BioDopp®

# BioDopp Micro-oxygen Biochemical Process

Biologische Hochleistungs Technologie

Beijing BHT Environment Tech Co., Ltd.

# Introduction to the craft

BioDopp®

The BioDopp process is a micro-oxygen biochemical wastewater treatment technology. It was developed by a Sino-German technical team who extracted the advantages of various biochemical processes through long-term water treatment engineering practices, continuously innovated and upgraded. The technology was industrialized in developing countries like China after 2000. It has undergone multiple technological iterations tailored to China's water quality conditions and discharge requirements. It has now evolved into the third generation of industrial wastewater reactors and the fifth generation of municipal wastewater reactors, and is widely used in industrial wastewater treatment, industrial park sewage treatment, and municipal sewage treatment plants.

## 01 First generation

**BioDopp**

- Henan Yima Gasification Plant Supporting Sewage Treatment Renovation Project
- PetroChina Propylene Cyanide Plant Wastewater Treatment Station
- Phase I Project of Lezhi Sewage Treatment Plant in Sichuan Province
- Phase II Project of Fengxiang Sewage Treatment Plant in Shaanxi Province
- Qinhuangdao North Sewage Treatment Plant Project

**2009**

## 02 Second generation

**BioDopp**

- Tianchen Yaolong Supporting Sewage Treatment Project
- Sewage Treatment Project of Desen Biomass Gas Centralized Gas - supply Station
- Phase II Project of Sichuan Yilong Wastewater Treatment Plant
- Sewage Treatment Plant Project in Longxian County
- The East Sewage Treatment Plant Project of Shishou City

**2013**

## 03 Third generation

**BioHopp**

- Lanqiao Sewage Treatment Plant Phase II Project
- Datong Yudong New Area Sewage Treatment Plant Project
- Expansion Project of Shifang city Domestic Sewage Treatment Plant
- Sewage Treatment Project in Wentang Town, Mingyue Mountain
- Phase II project of Guilinyang Wastewater Treatment Plant in Haikou, Hainan Province.

**2018**

## 04 Forth generation

**BioSopp**

- Phase III project of Lezhi Sewage Treatment Plant in Sichuan Province
- Supporting Sewage Treatment Plant Project in Wuxue Economic Development Zone
- Phase II Project of Yixian Sewage Treatment Plant in Anhui Province
- Phase II of Lingao Sewage Treatment Plant in Hainan Province
- The sewage treatment plant project in Dingxing County
- Several Wastewater Treatment Plants in Xinjiang Province.

**2021**

## 05 Fifth generation

**BioTopp**

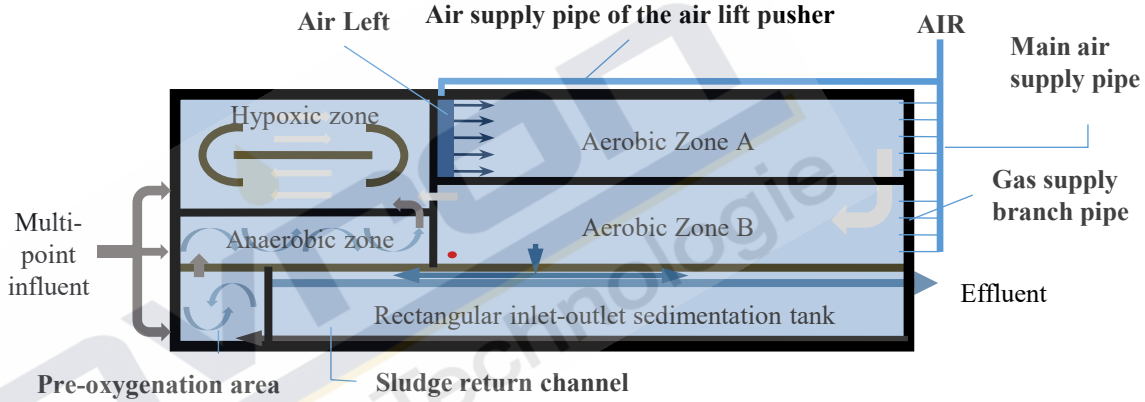
It has successfully completed multiple rounds of pilot tests, developed a series of supporting patented technologies, launched a variety of products and control modules, and completed the application of independent technical modules.

**2024**

# Introduction to the craft

BioDopp

**BioDopp** is a highly intensive biochemical sewage treatment technology, which has obvious advantages in the treatment of high-concentration refractory industrial wastewater and in the field of municipal sewage treatment. The industrial scale is nearly **3 million tons per day.** In the segmented field of the micro-aerobic process, the BioDopp process has developed into the process with **the highest global market share, the deepest industrialization depth, and the widest industry coverage**.





For general domestic wastewater/industrial wastewater

Strengthen the impact resistance performance、Strengthen the treatment of nitrogen and phosphorus removal、Aiming at the surface water Class IV discharge standard

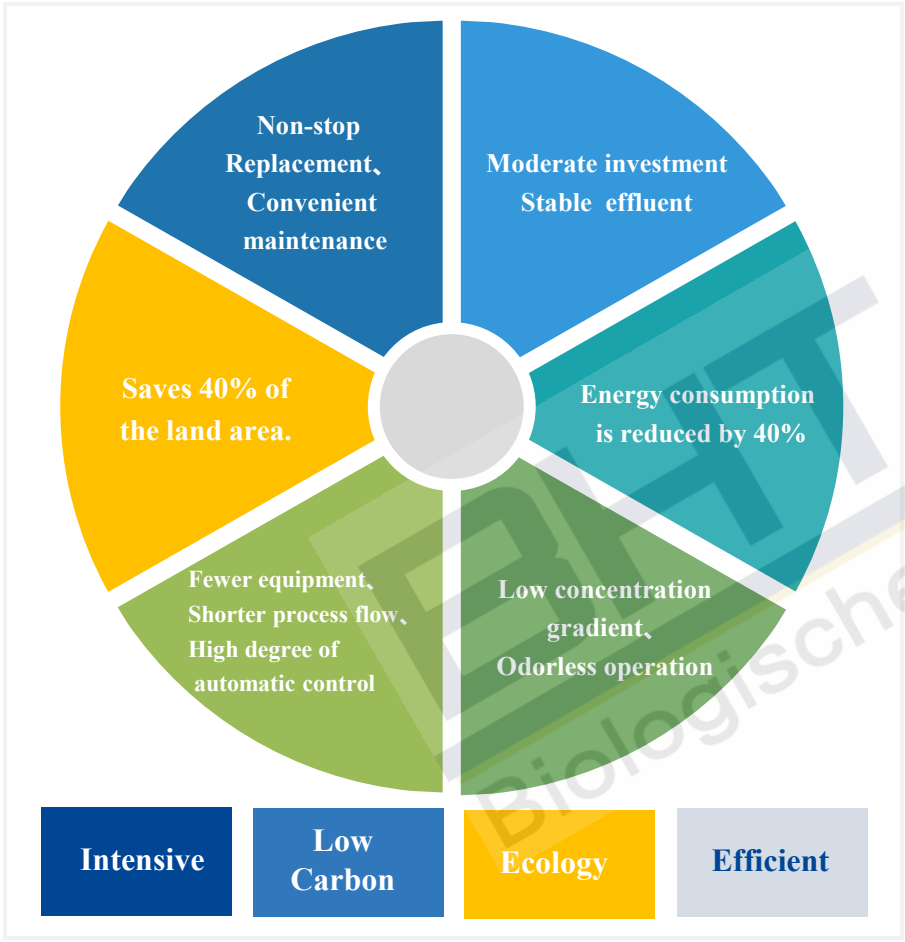
Strengthen the impact resistance performance, Strengthen the treatment of refractory pollutants, aim at the treatment of high difficulty industrial wastewater.

**Micro-aerobic granular sludge process**
The produced water reaches/approaches the quasi-Class III water quality，Coupling of P resource recovery and pyrolysis technology，Build an energy-neutral water treatment plant

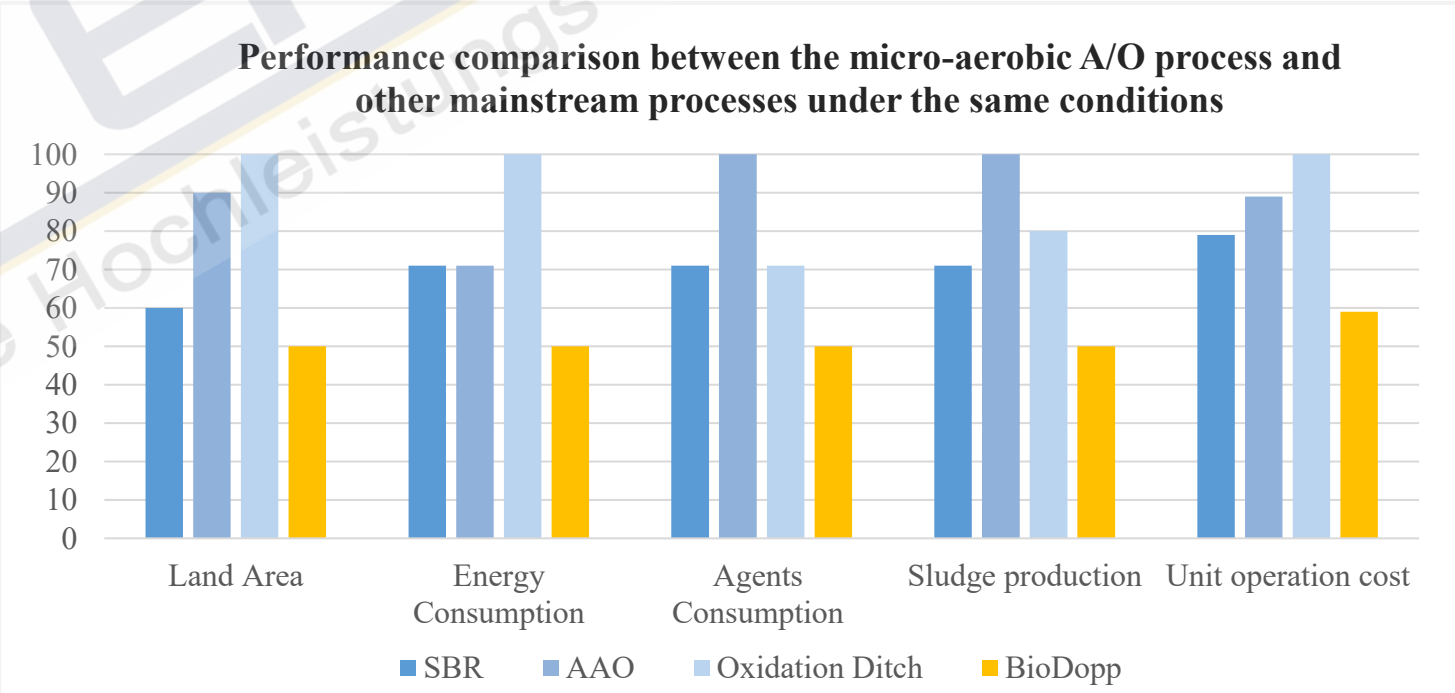
# Composition and advantages of the craft

BioDopp®

BioDopp integrates the full-liquid internal reflux of the oxidation ditch process, the different functional partitions of the $A^2/O$ process, and the advantages of the pre-positioned microbial selection zone of the CASS process. Complemented by highly efficient aeration technology, and taking the innovative air lifting and pushing technology as the source power, it has formed an integrated biochemical treatment process. It has the advantages of small land occupation, low energy consumption, low investment, and simple operation and management, and has remarkable advantages in the treatment of high-concentration refractory industrial wastewater and municipal sewage treatment.




| | | |
|---|---|---|
| MAT aeration technology | High reflux ratio technology | Microbial domestication technology |
| Air push technology | High-speed clarification technology | SAS control technology |



# Honors received by BioDopp technology (partial)

BioDopp®

- Selected for the "Green Technology Promotion Catalogue" jointly released by **the National Development and Reform Commission, Ministry of Science and Technology, Ministry of Industry and Information Technology, and Ministry of Natural Resources** (2020 version)
- Selected as an environmentally friendly technology product recommended by **the Ministry of Environmental Protection**
- Awarded the China Industry-University-Research Cooperation Innovation Achievement Award (the first national award in China for industry-university-research cooperation, established by **the Ministry of Science and Technology** and the National Science and Technology Awards Office).
- The Technology Product Progress Award of BioDopp presented by **the Ministry of Environmental Protection.**
- Appraisal Certificate of Environmental Protection Technology Achievements issued by **the Ministry of Environmental Protection.**
- Applicable Technologies for Green Chemical Industry Parks in 2021
- Selected into the Recommended Catalogue of Energy-saving Technology Products in Beijing
- Awarded the Certificate of New Technology and New Product in Beijing
- List of Practical Technologies for Key Ecological and Environmental Protection in 2021
- Awarded the Second Prize for Environmental Technology Progress in 2019
- Key Practical Technologies for Environmental Protection in 2017
- Science and Technology Achievements Award in the Industry and Information Technology field of **Henan Province** .
- Top 100 Technologies of the International Smart Convergence Platform for Environmental Protection Technologies (by the Foreign Cooperation Center of **the Ministry of Environmental Protection**)
- BioDopp Biochemical Process Technology Innovation Contribution Award
- Editorial Board Member of the National Standard Plan GB "Technical Requirements for the Evaluation of the Operation Effect of Urban Sewage Treatment Facilities"
- Editorial Board Member of the Group Standard 《Technical Specification for the Utilization of Industrial Brine》 and 《Specification for the Operation and Maintenance Management of Industrial Sewage Treatment and Reuse Engineering》

Won more than 50 provincial and ministerial-level honors.

# BioDopp biochemical process layout (Industrial wastewater I)

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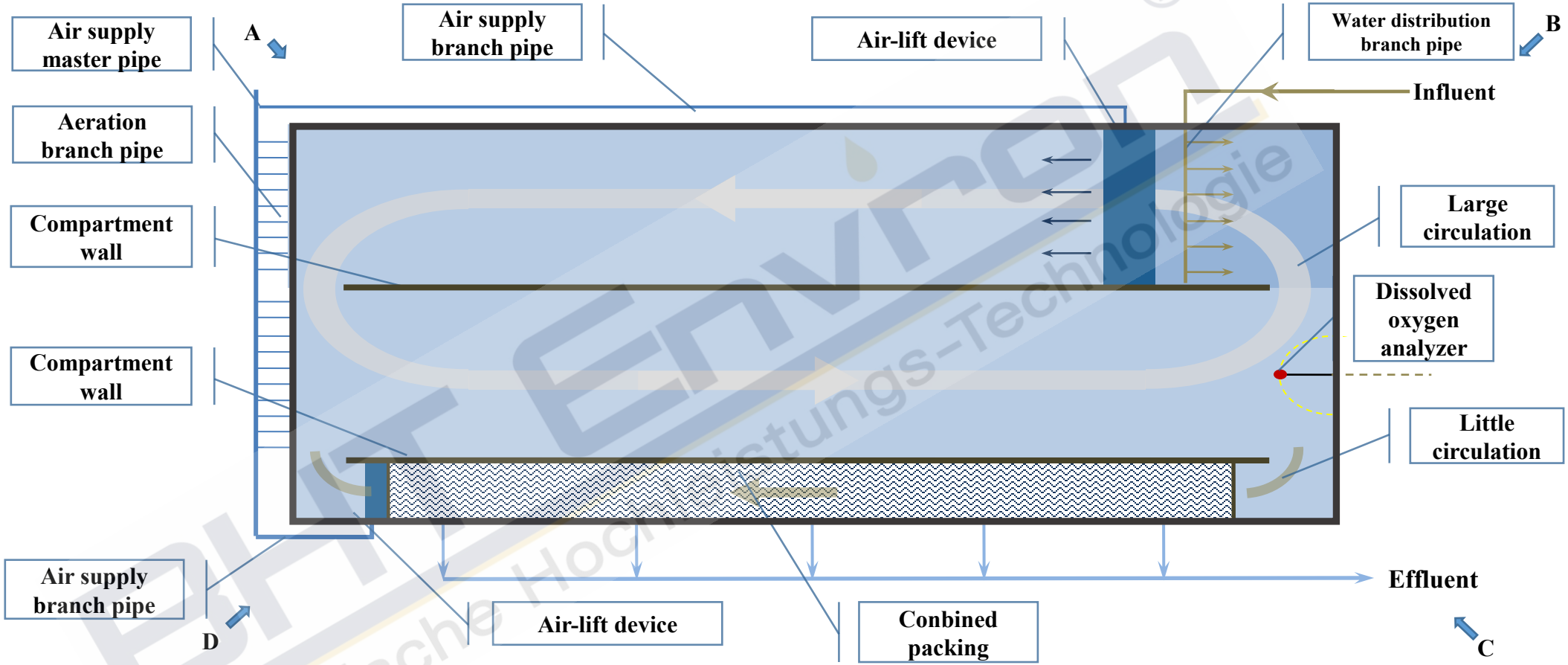
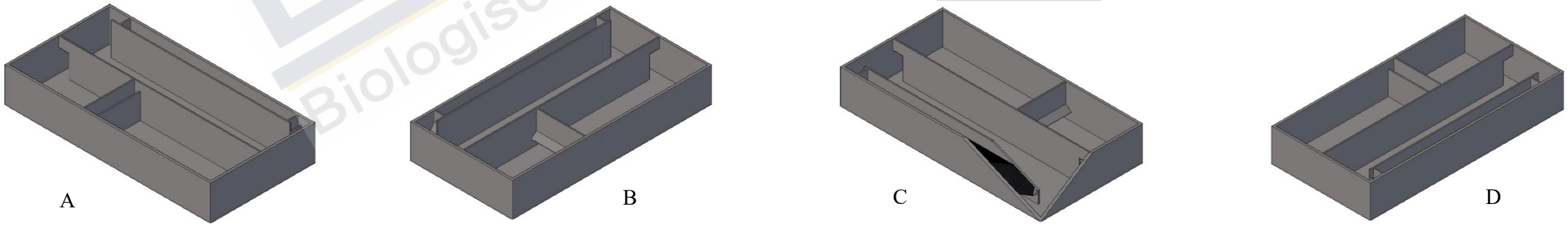
- BioDopp MAT
- Air-lift technology
- High reflux ratio technology
- Mud-water separation system
- Microbial domestication
- SAS system



# BioDopp biochemical process layout (Industrial wastewater II)

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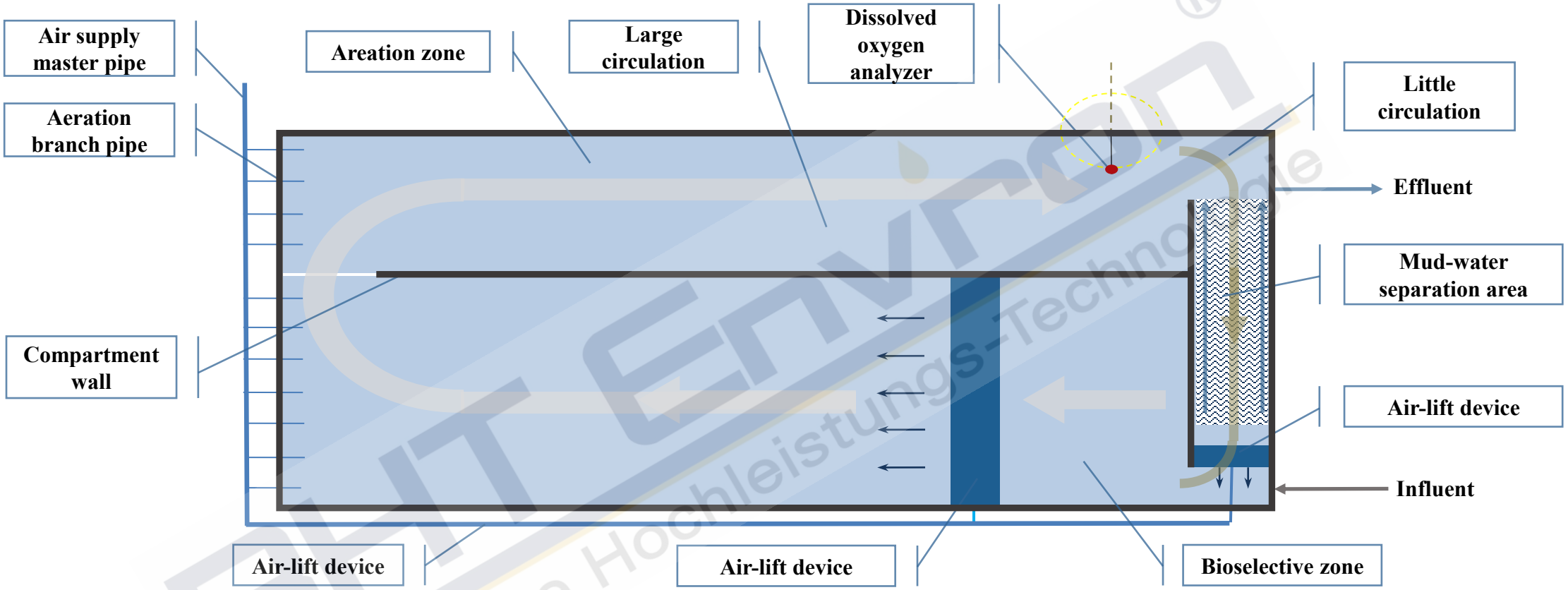


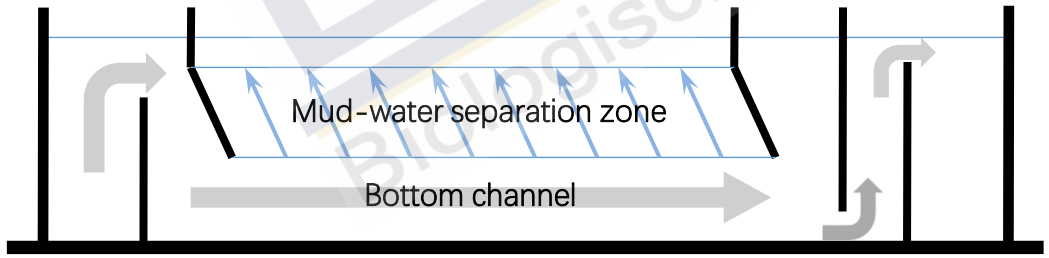


# BioDopp biochemical process layout (Industrial wastewater II)

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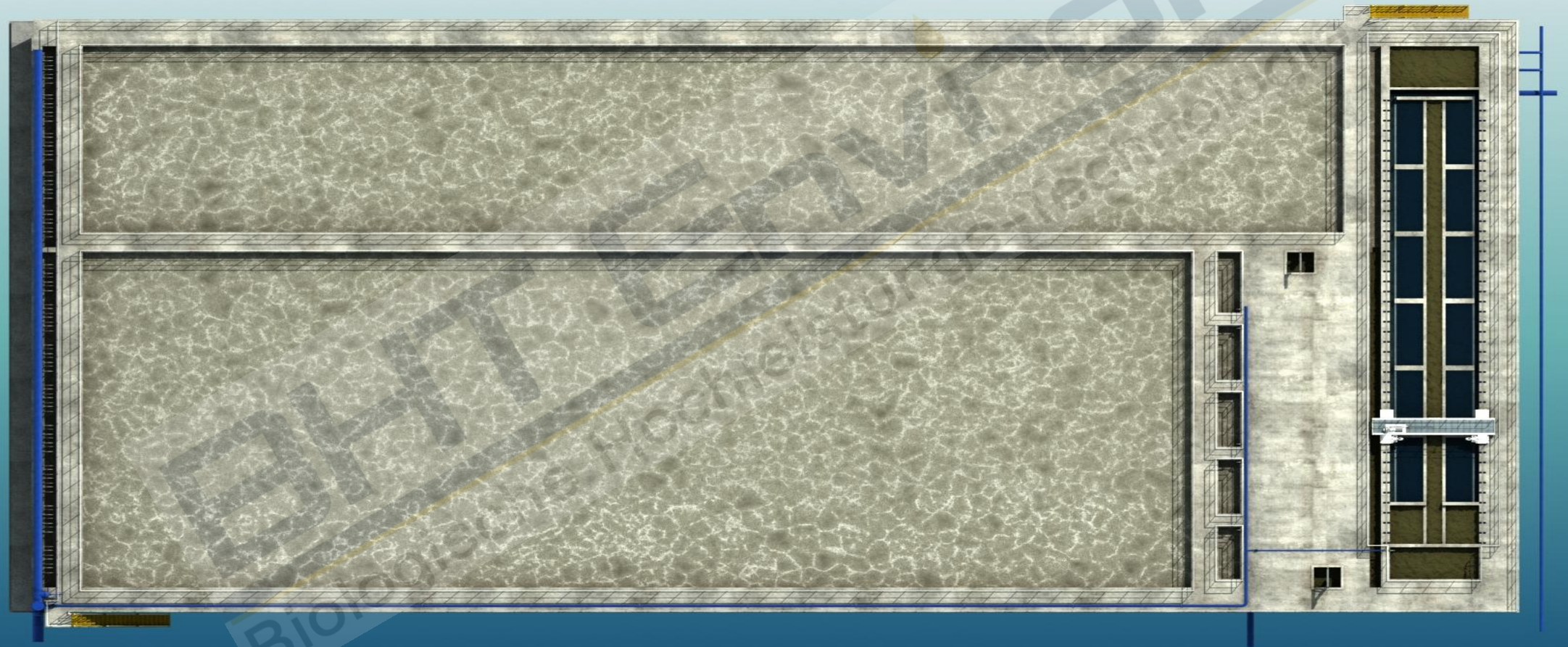

# BioDopp biochemical process layout (Industrial wastewater III)

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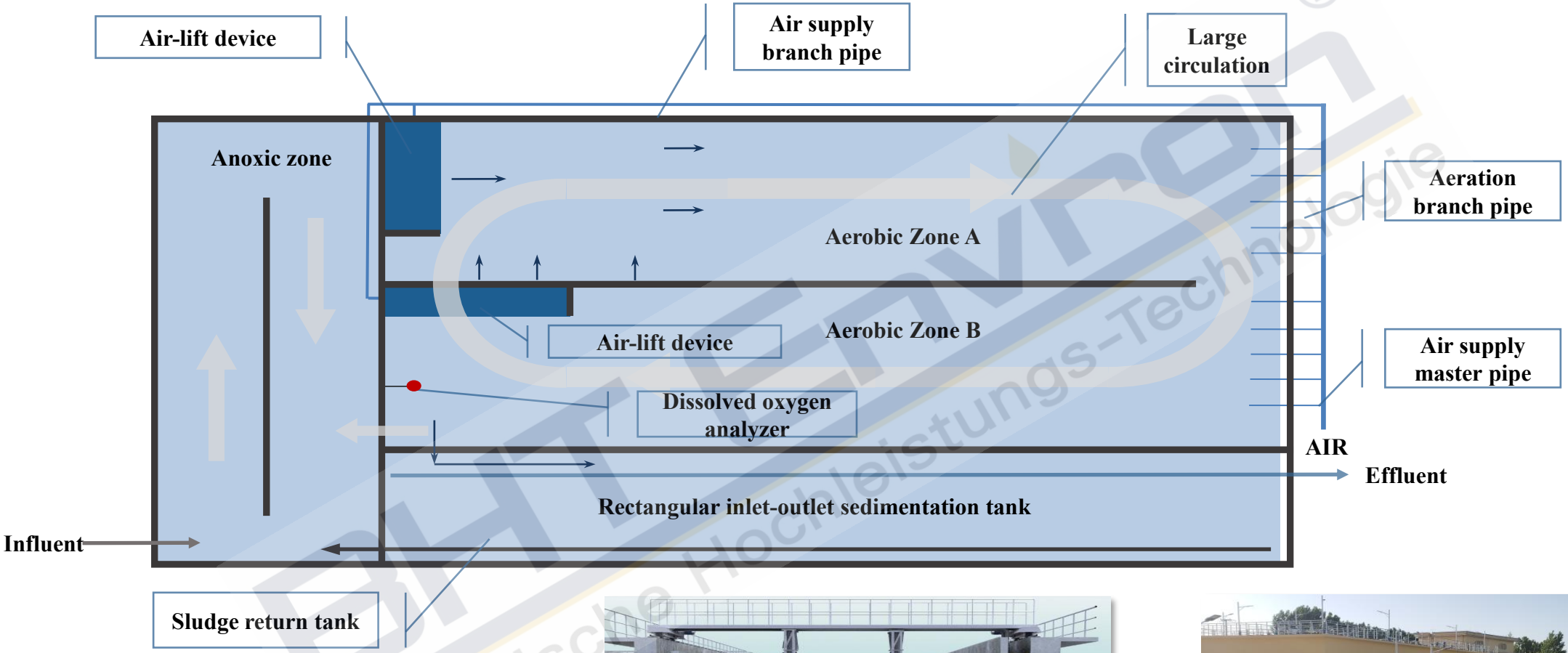


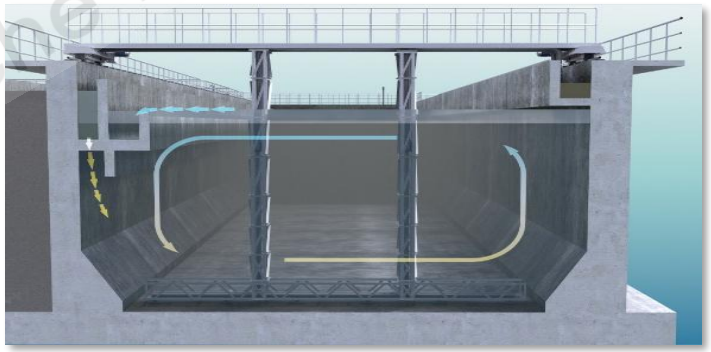

# BioDopp biochemical process layout (Municipal sewage I)

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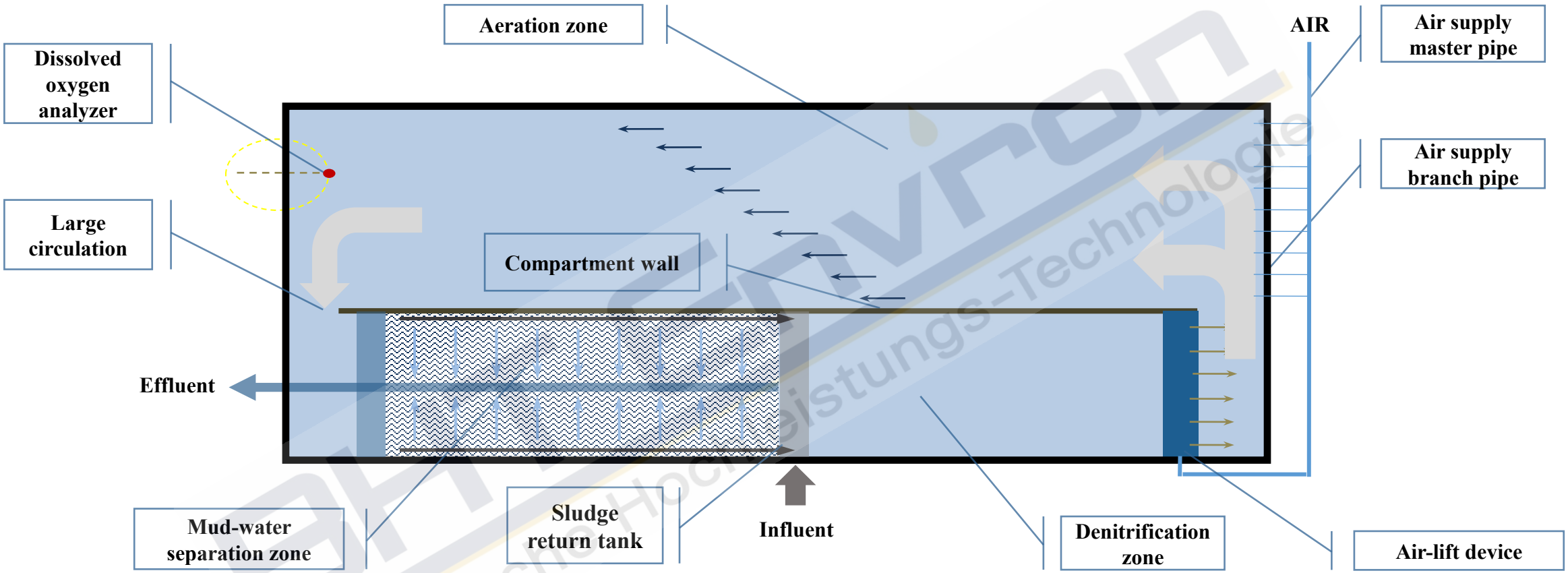


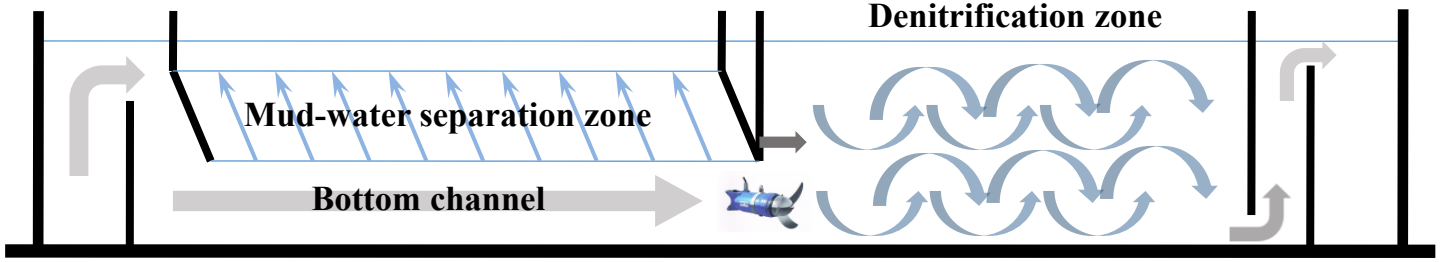

# BioDopp biochemical process layout (Municipal sewage I)

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# BioDopp biochemical process layout (Municipal sewage II)

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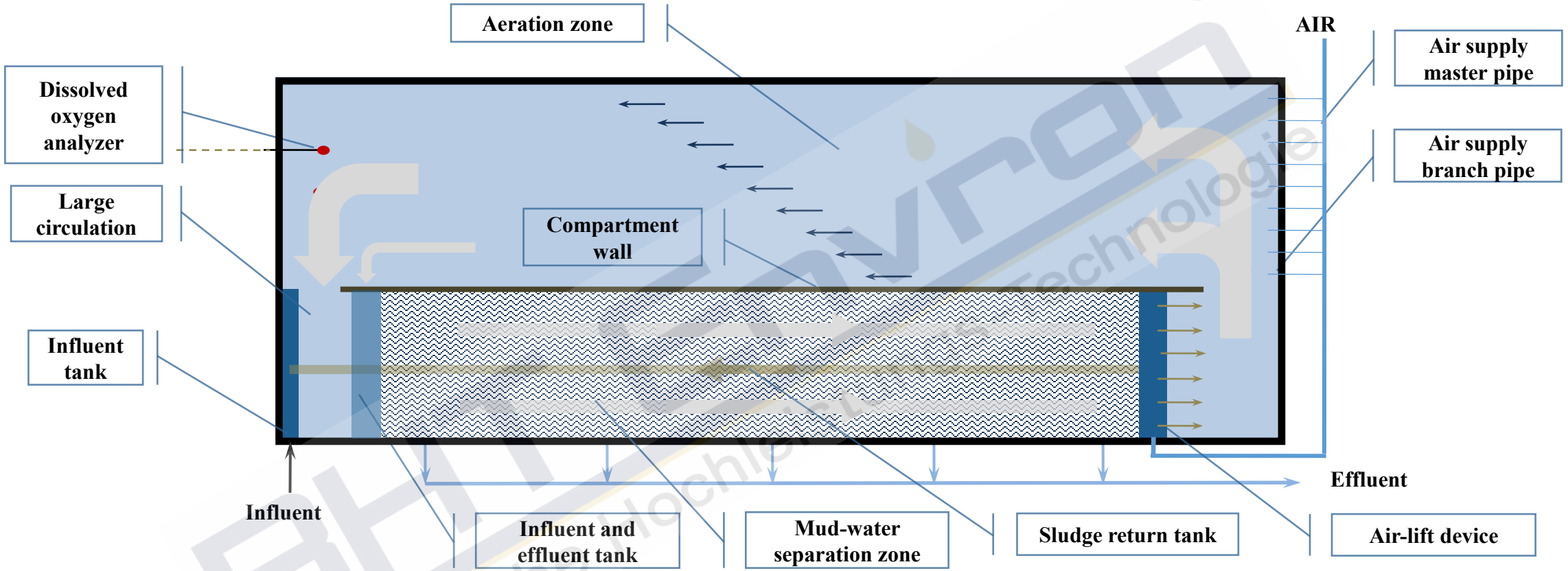


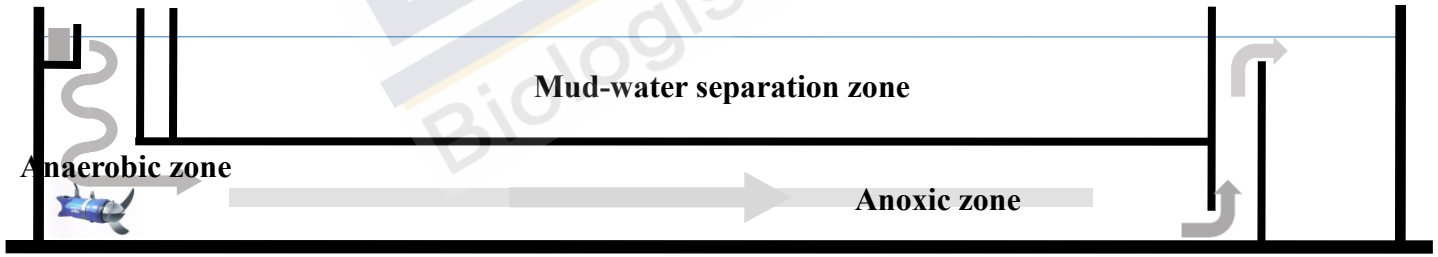


# BioDopp biochemical process layout (Municipal sewage III)

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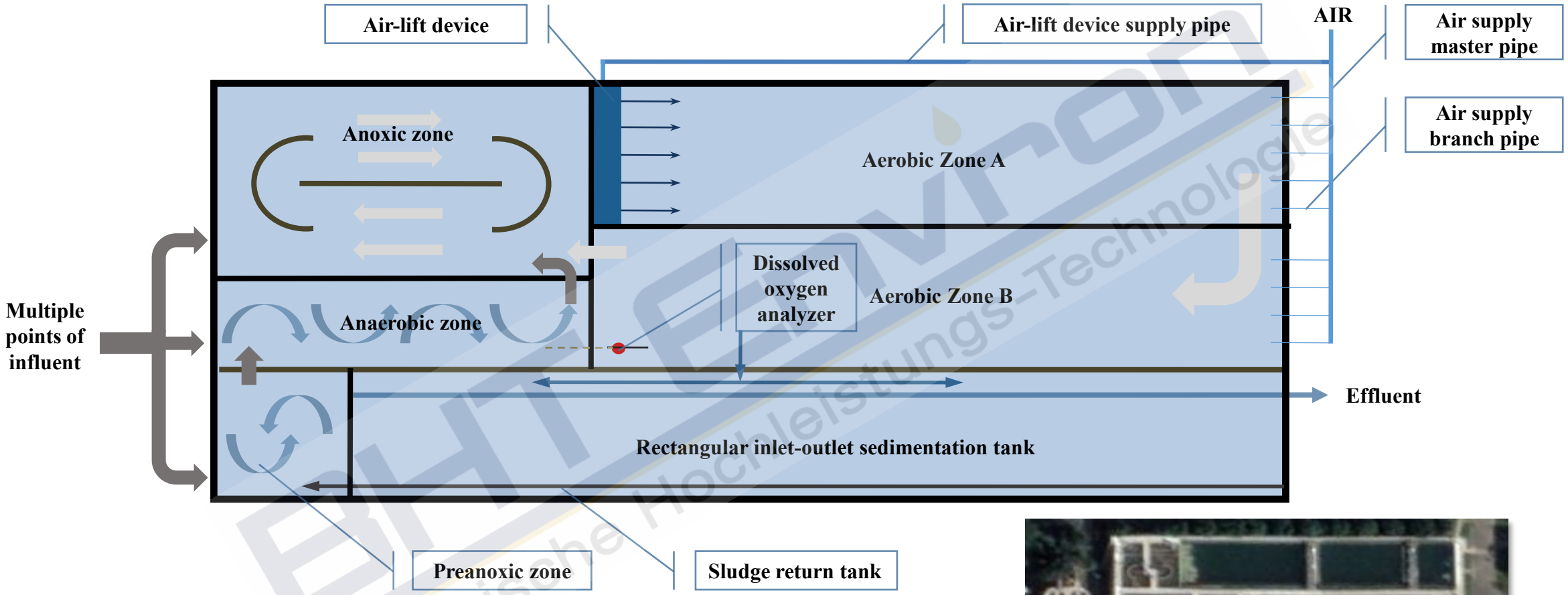


# BioDopp biochemical process layout (Municipal sewage III)

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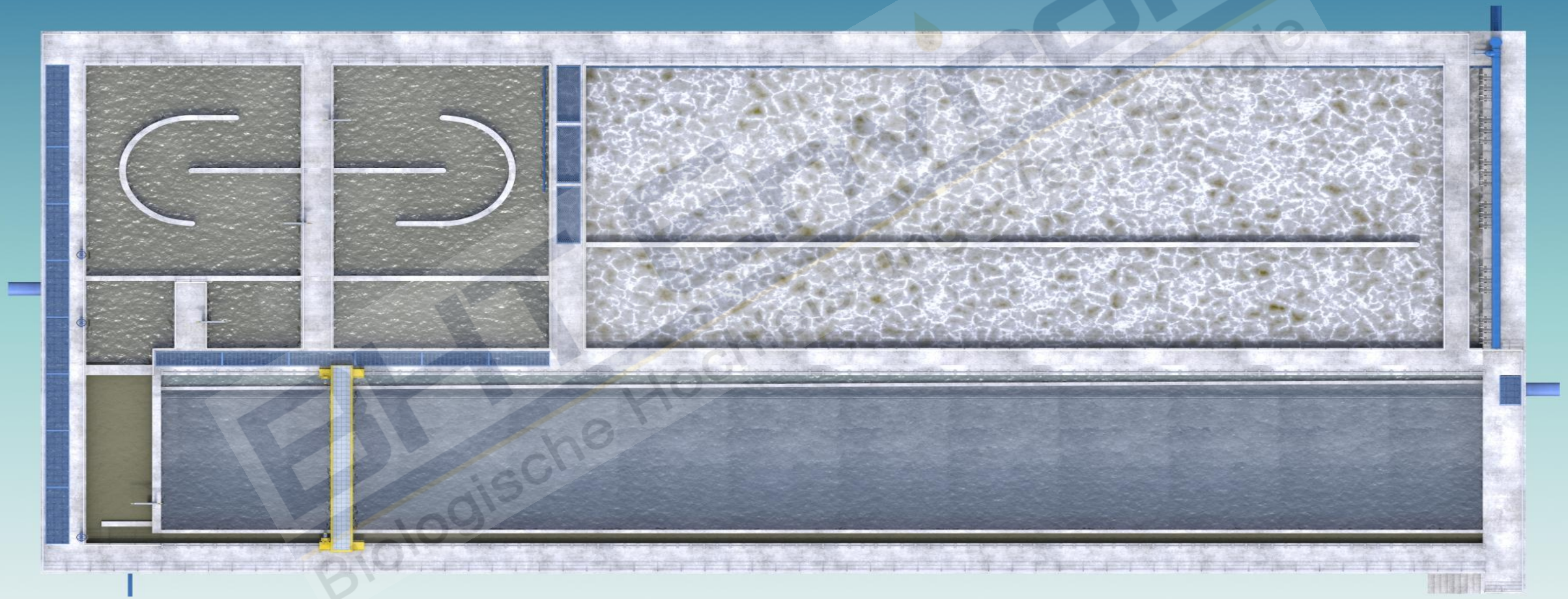

# BioDopp biochemical process layout (Municipal sewage IV for special emission standards)

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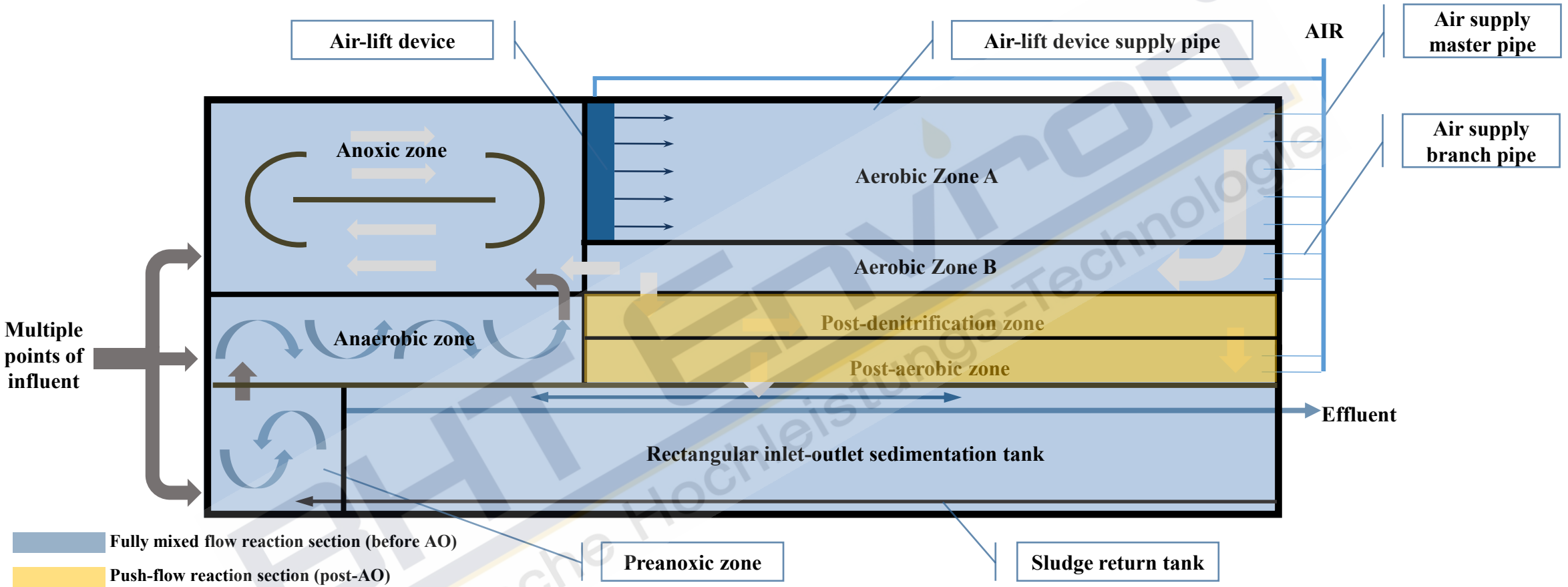


Based on the existing BioDopp III system, a post-denitrification zone and a post-aerobic zone are added. In the post-denitrification zone, an external carbon source is supplemented to enhance nitrogen removal. The post-aerobic zone further degrades residual carbon sources and ammonia nitrogen, preventing carbon source breakthrough while avoiding secondary release of TP in the sedimentation zone. This configuration ensures effluent COD, BOD, $NH_3$-N, and TN meet quasi-Class IV discharge standards. Additionally, chemical phosphorus removal methods are integrated to maximize TP elimination.

# BioDopp biochemical process layout (Municipal sewage IV for special emission standards)

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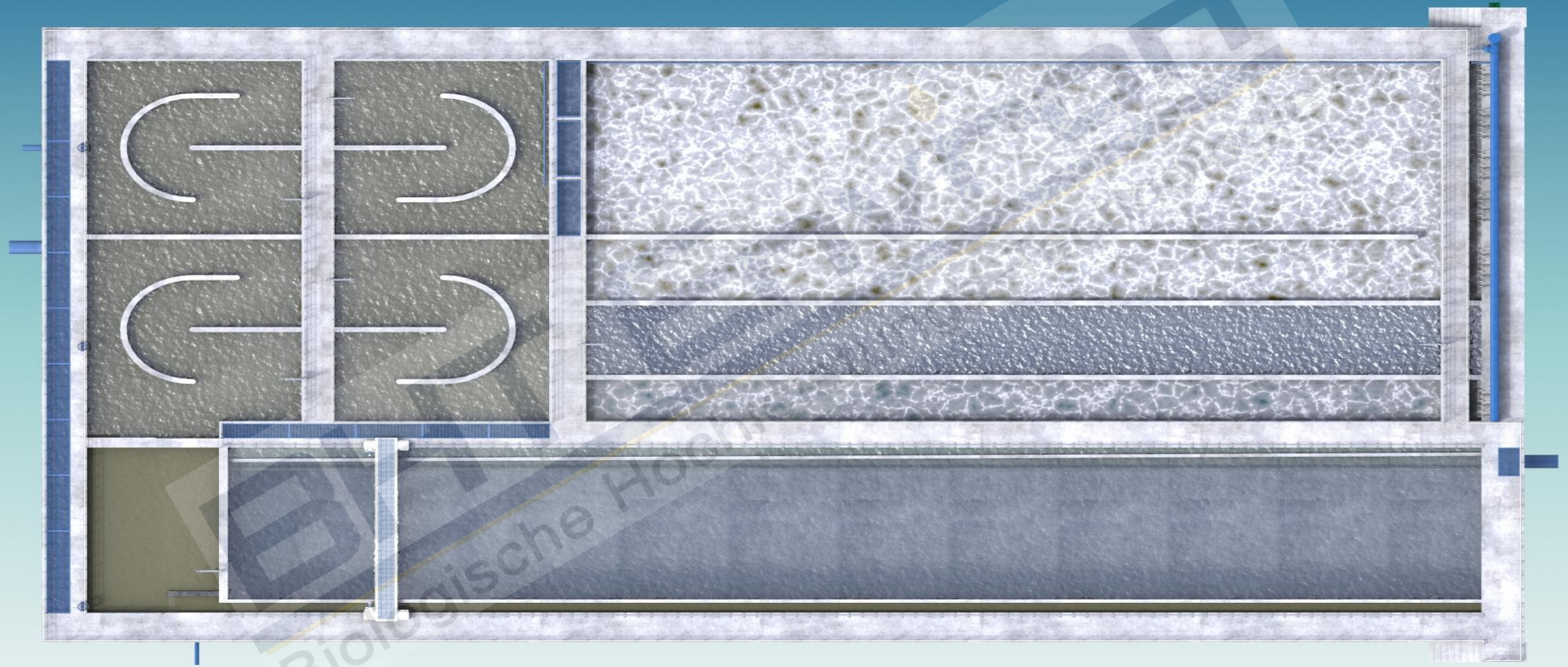

# BioDopp biochemical process layout (Municipal sewage IV)

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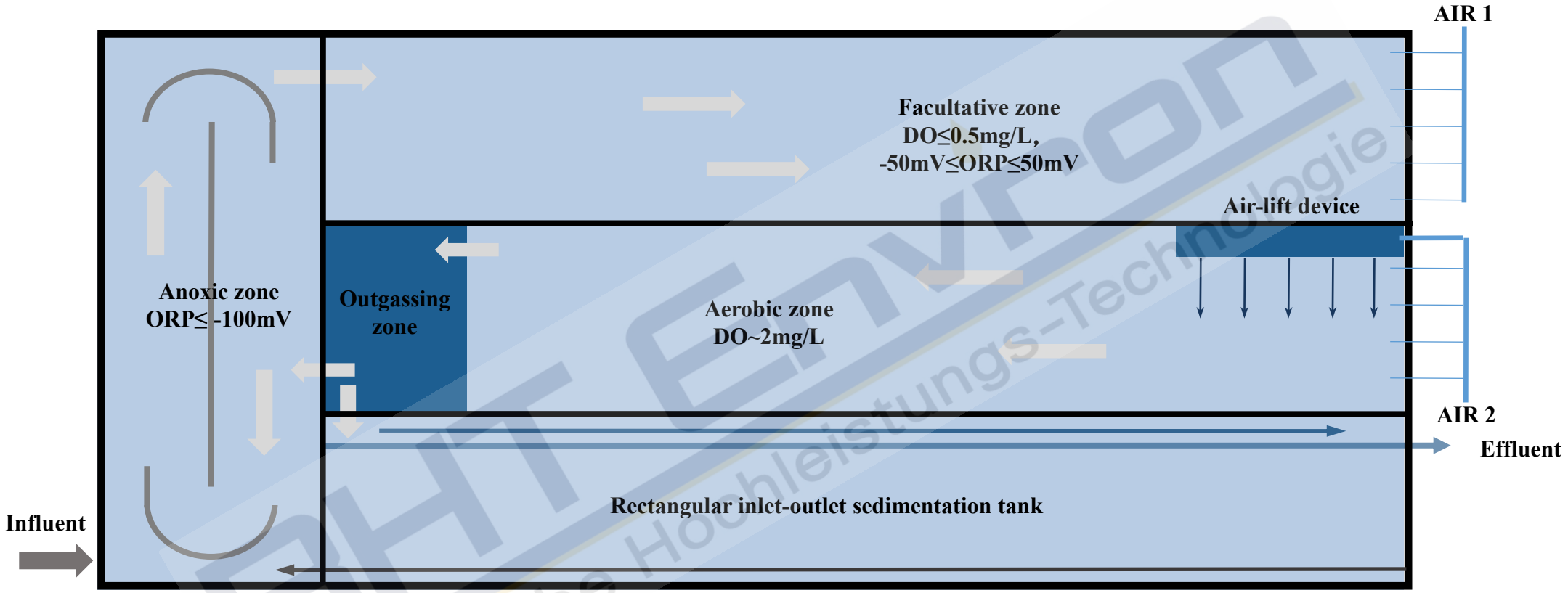


This reactor is suitable for treating influent with high $NH_3$-N concentrations. By properly configuring the facultative zone to fully utilize its simultaneous nitrification and denitrification (SND) capability, strictly controlling operational parameters across all functional zones, and maintaining adaptability to multiple operating conditions, it ensures stable effluent quality while addressing diverse process requirements.

# BioDopp biochemical process layout (BioDopp-V)

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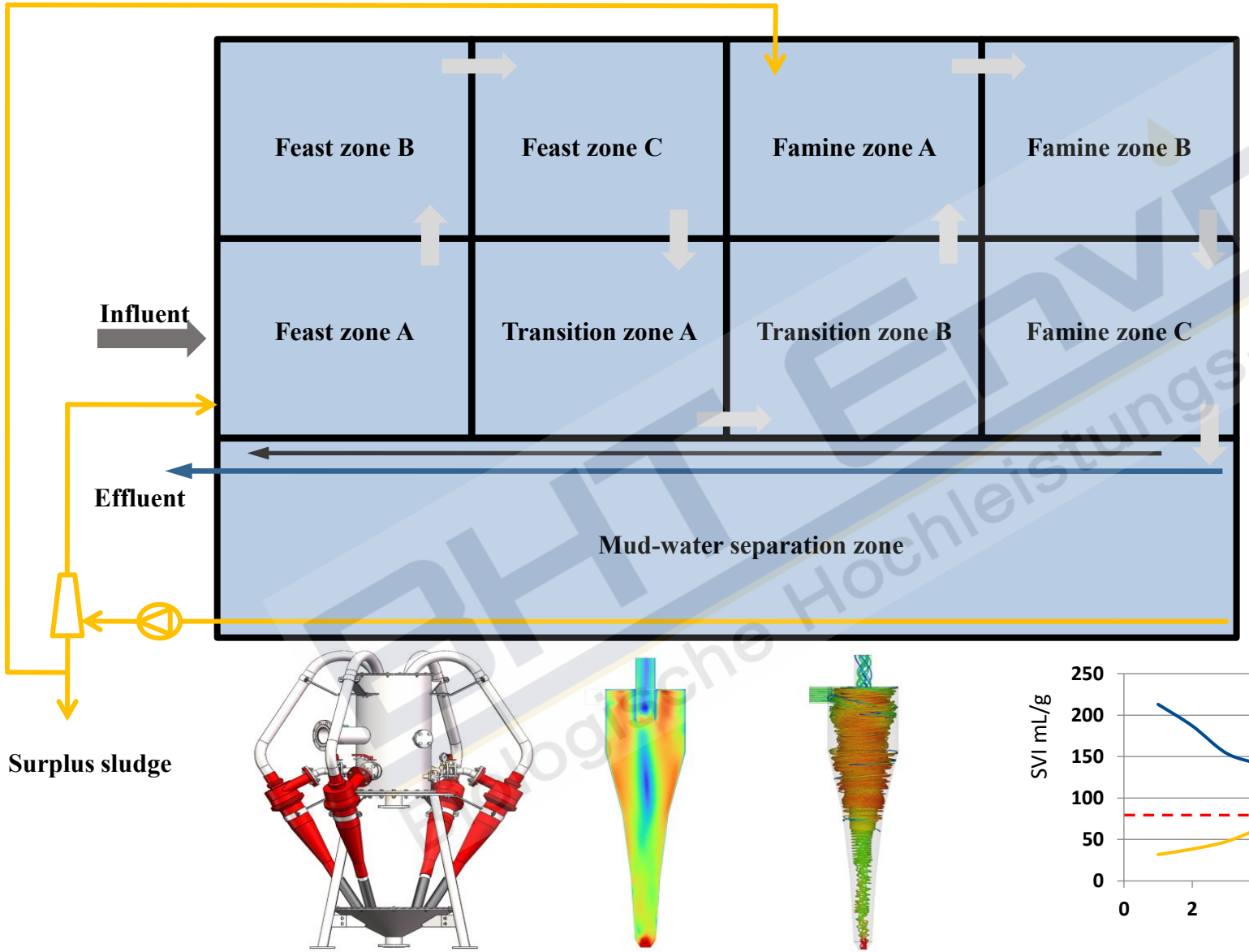



**Feast zone:**

DO: 0.3~0.8mg/L

ORP:0~100mV

MLSS:3000+1000mg/L

**Transition zone:**

DO: 0.5~2.0mg/L

ORP:50~200mV

MLSS:3000+1000mg/L

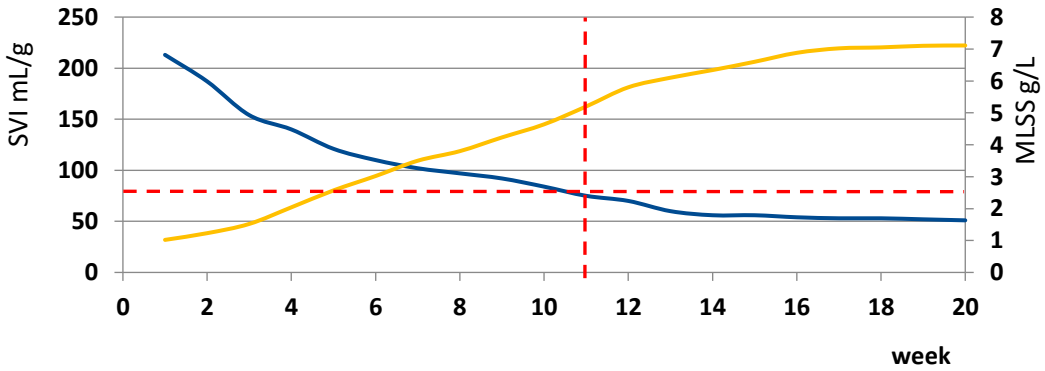
**Famine zone:**

DO: 1.0~2.0mg/L

ORP:100~300mV

MLSS:3000+3000mg/L





# BioDopp biochemical process layout (Upgrade and Retrofit of CASS)

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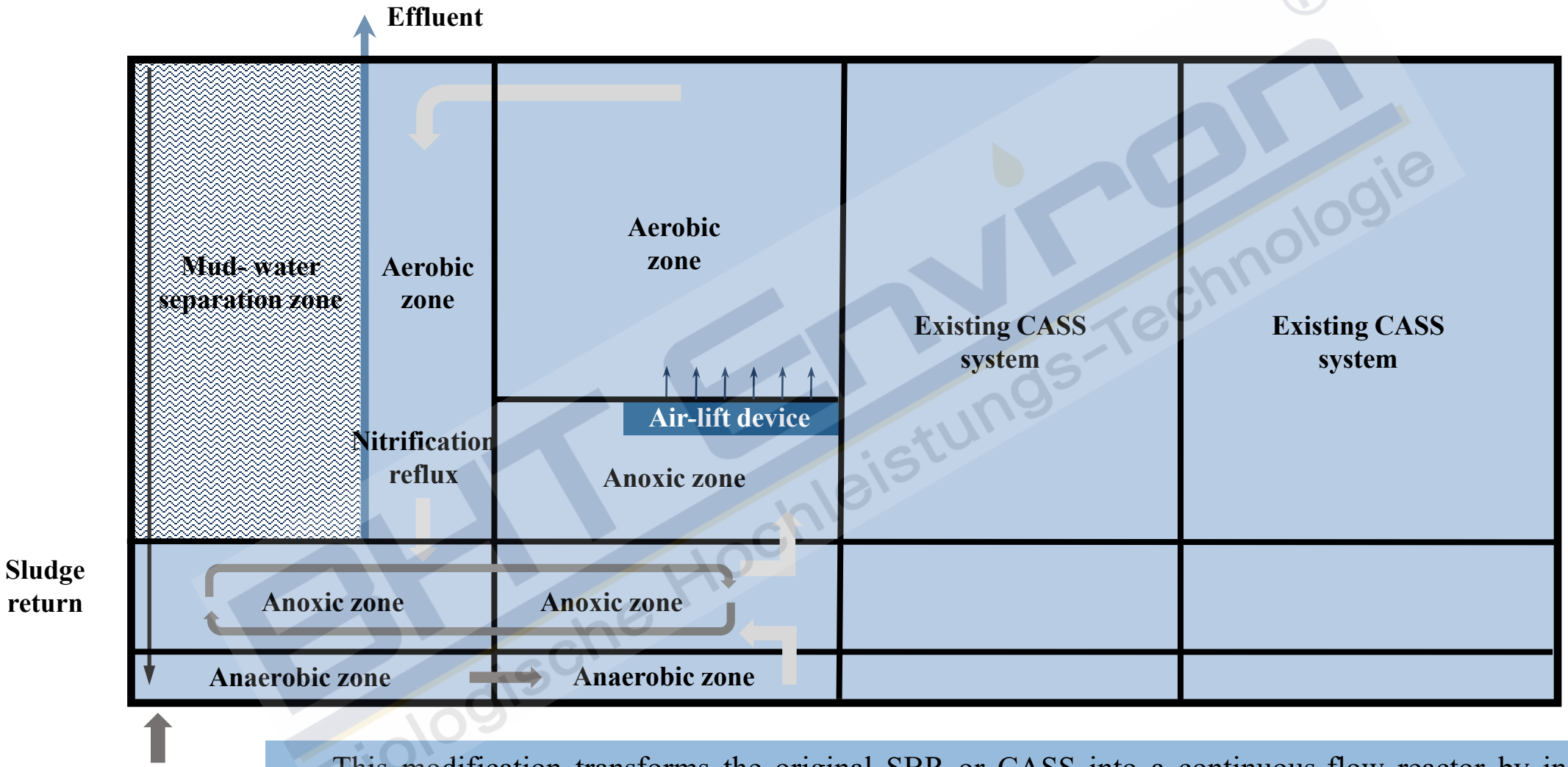



This modification transforms the original SBR or CASS into a continuous-flow reactor by incorporating partition walls and necessary equipment within the existing bioreactor, without compromising its structural integrity. The extended HRT enhances effluent quality reliability while maintaining operational continuity.

# BioDopp proprietary technology - Aeration system

BioDopp®

## Characteristics of MAT Aeration Technology

MAT aeration is a low-airflow microporous aeration technology that employs high-density uniform distribution and specialized perforation methods. This design produces small bubbles with slow ascending velocity, ensuring sufficient contact time for effective mass transfer between gas and liquid phases. The system significantly enhances oxygen transfer efficiency while eliminating aeration dead zones. By creating a fully integrated sludge-water contact environment, it maintains optimal oxygen utilization rates throughout the treatment process.

### High oxygen transfer efficiency

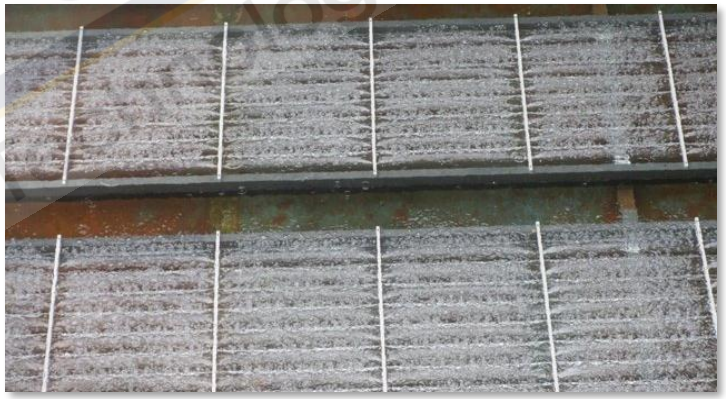
The MAT aerators made of special composite plastic material can generate microbubbles approximately 1mm in diameter. Under optimal airflow rates, it can achieve an average oxygen transfer efficiency of up to 8% per meter of water depth.

### Constant oxygen utilization

The MAT system incorporates a self-cleaning capability to ensure consistent oxygen utilization rates. Throughout its service life, the decline in oxygen utilization efficiency does not exceed 5% of the design value.

### Long service life

The base material of MAT is enhanced with special additives, providing high deformation resistance and tear resistance indices. The aeration pipes are guaranteed a service life of 10 years under normal operating conditions.



Generated microbubbles by BioDopp MAT

The bubbles produced byBioDopp MAT are tiny and uniform.

# Physical and chemical characteristics of BioDopp MAT

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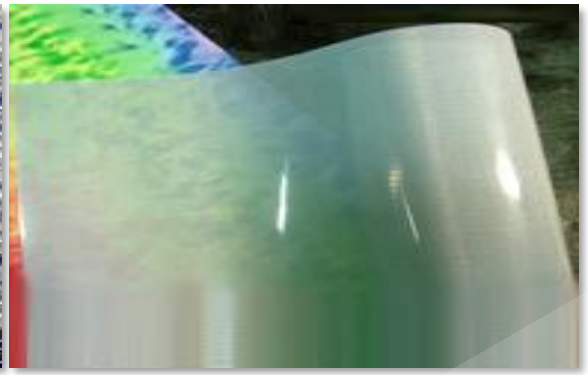


| Application environment | Polyether urethane | Ethylene-Propylene-Diene Monomer, EPDM | Silica gel |
|---|---|---|---|
| Soft and crack-resistant | ● | △ | ● |
| Resistant to organic oil and fat | ● | △ | ◎ |
| Resistant to mineral oils | ● | △ | ◎ |
| Smooth surface | ● | △ | ● |
| Resistant to biodegradation | ● | △ | ● |
| Resistant to hydrolysis | ● | ◎ | △ |
| Continuous tensile properties | ● | ◎ | ◎ |
| Resistant to UV resistant | ● | △ | ● |
| Resistant to strong oxidizers | ● | △ | ● |

●Strong tolerance ; ◎Weak tolerance ; △Intolerable

In the field of wastewater treatment, BioDopp MAT demonstrates exceptional physicochemical performance across diverse application environments. With superior broad-spectrum adaptability, it can be effectively utilized in any complex water conditions.

| Soaking solvents | Polyether urethane | Ethylene-Propylene-Diene Monomer, EPDM | Silica gel |
|---|---|---|---|
| 60% sulfuric acid | ● | ● | ● |
| 10% hydrochloric acid | ● | ● | ● |
| 5% acetic acid | ● | ● | ● |
| 50% caustic alkali | ● | ● | △ |
| 95% ethanol | ● | ● | ● |
| Acetone | ● | △ | ◎ |
| Benzene | ● | △ | ● |
| Ethyl acetate | ● | △ | ● |
| Concentrated ammonia | ● | ● | ◎ |
| Formaldehyde | ● | ● | ● |
| 3% hydrogen peroxide | ● | ● | ◎ |
| Detergent | ● | ● | ● |
| White lamp oil | ● | ◎ | ● |
| Unleaded gasoline | ● | △ | ● |
| Braking oil | ● | △ | ● |
| Mechanical oil | ● | ◎ | ● |
| 50% ethanol | ● | ● | ● |

Immersion for one month at room temperature ●Insoluble; ◎Dissolved; △Soluble

In the field of wastewater treatment, BioDopp MAT demonstrates exceptional resistance to nearly all non-extreme chemical solvents. Even after immersion in acids, bases, oxidizing agents, and swelling agents for one month, it maintains superior operational performance. This offers significant advantages over traditional materials such as EPDM rubber and silicone rubber commonly used in such applications.

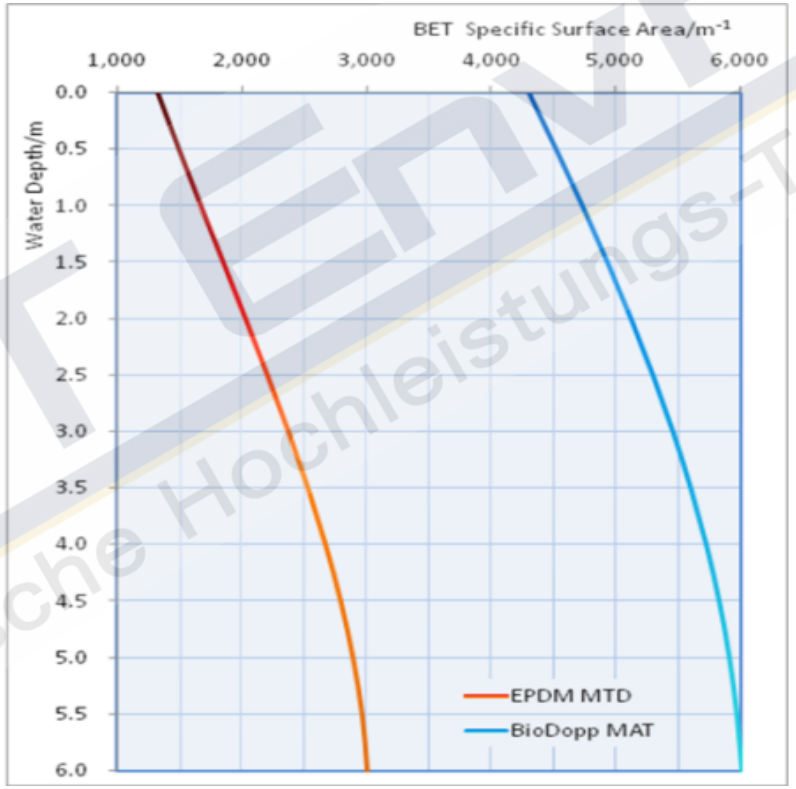
# Working characteristics of BioDopp MAT

BioDopp®

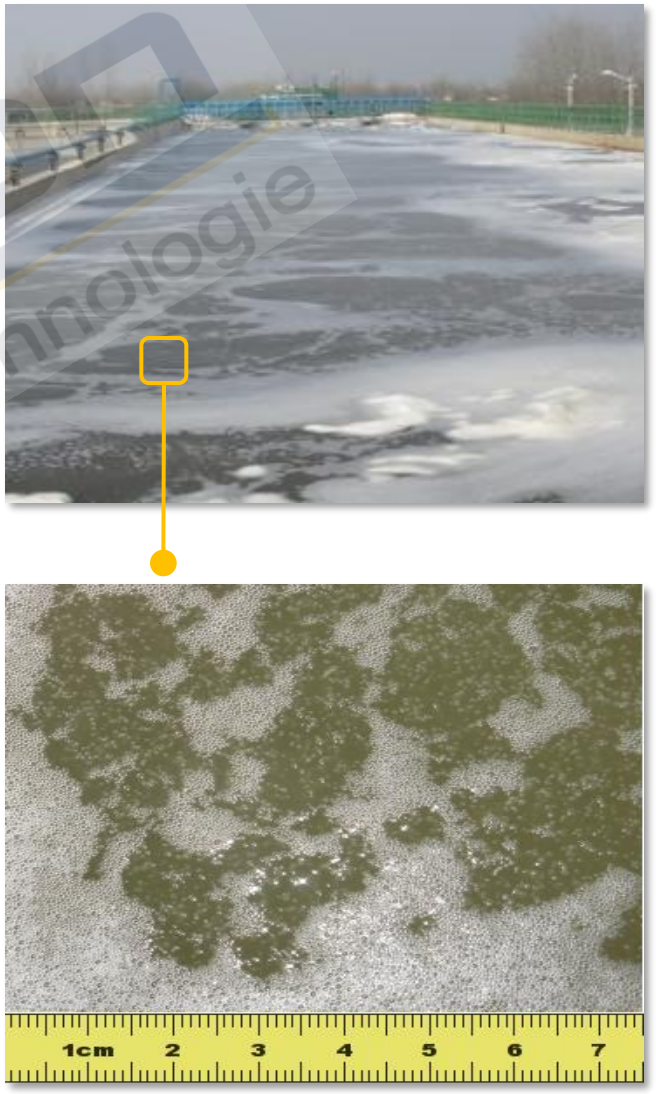
The BioDopp MAT generates bubbles with a smaller diameter of approximately 1mm. These bubbles rise relatively slowly in water and are less prone to mutual collisions, significantly weakening the clustering effect. This allows the bubbles to remain in the tank for an extended duration, prolonging mass transfer time and enhancing oxygen utilization efficiency.

Under the same aeration volume at a 6m water depth, the specific surface area of bubbles produced by BioDopp MAT is 2–4 times greater than that of EPDM MTD. This greatly enhances the oxygen mass transfer area, thereby improving oxygen utilization rates in wastewater treatment processes


Comparison of bubble diameters from different aerator pipes under varying water depths.




Comparison of specific surface area from different aerator pipes under varying water depths.



# Installation of BioDopp MAT

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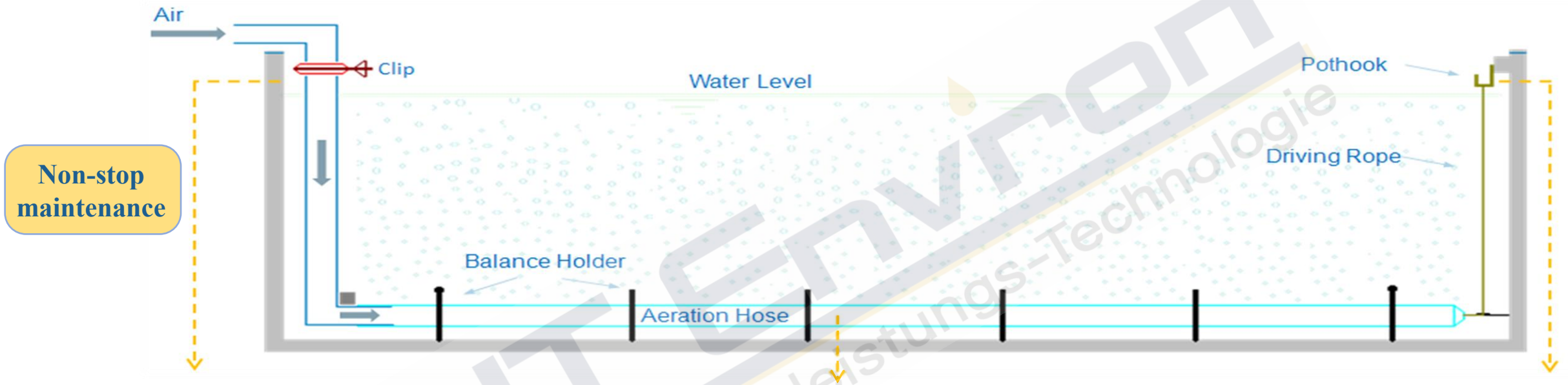


**Non-stop maintenance**

Air distribution branch pipe

BioDopp MAT

Tow rope

# Cleaning and replacement of BioDopp MAT

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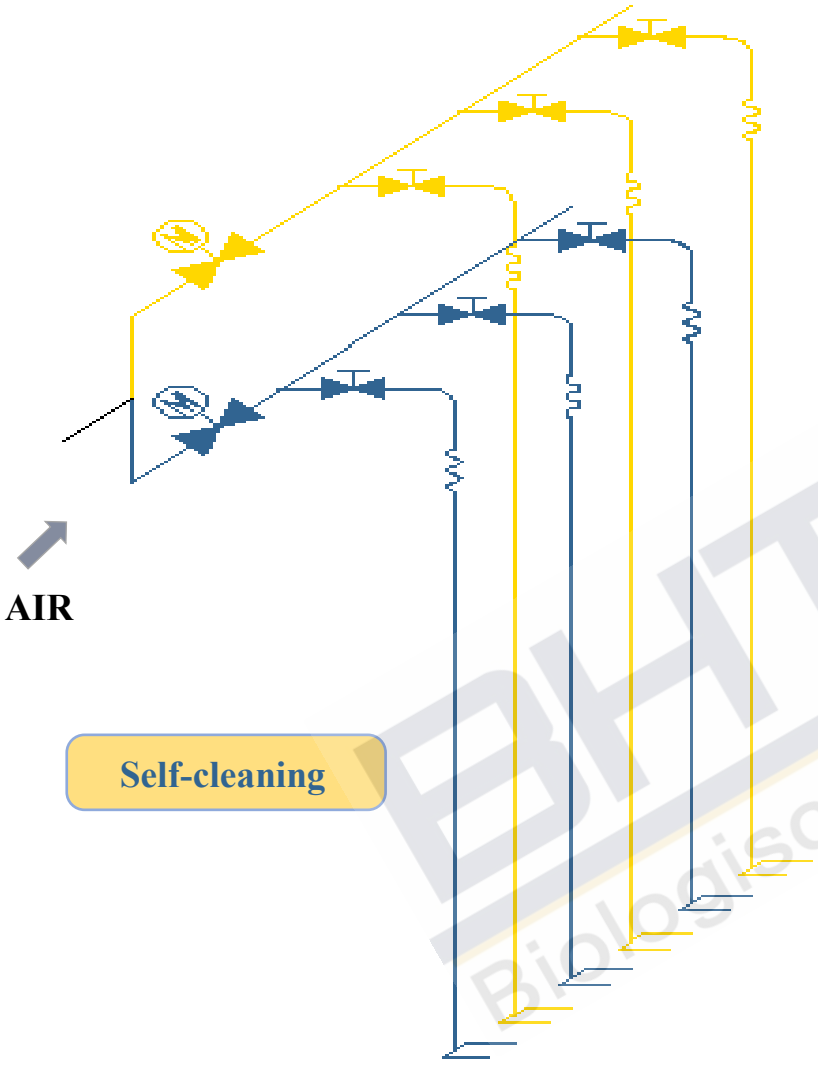


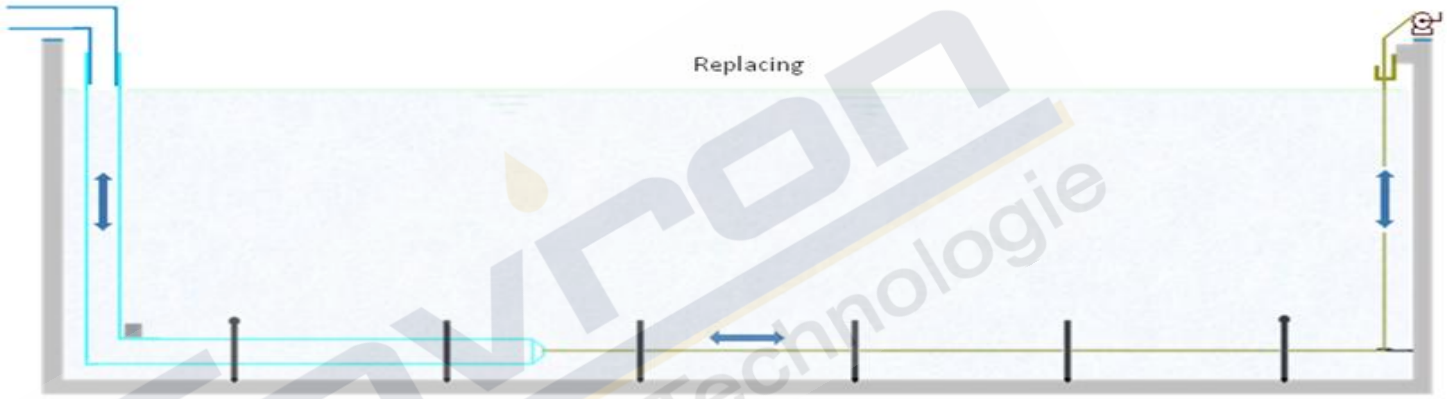


The BioDopp MAT system adopts an innovative full-length layout design, breaking away from traditional configurations. Its air distribution branch pipes feature a double-layer arrangement, where one end of the aeration tube connects to the air supply branch pipe equipped with quick-connect couplings, while the other end is tensioned with a composite material rope. By opening or closing the electric valves on the air supply branch pipes, the aeration tubes can expand or collapse to achieve self-cleaning functionality.

During aeration tube replacement, operators simply need to disconnect the tensioned rope and quick-connect couplings on the air supply branch pipe. The aeration tube can then be removed from the tank bottom along the stabilizing guide device. After replacement, the new tube is guided back into position along the tensioned rope. The entire process requires only one operator and can be completed within 15 minutes without stopping operations or emptying the tank, ensuring efficient and convenient maintenance.

# BioDopp proprietary technology - Air-lift technology

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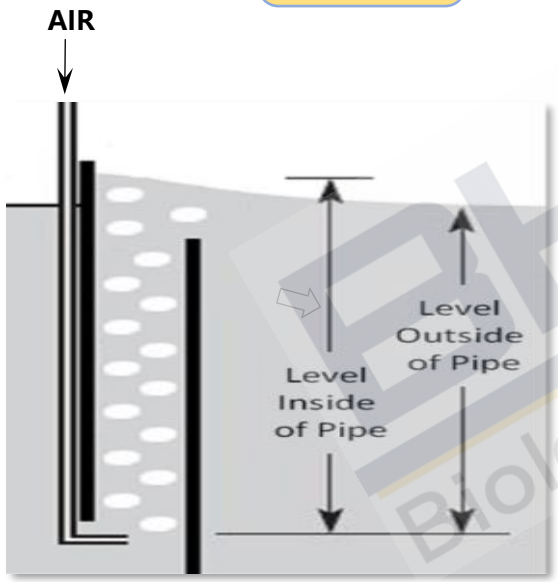
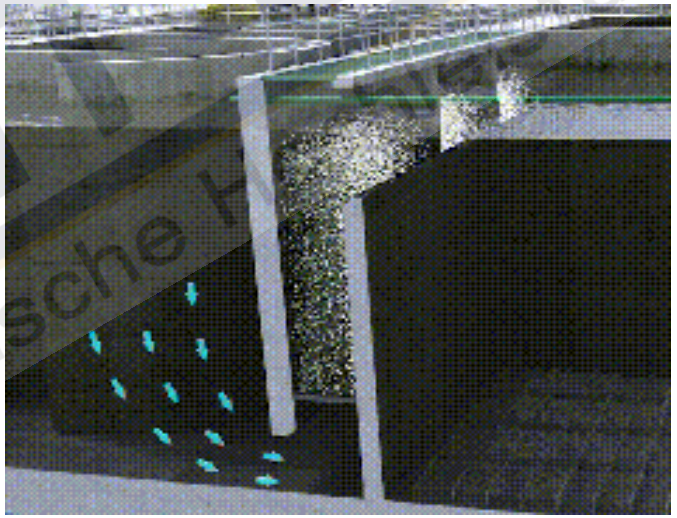
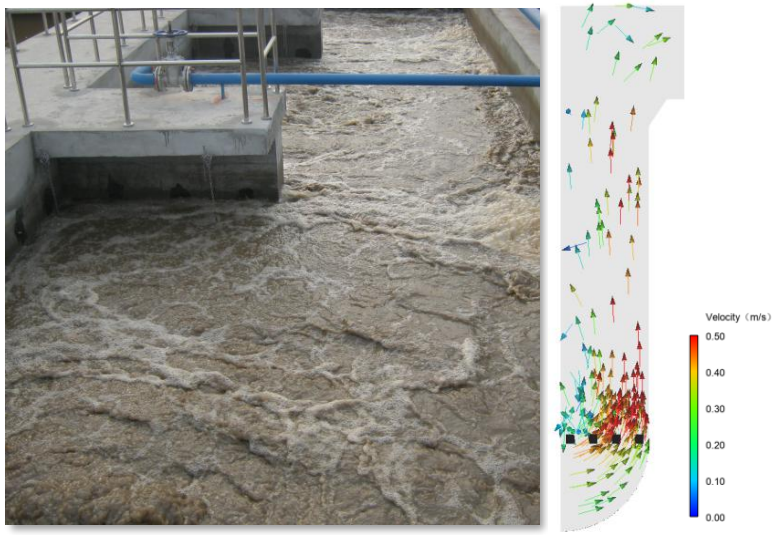
## The principle of air-lift device

The air-lift device utilizes compressed air generated by blowers as the power source. By applying uniform aeration distribution technology, it alters the density of localized water bodies, raising the liquid level in the aerated zone within a specialized tank configuration to drive directional water flow. Adjusting the airflow rate of the aeration system directly regulates the mixed liquor recirculation ratio, thereby enabling dynamic control of high-flow water currents throughout the tank for adaptive process management.

Low head → Low energy consumption → Large cross-section → Large flow

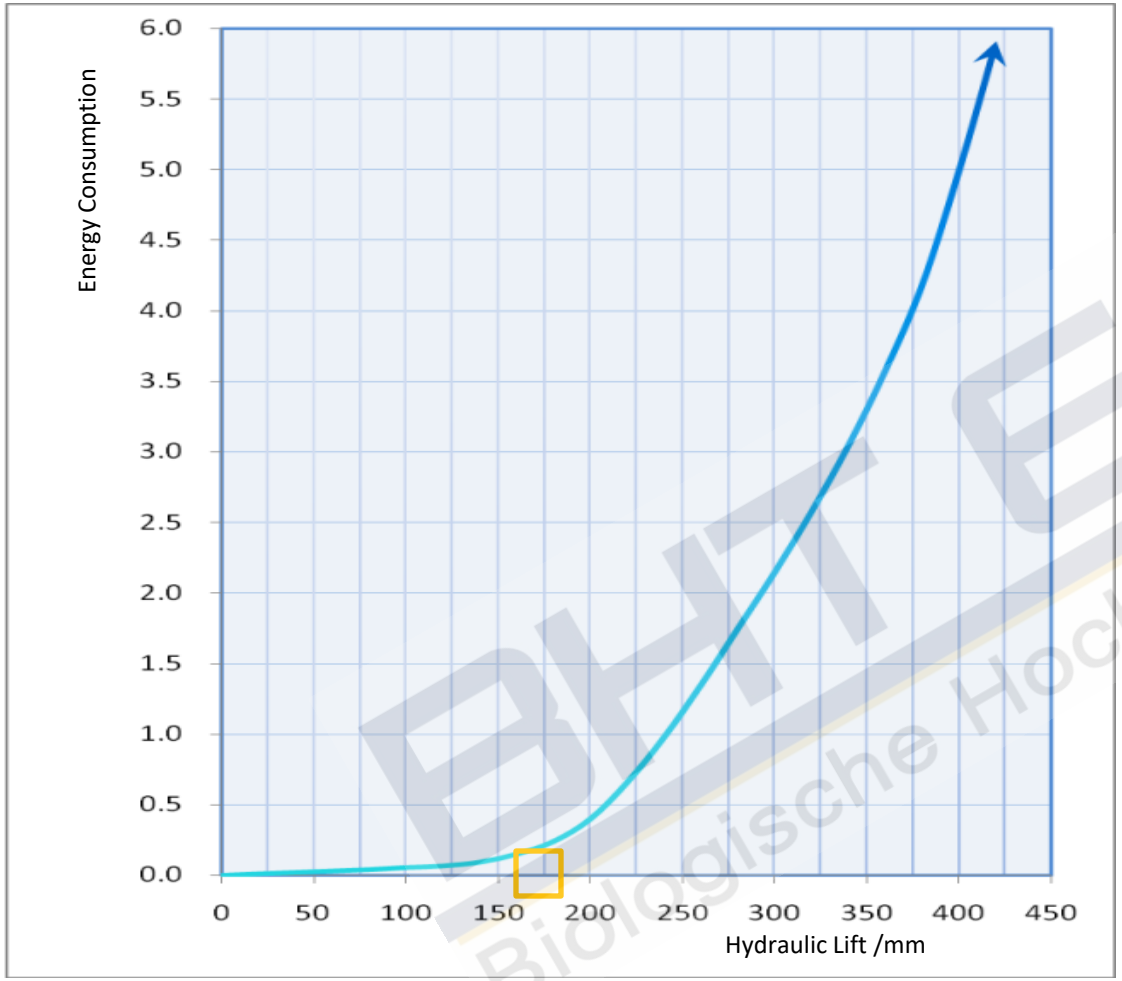


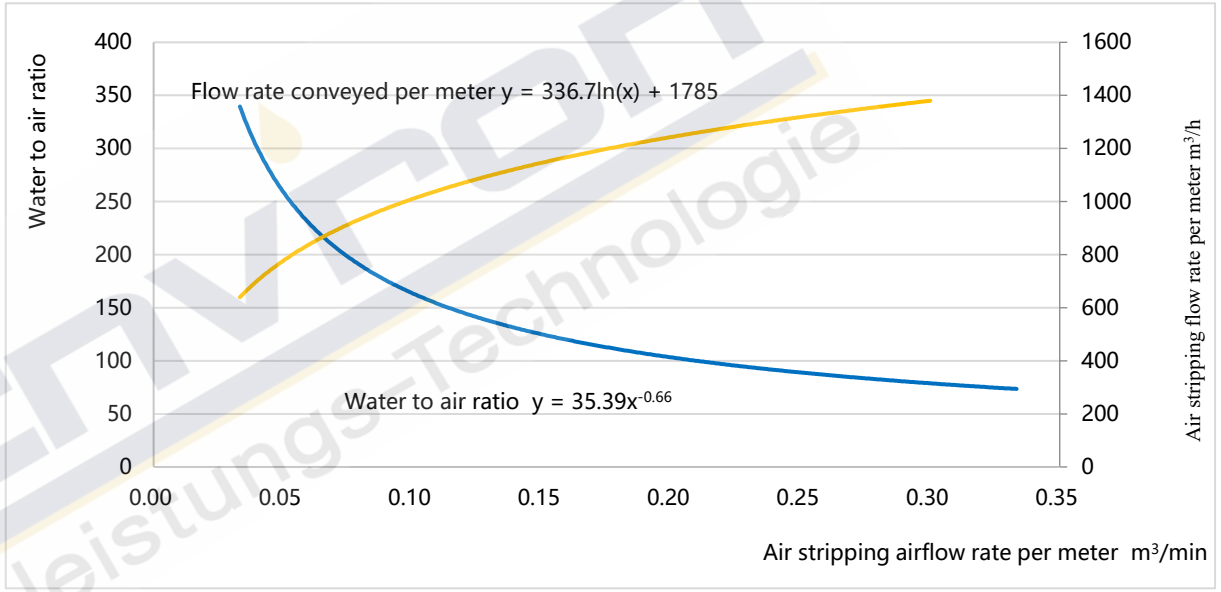





# Working range of air-lift device in BioDopp

BioDopp®

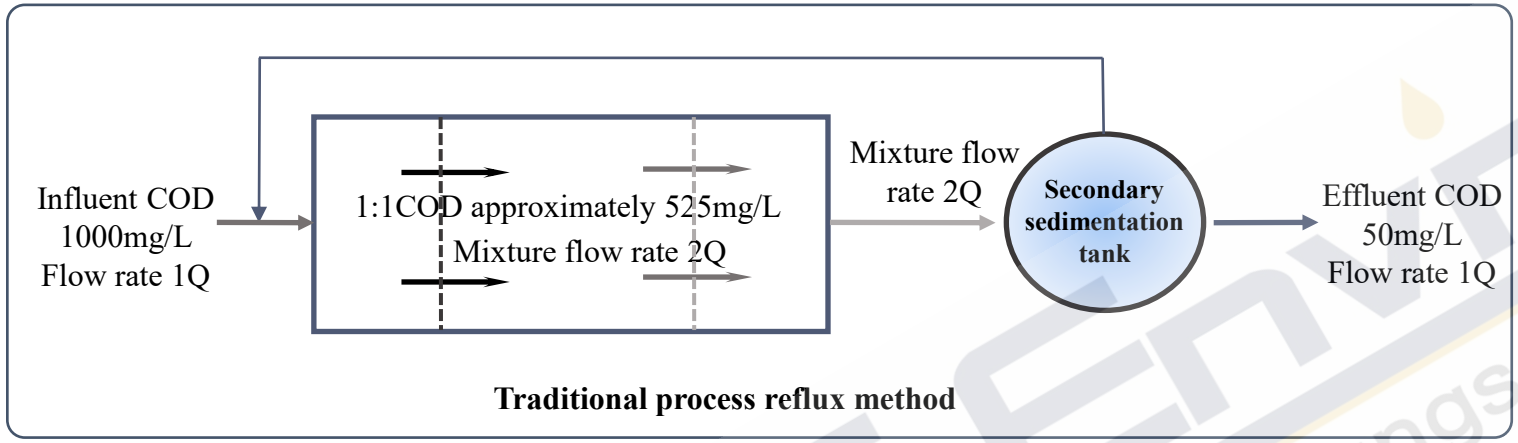


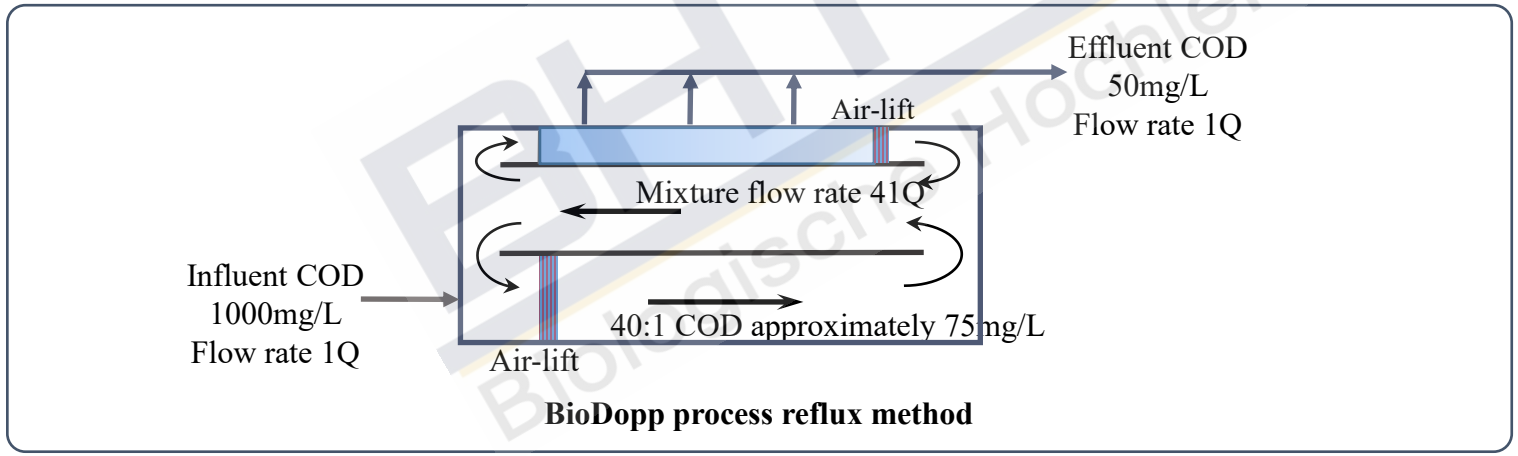

The liquid level generated by the air-lift device exhibits an exponential relationship with its energy consumption. In BioDopp systems, air-lift device achieves high-volume flow through a low-head, large cross-sectional design, with the lift typically maintained at approximately 50mm (operating range indicated by the yellow zone in the diagram). This configuration enables complete liquid recirculation ratios ranging from tens to hundreds of times the original flow under low airflow (low energy consumption), effectively meeting process design requirements.

# BioDopp proprietary technology - High reflux ratio technology

BioDopp®




**Traditional process reflux method**

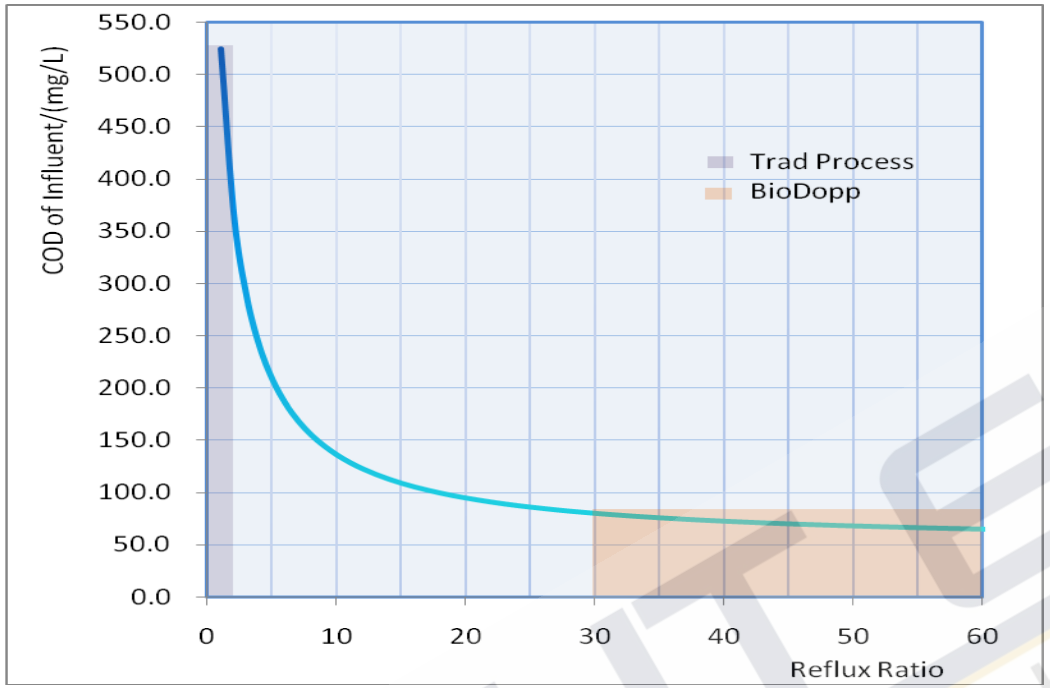



**BioDopp process reflux method**

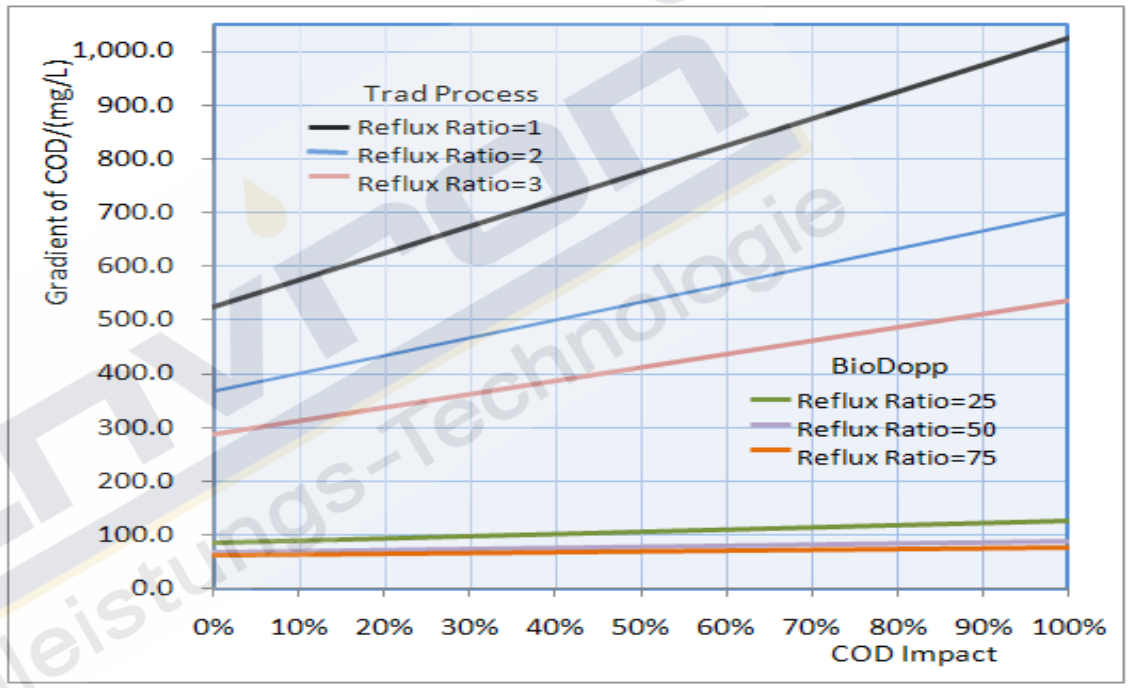
The high reflux ratio in BioDopp biochemical process is achieved through air-lift technology. Its primary advantage lies in instant dilution of influent concentration, minimizing concentration gradient loads within the entire biological tank while effectively resisting shock loads. Conventional processes typically employ pump-driven sludge-water recirculation with ratios between 1:1 and 3:1, whereas BioDopp biochemical process utilizes air-lift device for full-liquid recirculation, achieving ratios from tens to hundreds of times under low energy consumption.

Under equivalent conditions, the pollutant concentration gradient within BioDopp biochemical process is approximately 1/20th of that in traditional biochemical reactors. This provides microorganisms with a stable external environment conducive to growth and reproduction.

# Working range of the reflux ratio in BioDopp




Different reflux ratio working range between traditional process and BioDopp biochemical process



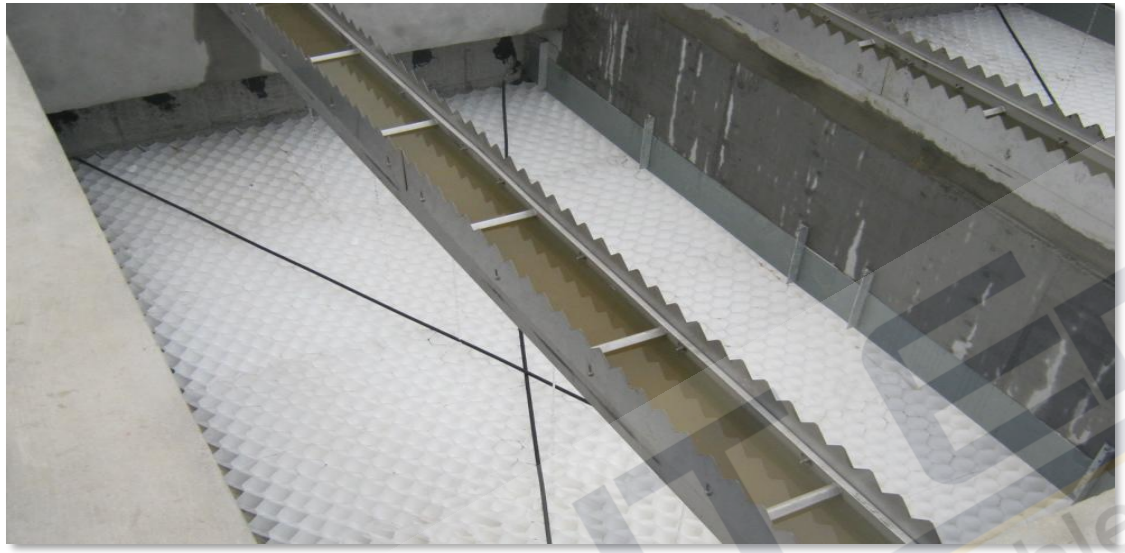

COD concentration gradient in the biochemical tank under concentration shock

| Process | Reflux ratio | Influent COD/(mg/L) | COD after reflux dilution/(mg/L) | Effluent COD/(mg/L) | COD gradient in the biochemical tanks/(mg/L) |
|---|---|---|---|---|---|
| Traditional process | 1 | 1000 | 525 | 50 | 475 |
| BioDopp biochemical process | 40 | 1000 | 75 | 50 | 25 |

# BioDopp proprietary technology - High-speed clarifier

BioDopp®

## BioDopp high-speed clarifier (Model I)



The BioDopp high-speed clarifier (Model I) is a sludge-water separation device that prevents sludge accumulation at the tank bottom through high-velocity sludge recirculation. It achieves efficient and rapid clarification via integrated media, a uniquely designed suction-scraper mechanism, and proprietary media arrangement. With its special design structure and air lift pumping technology, it not only reduces the energy consumption of the reflux process but also saves the pumping station for sludge reflux.

**Reflux power relies on airlift device to save energy consumption**

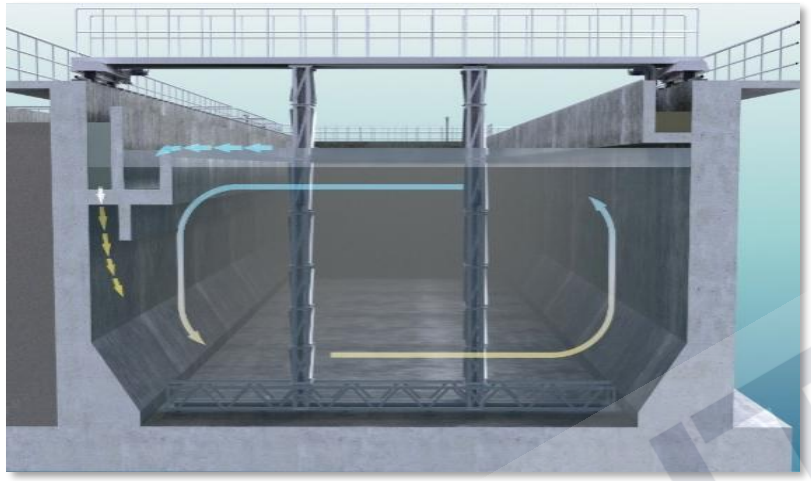
**No external secondary sedimentation tank to save sludge pumping room**

# BioDopp proprietary technology - high-speed clarifier

BioDopp®

## BioDopp high-speed clarifier (Model II)

The BioDopp high-speed clarifier (Model II) adopts a rectangular inlet-outlet sedimentation tank, effectively combining with the aeration zone and anaerobic zone to maximize the utilization of tank capacity.



## Advantage

**Small footprint**

High surface loading;
Reduce the surface area of the secondary sedimentation tank.

**Short construction period**

The tank structure is simple and easy to construct.

**Low investment cost**

No sludge reflux pump station;
Save sludge reflux pipeline

**Fast sludge reflux**

Prevent sludge flotation caused by denitrification and anaerobic conditions.

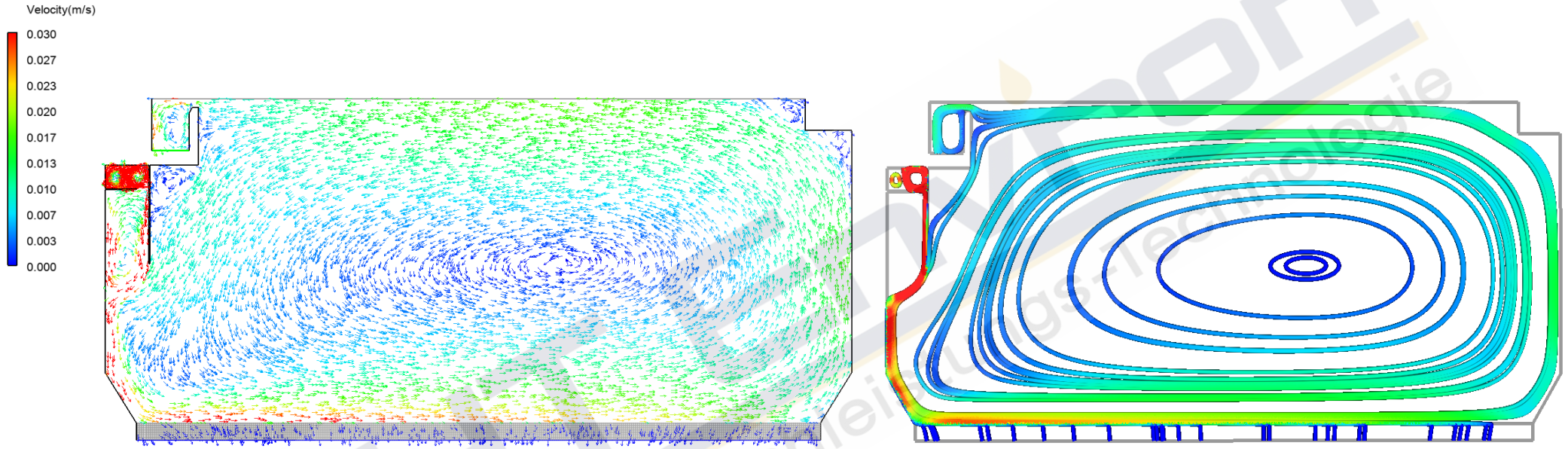
**High solid loading**

High concentration of returned sludge

# BioDopp proprietary technology - high-speed clarifier

BioDopp®

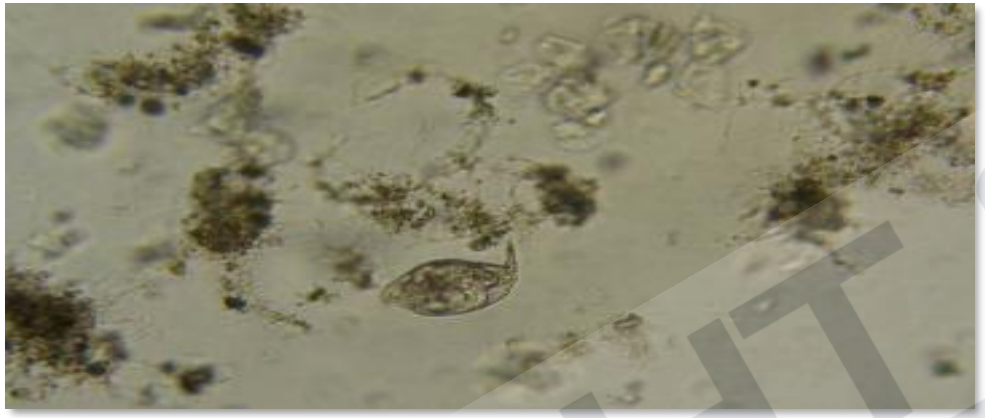
## BioDopp high-speed clarifier (model II)

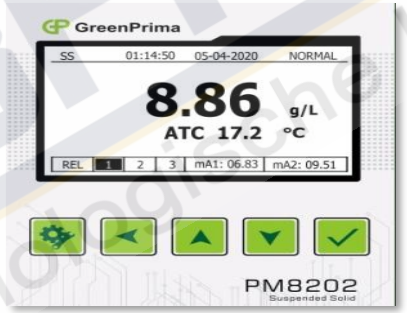



| Types of sedimentation tanks | Surface loading | Peak loading | Sludge loading |
|---|---|---|---|
| | $m^3/(m^2 \cdot h)$ | $m^3/(m^2 \cdot h)$ | $kg/(m^2 \cdot h)$ |
| Combined inclined tube and inclined plate sedimentation tank | 1.5~2.4 | 1.8~3.0 | ≤12 |
| Rectangular inlet-outlet sedimentation tank | 0.9~1.2 | 1.2~1.5 | ≤8/10 (4.5/5.8m) |

# BioDopp proprietary technology - cultivation and domestication of microorganisms BioDopp®

In BioDopp biochemical system, the cultivated sludge exhibits smaller flocs compared to conventional processes, with relatively slower microbial growth rates. The sludge age in this system exceeds twice that of traditional processes, while the sludge concentration reaches 2-3 times higher. Furthermore, the finer floc structure enhances oxygen mass transfer efficiency within the aggregates, thereby facilitating easier diffusion of pollutants through the floc matrix. This structural advantage enables more efficient nutrient and contaminant uptake by individual microbial cells, optimizing the biological treatment performance in wastewater processing.



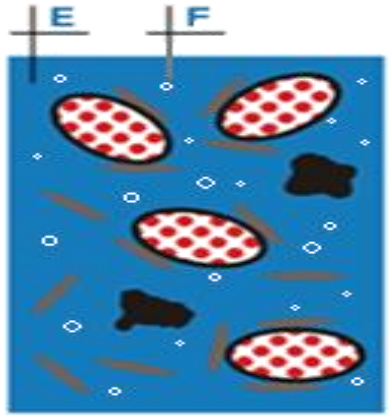

A:Protecting capsule
B:Microorganism
C: Organic pollutants
D: Inorganic pollutants
E: Water
F:Dissolved oxygen

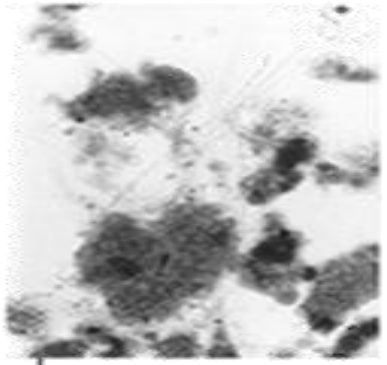
1. Traditional craft
2. BioDopp

Low dissolved oxygen environment
<0.3mg/L、0.5mg/L

ORP control value
-50~50mV

High sludge concentration
8-12g/L、4-6g/L

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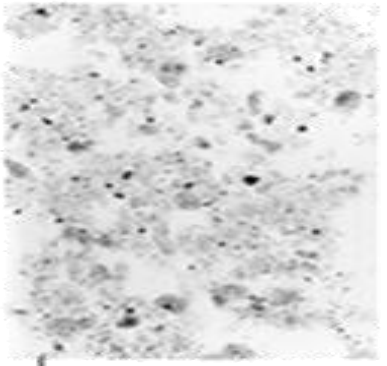
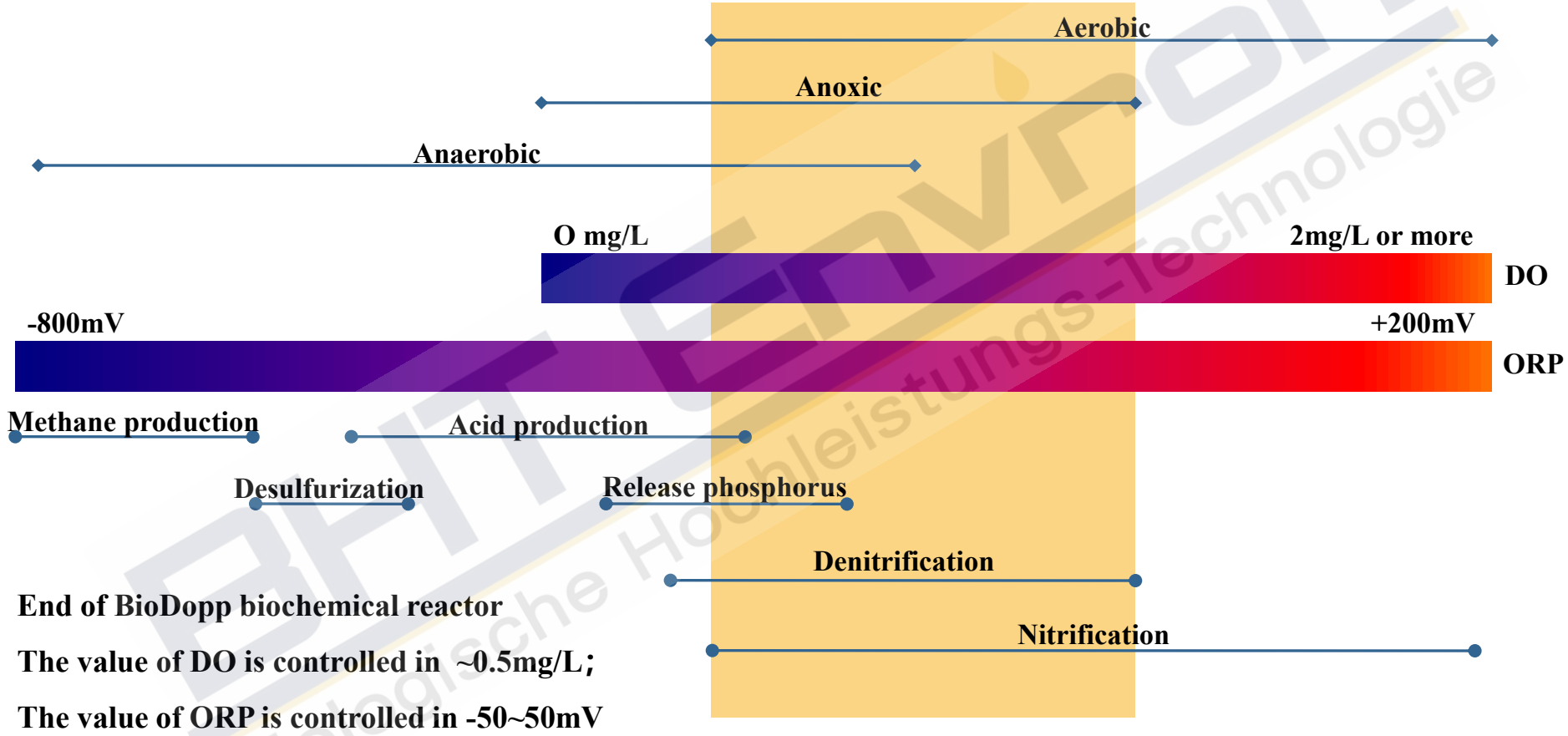


2.

# BioDopp proprietary technology - control of DO and ORP values BioDopp®




End of BioDopp biochemical reactor

The value of DO is controlled in ~0.5mg/L;

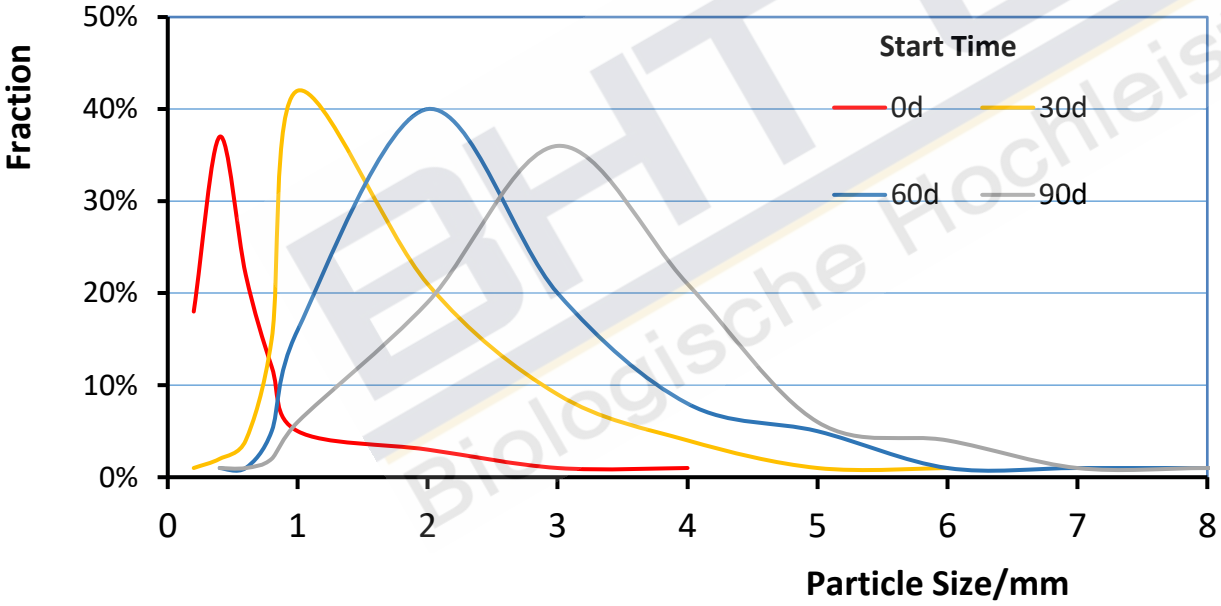
The value of ORP is controlled in -50~50mV

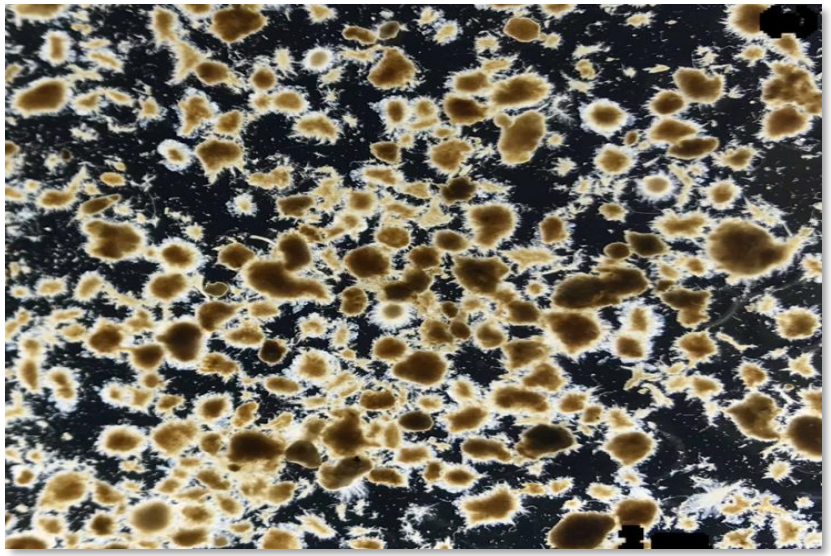
# Excess sludge hydrocyclone split-flow system

BioDopp®

The BioDopp system employs a hydrocyclone to divert excess sludge, allowing the sludge with a low SVI to be returned to the bioreactor, while discharging sludge with a high SVI as residual waste.

This system enhances the settling properties of activated sludge within the bioreactor, indirectly increasing sludge concentration. Under specific conditions, it can also separate and screen out granular sludge, thereby improving the bioreactor's treatment efficiency, ensuring effective sludge-water separation in the sedimentation tank, and achieving lower effluent SS.

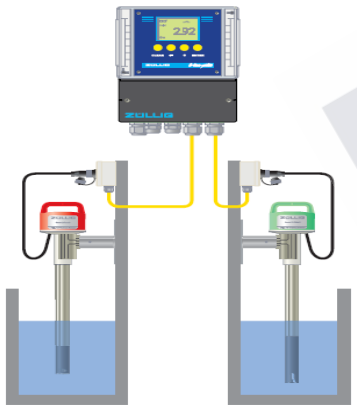


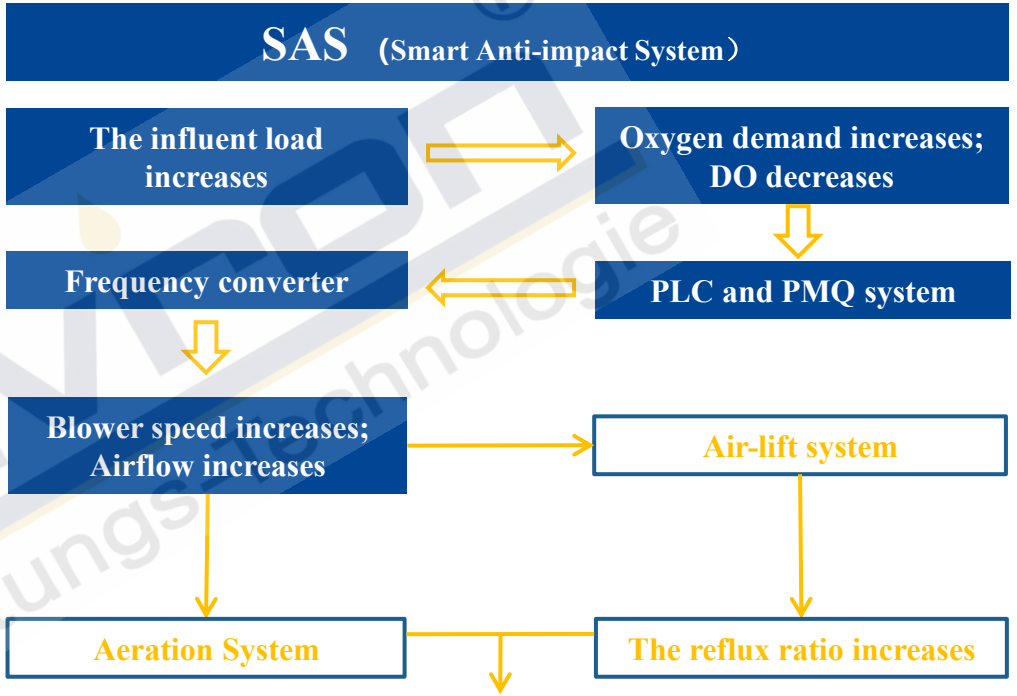



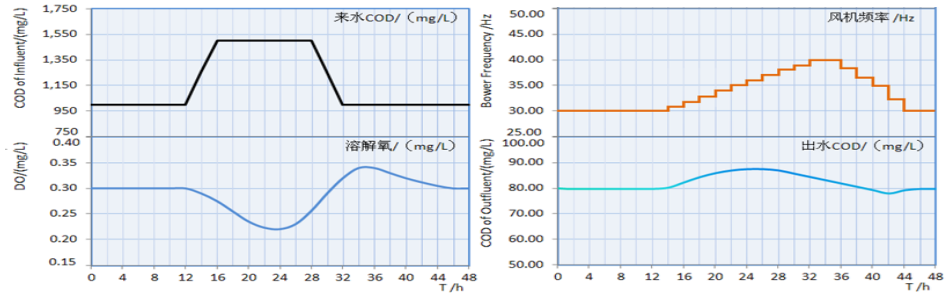
# BioDopp proprietary technology - SAS control system

**SAS (Smart Anti impact System) system** is the abbreviation of Smart Anti-impact System and Precise Aeration System. The SAS system mainly consists of online DO and ORP meters, PMQ system, PLC automatic control system, frequency converter, blower, air-lift device and aeration equipment. The entire SAS system does not require manual control and can automatically handle influent load shock without human intervention, thereby providing better operational stability for the biochemical system.

**PMQ (Predictive Maintenance and Quality)** is a predictive maintenance solution based on big data and operation models, which can give the system great self-learning ability.

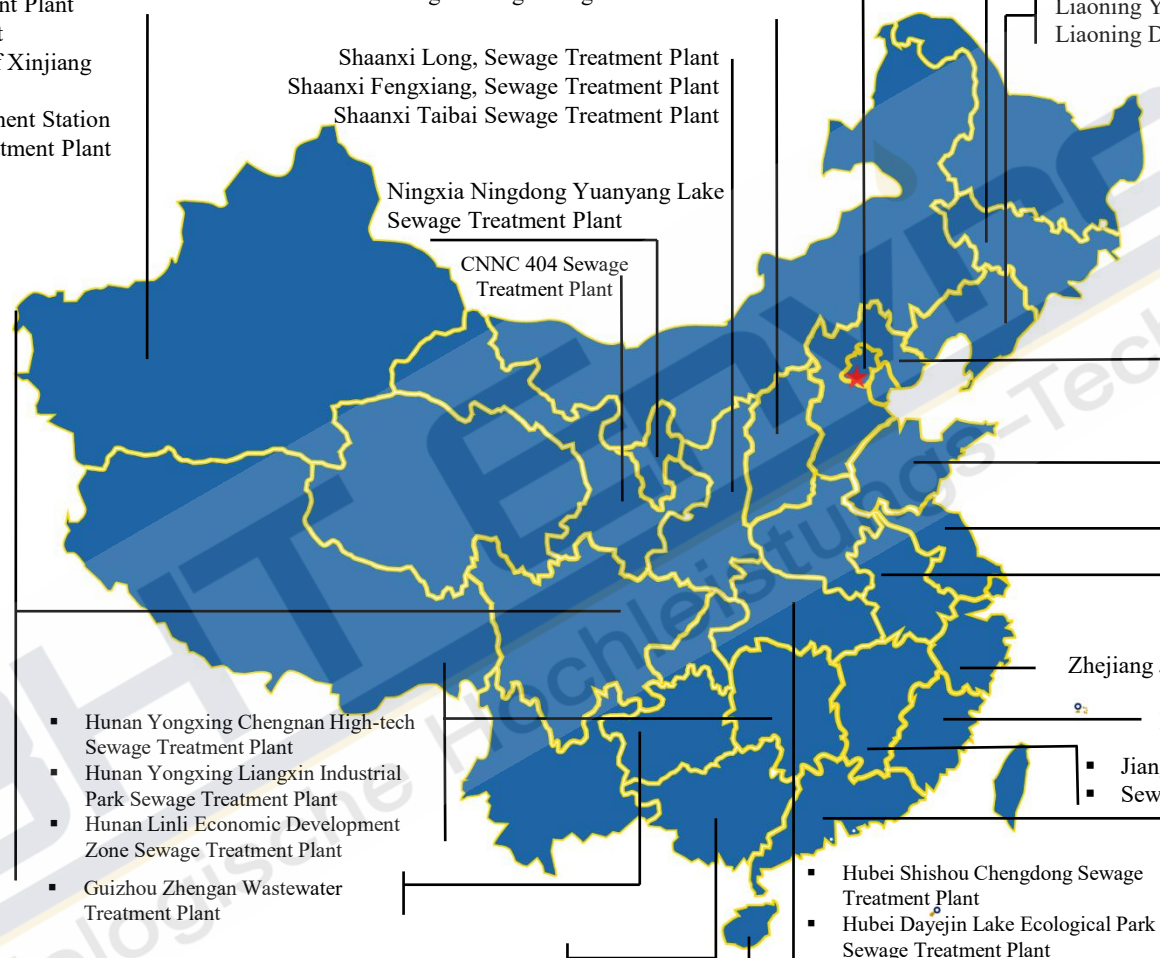


# Portion Projects of BioDopp

BioDopp®



- Xinjiang Manas New Lake Sewage Treatment Plant
- Xinjiang Huyanghe Sewage Treatment Plant
- Sewage Treatment Plant of 181 Regiment of Xinjiang Agricultural 10th Division
- Xinjiang Shengwo Chemical Sewage Treatment Station
- Xinjiang Atushi Central Urban Sewage Treatment Plant

Beijing Fangshan Rural Sewage Treatment Project

Shanxi Datong Yudong Sewage Treatment Plant

Shaanxi Long, Sewage Treatment Plant
Shaanxi Fengxiang, Sewage Treatment Plant
Shaanxi Taibai Sewage Treatment Plant

Ningxia Ningdong Yuanyang Lake Sewage Treatment Plant

CNNC 404 Sewage Treatment Plant

Jilin Nong'an Second Sewage Treatment Plant

Liaoning Yingkou Industrial Base Sewage Treatment Plant
Liaoning Datang Fuxin East Sewage Treatment Plant

- Hebei Hengshui Binhu New Area Sewage Plant
- Hebei Guantao Sewage Treatment Plant
- Hebei Dingxing County Sewage Treatment Plant
- Hebei Cangxian Xingji Sewage Treatment Plant
- Hebei Zanhuang County Huangming Sewage Treatment Plant
- Hebei Qinhuangdao North Sewage Treatment Plant
- Hebei Longhua Miaoshan Sewage Treatment Plant

- Shandong Expressway Service Area Sewage Treatment Project
- Shandong Linqing Rural Sewage Treatment Project

- Jiangsu Qidong Dongyuan Wastewater Treatment Plant
- Lianyungang Runze Chemical Sewage Treatment Station in Jiangsu

- Anhui Yixian Wastewater Treatment Plant
- Anhui Xiatang Industrial Park Sewage Treatment Station

Zhejiang Jingshan Town Integrated Technology Demonstration Project

Fujian Tianchen Yaolong Sewage Treatment Plant

- Jiangxi Yichun Wentang Town Sewage Treatment Plant
- Sewage treatment in Economic Development Zone, Jiangxi

- Environmental comprehensive improvement project of Jiukeng River drinking water source in Dinghu District, Zhaoqing, Guangdong
- Emergency purification of rivers in Shishan Town, Foshan, Guangdong
- Emergency drainage purification of No. 1 rainwater pump station in Guicheng North District, Foshan, Guangdong
- Guangdong Dongguan Tangxia Sewage Treatment Station
- Comprehensive treatment of Shima River basin in Dongguan, Guangdong
- Guangdong Maoming Dianbai Rural Sewage Treatment Station
- Guangdong Heyuan Zijin Sewage Treatment Station

- Sichuan Yilong County Urban Domestic Sewage Treatment Plant
- Sichuan Yilong Hexi domestic sewage plant
- Sichuan Yingjing Integrated Sewage Treatment Plant
- Sichuan Xuyong County Urban Domestic Sewage Plant
- Sichuan Shifang City Domestic Sewage Treatment Plant
- Sichuan Longchang Sewage Treatment Plant
- Sichuan Lezhi Wastewater Treatment Plant
- Sichuan Ebian County Sewage Treatment Plant
- Sichuan Dachuan Sewage Treatment Plant
- Dahua Town Sewage Wastewater Treatment Plant, Chongzhou City, Sichuan Province
- Sichuan Mianzhu Industrial Park Sewage Treatment Plant
- Sichuan Zigong Chenguang Industrial Wastewater Treatment Plant
- Sewage Treatment Plant of Hexi Industrial Zone, Yilong County, Sichuan

- Hunan Yongxing Chengnan High-tech Sewage Treatment Plant
- Hunan Yongxing Liangxin Industrial Park Sewage Treatment Plant
- Hunan Linli Economic Development Zone Sewage Treatment Plant

- Guizhou Zhengan Wastewater Treatment Plant

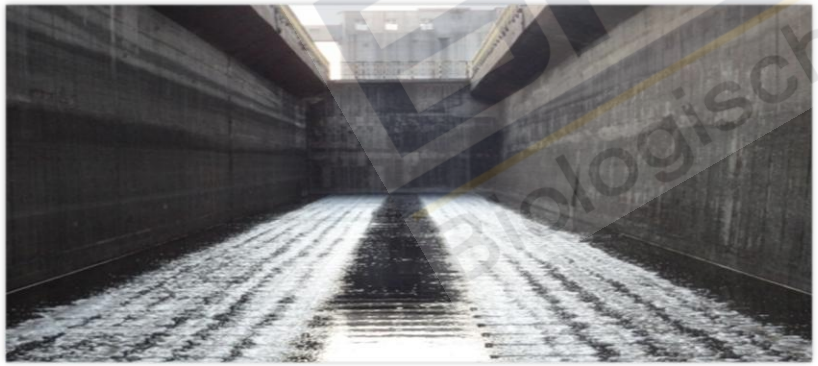
- Guangxi Chongzuo Emergency Sewage Treatment Station Project

- Hainan Haikou Guilinyang Sewage Treatment Plant
- Hainan Changan Pharmaceutical Sewage Treatment Station
- Hainan Wenchang Moon Bay Decentralized Sewage Treatment Station
- Hainan Qionghai Litao Village Decentralized Sewage Treatment Station
- Emergency purification of Shapo Reservoir in Haikou, Hainan

- Hubei Shishou Chengdong Sewage Treatment Plant
- Hubei Dayejin Lake Ecological Park Sewage Treatment Plant
- Hubei Daye Baoan Town Sewage Treatment Plant
- Hubei Daye Lingxiang Sewage Treatment Plant
- Hubei Daye City Chengui Sewage Treatment Plant

# 1.Henan Yima Gasification Plant Supporting Sewage Treatment Renovation Project

BioDopp®



**Henan Province Industrial and Information Technology Achievement Award**

**Coal Chemical Wastewater (I) (Lurgi Gasifier)**

The Yima Gasification Plant in Henan Province is one of the earliest coal gasification plants in the country to adopt the Lurgi gasifier. In 2011, the BioDopp biochemical technology was used to transform one of the SBR tanks, resulting in a 70% reduction in the cost of water treatment per ton.

| Unit of measurement | | | |
|---|---|---|---|
| **Parameters** | **Unit of measurement** | **Original SBR Bioreactor** | **BioDopp Bioreactor** |
| Water treatment volume | $m^3/h$ | 40 | 75 |
| Volume load | kgCOD/ ($m^3$·d) | 0.85 | 1.5 |
| Hydraulic retention time | h | 125 | 67 |
| Water and electricity consumption in tons. | kW·h/$m^3$ | 4.2 | 2.5 |
| **Test indicat** | | | |
| Test indicat | **Infllent/mg/L** | **Original SBR effluent/mg/L** | **BioDopp effluent/mg/L** |
| $COD_{Cr}$ | 3000~5000 | 400~600 | 200~300 |
| $BOD_5$ | 600~1200 | 60~120 | 30~50 |
| $NH_3$-N | 150~300 | 20~50 | 5~20 |
| SS | 100~200 | 50~100 | 20 |
| pH | 6~9 | 6~9 | 6~9 |
| Volatile phenols | 200~500 | 20~80 | 2~10 |
| Total phenols | 300~800 | 30~100 | 10~20 |
| Colorimetric | 200 | 80 | 50 |
| **Petroleum products** | 50~100 | 20~50 | 10~20 |

# 2. Datang Duolun Coal-to-Olefins Utility Water Treatment Project

BioDopp®

## Coal Chemical Wastewater (II) (Coal-to-Olefins Project)

Datang International Duolun Coal Chemical Project was then the world's first large-scale industrial coal-to-olefins (MTP) application. Two new BioDopp biochemical tanks were built, with treatment capacity equal to nearly 5 same-volume SBR tanks—saving land and cutting operating costs by 40%.

The plant achieves "zero discharge". Incoming water covers: plant domestic sewage; production sewage from the chemical zone's coal gasification, methanol, propylene and polypropylene units; equipment flushing drainage; and first 15 minutes of initial rainwater in contaminated areas. Treated clarified water is reused as make-up water for the chemical zone's circulating water system and dry ash wetting water plant-wide.

| Test indicat | $COD_{Cr}$ | $BOD_5$ | $NH_3$-N | SS | Petroleum hydrocarbons | Total cyanide | Sulfides | Fluorides | Phosphates | $Cl^-$ |
|---|---|---|---|---|---|---|---|---|---|---|
| **Infllent/mg/L** | 900 | 600 | - | - | - | - | - | - | - | - |
| **BioDopp effluent/mg/L** | 60 | 20 | 15 | 70 | 5 | 0.5 | 1 | 10 | 0.5 | 250 |
| **Advanced treatment effluent/mg/L** | 40 | 5 | 1 | 10 | - | - | - | - | - | 250 |

# 3. Indonesian Coking Industry Park Wastewater Treatment Project

BioDopp®

**Indonesia – the Pioneering Place of the "Maritime Silk Road"**

**Coal Chemical Wastewater (III) (Coking Wastewater)**

Indonesia's largest coking park. This project has successfully solved the problem of treating high-concentration coking wastewater. Among them, the designed water volume of ammonia stripping wastewater is 500 $m^3/h$, and the total designed capacity is 800 $m^3/h$ (19,200 $m^3/d$). It effectively removes harmful substances such as phenols, cyanides, and ammonia nitrogen from coking wastewater. The effluent quality meets the standard of GB 16171-2012—Coke Quenching Reuse Water, and has achieved the goals of "zero wastewater discharge" and resource reuse, providing an economical and efficient Chinese solution for global industrial wastewater treatment.

| Test indicat | Infllent/mg/L | Effluent/mg/L |
|---|---|---|
| $COD_{Cr}$ | 5000 | ＜150 |
| $BOD_5$ | 1200 | ＜15 |
| $NH_3$-N | 250 | <25 |
| TN | 350 | <100 |
| Petroleum-related | 100 | ＜10 |
| Volatile Phenols | 800 | ＜0.3 |
| Cyanide | 100 | ＜0.2 |
| SS | 150 | <70 |
| pH | 7~9 | 6~9 |

# 4. Renovation Project of the Acrylonitrile Sewage Treatment Station of Jilin Chemical Company of PetroChina

BioDopp®

中国石油

## Cyanide-containing industrial wastewater (I)

- **Project Difficulties** :The project involves highly toxic and difficult-to-degrade chemical substances such as acrylonitrile, hydrogen cyanide, acetone cyanohydrin, and dimethyl carbonate in wastewater. The engineering has been modified using traditional processes four times, but there have been consistent issues with higher $COD_{Cr}$ in the effluent and higher NH3-N at the outlet compared to the inlet.
- **Renovation Effect：** After upgrading the original engineering with BioDopp, the treated water volume per unit time has doubled while maintaining the same land area, and the operating costs have been reduced to about half of the original process.

| Test indicat | Infllent/mg/L | Effluent of original process/mg/L | Effluent of BioDopp/mg/L |
|---|---|---|---|
| $COD_{Cr}$ | 1800 | 300~500 | 50~150 |
| $BOD_5$ | 600 | 30~50 | 5~10 |
| $NH_3$-N | 40~150 | 300 | 15 |
| TN | 350 | 330 | 40 |
| pH | 6~9 | 6~9 | 6~9 |
| $CN^-$ | 5 | 1~3 | 0.01 |

# 5. Sewage Treatment Project of Tianchen Yaolong New Materials

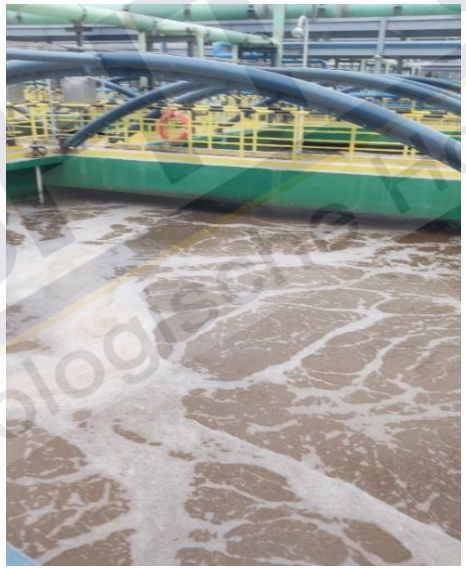
BioDopp®

中国天辰工程有限公司
CHINA TIANCHEN ENGINEERING CORPORATION

## Cyanide-containing industrial wastewater (II)

The nylon new material project of Tianchen Qixiang New Materials Co., Ltd. utilizes the butadiene method independently developed by Tianchen Company for the industrialization of hexanedinitrile synthesis technology, producing products such as **hexanedinitrile, hexanediamine, nylon 66, and acrylonitrile.** This is the first industrialized production project of hexanedinitrile in the country, **which is of significant importance for breaking the monopoly of high-end nylon technology and achieving the revitalization of the national industry.**

This wastewater treatment project handles the production and domestic wastewater of the entire plant and the concentrated water generated by the reclaimed water reuse facility, with a designed treatment capacity of 330$m^3$/h (7920$m^3$/d). The wastewater has high COD, high TN, and contains cyanides, fluorides, petroleum substances, and difficult-to-degrade toxic organic compounds. This project provides an efficient **microporous aeration system,** characterized by a **long service life, high aeration efficiency, and ease of operation and maintenance.**



| Test indicat | Infllent/mg/L | Influent of BioDopp /mg/L | Effluent of BioDopp /mg/L |
|---|---|---|---|
| $COD_{Cr}$ | 10500 | 1100 | ＜200 |
| $BOD_5$ | 2860 | 450 | ＜50 |
| $NH_3$-N | 120 | 100 | <10 |
| TN | 870 | 210 | <30 |
| TP | 0.3 | - | <0.4 |
| SS | 180 | 50 | <30 |
| pH | - | 6~9 | 6~9 |

# 6. Renovation Project of the Sewage Treatment Station of Shijiazhuang Chemical Fiber Plant of Sinopec

BioDopp®

## Synthetic Fiber Wastewater (I)

- **Project Difficulties:** The annual output of caprolactam in this factory is 160,000 tons. The wastewater has a high concentration of $COD_{Cr}$ and $NH_3$-N, and contains difficult-to-degrade aromatic substances, making treatment challenging.
- **Renovation Effect:** After the transformation using BioDopp technology, the effluent indicators have significantly improved, and the process flow has been greatly shortened, with operating costs reduced to only 50% of the previous amount, and the land area also halved compared to the original process.

| Test indicators | Inlet water/mg/L | Original process water/mg/L | BioDopp process effluent/mg/L |
|---|---|---|---|
| $COD_{Cr}$ | 6000~8000 | 500~800 | 100~200 |
| $BOD_5$ | 2000~3000 | 100~150 | 10~20 |
| $NH_3$-N | 600~1000 | 100~200 | <15 |
| pH | 6~9 | 6~9 | 6~9 |

Note: Influent $SO_4^{2-}$ concentration 500-700mg/L

# 7. Tianchen Yaolong's 200,000 - ton Annual Caprolactam Supporting Sewage Treatment Project

中国天辰工程有限公司
CHINA TIANCHEN ENGINEERING CORPORATION

## Synthetic Fiber Wastewater (II)

- **Project Difficulties：** The factory primarily uses the cyclohexanone oxime method to produce caprolactam, which once had the largest single-line production capacity in the world, with an annual output of 200,000 tons. The wastewater has high concentrations of $COD_{Cr}$ and ammonia nitrogen, and contains difficult-to-degrade aromatic substances, making treatment challenging.
- **Process Flow：** First, the oxime wastewater undergoes Fenton pretreatment, and then it is combined with wastewater from other chemical sectors for joint treatment. The combined treatment employs the BioDopp biochemical treatment process, and after treatment, it directly meets the discharge standards for pipeline discharge.

| Test indicators | Inlet water/mg/L | BioDopp process effluent/mg/L |
|---|---|---|
| $COD_{Cr}$ | 6000 | ＜200 |
| $BOD_5$ | 2000 | ＜30 |
| $NH_3$-N | 800 | <15 |
| pH | 6~9 | 6~9 |

# 8. Datong Yudong New Area Sewage Treatment Plant Project

BioDopp®

## Pharmaceutical Industrial Park Wastewater

- **Type of sewage：** Wastewater from the pharmaceutical industrial park
- **Design scale：** The total designed capacity of this wastewater treatment plant is 120,000 $m^3$/d. The scale of the first-phase renovation project is 60,000 $m^3$/d., and the scale of the second-phase new construction project is 60,000 $m^3$/d..
- **Effluent standard：** The biochemical effluent undergoes advanced treatment, achieving Class A water quality, and space is reserved for upgrading to surface water Class IV quality.

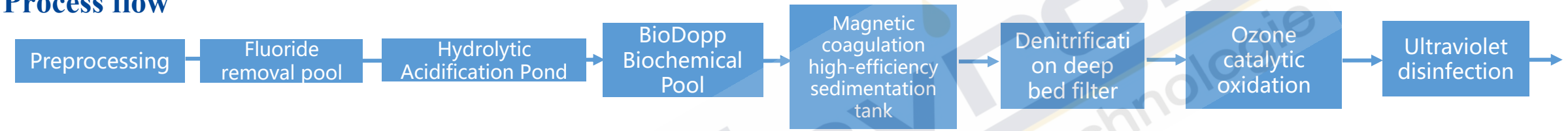
| Test indicat | Inlet water /mg/L | Biochemical pool effluent /mg/L |
|---|---|---|
| $COD_{Cr}$ | 700 | ＜110 |
| $BOD_5$ | 100 | ＜15 |
| $NH_3$-N | 60 | <5（8） |
| TN | 80 | <15 |
| TP | 8 | ＜3 |
| SS | 300 | <30 |
| pH | 6~9 | 6~9 |

# 9. Yibin Gaojieyuan Wastewater Treatment Project in Sichuan

BioDopp®

- Main tasks: collect, treat and discharge the industrial sewage from the industrial park in the High-tech Zone.
- The type of sewage：sewage from the **crystalline silicon photovoltaic** industry park.

## Process flow




- The design total capacity is 150,000 $m^3/d$, the second phase with a construction scale of 50,000 $m^3/d$.
- The effluent's main pollutant indicators meet the urban sewage treatment plant standards outlined in the "Sichuan Province Minjiang and Tuojiang River Basin Water Pollutant Discharge Standards" (DB51/2311 2016).

## Water quality of inflow and outflow in the biochemical unit

| Process Unit | $COD_{Cr}$ | $BOD_5$ | $NH_3$-N | TN | F+ | TP | SS |
|---|---|---|---|---|---|---|---|
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| Infllent | 270 | 120 | 45 | 54 | 8 | 7 | 300 |
| Effluent | 30 | 6 | 1.5 | 10 | 1 | 0.3 | 10 |

# 10.Sewage Treatment Project in Wentang Town, Mingyue Mountain

BioDopp®

- The construction scale is **20000 $m^3$/d** and the long-term scale is **40000 $m^3$/d.**
- The effluent standard implements the "Pollutant Discharge Standard for Urban Sewage Treatment Plants" (GB18918-2002) Grade A standard.
- The **COD reduce 1095 t/year**, which will greatly improve the ecological environment, achieve the harmony and unity of environmental benefits, economic benefits and social benefits.

| Test indicat | Inlet water /mg/L | Biochemical pool effluent /mg/L |
|---|---|---|
| $COD_{Cr}$ | 200 | < 50 |
| $BOD_5$ | 100 | < 10 |
| $NH_3$-N | 25 | <5 (8) |
| TN | 30 | <15 |
| TP | 4 | < 2.5 |
| SS | 200 | <20 |
| pH | 6~9 | 6~9 |

# 11.Reconstruction and expansion project of sewage treatment plant in Dingxing

## Upgrading the standards - Class IV discharge standards

The upgrading and reconstruction project in the area around Xiongan, Hebei Province aims to meet the requirement of upgrading the effluent water quality from the original first-class A standard to Class IV standard (excluding TN) in the Environmental Quality Standards for Surface Water (GB3838-2002). The effluent water will be used for urban landscape water and road sprinkling water.

Both sewage treatment plants select the BioDopp process as the preferred process. The water treatment capacities are respectively 12,000 $m^3/d$ and 10,000 $m^3/d$. The sewage treatment processes are similar, which are “pretreatment section + BioDopp process (improved $A^2/O$) + coagulation sedimentation tank + fiber disc filtration".

# 11.Reconstruction and expansion project of sewage treatment plant in Dingxing

BioDopp®

## Dingxing Town Sewage Treatment Plant

Project scale： 12000$m^3$/d

| Test indicat | Inlet water /mg/L | effluent /mg/L |
|---|---|---|
| $COD_{Cr}$ | 350 | ≤30 |
| $BOD_5$ | 180 | ≤6 |
| $NH_3$-N | 50 | ≤1.5（2.5） |
| TN | 60 | ≤15 |
| TP | 5 | ≤1.5 |
| SS | 200 | ≤20 |

## Dingxing County Sewage Treatment Plant

Project scale： 10000$m^3$/d

| Test indicat | Inlet water /mg/L | BioDopp effluent /mg/L |
|---|---|---|
| $COD_{Cr}$ | 400 | ≤30 |
| $BOD_5$ | 200 | ≤6 |
| $NH_3$-N | 30 | ≤1.5（2.5） |
| TN | 40 | ≤15 |
| TP | 4 | ≤1.5 |
| SS | 180 | ≤20 |

# 12. Lezhi County Urban Domestic Sewage Treatment Plant Project

BioDopp®

## Phase I: Reconstruction of the Oxidation Ditch

## Phase III: Class IV discharge standard

| Project | Designed water volume /mg/L | Design effluent quality /mg/L |
|---|---|---|
| Phase I project | Raising from 10000 to 12000 | Raising to (GB18918-2002) grade A standard |
| Phase II project | 15000 | (GB18918-2002) grade A standard |
| Phase III project | 20000 | DB51 class IV standard |

| Test indicat | Actual inffluent /mg/L | Design effluent /mg/L | Actual effluent /mg/L |
|---|---|---|---|
| $COD_{Cr}$ | 420 | < 30 | < 20 |
| $BOD_5$ | 220 | < 5 | < 5 |
| $NH_3$-N | 40 | <1.5/3 | <1 |
| TN | 50 | <10 | <8 |
| SS | 250 | <10 | <10 |
| pH | 6~9 | 6~9 | 6~9 |

# 13. Lezhi County Urban Domestic Sewage Treatment Plant Project

BioDopp®

**Phase III : BioDopp IV,**

**Treatment capacity: 20000m³/d, Effluent quality: DB51 standard;**

**Size：2×64×19m;**

**land occupation per ton of water :0.122m²**

**Installed power: 55×3+4×8+16.5×2kW;**

**Operating power 175kW;**

**Electricity consumption per ton of water 0.21kW·h。**

**Phase II : BioDopp I,**

**Treatment capacity: 10000m³/d,**

**Effluent quality:(GB18918-2002)grade A;**

**Size：60×24m;**

**land occupation per ton of water : 0.144m²**

**Installed power: 75×2+4×2+10kW;**

**Operating power 93kW;**

**Electricity consumption per ton of water 0.22kW·h。**

**Phase I : Renovation of the Carousel 2000 Type Oxidation Ditch, with a treatment capacity of 12,000 m³/d;**

**Effluent quality:raised to (GB18918-2002)grade A;**

**Size：24×12m Anaerobic treatment section +60×24; Aerobic treatment section +Φ24m Two sedimentation tanks;**

**land occupation per ton of water： 0.230m²;**

**Installed power 3.0×4+37×3+11×2+11×4kW;**

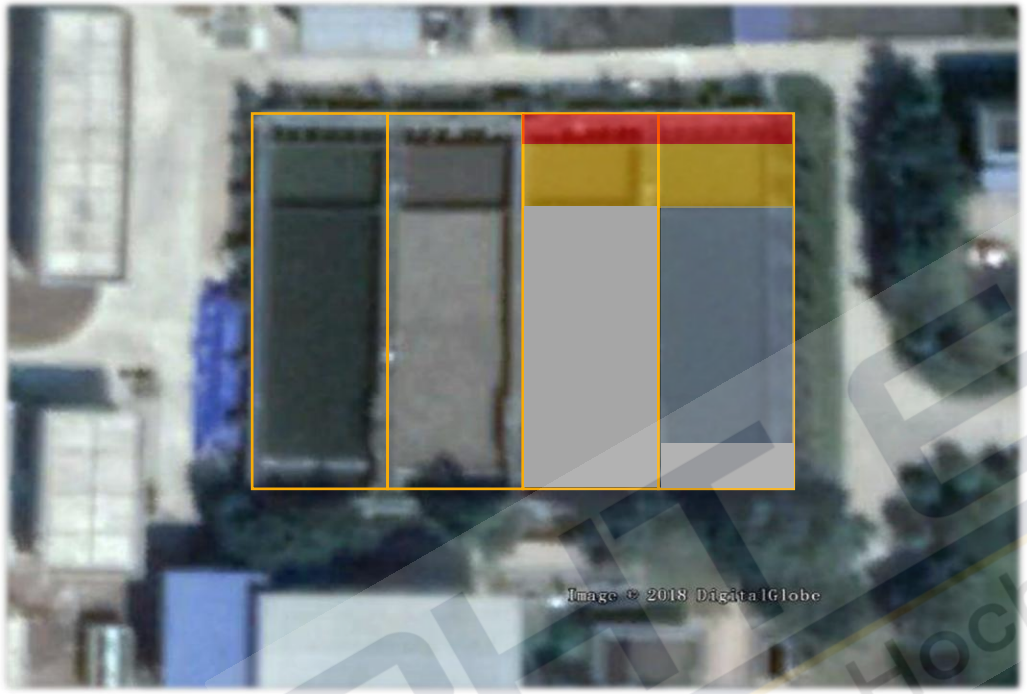
**Operating power 167kW;**

**Electricity consumption per ton of water 0.40kW·h。**

# 14. CASS Reconstruction Project of Longchang Sewage Treatment Plant

BioDopp®

## CASS Renovation Layout




**Anaerobic zone**

**Aerobic zone**

**Hypoxic zone**

**Sedimentation area**

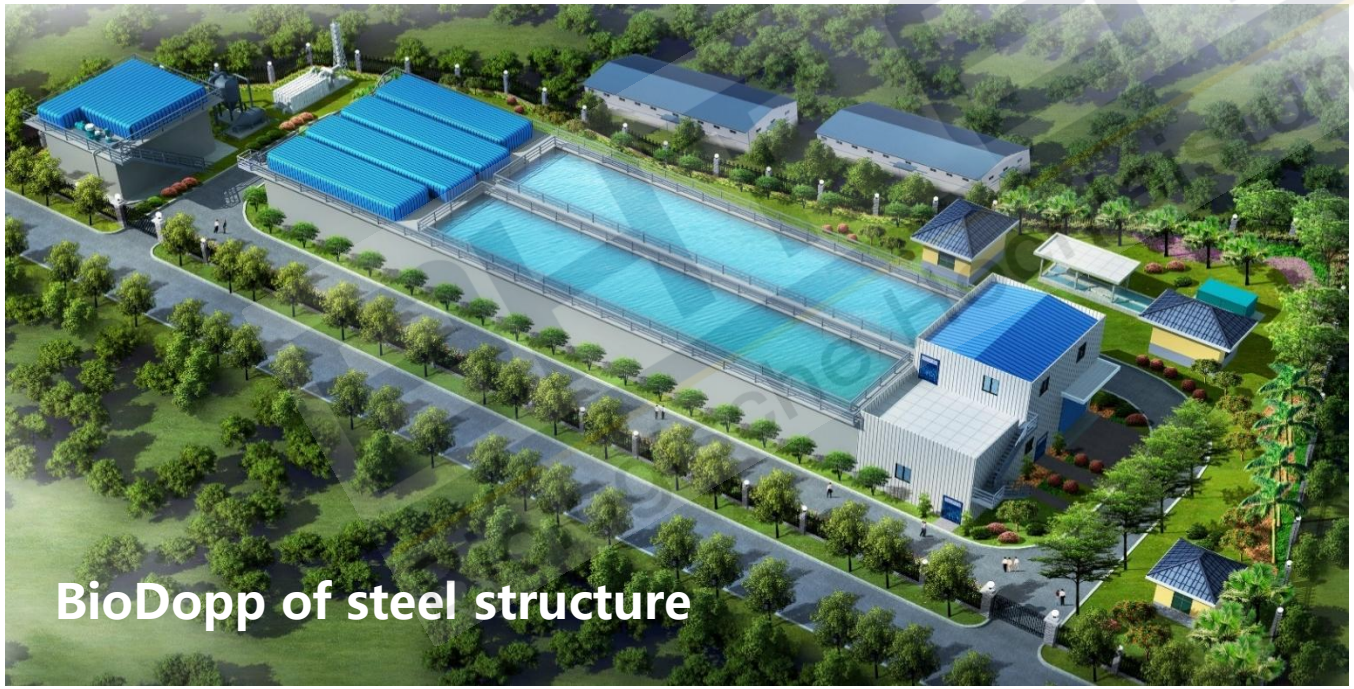
- The flowrate scale is 30000$m^3$/d.
- The effluent index transformed from GB18918-2002 Grade B to the GB18918-2002 Grade A.
- Retaining the original CASS overall civil engineering structure.
- The retrofit will save ¥180,000 in electricity costs over the course per year.

# 15. Emergency purification project of Baishuitang in Shapo Reservoir

BioDopp®

- Selection of BioDopp with **strong impact resistance** for purification, in the form of **above-ground steel structure**.
- The effluent index implements "Urban Sewage Treatment Plant Pollutant Emission Standards" (GB18918-2002) Class A standard, at the same time to meet the "Surface Water Quality Standards" (GB3838-2002) Class IV standard (TN ≤ 15mg / L).

| Test indicat | $COD_{Cr}$ | $BOD_5$ | $NH_3$-N | TN | TP | SS |
|---|---|---|---|---|---|---|
| Influent water quality mg/L | 250 | 100 | 40 | 55 | 4 | 200 |
| Effluent water quality mg/L | 30 | 6 | 1.5 | 15 | 0.3 | 10 |



BioDopp of steel structure

# THANK YOU



WeChat Official Account

Video Account

**For more information, please visit our website:**
**www.bhtwater.com**