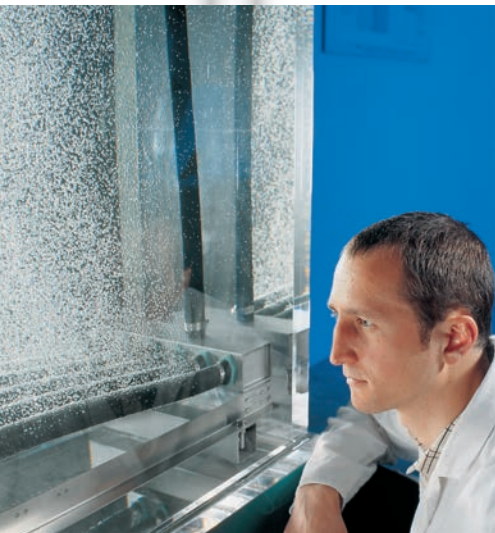
Lay-out example of an existing E-FLEX[®] plant

Thus, as early as during the offer stage, importance is attached to the optimisation of the design. If the project is implemented the piping design will be examined with regard to pressure loss and air distribution. **INVENT** uses special numeric simulation programmes for this purpose. It is recommended, for bigger plants, to carry out a calculation of the expected oxygen profile in the activated sludge

tank. This helps to establish an optimal grading of the density.

We use the software package **GPS-X** for the purpose of dynamic simulation of wastewater treatment plants (further information about **GPS-X** is available from **INVENT** or under www.hydr mantis.com).

Competent and experienced

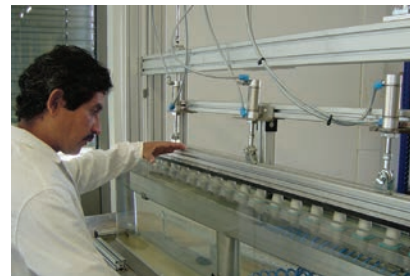


Laboratory test tank

The Laboratory

In the **INVENT** laboratories in Erlangen all **INVENT** products are continuously developed and improved. The most modern equipment, measuring methods and analytical devices are available for this task. In order to determine fluid mechanical parameters scale models are examined and optimized with the help of laser and ultrasound measuring methods. Chemical analyses help to examine mixed processes on micro and macro scale. Standard methods, recommended by DWA¹ or ASCE² are used to measure the mass transport.

Measuring instruments appropriate for taking measurements on large-scale plants are available. The parameter „Bubble size“, important for the lay-out of aeration systems, is determined with optical measuring methods.



Leakage test of an air distributor

The application of a characterization method developed by **INVENT** allows us to characterize and lay-out aeration systems with just a few measurements.

The **INVENT** laboratories, however, are not only used for research and development purposes. A central task is the assurance of the quality of the delivered products. 100% of all delivered **E-FLEX®** aeration modules, for instance, are put through a static and dynamic leakage test. The tube membranes are continuously tested with regard to the oxygen transfer. Additionally, the material characteristics are examined in each batch.

These high level quality control procedures provide an assurance of quality that you should expect from superior products for water and wastewater treatment.

Continuous improvement
and quality control

¹ DWA: Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e. V.

² ASCE: American Society of Civil Engineers

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 custom-made 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.

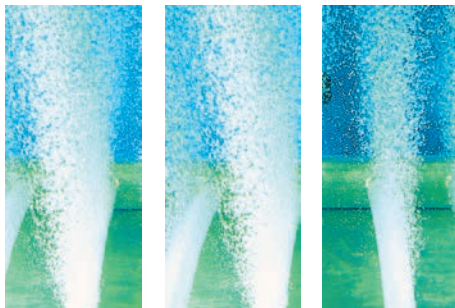
We also carry out oxygen transfer measurements for you, which are in accordance with all generally accepted guidelines.

Professional and innovative

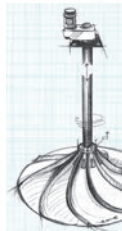
Other products and services

INVENT is the market leader for mixers, mixing and aeration systems and membrane aeration systems for the water and wastewater treatment. Please do not hesitate to ask for information about our additional product lines. We would also be happy to offer you complete system solutions for your plants, such as a carefully laid-out and adapted equipment package. We simulate and optimize your plant with the help of appropriate software packages, or else we optimize your plant or building with regard to fluid mechanics.

We are your competent partner for all questions on water and wastewater treatment.



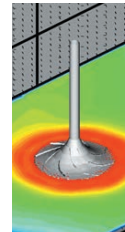
*mixing
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*system
solutions*



*engineering &
consulting*



*software-
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*research &
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