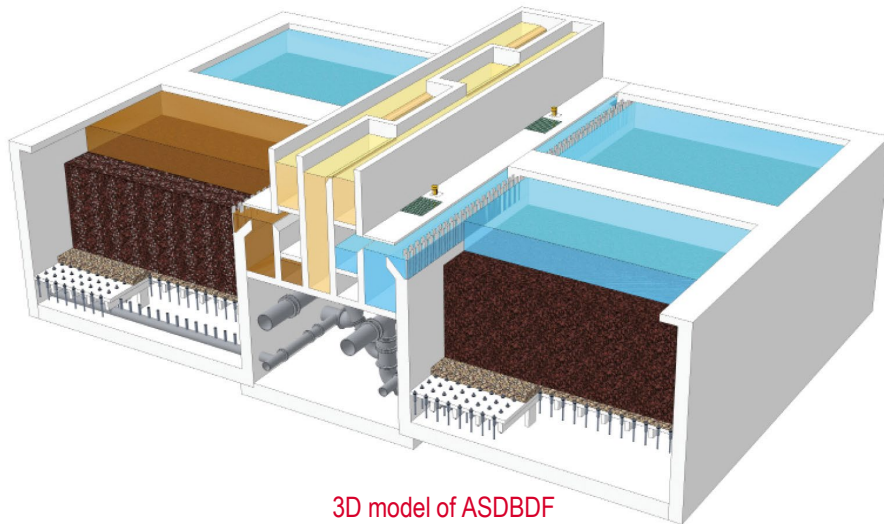




**ATAL Super Deep Bed  
Denitrification Filter  
超深床反硝化生物濾池  
(ASDBDF)**

## Introduction 简介

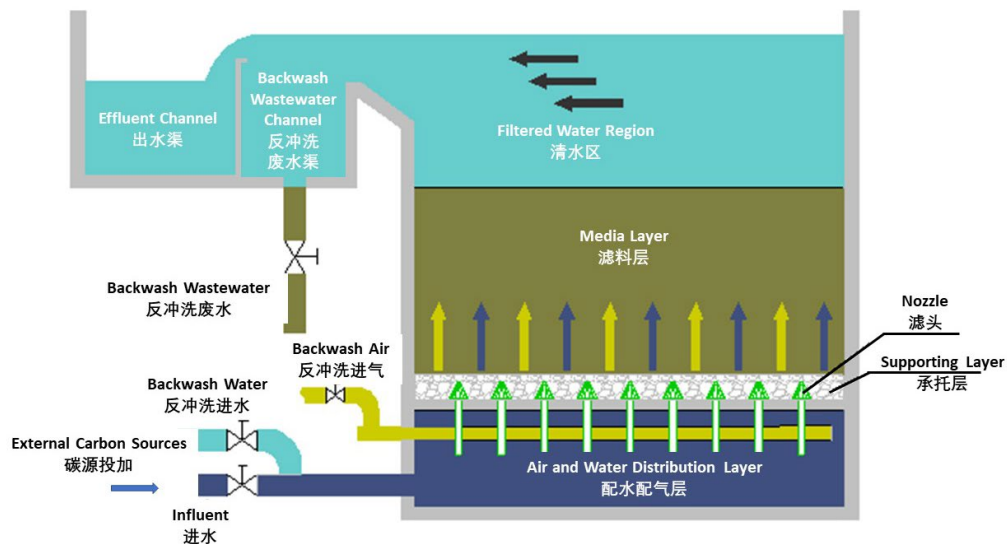
# ATAL Super Deep Bed Denitrification Filter (ASDBDF) 超深床反硝化生物濾池



3D model of ASDBDF  
超深床反硝化生物濾池3D效果图

**ATAL Super Deep Bed Denitrification Filter (ASDBDF)** is a technology developed by ATAL Engineering Limited. Our Group has accumulated rich experience and good performance in the process design, equipment integration and "turnkey" project. We have a team of engineers with strong technical capabilities and rich experience in project management. In the process design, equipment supply, installation, commissioning and operation of the process package, it is practical to achieve safety, reliability, economical application, advanced technology, and ensure that the effluent meets the standards.

**超深床反硝化生物濾池 (ASDBDF)** 是安樂工程有限公司研发的技术。我司在此工艺的设计、成套设备集成和“交钥匙”工程上积累了丰富的经验和良好的业绩，并拥有一支专业技术能力强、工程管理经验丰富的工程师队伍。在工艺包的工艺设计、设备选购、施工、安装、调试和运营中，切实做到安全可靠、经济适用、技术先进、确保出水达标。



Schematic diagram of ASDBDF process  
超深床反硝化生物濾池工艺示意图

## Major Features 主要特点

ASDBDF has three functions simultaneously:

- Suspended solids (SS) removal;
- Chemical dephosphorisation for total phosphorus (TP);
- Biological denitrification for total nitrogen (TN).

超深床反硝化生物滤池同时具有三个功能：

- 悬浮物 (SS) 的过滤去除；
- 总磷 (TP) 的化学除磷；
- 总氮 (TN) 的生物反硝化脱氮。

### Filtration Mechanism 过滤原理

ASDBDF adopts filter media made of clay. SS and  $PO_4\text{-P}$  particles produced by reaction with metallic ion in the water can be removed at the same time through the retention in the filter material layer.

超深床反硝化生物滤池采用粘土制成的滤料，通过滤料层的截留作用去除水中的SS和 $PO_4\text{-P}$ 与金属阳离子反应生成磷酸盐的固体颗粒物，从而达到同时去除SS和TP的目的。



Biological filter media  
生物滤料

### Denitrification Filtration Mechanism 反硝化脱氮原理

The filter layer of ASDBDF operates in an anoxic environment, and a large number of denitrifying microorganisms grow and attach to the surface of the filter media. Nitrate ( $NO_3^-$ ) or nitrite ( $NO_2^-$ ) in the sewage is adsorbed by the biofilm grow on the filter media and reduced to nitrogen gas ( $N_2$ ) through the biochemical reaction of microorganisms.  $N_2$  gas will be released from the sewage and thereby realising the denitrification process. Besides, the filter media also has the function of retaining suspended solids.

超深床反硝化生物滤池滤料层是在缺氧环境下运行的，滤料表面附着生长大量的反硝化生物菌群，污水中的硝酸盐 ( $NO_3^-$ ) 或亚硝酸盐 ( $NO_2^-$ ) 被吸附于滤料载体的生物膜上，经过微生物的生化作用被还原成氮气 ( $N_2$ ) 从污水中释放出来。在反硝化脱氮过程中，颗粒滤料同时具有截留悬浮物的作用。

### Backwash 反冲洗

The influent of ASDBDF exhibits an upward flow, which is the same as the  $N_2$  overflow direction.  $N_2$  overflows along with the inflow, thus separate nitrogen driven is not needed and energy saving is also achieved.

After running for 18-48 hours, accompanied by the increase of retained suspended solids and thickening of the biofilm on the surface of the filter media, the filter tank will need to be backwashed to maintain the treatment performance. The wastewater after backwashing can be directly discharged into the primary sedimentation tank of the sewage treatment plant or the intake well of the intake pump station.

超深床反硝化生物滤池进水为向上流式，与 $N_2$ 溢出方向相同， $N_2$ 随进水溢出，不需要单独驱氮，从而达到节能的目的。

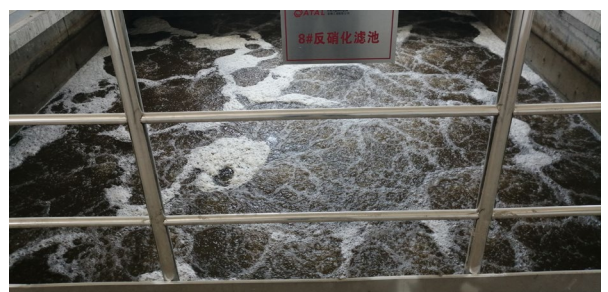
滤池通常在运行18-48小时后，随着截留的悬浮物增多和滤料表面生物膜的增厚，需要对滤池进行反冲洗，以保证滤池良好的处理效果。反冲洗后的废水可以直接排到污水厂的初沉池或进水泵房进水井内。



Water and air distribution  
system in Filter Tank  
滤池配水配气系统



ASDBDF under operation  
运行中的ASDBDF



ASDBDF under backwash  
反冲洗中的ASDBDF

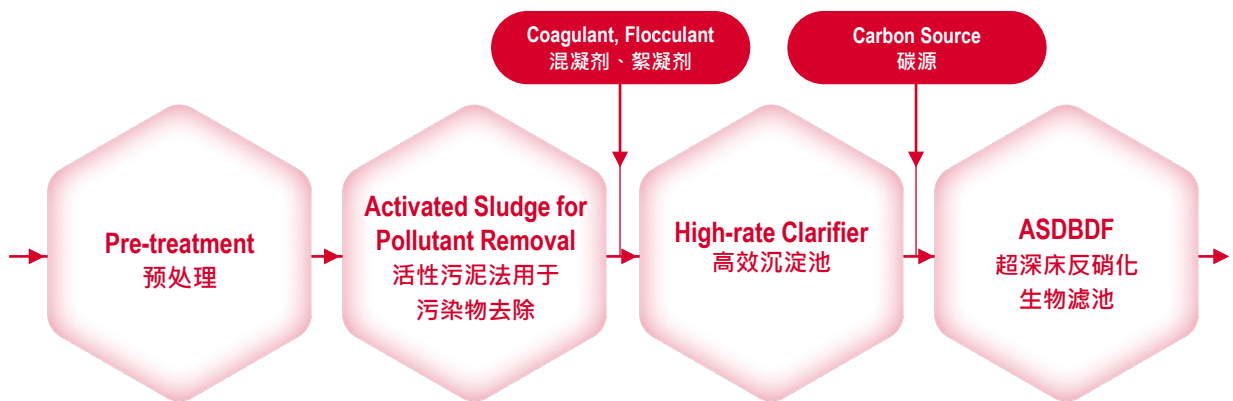
## Major Features 主要特点

### Control of Carbon Source Dosing 碳源投加控制

The professional automatic control system can realise accurate carbon source dosing based on the operation parameters and further calculation by our Knowhow software. The operation parameters including inflow rate, concentration of nitrate, COD or BOD in both influent and effluent is automatically collected by the auto-control system. Consequently, increases in COD and chemical waste caused by excessive carbon source dosing could be avoided. Also, total nitrogen exceeding the limit caused by insufficient carbon source could be avoided.

专业编制的自控系统软件通过获取滤池的进水流量，结合滤池的进、出水硝酸盐、COD或BOD的浓度，经过本公司Knowhow的应用软件计算，实现精确控制加药泵的碳源投加量，从而避免因碳源投加过量造成的COD超标和药剂浪费，或因碳源不足引起的总氮出水超标。

### Post-denitrification 后置反硝化



After the activated sludge or other biological treatment process, if the total nitrogen in the effluent cannot meet the discharge standard, the anoxic biological filter can be adopted for denitrification. The denitrification process is achieved by adding carbon source (e.g. methanol), and efficiently converting nitrate generated in nitrification process to nitrogen gas. A high-rate clarifier can be used synergistically to remove SS and TP at the same time.

在经过活性污泥法或其他生物处理后，如果出水的总氮达不到要求，可以采用缺氧生物滤池进行反硝化。通过加入外部碳源（甲醇等）来完成反硝化过程。以高效率把硝化过程中产生的硝酸态氮转化为氮气。高效沉淀池可以协同使用，同时去除SS和总磷。



System developed by ATAL  
安樂工程的研发装置

## Advantages 优点

### Mature and Leading Technology 成熟领先的生物处理技术

- High effluent quality
- Upflow velocity: 4-15 m/h
- Less impact from hydraulic loading variation
- Overall automatic control
- High NO<sub>3</sub>-N loading
- Max. 2.5 meters depth filter bed, high fluctuation resistance
- 出水水质高
- 4-15 m/h的上升流速
- 水力负荷变化影响小
- 处理过程全自动控制
- 较高的硝酸盐氮去除负荷
- 滤床深度大·达2.5 m·抗冲击能力强

### High Quality Filter Media 高质量的滤料

- Manufactured by natural clay
- Robust mechanical structure with long service life
- Low loss rate of filter media
- Different spec to match various treatment purposes
- Honeycomb surface with large surface area
- High biological organic removal rate
- 采用天然粘土加工而成
- 机械强度高·使用寿命长
- 滤料损耗率低
- 各种规格形状·满足各种处理目的
- 表面蜂窝状·比表面积大
- 生物处理有机物去除率

### Excellent Filtration Performance 卓越的过滤效率

- Low SS concentration in effluent, maintained under 10 mg/L
- Patented water distribution system to achieve even air and water distribution
- Double layer-effect between filter media and biofilm, which makes the capture of SS more prominent
- 出水SS浓度低·稳定地小于10 mg/L
- 专利的配水系统·使布水、布气更均匀
- 滤料和生物膜的双重作用·使悬浮固体的捕获性能更加突出

### Less Pollutant Discharged 污染物排放少

- Less odor and volatile
- Use treated effluent as backwash source
- Surrounding air only contact with treated effluent to avoid second pollution
- Backwash wastewater is discharged to confined space rather than exposed to air
- 臭味和挥发物更少
- 反冲洗水源为处理后的出水
- 滤池周围的空气仅和处理后的水接触·避免二次污染
- 反冲洗污水排放到密闭的空间内·而不是暴露在空气中

## Job Reference 案例

### Expansion of Xinjiang Hexi WWTP, Phase I, China 中国新疆河西污水处理厂 改扩建工程一期

**Capacity 处理水量**  
80,000 m<sup>3</sup>/d · Kz=1.3

**Application 用途**  
Removal of SS, TP and TN as tertiary treatment process  
该工艺段作为深度处理·用于降低SS、TP和TN

#### Influent Quality 进水水质

Parameter 指标	Unit 单位	Design Value 设计值
CODcr	mg/L	≤60
BOD <sub>5</sub>	mg/L	≤20
SS	mg/L	≤20
TN	mg/L	≤22
NH <sub>4</sub> <sup>+</sup> -N	mg/L	≤1.5
TP	mg/L	≤1.5
Temperature 设计水温	°C	11 ~ 25

#### Effluent Quality 出水水质

Parameter 指标	Unit 单位	Design Value 设计值	Actual Value 实际值
CODcr	mg/L	≤40	20 ~ 40
BOD <sub>5</sub>	mg/L	≤6	4 ~ 6
SS	mg/L	≤10	6 ~ 8
TN	mg/L	≤7	4 ~ 7
NH <sub>4</sub> <sup>+</sup> -N	mg/L	≤1.5	0.5 ~ 1.0
TP	mg/L	≤0.3	0.1 ~ 0.3



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