

# **Green Blue Co., Ltd.**

## **fine bubble solution**

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2023/05/07

# 1. About Fine bubble

Fine bubbles" are much smaller than the bubbles we see in our daily lives, with diameters smaller than  $100\ \mu\text{m}$  ( $= 0.1\ \text{mm}$ ).

There are two types of "fine bubbles" depending on the size of the bubble: microbubbles and ultrafine bubbles.

Bubbles with a diameter of less than  $100\ \mu\text{m}$  and greater than  $1\ \mu\text{m}$  ( $=0.001\text{mm}$ ) are called "microbubbles," and bubbles with a diameter of less than  $1\ \mu\text{m}$  are called "ultrafine bubbles.

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# 1. About Fine bubble

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Fine bubbles" are highly reactive and accelerate reactions in water treatment.

Accelerated reactions result in shortened process times, water savings, and energy savings.

Furthermore, reducing water consumption, saving energy such as heavy oil, and reducing electricity consumption will help conserve the earth's resources and contribute to a sustainable society.

We will use this fine bubble technology to conserve the earth's resources and contribute to a decarbonized and sustainable society.

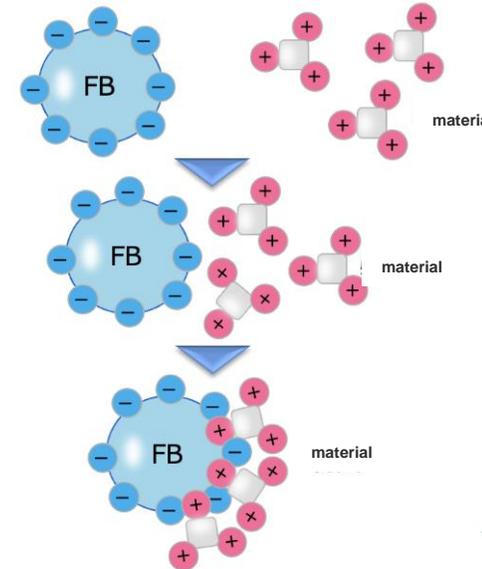
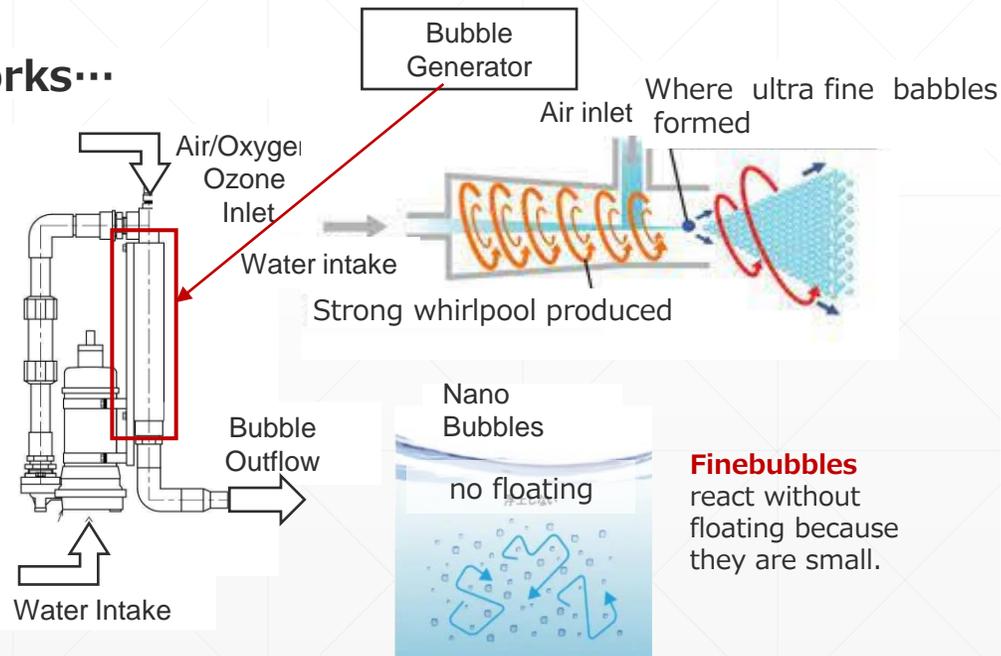
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# Fine bubble Generator



- ✓ Generates ultra fine bubbles <1 nanometer.
- ✓ Produces very strong whirlpool, forming nano bubbles of air/oxygen.

## How it works...



**Finebubbles** are charged with zeta potential (negative potential). It has a positive electron and adsorption effect.

# 1. Fine bubble solution map

field	purpose	GAS
Factory	Wastewater treatment facilities and biological treatment	O2
	Deodorization and decolorization	O3
	Increased cleaning power	AIR
	Ability to neutralize alkaline wastewater	CO2
environment	Restoration of contaminated river sediment	O3
	Inhibition of algae growth	O2
	Countermeasures against oxygen deficiency in marine areas	O2
agriculture	Hydroponics Growth Promotion	O3
fishing (industry)	Fish Farming	O2
	Fresh Fish Freshness	O2

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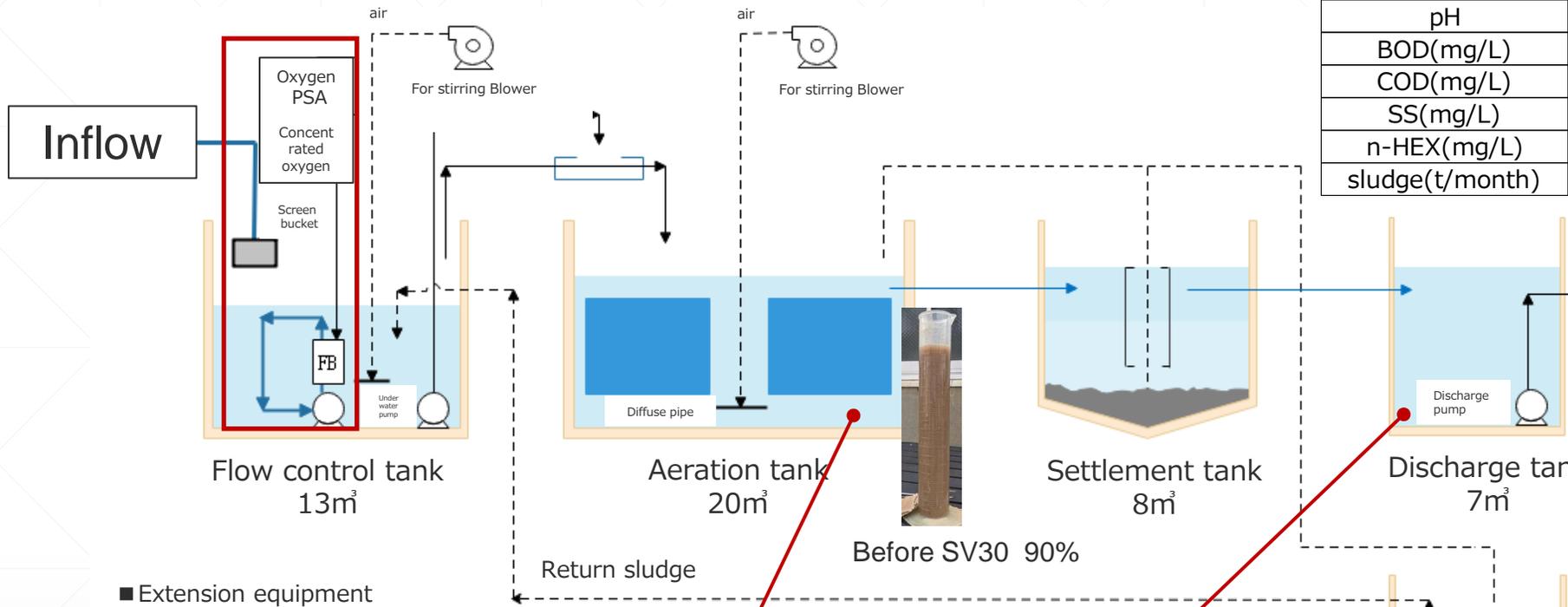
# 2. Wastewater treatment facility

Water quality item	Regulated value (JAPAN)	inret	NORMAL outlet	FB outlet
pH	5-9	6.8	6.9	7.2
BOD(mg/L)	120	1,400	200	27
COD(mg/L)	120	260	120	41
SS(mg/L)	200	870	94	34
n-HEX(mg/L)	30	950	13	2
sludge(t/month)			3	0.5

Red letters: exceeding the reference value

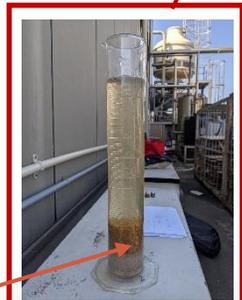
discharge

Carry out (Industrial waste)



Extension equipment

symbol	name	Model number
FB	Finebubble device	F.JP-24-SP-1-I-N
	Underwater pump	WUO-656-1.5
	Oxygen PSA	IT0-08
	Return sludge pump	SP-150BN



after SV30 25%

Aeration tank



Before introduction

After introduction

Discharged water

Oil balls decrease before and after introduction

BOD 27mg/L

Sludge storage tank 7m<sup>3</sup>

# System flow (Photo)



Finebubble Device  
underwater  
pump



Oxygen  
generator



Aeration tank  
Sludge  
Subsidence

SV30 25%



Discharged  
water

BOD  
1200mg/L→27mg/L  
clear water



Before Discharge tank  
There is an oil ball

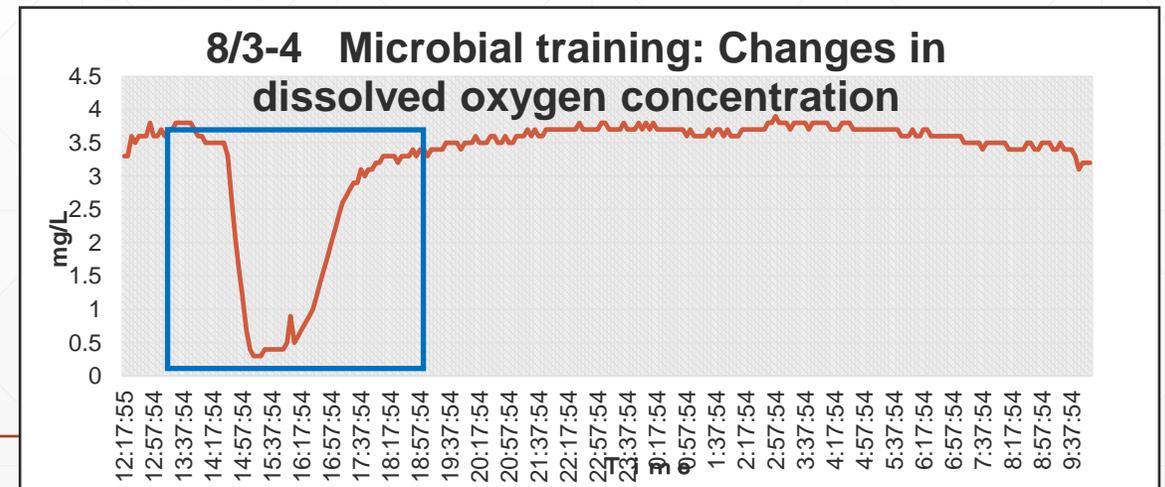


After Discharge tank  
No oil ball

# Principle of microbial activation

## Fine bubble function

The sludge returned from the sludge storage tank (the microorganisms are put into the flow control tank) and oxygen fine bubbles are put into the flow control tank, and the oxygen fine bubbles are injected / circulated. Then, the microorganisms in the flow rate adjusting tank and the aeration tank absorb oxygen to increase the activity, and carry out more organic matter decomposition activity than before. As a result, BOD decomposition is also promoted, resulting in a system with a high removal rate. As a result, the BOD value is also reduced. In addition, the amount of sludge can be reduced, and the cost of industrial waste disposal can be reduced.



# Effect of fine bubble / basic design

## BOD removal of conventional facilities

Conventional facility			
Inflow BOD	800mg/L	BOD removal by aeration tank Exclusion rate 80%	$800 \times (1-0.8) = 160\text{mg/L}$

## Removal rate by installing oxygen fine bubbles in the flow control tank

Inflow BOD 800mg/L	BOD removal in flow control tank Exclusion rate 80% . . . ①	BOD removal by aeration tank Exclusion rate 80% . . . ②	Removal by ① $800 \times (1-0.5) = 400\text{mg/L}$ Removal by ② $400 \times (1-0.8) = 80\text{mg/L}$ Result : 90% removal rate

## Other effects

- **Sludge volume reduction**  
→ Industrial waste treatment three times a year once a year
- **Odor improvement**  
→ **The stench is less noticeable.**

※When microbubbles are used, the design is capable of reducing BOD and other parameters by 30-50% in a flow control tank. In wastewater environments, even greater effects can be expected.

# Approximate price

## ■ Oxygen PSA gas amount and Fine bubble generator

## Approximate price

Discharged water (m <sup>3</sup> /day)	100		300		500	
BOD concentration(mg/L)	1,000-2,000					
Required oxygen amount (L/min)	8	12	30	50	70	100
oxygen system Power (KW)	1	2	3.7	5.5	15	22
FineBubble Suitable flow rate(m <sup>3</sup> /h)	24		60		150	
FineBubble pump Power (KW)	1.5	2.2	3.7	5.5	7.5	11
Electricity TOTAL(KW)	2.5	4.2	7.4	11	22.5	33
Fine bubble generator (IRP)	2,419,200	2,419,200	4,384,800	4,384,800	7,408,800	7,408,800
Oxygen PSA gas amount (IRP)	982,800	1,474,200	4,422,600	5,896,800	6,879,600	8,845,200
Installation cost TOTAL (IRP)	3,402,000	3,893,400	8,807,400	10,281,600	14,288,400	16,254,000

### 3. Textile factory textile washing factory Saving water and energy



Storage tank (1m<sup>3</sup>~)



Produce fine bubbles,  
Provides.

Install a FineBubble Device in the pump room of the water storage tank.

■ **Improved cleaning ability in short**

**Water saving and time saving**

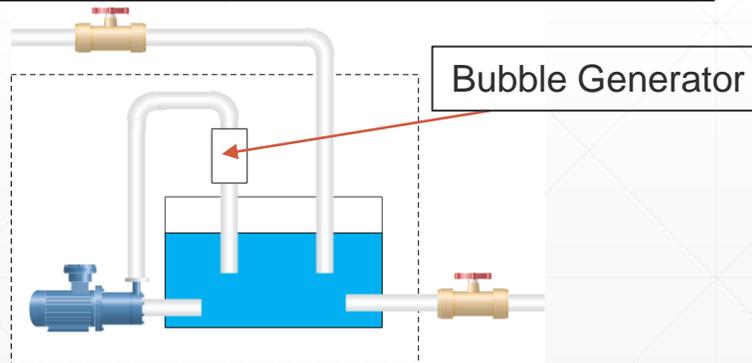
**Odor reduction**

**1/5 to 1/10 less detergent**

Shortening the time and saving water also leads to a reduction in boiler energy. (approx. 25-30%)



Wash machine



Many Bubble water provided

# Improvement effect of washing process by using fine bubble technology

1. Reduced number of cleanings by improving cleaning power  
→ Water saving and time saving
2. Response to odor → Odor reduction
3. Detergent amount by fine bubbles  
→ Reduced detergent to 1/5 ~ 1/10

【 effect 】

Improved quality and productivity

Shortening process time = Boiler Energy reduction about 25-30%

Water saving effect about 25-30% / Reduced detergent

Wastewater load reduction = environmentally friendly

Reduction of running cost

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# running cost down

## ■ annual cost savings

	Annual reduction	unit price	total fee	before fee	after fee
water cost	10,080 t	183	1,844,640	10,590,624	8,745,984
fuel saving	54,367 L	50	2,718,333	12,126,333	9,408,000
electric bill	28,800 KW	11	316,800		316,800

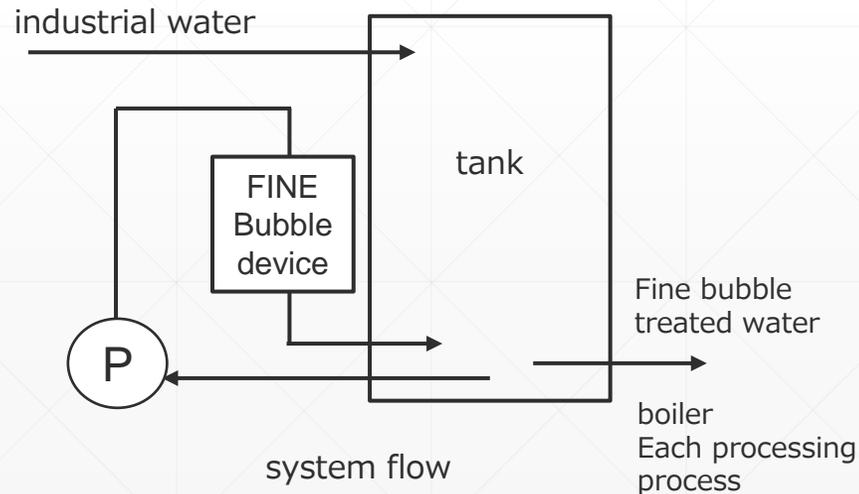
22,716,957 18,470,784

Annual cost reduction about **4,250,000IRP / year**

initial cost about **5,040,000IRP (Fine bubble device and pump only)**



wool washing machine



System appearance

# Cleaning test effect

## 1. Water saving test

Normal water	wash 1 Hour × 5 times (360L × 5 times)	Immersion × 12 Hour
FB water	wash 1 Hour × 3 times (360L × 3 times)	Immersion × 12 Hour

## 2. result

Comparison with normal cleaning

Appearance (color)      same

odor      Fine bubbles have less odor

## 3. Conclusion

Fine bubble has better detergency (deodorization)

30% reduction in water volume

(Daily water usage 120t → 90t)

30% reduction of heavy oil



# Cleaning test

# in factory



FineBubbleWater



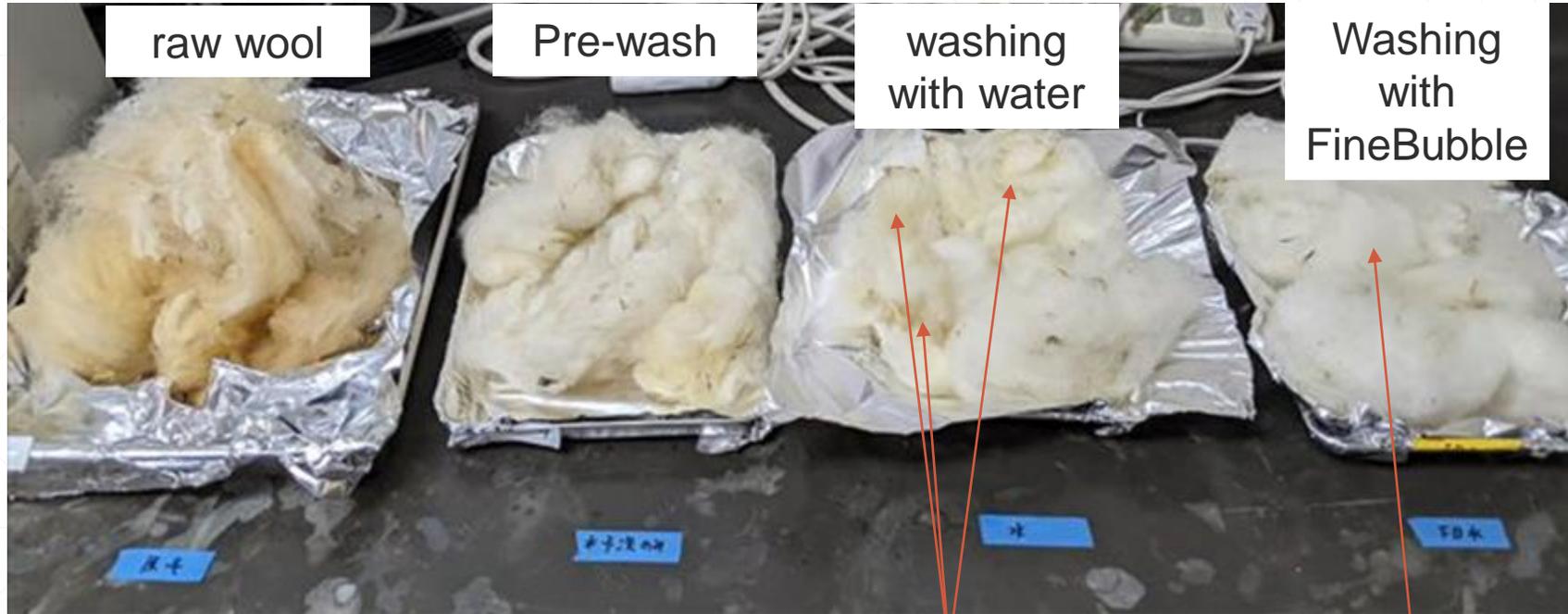
FineBubbleWater  
wash



Water wash  
Transparent

Finebubble  
wash  
Muddy

# Cleaning result

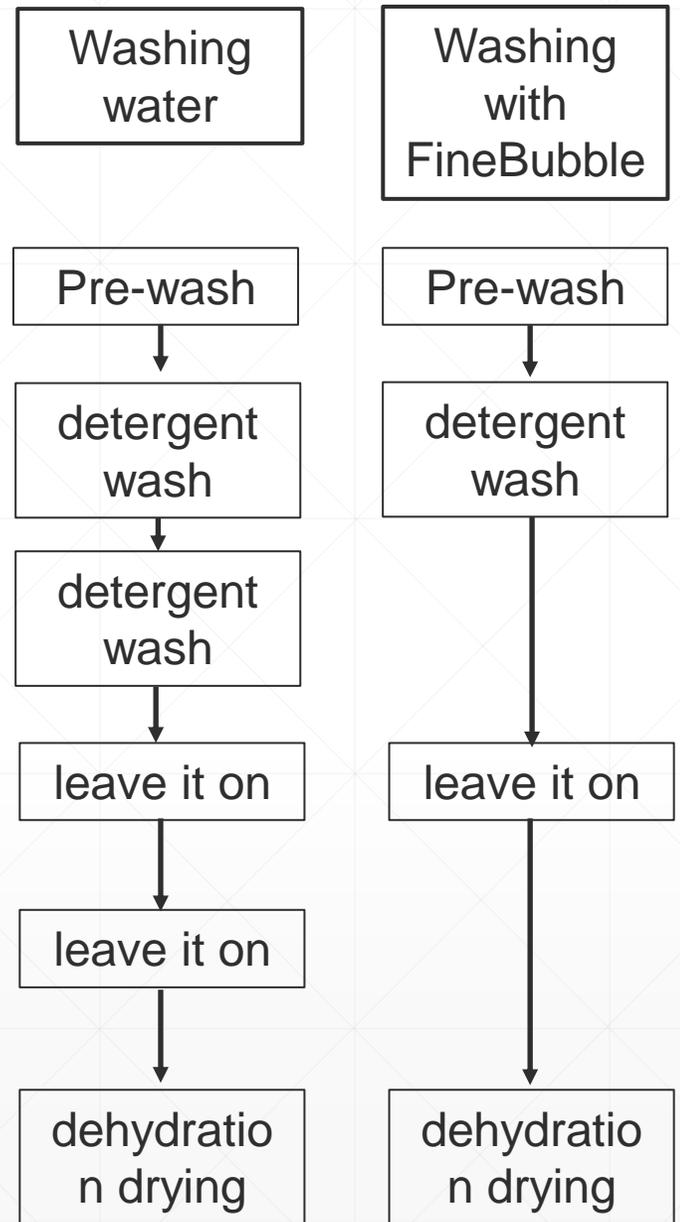


There are yellow parts here and there oil is not removed

all white  
Oil content is falling

Washing with FineBubble

saving water  
Energy Conservation  
Shortened production process  
Environmental load reduction



# 3. Wastewater odor control for fish factories



Fish processing site



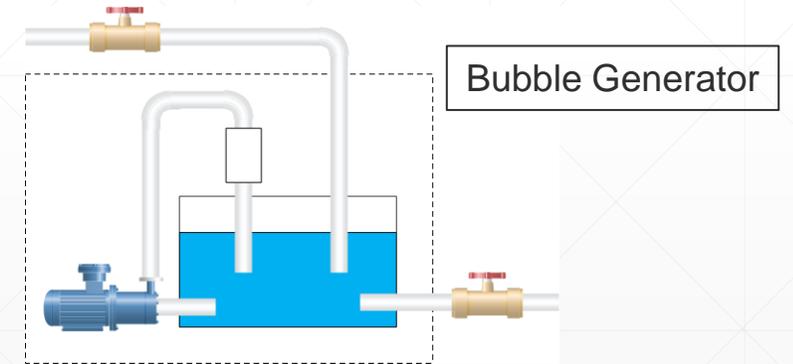
drainage underground pit



Finebubble

## ■ evidence

	water temperature	DO	pH	H2S	CH4SH
	°C	mg/L		ppm	ppm
raw water test1	18.3	1.5	7.02	25	ND
FB 10min	22.6	6.4	6.86	ND	ND
raw water test2	18.4	0.9	6.81	240	7
FB 45min	21.7	4.7	6.97	55	ND
FB 90min	23.2	5.5	7	ND	ND



drainage underground pit

# 4. Paper mill odor control

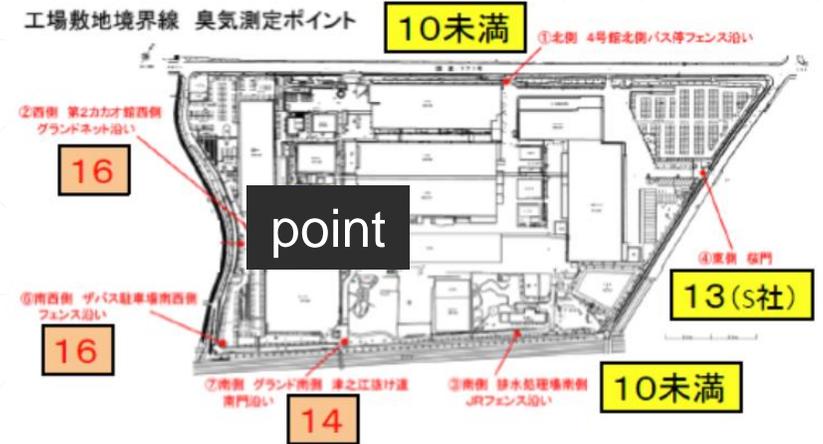


## Hydrogen sulfide Odor control

H<sub>2</sub>s NH<sub>3</sub> CH<sub>3</sub>SH etc

in the pit DO 0.1mg/L → FB DO 6-10mg/L  
 in the pit 600 m<sup>3</sup> 6,000 m<sup>3</sup>/day

Device	FJP	72 m <sup>3</sup> /Hour	×	4 set
	O <sub>2</sub> PSA	120 L/min	×	1set



# 3. Device lineup

type name	FJP-6	FJP-12	FJP-24	FJP-40	FJP-60	FJP-100	FJP-150	FJP-300
m <sup>3</sup> /Hour	6	12	24	40	60	100	150	300
GAS input(L/min)	2	4	10	20	30	40	60	100
Inlet piping	32A	40A	40A	65A	100A	100A	150A	200A
outlet piping	32A	40A	50A	100A	100A	150A	200A	250A
pump output (KW)	0.2	0.75	2.2	3.7	5.5	7.5	15	22
pump and pedestal (L*W*H)(mm)	415*180*730	500*400*855	510*635*1530	455*790*1765	490*865*2070	1140*970*2400	1230*1130*2705	1410*1380*3540
mass(Kg)	12	44	60	120	270	380	470	670
PRICE Generator Only (Not including tax and shipping)	283,500	472,500	756,000	787,500	866,250	3,150,000	3,937,500	4,725,000
exterior								

## 4 . others

When introducing fine bubbles, we will design the introduction. It is necessary to select a fine bubble device suitable for the application, hardware design such as pump capacity setting, and software design to keep the gas flow rate and the number of fine bubbles.

We do product sales and installation design.

Other devices will be procured and engineered in India company. I sincerely hope that our business will continue to grow in the future.

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# Green Blue Co., Ltd.

## Fine bubble system integrator

### Contact information

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