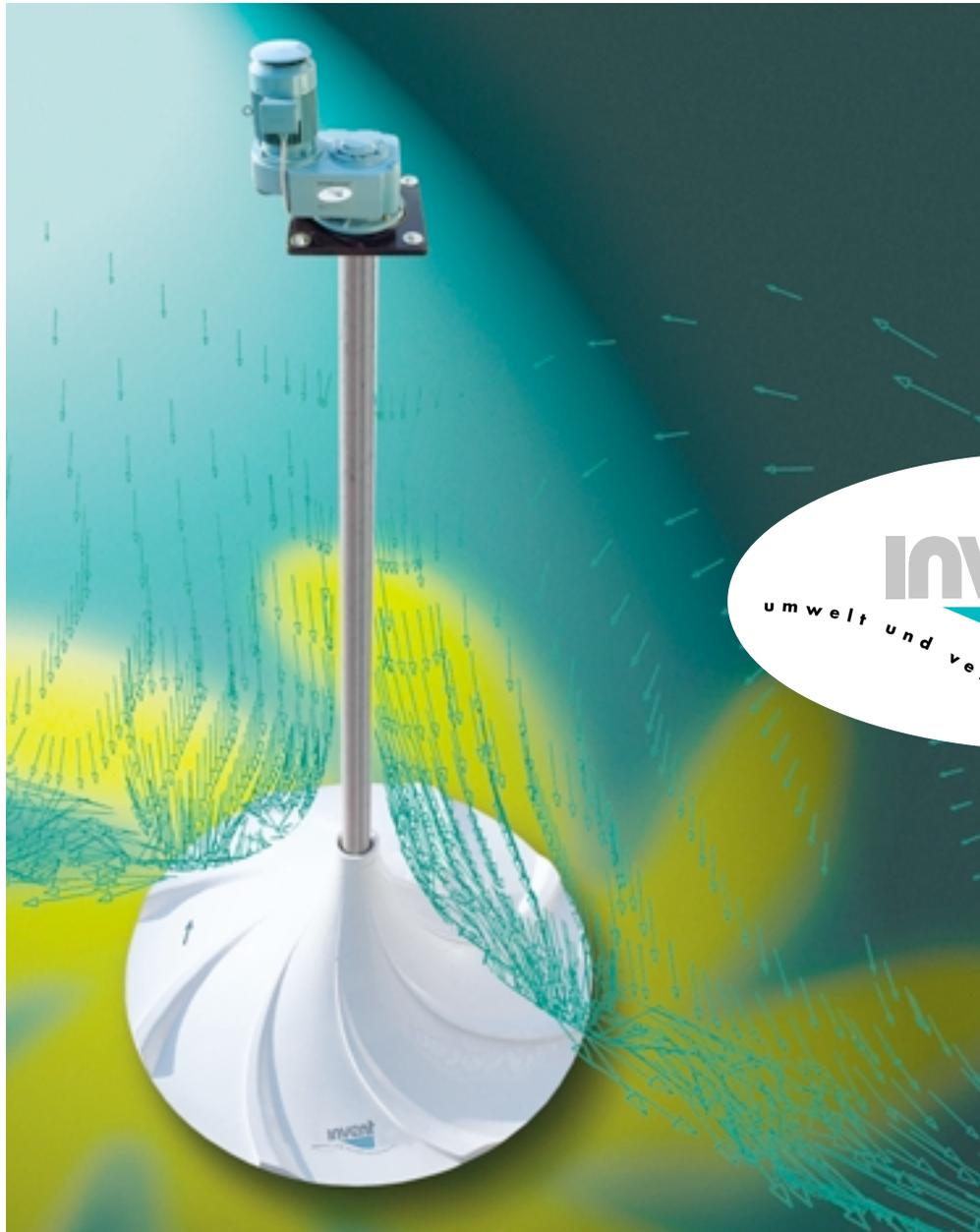


# *H Y P E R C L A S S I C*<sup>®</sup>

*m i x i n g t e c h n o l o g y*



**invent**<sup>®</sup>  
umwelt und verfahrenstechnik

## **The Mixer**

## **The Mixing and Aeration System**

Optimised fluid mechanics, resulting in:

excellent suspension properties

low energy consumption

high longevity



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

*The ever increasing strain on our environment is a problem which effects us all.*

*For years, water pollution, in particular, has reached threatening levels. At the same time the law makers are constantly setting higher requirements on the quality of the wastewater.*

*As a result, the application of innovative technology for future-orientated wastewater treatment is a necessity. With great commitment **INVENT** is dedicated to the development of such technology. Consequently products are being produced, which contribute in great measure to the preservation of our environment. The 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.*



## **HYPERCLASSIC®**

### The Classic Mixer

Purification of wastewater is an area in which **INVENT** specialises. Biological wastewater treatment requires mixing and aeration devices, which fulfil the task of constantly keeping the activated sludge in motion, to achieve high purification performance.

**HYPERCLASSIC®** is the Classic Hyperboloid Mixer. It is available in the following two versions:

- as a pure bottom mixer
- as a combined mixing and aeration system

Both versions of the **HYPERCLASSIC®** fulfil all the requirements for a mixing and aeration system in communal and industrial treatment plants:

- it uniformly distributes the activated sludge particles in the wastewater to efficiently reduce the percentage of nitrate and phosphate.
- it effectively prevents the settlement of bacteria particles in the activated sludge tank.
- The combined **HYPERCLASSIC®** Mixing and Aeration System achieves high oxygen transfer during the decomposition of BOD<sup>1</sup> and COD<sup>2</sup>, nitrification, respectively denitrification with intermittent aeration.

## **HYPERCLASSIC® – Efficient and Flexible**

### Fields of Application

The **HYPERCLASSIC® Bottom Mixer** inhibits mainly the sedimentation of activated sludge particles during denitrification or biological phosphate elimination.

Without additional expensive aeration equipment, the combined **HYPERCLASSIC® Mixing and Aeration System** achieves high oxygen input levels during nitrification, respectively during denitrification with intermittent aeration.

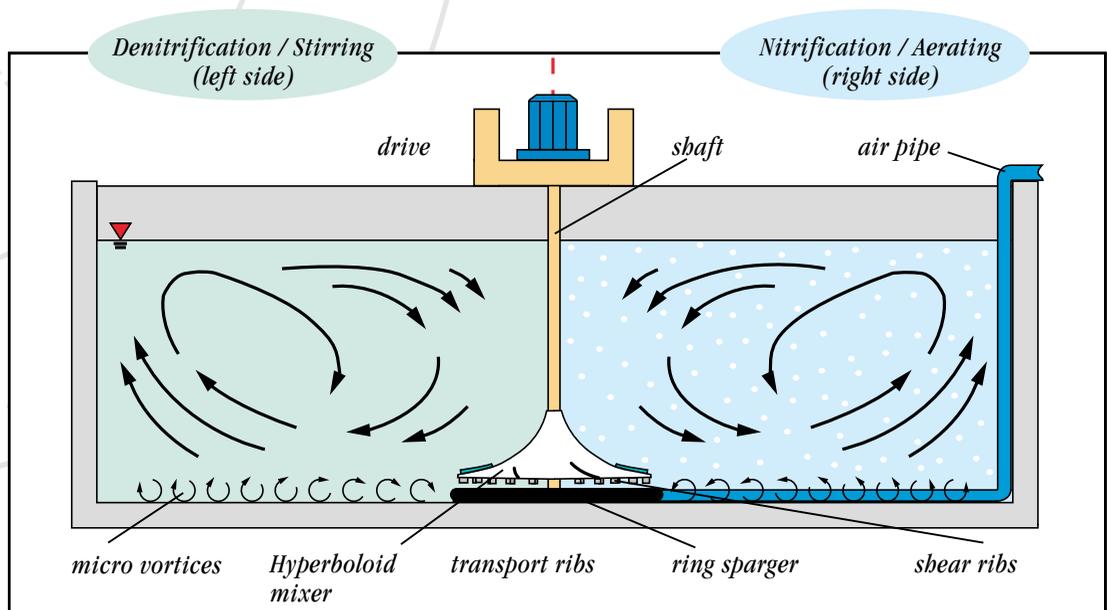
<sup>1</sup> Biological Oxygen Demand  
<sup>2</sup> Chemical Oxygen Demand

### Excellent Suspension Properties

The design of the Hyperboloid Mixer's body is based on fundamental potential-theory flow calculations. The special shape of the mixer creates:

- a flow, which follows the mixer's surface, thus minimising separations and their associated energy losses.

*schematic representation of the installed system and the flow pattern in the two operating conditions (Mixing / Mixing and aerating)*



**HYPERCLASSIC® – High Efficiency,  
Low Energy Consumption**

- an all-encompassing flow which guarantees a complete mixing of the tank contents.
- an energy concentration, that is deliberately at the tank bottom, where high bottom velocities are needed to prevent the settlement of activated sludge.

*In operation:*



*calm water surface during  
denitrification*



*even distribution of bubbles during  
nitrification*

**No Odour Problems**

The transport ribs, integrated in the mixer body, cause an acceleration of the medium in a radial direction, therefore supporting the complete circulation of the tank contents. Henceforth, a disruption in the water surface is prevented, from which, a minimisation of air input during the denitrification and the phosphate elimination is accomplished, and the output of aerosol and resulting odour problems is avoided.

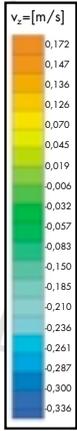
**An Overview**

**Innovative Mixing Technology**

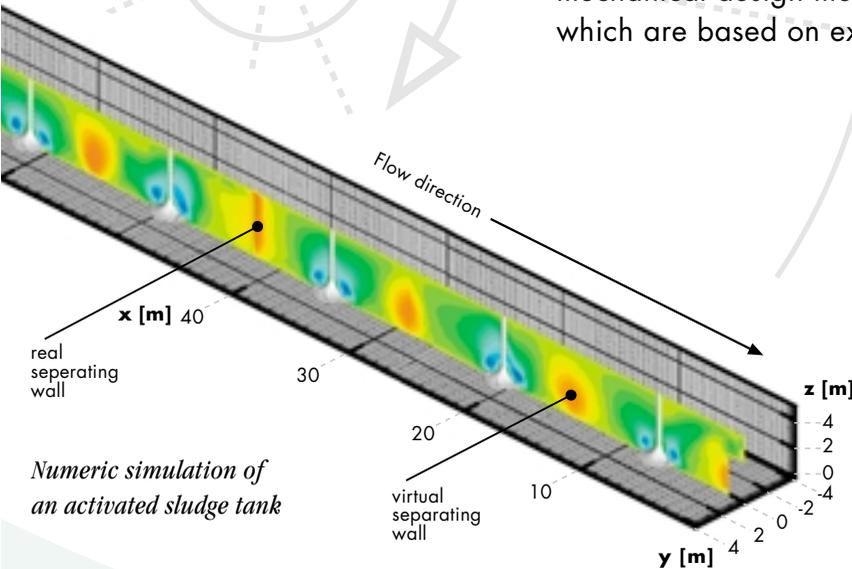
Innovative mixing technology not only comprises the efficient control of fluid mechanical designs, but also requires detailed knowledge of the mechanical design of bridges, motors, shafts and connecting elements. Therefore, in addition to the conventional fluid mechanical design methods, which are based on experi-

mental methods, **INVENT** also uses modern numerical simulation methods (CFD<sup>1</sup>).

3D-CAD-Programs and Finite Element Methods (FEM) are used for the mixer design. The implementation of mixers also requires process technology know-how, for the optimal functionality of the biological reactors. The figure to the left shows a numerical simulation of an activated sludge tank with multiple complete mixing reactors, which was created with individual **HYPERCLASSIC®** mixers.



*Velocity in z-direction*



*Numeric simulation of an activated sludge tank*

<sup>1</sup> Computational Fluid Dynamics

## **HYPERCLASSIC®**

### **An Overview**

By means of a control system, that controls both the air entry as well as the rate of revolutions, defined conditions can be set.

- In the case of winter operations or peak loads, the system can make additional space available for nitrification.
- It is also optimally suited for SBR-plants.
- In summer operations, it can exclusively serve the denitrification process.
- The system is, of course, also applicable towards nitrification, BOD- and COD-reduction.

### **High Oxygen Input**

In addition to the mixer, the combined **HYPERCLASSIC®** Mixing and Aeration system possesses a ring sparger, which is installed underneath the mixer body and facilitates the uniform distribution of air. During the aeration process, the velocity increases in comparison to the velocity during the mixing process. This occurs with the use of a two

speed motor or a frequency converter control. The shear ribs, mounted on the circumference of the mixer body, chop air or pure oxygen, which is fed through the aeration ring, into bubbles with an optimum diameter of 1.5 to 3 mm. These are carried away by the flow and distributed throughout the tank, thus creating a large input of oxygen.

## **HYPERCLASSIC®**

### **In Extreme Conditions**

#### **Industrial Wastewater**

Industrial wastewater places extreme demands on aeration systems. A robust structure against harsh operations, problematic wastewater content and high temperatures belongs to the standards of such a system. In this area of waste-

water treatment, conventional membrane aerators are considered failures due to the sensitivity of the material and insufficient mixing flows. For this type of case, **INVENT** specialises in and offers for all application areas a tailor made solu-

tion with **HYPERCLASSIC®** Mixing and Aeration Systems. This creates an optimal aeration performance with high values paired with prominent mixing consistency.

*10 **HYPERCLASSIC®** mixing and aeration systems of an industrial treatment plant in Belgium*



### The advantages of the HYPERCLASSIC® system:

- solid
- non-corrosive
- low maintenance requirements
- high operational safety level
- high longevity

### The Drive

- The mixing element is driven by a shaft and a parallel shaft geared motor, installed in dry conditions.
- It is run by exclusive robust geared motors from renowned manufacturers, which, depending on the field of application, can be supplied complete with control and sequencing units.

### The Material

- Only selectively chosen materials, particularly fibre-glass reinforced plastics, are used for the drive and mixer body.
- The surface of the mixer body is coated with a biologically neutral gel-coat (for the uninhibited breakdown of bacteria).
- All materials used can be recycled or disposed of without difficulty.

### The Bearing

- The **HYPERCLASSIC®** mixer is principally chosen **without** a bottom bearing. The shaft bearing occurs in the geared motor.
- The gear motor is beared in rubber buffer.
- Mixing and aeration systems usually have an additional security in-tank steady bearing to restrict the occurrence of parallel deviation of the shaft.
- The mixer body and the optional bearing unit are designed with a favourable flow pattern, thus preventing any accumulation areas for agglomerations.

**HYPERCLASSIC® – Outstanding  
due to Economical Energy Consumption  
and Low Operation Costs**

## **HYPERCLASSIC®**

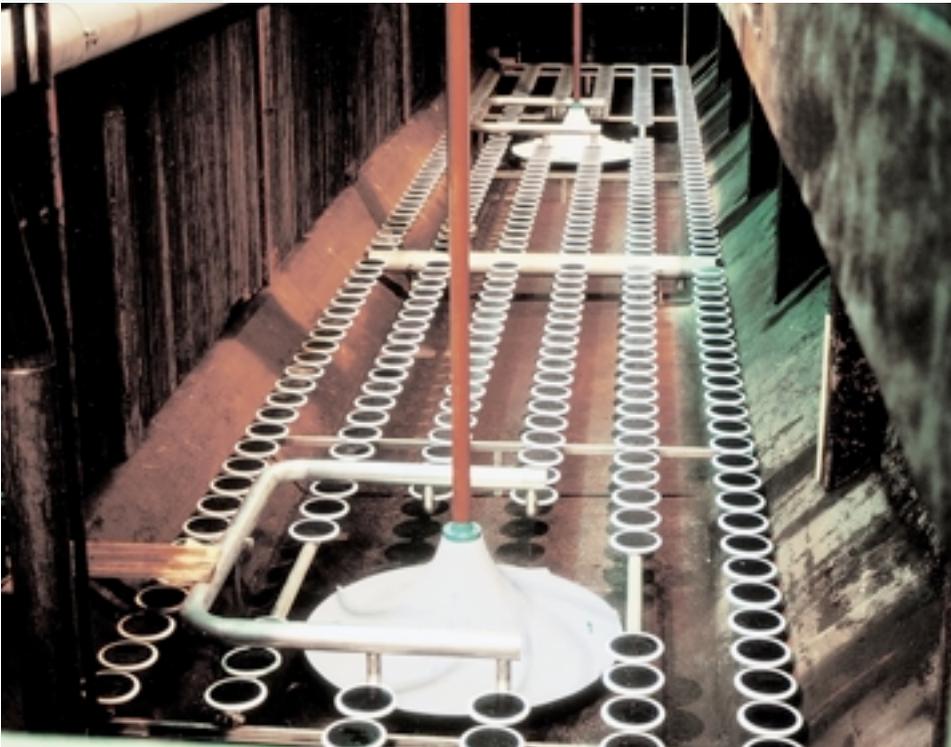
### **Further Application Possibilities**

#### **Dimensioning and Construction Sizes**

The systems' dimensions depend on the sizes and shapes of the tanks, as well as the characteristics of the medium. These properties define the mixer diameter (readily available in sizes between 500 mm

and 2.500 mm – other sizes available on request), the arrangement of the transport ribs and the other parameters. The desired bottom velocity can be adjusted by the number of revolutions.

*2 of 48 **HYPERCLASSIC®** mixers of a treatment plant in Stockholm*



#### **Areas of Application**

Due to its flexibility in dimensioning and its outstanding properties, **HYPERCLASSIC®** is perfectly suitable for numerous other fields of application:

- Nitrification as well as BOD- and COD-reduction
- Aerobic-thermophilic treatment of sewage sludge
- Liquid manure treatment
- Coagulants and flocking agents
- Buffer-tanks or mixing and equalisation tanks
- Storm-water tanks
- Chemical industry
- Paper industry
- Food and drink industry
- Biotechnology and pharmaceuticals
- Textile industry

**HYPERCLASSIC®**



6 of 60 **HYPERCLASSIC®** mixers of a treatment plant in Berlin

**HYPERCLASSIC®** can be used for intermittent and alternating operations; thus, it is excellently suitable to application in Sequencing Batch Reactor Plants. In wastewater treatment, the Hyperboloid Mixer has proved its efficiency in large wastewater treatment plants, as well as in small and compact wastewater treatment plants for years.

### **The INVENT Service**

Our **INVENT** team takes care of all details from the dimensioning, the project planning, and the installation, to the start-up of operation and service – trouble-free for you.

**HYPERCLASSIC®** is a registered trade-mark of **INVENT** Umwelt- und Verfahrenstechnik GmbH & Co. KG.



We are here for you:

● ● ● ● ● ● ● ● ● ● **INVENT** Umwelt- und Verfahrenstechnik  
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