



## Perfect Equipment for **Aeration** and **Mixing** of Wastewater Treatment Systems

# The “HyperClassic<sup>®</sup>”-Technology

**Innovative – Outstanding – Worldwide Patented**

### 1. Stirring and Aeration in Wastewater Treatment Plants

A successful operation of different processes in wastewater treatment plants requires **mixing** and **aeration** (oxygen supply) as two of the most important actions. Based on these requirements, the wastewater industry developed plenty of different technologies to fulfil these important process-tasks. As a result, manifold for mixing and aeration (submersed and dry-mounted equipment, vertical and horizontal operation modes etc.) are available at the market.

For input of oxygen into biological stages, equalisation tanks and other treatment reactors, basically two different technologies are representing available technologies: **Fine bubble air diffusers** (flexible membrane or ceramic material) as well as **surface aerators**. Both systems are more or less reliable, but unfortunately entailed with some well-known typical disadvantages.



Picture no. 1: HyperClassic<sup>®</sup>-Aerators for a SBR-wastewater treatment plant (25,000 p.e.)



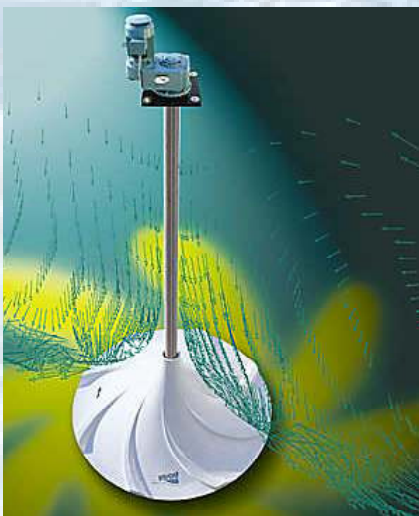
It was the objective of a German University in cooperation with a group of engineers to develop a new technology, which is able to combine mixing and aeration by using a completely different way. This new system was tasked to avoid typical and serious disadvantages of conventional mixing and aeration methods.

The result of this development is the innovative **HYPERCLASSIC®-TECHNOLOGY**, which represents an outstanding way for **mixing** as well as for **aeration**.

The newest HyperClassic® Generation is representing an upgrade of all features – now worldwide patented.

## **2. The HyperClassic®-Stirrer: A perfect system for mixing**

The main task of a stirring system is to mix-up the contents of a tank homogeneously, without any settling and “dead zones” and - moreover - with a minimum demand of energy. As a further target - particularly by use of stirring systems inside of activated sludge tanks - it must be guaranteed, that the sludge-flakes are not destroyed, do not settle and are evenly distributed in the biological reactor.



Picture no. 2: HyperClassic®-stirring and aeration system. The principle shape of the equipment.

As a result of intensive studies and plenty of tests, the typical shape of the **HyperClassic®-stirrer** was improved. This upgraded and now worldwide patented form of the stirrer body is again an outstanding equipment for sewage technology and industrial applications. The new **HyperClassic®-Generation** is particularly able to replace traditional systems more and more.

### **Typical applications for HyperClassic®-mixers:**

- Sewage treatment plants
- Denitrification-reactors
- Paper and chemical industry
- Equalization tanks
- Stormwater tanks
- Sludge storage tanks

As picture no. 2 is clearly showing, the special shape of the stirring element (stirring body) impresses the optimized form for a perfect hydraulic performance. By use of special transport-ribs, integrated at the top surface of the stirrer body, a soft but intensive circulation of the tank contents is easily generated.

The hydraulic profile of a tank under mixing-process demonstrates the perfect result by use of a **HyperClassic®-stirrer**: The input of mixing power is performed in the centre of the tank and next to the bottom. As a result, the highest speed occurs in a most sensitive bottom-area and consequently guarantees a settling-free process as well as an intensive circulation and homogenisation of the suspension. Moreover, thousands of high active micro-turbulences (eddies) are supporting the mixing capacity and prevent a sludge accumulation at the bottom-area.



Beside these outstanding hydraulic features, the special and typical shape of **Hyper-Classic®-mixers** reduces lost-energy of mechanical parts to a minimum. In opposite to other mixing technologies, the **HyperClassic®-system** requires only 1,5-2,5 W/m<sup>3</sup> for perfect mixing (i.e. for activated sludge) with a bottom- speed of not less than 20 – 30 cm/s.



Picture no. 3: HyperClassic®-stirrers in a denitrification tank.

In its standard version, the speed of the stirrer is fixed. However, if the motor of the gear-drive could be adjusted by a frequency converter, a perfect adaption of the mixing capacity (if process conditions are changing) is possible.

The new HyperClassic-Generation offers some additional advantages, which are unique and improves the efficiency and function of the HyperClassic stirrers. Additional worldwide patent rights are demonstrating that the features are representing a high engineering level:

- **Specifically formed openings at top of the HyperClassic stirring body make sure, that air is able to leave the underside**
- **Internal transport ribs (installed at the underside) are generating turbulences below the stirrer and are preventing any sludge settling**

- **The specific form of the transport-fins increase the operation-efficient with up to 20 % compared with the former HyperClassic generation**

**Summary of the most important advantages of the HyperClassic®-mixers:**

- **Perfect mixing profile**
- **No settling at the tank bottom**
- **High speed at the tank bottom**
- **Low energy requirement**
- **Economic stirring concept**
- **Gentle mechanical force**
- **No danger of flakes-destruction**
- **No aerosols**
- **Destroys floating sludge blankets (by additional installation of hyperpitch-paddel)**

**3. Perfect and High Efficiency Oxygen Input for Activated Sludge Tanks**

It is the outstanding feature of the Hyper-Classic®-system, that this technology is not limited to be an outstanding mixing installation, but moreover a perfect equipment for **oxygen (O<sub>2</sub>) input**.



Picture no. 4: HyperClassic®-aeration system for an industrial company in Europe.



The oxygen supply into biological tanks, sludge tanks and other (industrial) applications is carried out on a high performance level, which could be hardly beaten by other aeration technologies.

The fascinating simplicity of the aeration concept characterises the outstanding technology of the HyperClassic<sup>®</sup>-system. In order to enable the oxygen transfer, not more than two very simple measures have to be carried out:

- **Compressed air must be blown under the stirrer body and**
- **The stirrer speed must be doubled (two speed gear box).**

The “trick” to change the incoming big air-bubbles into fine bubbles is the use of plenty of specially formed diffusing ribs (shear ribs), which are installed alongside the border of the stirrer-body. The special shape of the shear-ribs, supported by the high rotating speed, results in a significant reduction of the air-bubble size to micro-sized fine bubbles. As a further effect of the high stirrer-speed a homogeneous distribution of the diffused air- bubbles within the tank is perfectly performed. Consequently, the air is reaching all areas of the aeration tank with the result, that the oxygen supply profile is perfect.



Picture no. 5: HyperClassic-Mixers for a big wastewater treatment plant. They are tasked to mix-up the activated sludge during the denitrification phase.

The required compressed air is normally produced by so-called rotary piston blowers (for instance products of the Aerzener Maschinenfabrik GmbH). By use

of noise-dampening covers, it is easily possible to locate such a blower directly beside the aeration tank or at top of the bridge.

The compressed air is transported by a simple pipe (plastic or stainless steel), which ends below the stirrer. An even distribution of the compressed air is performed by a ring-pipe, being perforated with simple holes.

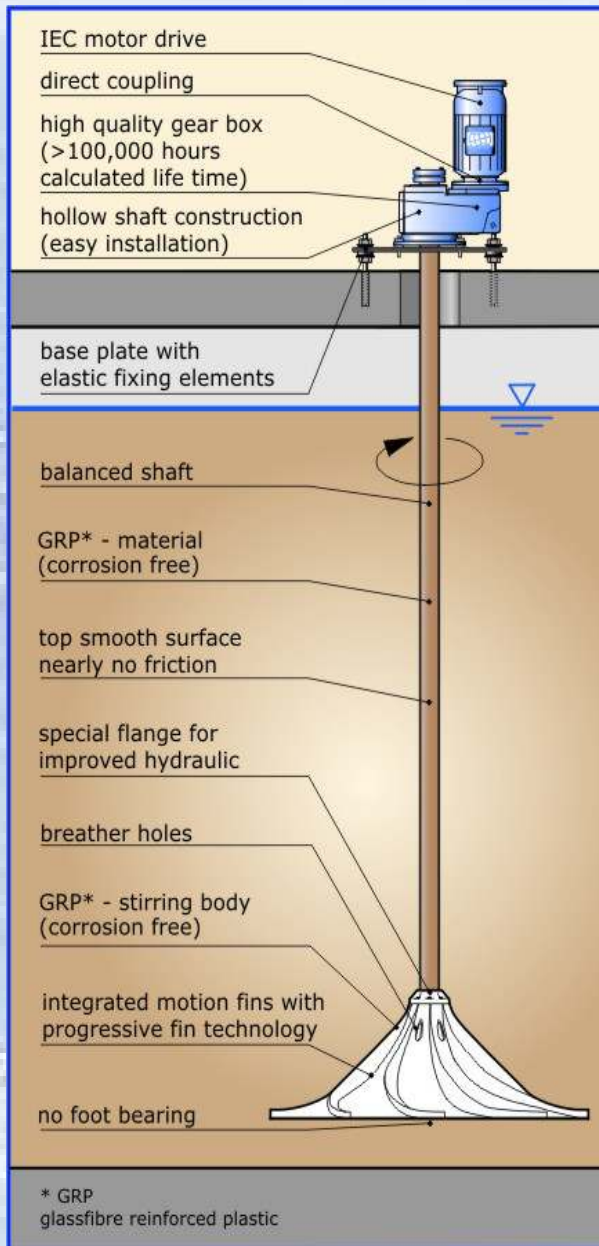
No clogging of fine openings, no breaking of membranes and no change of physical characters must be feared for the life-time of this single air-input system.

The efficiency of the HyperClassic<sup>®</sup>-aeration system is mainly depending on the tank volume, the depth of the liquid and the tank-shape. However, the efficiency rate is between 2,0 and 2.5 kgO<sub>2</sub>/kWh (pure water conditions). As the so-called alpha-factor is not less than 0.9, the O<sub>2</sub>-supply-efficiency under operation conditions is nearly unchanged. As a result, the operation-efficiency is comparable with fine-bubble membrane systems.

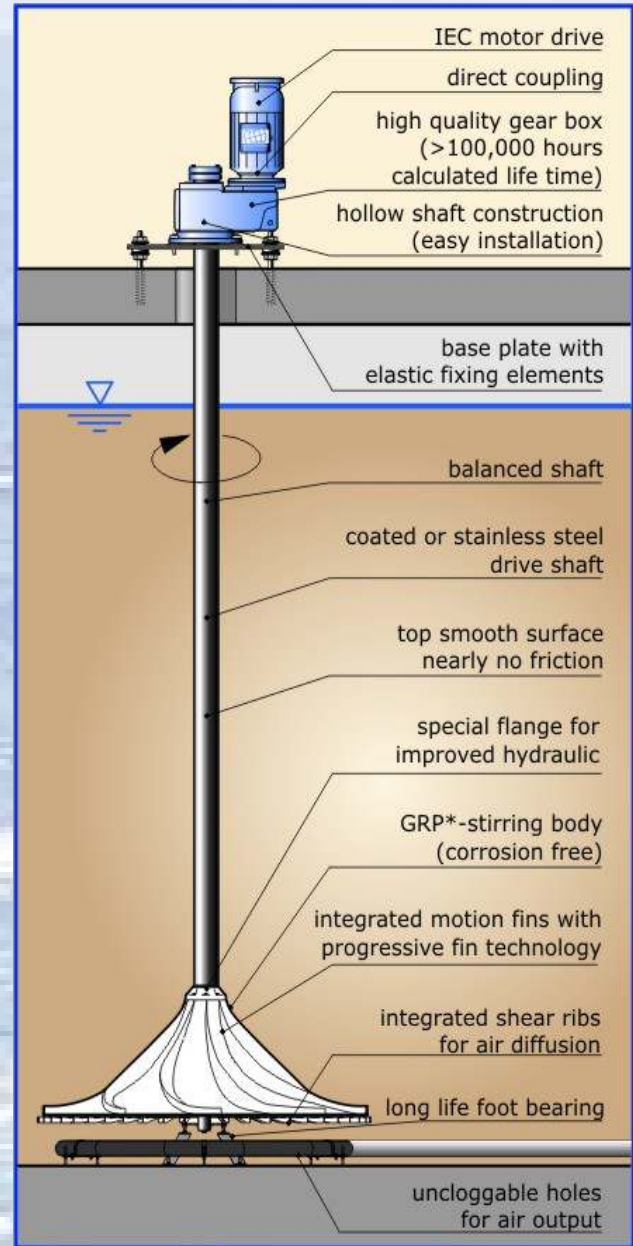
However, the most important difference to the traditional membrane aerators is the fact, that no expensive installations (complicated pipe systems etc.) are required, no wear and tear of membranes can occur, the O<sub>2</sub>-input capacity cannot be reduced caused by changing mechanical characteristics, by widening of membrane-slots or even by typical membrane break.

#### Summary of the features of HyperClassic<sup>®</sup>-aerators:

- **Simple and reliable system**
- **No wear and tear parts under water**
- **High efficiency and oxygen transfer rates**
- **Perfect mixing and air-bubble distribution**
- **No aerosols at the liquid surface**
- **Mixing and aeration by use of only one system**



General configuration of a HyperClassic-stirrer



General configuration of a HyperClassic-aerator

#### 4. Typical Applications for the HyperClassic®-Mixing and Aeration System

Principally, the HyperClassic®-mixing and aeration system is useable in all tanks, which requires mixing and aeration. Consequently, it is also a perfect installation for those activated sludge systems, which operate according to the so-called nitrification and denitrification in change. During the nitrification phase

oxygen supply is required the blower is operating and the stirrer works at its high speed.

During the denitrification (no oxygen supply) only a mixing of the activated sludge is required. Consequently, the blower will be shut off and the HyperClassic®-stirrer is operated at the low speed. Both operation modes guarantee perfect process conditions.



Also for SBR-treatment systems the Hyper-Classic<sup>®</sup>-aeration and mixing technology is a perfect equipment. Changing water level does not require any floating systems (which are necessary by use of surface aerators). Moreover, the reactors could be designed as deep tanks in order to reduce space requirement and to increase the oxygen efficiency (example: the wastewater treatment plant for the EKU-brewery in Germany - designed and realised by *Biogest International GmbH* - operates two SBR's with a tank height of 12.00 m).

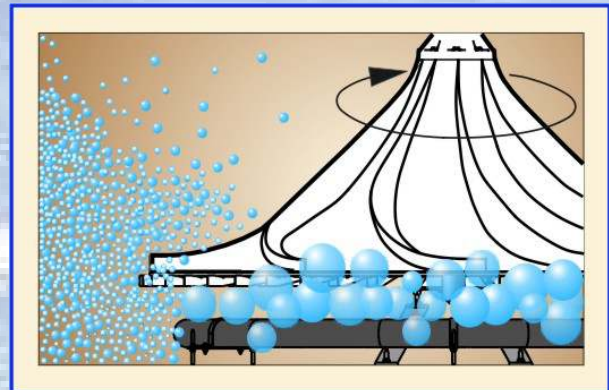


Picture no. 6: Installation example.

A wide range of applications for the HyperClassic<sup>®</sup>-technology is the industry with its numerous tasks. There is nearly no process, which does not require *mixing* and / or *aeration*. Plenty of HyperClassic<sup>®</sup>-systems were installed in the paper mill industry, in the chemical industry and in the food industry. The typical motto is: to make high quality products, high quality equipment as required.

## 5. Operation of the HyperClassic<sup>®</sup>-Aeration and Mixing System

It was already described, that the maintenance requirements for the HyperClassic<sup>®</sup>-systems are minimized – and compared with other aeration systems nearly negligible. As no wear and tear parts are located below the water level, the service-works are reduced to the periodical oil-change of the gearbox. This has to be performed every two years, as the gear box will be filled-up with a special synthetic lubrication oil.



Plenty of shear ribs are diffusing coarse bubbles into micro-fine air-bubbles for perfect oxygen supply.

If the HyperClassic<sup>®</sup>-system is used for aeration, a simple guide-construction is installed under the stirrer body. By help of this foot bearing, the horizontal movement (swinging) of the stirrer-shaft is prevented.

The bearing construction is extremely strong and requires not more than a five-years-check. However, for this purpose the tank must not be emptied. As the HyperClassic<sup>®</sup>-aerator is preferably installed by use of a support construction, which is fixed at the rim of the bridge construction (see picture no. 10), the stirrer could be easily moved above the maintenance level by use of a mobile crane.



If necessary, the specially constructed shaft-end could be replaced. Afterwards, the stirrer will be reinstalled. As the foot bearing is equipped with a funnel, the correct placement is easily performed. However, as most of the wastewater treatment plants are inspected regarding the concrete constructions all 5 – 10 years, the check of the foot bearing could be done at the same time.



Picture no. 7: HyperClassic®-aeration systems for an industrial wastewater treatment plant.

Finally, it should be pointed out, that the gear-drive (gear box with electrical motor) is designed and constructed for a life-time (of the bearings) of more than 100,000 operation hours. Moreover, only high quality manufacturers, which are internationally represented, are chosen as suppliers. This guarantees perfect worldwide service.



## The HyperClassic®-Mixing and Aeration System

### Most Important Facts and Figures

#### 1. Fields of Application

- Wastewater treatment plants
- Equalization tanks
- Sludge storage tanks
- Denitrification tanks
- SBR-plants
- Chemical industry, food industry etc.
- Water treatment plants

#### 2. Sizes and Models

- Stirrer diameter between 500 – 2,500 mm
- Max. tank depth: up to 13.00 m
- Max. volume / stirrer: up to 5,000 m<sup>3</sup>
- Specific mixing energy: 2 W/m<sup>3</sup>
- Oxygen input efficiency: 2 – 3 kgO<sub>2</sub>/kWh
- Completely constructed out of non-corroding material (GRP)
- Gear box lifetime: > 100,000 hours
- Gear box oil change cycles: 2 years

#### 3. Key Benefits for Our Customers

- Nearly no wear and tear
- Optimized process conditions
- No aerosols (difference to surface aerators)
- Non-cloggable air-supply system (difference to membrane aerators)
- One installation for two purposes (mixing and aeration)

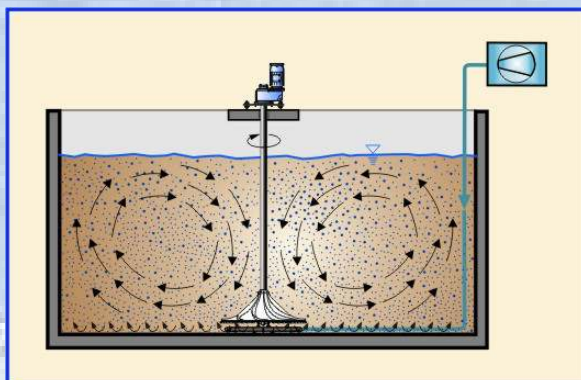
Remark: The HyperClassic®-mixing and aeration system is a product of our partner-company INVENT.



## 6. Hundreds of Reference Plants are the Proof for Quality and Outstanding Performance

Since the **HyperClassic®-system** was introduced to the market some years ago, hundreds of stirrers and aeration systems were delivered for different tasks. More and more customers are understanding the great difference between conventional systems and the **HyperClassic®-technology** and order this exciting equipment.

An international reference list and specific case descriptions are available.



Picture no. 8: Principle structure of a HyperClassic®-mixing and aeration system (e.g. for use in activated sludge tanks). Coarse air-bubbles (generated by a blower) are dispersed into micro-bubbles by high speed shredding.



Picture no. 9: HyperClassic®-Aerators for a SB-reactor. Totally four reactors are combined to a wastewater treatment plant (65,000 p.e.).



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