

The facilities of seawater treatment and the design of technological process in recirculating mariculture system

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Design of technological process

- The system technological process was as follow: fishpond - automatic micro-screen drum filters - fast filter - biological purification pond - water temperature regulating reservoir - ultraviolet ray disinfection pond - highly effective oxygen dissolved tank - water quality monitor - fishpond (Figure 1).

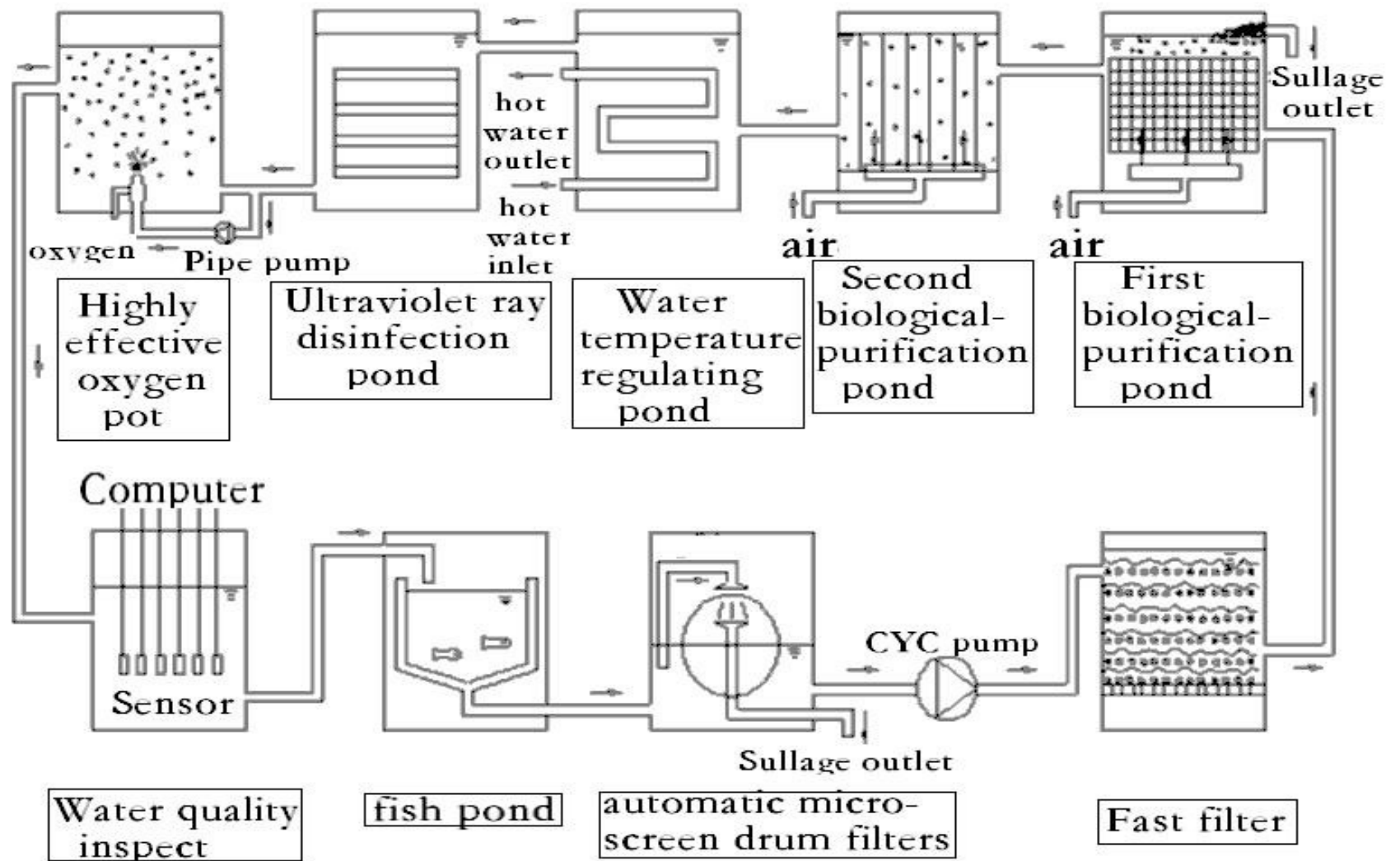


Fig.1 The system technological process

The engineering design of water treatment system - fish pond

- Total area, 1000m² ;
- The depth of fish ponds, 1.0m; the water level, 0.8m;
- The volume of recircling water, 400m³/h;
- The reusing rate of the water, >90%;
- The yield of turbot, 30kg/m².

The height design of the water treatment system

- The areas of water treatment room, 368m² , the height of floor on grade , ± 0.00 .
- The height of floor of the reservoir, -1.8m.
- The height of floor and the apex, +1.5 m and +3.5m respectively.
- To save electric power, single water-lifting pumping were adopted, and the rule of “water flow by gravity” was considered firstly at overall arrangement of the facilities.

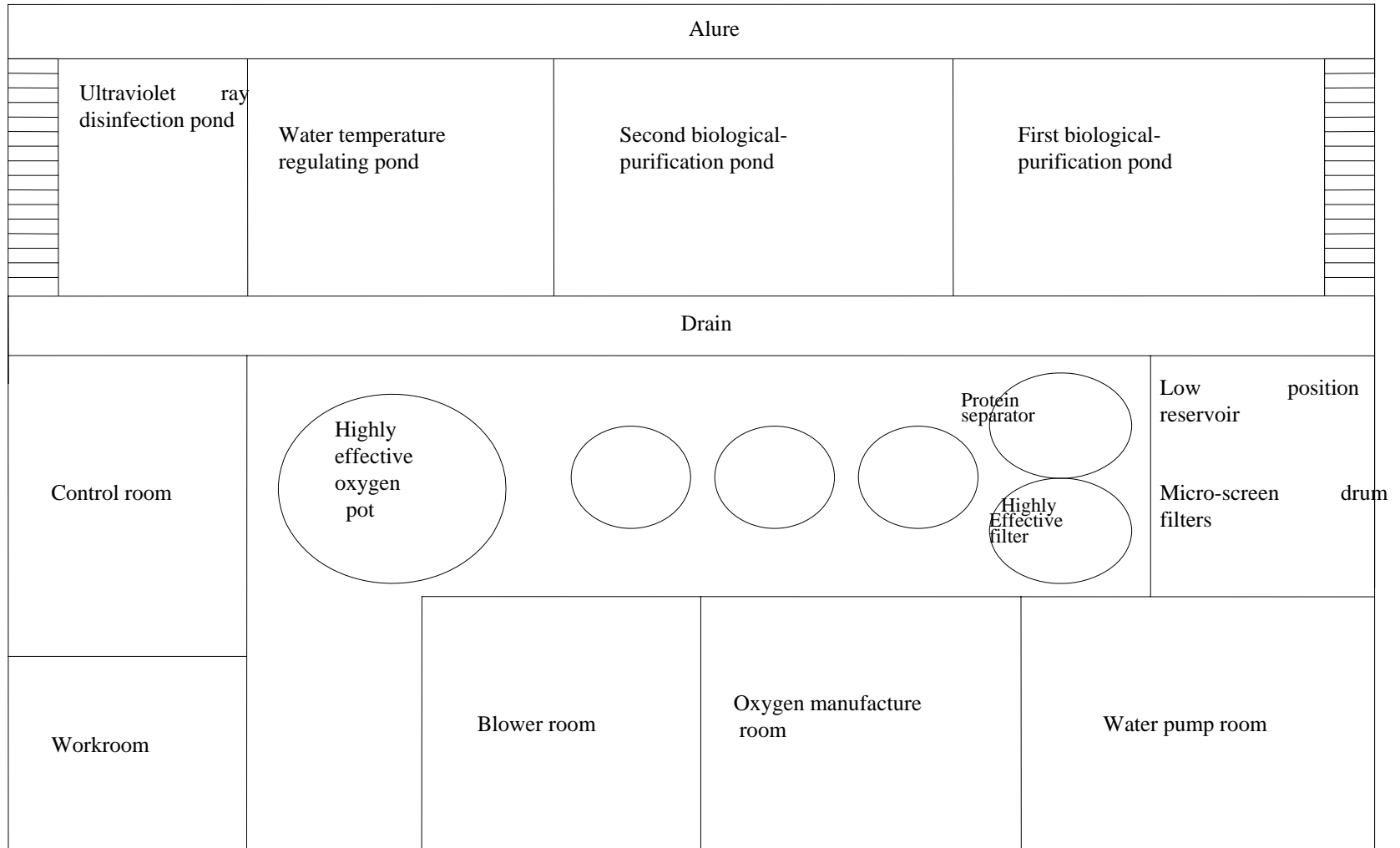


- Apperance of water treatment room



- water treatment quipment room

The layout plan of water treatment room



The design of water flow state in circulating system

- The fishpond designed to be a circularity, the bottom of the pond was the cone-shape, central position for draining water. the radiation flow was formed in the pond bottom, so the TSS were cleaned.
- The water flow state in the others were mainly designed as even.

Details of the supporting facilities for industrial aquaculture

Names of facilities	type	performance	amount
Auto-control micro-screen drum	ZLW14-A	400 M3/hr	1
Foam separator	HY863-50	50 M3/hr	1
Filter	KSG-1800	200 M3/hr	3
Oxygen dissolving tank	GXR-1800	400 M3/hr	1
Oxygen generator	KDFO-6, ZY-6	6 M3/hr	2
Ozone generator	KV-C	20 g/hr	1
Ultraviolet ray disinfectant	ZHC30-15	400 M3/hr	1
Pump	ISG100-125 , ISG65-160	100 M3/hr, 50 M3/hr	7
Air compressor	Ww-1.8/7	1.8 M3/min	1
Air drier	Tclf-2.0/10	2.0 M3/min	1
Roots blower	L32LD	6.8 M3/min	1

The manufacture of facilities

- The automatic micro-screen drum filter
- The Auto-control micro-screen drum filter are the main equipment of eliminating suspended particle and impurity, the removal rate may achieve 70%.
- We had developed the new stainless steel micro-screen drum filter .

The Auto-control micro-screen drum filter



Technical specifications of new fully automatic micro-screen drum filter

- 1) Type : WL14A
- 2) Diameter of filter drum : ϕ 1400mm
- 3) Length of filter drum : 1700mm
- 4) Total area of filter drum : 5.96m²
- 5) Effective filter area : 2.68m²
- 6) Filtration accuracy : 120mm
- 7) Power of electrical engine : 1.3kw
- 8) the amount of water treatment : 400m³/h
- 9) The weight of complete machine : 800kg

Features of the new automatic micro-screen drum filter

- **(1) pattern of central-axis transmission**
- **(2) Automatic control system of water-level and flushing**
- **(3) Wear-resisting, anti-corrosive bearing**
- **(4) Anti-corrosion of engine base**
- **(5) Cheap price, installed easily**

The manufacture of facilities

- The oxygen dissolving tank

- One of the most important water conditions of fish culture is dissolved oxygen, the higher level DO in the water may oxidize the deleterious substance, restrain bacterium growth, oxide the organic matter.
- So increasing DO level has important significance in the recircling production system for finfish culture.
- We had manufactured the oxygen dissolving tank for recircling production system for fish culture.

The performance of the oxygen dissolving tank

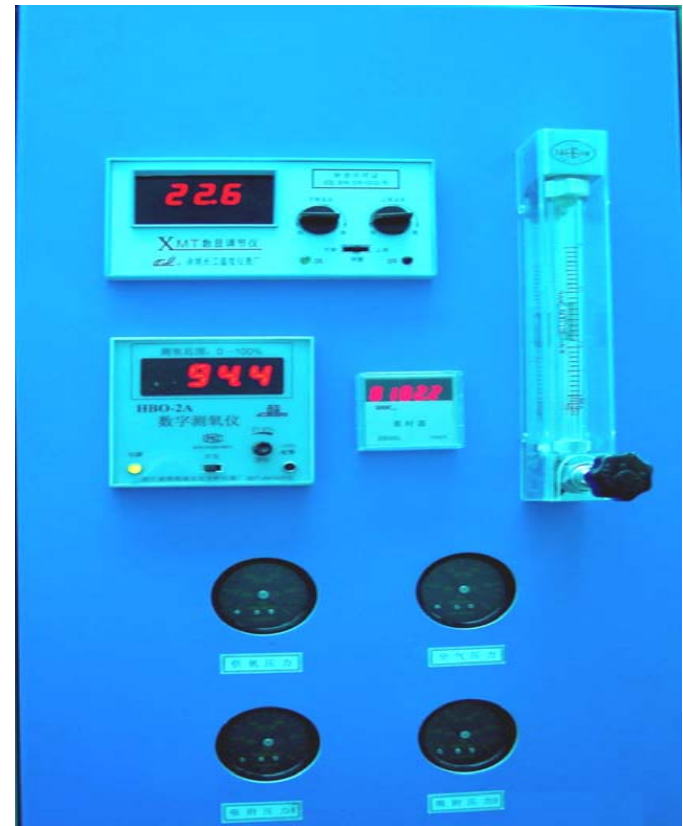
- The diameter , ϕ 1,800;
- The current capacity, 400m³/hr;
- The dissolving rate, >70%;
- The highest level of DO, 30 mg/L.



The manufacture of facilities

- The oxygen generator

- Molecular sieves were used;
- The content of oxygen, 90%;
- Running stably;



The manufacture of facilities

- The new fast filter

- The diameter, ϕ 1,800;
- The volume , 1.8m³;
- Filters area , 2.54m²;
- Rate of filtering, 60m/hr;
- Volume of filtering, 150 m³/hr;
- Work pressure, 0.4Mpa;
- Resin design, 20 ~ 40 m³/m².hr; work pressure 0.1 ~ 0.15Mpa,flushing lasted 8min;
- Resin water-consumption < 2%.

The new fast filter



The results of experiments for the new fast filter

Item	results
Removal rate of TSS (diameter>2um)	91%
Filtrating rate	81m/h
Water consumption of resin	1.9%
The rate of residual deposition	3.5%

The manufacture of facilities

- The ozone generator

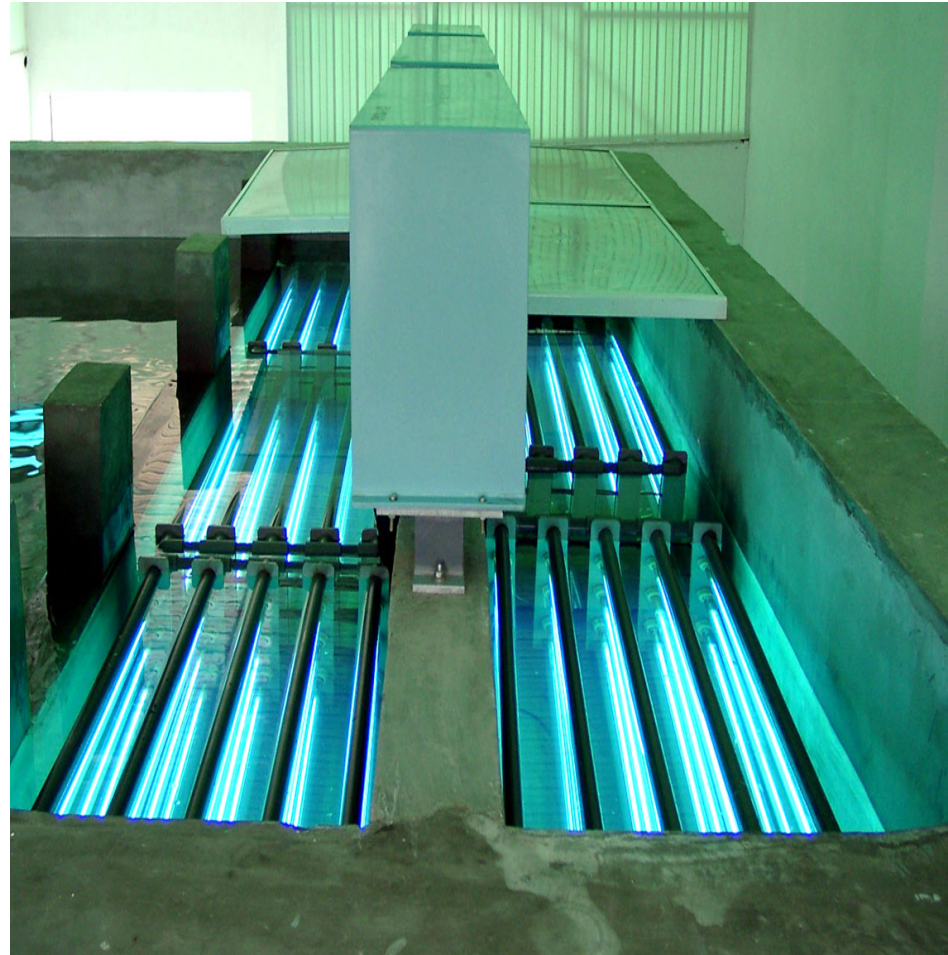
- Power , 220v and 50HZ;
- Ozone output 20g/hr;
- Air source;
- high ozone production capacity, low power consumption, small volume, light weight;
- As a supporting equipment for foam separator.



The manufacture of facilities

- The ultraviolet disinfecter

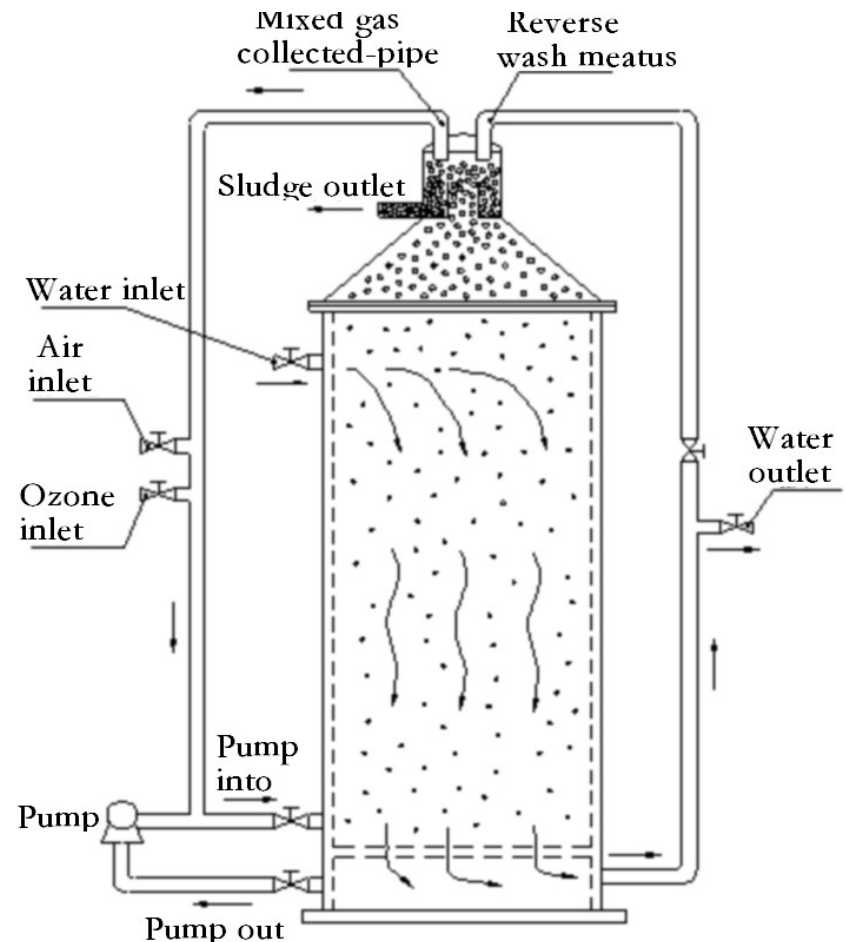
- Power Sources, 220v and 50HZ;
- The power of lamps , 30~40W;
- Wavelength generated by the lamp, 253.7 ;
- The life of the lamps, 10000h.



The manufacture of facilities

- The foam separator

- Treatment capacity, 50m³/h;
- The contact time between air and water, 2 minutes;
- The diameter of micro-bubbles produced, < 1 mm;
- The parameters:
 - the diameter, 800mm;
 - the total height, 2500mm;
 - the diameter of water inlet, 75mm;
 - the water outlet, 90mm;
 - the diameter of air inlet, 20mm;
- The removing rate of nitrogen oxide, organonitrogen, protein, and TSS, >50%, >80%, 75%, and 70% respectively;
- The DO increased, 100%.





Foam separator



parallel connection of foam separator

The manufacture of facilities

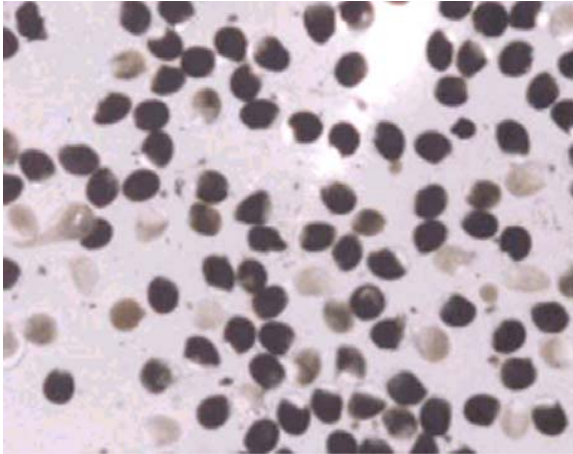
- The biological purification pond



Culture of nitrobacteria



Low temperature nitrobacteria



3-5 mm



28 mm



PVA as immobilized carrier for nitrobacteria

The results of turbot culture in the recirculating production system

- Experiment location : eacoast in Haiyang bordering upon Yellow Sea,Shandong province,China.
- The scale of the experiment was 1000m².



The result of turbot culture experiment

The mean initial weight (g)	220
The initial culture ensity (ind/m ²)	70.32
The period of culture (d)	60
The mean weight (g)	480
The mean culture density(ind/m ²)	70.1
The yield (kg/m ²)	33.6

THANK YOU

