SUZUKI AERATOR

Energy-saving wastewater treatment system based on a powerful aerator

We design for the future
SUZUKI AERATOR R - 1

- The Aerator R-1 is a stationary diffusing cylinder developed especially for aeration of activated sludge tank and it has no movable parts.
- Air blown to bottom passes through the aerator together with water. Then, the air and water are mixed with each other by stirring and generate ultra-fine bubbles.
- Simultaneous by the cylinder absorb and lift the lower fluid materials up.
- To circulate the whole fluid materials continuously the bubbles exchange, oxidize, deoxidize, absorb the upper and lower fluid materials continuously and efficiently.

Liquid current distribution in tank and structure

1. SKIRT UNIT
The skirt unit is welded to pneumatic pipe and leads the water from the bottom to a main unit utilizing the Air Lift Effect.

2. GUIDE VANE CHAMBER
A mixture of water and air is controlled accurately and fed into a current cutter chamber as strong spiral fluid stream.

3. CURRENT CUTTER CHAMBER
The Spiral fluid stream, i.e., mixture of water and air, is stirred by a current cutter of special shape and becomes into turbulent flow. It is further melted and is transformed into ultra-fine bubble stream.

- Improvement of Processing Performance of BOD, COD
- Agitation of for gas and liquid by strong stirring
- Improvement of liquid circulation and oxygen dissolution efficiency
- Extinction of stink due to accumulated of waste sludge
**EFFECT OF INTRODUCTION**

System Continuous active sludge treatment

- Aeration time: 8 Hr.
- Untreated material fluid flow: 1560 m³/D
- Untreated raw material fluid BOD: 1600 ppm
- Treated material fluid BOD: 20 ppm
- Aeration tank floor area: 280 m²
- Depth of aeration tank: 3.2 m

*TDying factory wastewater treatment (Japan)*

<table>
<thead>
<tr>
<th></th>
<th>Before Modification</th>
<th>After Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aeration system</td>
<td>190 units of diffuser</td>
<td>46 units of aerator R-1</td>
</tr>
<tr>
<td>Air suction capacity</td>
<td>45 m³/min</td>
<td>Average 32 m³/min</td>
</tr>
<tr>
<td>Number of blowers</td>
<td>59 kw</td>
<td>37 kw</td>
</tr>
<tr>
<td>DO in aeration tank</td>
<td>0.5 ~1 ppm</td>
<td>3 ~4 ppm</td>
</tr>
<tr>
<td>Excess Sludge</td>
<td>70 m³/month</td>
<td>50 m³/month</td>
</tr>
</tbody>
</table>

**AERATOR MODELS**

**AERATOR R-1**

**AERATOR R-2**
### SPECIFICATION

<table>
<thead>
<tr>
<th>Model</th>
<th>Dia.</th>
<th>Length</th>
<th>Material</th>
<th>Weight</th>
<th>Air capacity per unit</th>
<th>Aeration area per unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>mm</td>
<td>mm</td>
<td>Main Unit skirt Unit Connector Kg</td>
<td>m3/min</td>
<td>m3/m in</td>
<td>m3/m in</td>
</tr>
<tr>
<td></td>
<td>125</td>
<td>680</td>
<td>ABS</td>
<td>ABS Flange 2.7</td>
<td>1.0</td>
<td>1.4</td>
</tr>
</tbody>
</table>

- ✓ Active Sludge treatment of industrial waste water.
- ✓ Deaeration of volatile gas in wastewater, e.g., ammonia, hydrogen sulphide, trihalomethane, etc.
- ✓ Installed in a reacting chamber for oxidization, deoxidization, neutralization or reaction acceleration.
- ✓ Increase of efficiency in existing electric facility.
- ✓ Purification of reservoir water.
- ✓ Stirring and mixing of upper and lower fluid materials of pond, lake, etc.
- ✓ Culture of microorganisms in water using aeration and mixing.
- ✓ Stirring and mixing of material in brewery.
- ✓ Stirring and mixing of sediments in precipitator in human waste treatment.
Efficient Waste Water Treatment with Cost Reduction

**AERATOR R1**

- Crush generates minute air bubbles
- Fixed blades generate powerful swirling flow
- Air piping for oxygen supply

Draws water mixed with bottom sludge into the air diffuser (1.3 t/min.)
A static air diffuser without moving parts has been developed for aeration of the active sludge tank. This resulted in significant reduction (30% to 50%) of the electricity bill through improved oxygen dissolution efficiency and elimination of pressure loss. This paid off 1.5 years after the introduction. It eliminates bad odor and solves the float problem in settling tanks.

1. No clogging!
2. No sludge deposit, no maintenance!
3. No need for regular cleaning!
4. Lower electricity bill!
5. Easy installation!

Installation diagram of Aerator R-1

Allows installation without draining wastewater
Examples of the introduction of the powerful air diffuser Aerator R1

- Running cost trial calculation
- Electric power used for each drain: \(0.24\text{kw/㎥} \rightarrow 0.16\text{kw/㎥}\)
- Maintenance free.
- No sludge on the tank bottom.
- Improvement of the sedimentation ability.
- Reduction of the residual sludge.

### EQUALIZATION TANK
- 1200㎥
- Aerator R1 8 sets
- Flow rate 5,500 ㎥

### AERATION POND
- 6,000×12,000×5,500H 4 Tanks
- Aerator R1 8×4 32 sets
- Blower 8㎥15kw 4 sets (use 2 sets)
Biological treatment by surface aeration of the lagoon pond

From the surface aeration system of the lagoon pond will be energy-saving air system by AERATOR R1. It has become a high efficiency of processing performance. It became a significant reduction in electricity bills.

Waste Water Flow rate 5,000㎥/D
BOD 500mg/L ⇒ 20mg/L, COD 750mg/L ⇒ 10mg/L, N2 400mg/L ⇒ 30mg/L

New Aeration system by Aerator R1 (60sets)

STABLE NO-MAINTENANCE AFTER 6 YEARS

AERATION TANK

9,000×12,000×5,500H ×5Tanks
2,970㎥
Aerator R1 15×4 60sets
Blower 27㎥ 33kw 2sets
Electricity fee running cost
132Kw ⇒ 66 kW 50% Electric bill will be about half as compared to the surface aeration
**WASTEWATER NEW PLANT AC CENTRAL (JUNE 2011)**

- WASTE WATER FLOW RATE 5,500㎥/D
- BOD 250⇒20MG/L, COD200MG/L⇒20MG/L

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**Running cost trial calculation**
- In half of the electricity bill
- Maintenance free.
- No sludge on the tank bottom.
- Improvement of the sedimentation.
- Reduction of the residual sludge.

**Electricity fee running cost**
- 56Kw ⇒30KW 55%

Electric bill will be about half as compared to the surface aeration.
The improvement system of Lagoon pond

**Existing lagoon pond**
- **Surface aeration device**: 18.5 kW x 3 sets

**Blower**
- 12.2 m³, 12.4 kW, 4 sets (use 2 blowers)

**BIOLOGICAL LAGOON POND**
- 1,680 m³, Aerator R1 24 x 2, 48 sets

**Waste Water Flow rate**
- 6,000 m³/D
- BOD 250 → 20 mg/L, COD 200 mg/L → 20 mg/L

**POWERFUL AERATION SYSTEM by the Aerator R1**

**EQUALIZATION LAGOON POND**
- Aerator R1 5 sets

**Electricity fee running cost**
- 6 kW → 25 kW, 55%

Electric bill will be about half as compared to the surface aeration.
The improvement of an industrial wastewater treatment plant

**THE PRESENT SITUATION**

- Aerating Lagoons 3,134m³
- Wastewater 3,000m³/D × 1 Line
- BOD 100mg/L ⇒ 10mg/L

Motor-driven surface aerators
- 22kw × 3 sets = 65kw (1,584kwh/D)

The improvement system (2014 Sep) Necessary amount of AERATOR R1 32 Sets (30kw)

The electric cost for aeration will be reduced to 45%
- 65KW ⇒ 30kw 55%

Electric bill will be about half as compared to the surface aeration

Replace the AERATOR R1 32 set on the left side of the lagoon (2015 Sep)
AERATOR R1 SYSTEM TTW
Bang-pa Industrial WWTP

Powerful Aeration system by the Aerator R-1

Waste Water Flow rate 18,000㎥/D
BOD 100⇒10mg/L, COD150mg/L⇒20mg/L

AERATION TANK
Total 9,720㎥ Phase1 80Sets  Phase2 90Sets  Total 170Sets

Improvement of SV30 and cleared treatment water by exchange from Diffuser  AERATOR R1 was reduction of 55%. Reduction of the residual sludge.
Examples of the introduction of the powerful air diffuser Aerator R1

It had been using the diffuser of the tube type, it had exchange from obstruction.

High salinity wastewater treatment of the salt concentration of 20%. Wastewater treatment system by halobacterium. Running smoothly without any trouble from 2012.6 Electric bill due to the introduction of the AERATOR R1 was reduction of 40%.

BOD 1,000 ⇒ 12mg/L
Aerator R1 (104sets)

From based on this achievement, 2013.2, ADITYA BIRLA EPOXY new plant in India has been introduced 70 sets.
The introduction of the waste water treatment system in October 2014 Palm oil factory in Medan Indonesia. BOD500⇒20mg/L AERATOR R1 12sets
BINUANG Factory (October 2014)
wastewater treatment new facilities of palm oil factory
Drainage volume
960 m³/D AERATOR R1 72Sets

The palm oil wastewater treatment was insufficient treatment in a huge lagoon pond even a few months, but by adopting this system, it is possible to achieve BOD discharge regulation value of 20 mg/L
Comparative measurement of DO

DO was measured by sending the same amount of waste water and air to the two aeration tanks of the new wastewater treatment tank.

**Diffuser Tank DO**
0.5mg/L

**Aerator R1 Tank**
DO 1.5 mg/L

Dissolved oxygen value from DO meter. There was a remarkable difference in the numerical value of DO.

(September 2013) Wastewater treatment new facilities of palm oil factory. Drainage volume 960㎥/D. AERATOR R1 36Sets.
1ST JCM PROJECT IN SOUTH SUMATRA

“ENERGY SAVING INDUSTRIAL WASTEWATER TREATMENT PROJECT FOR RUBBER INDUSTRY”

IN JULY 2015, MOEJ (MINISTRY OF ENVIRONMENT OF JAPAN) OFFICIALLY AGREED TO START JCM PROJECT OF “ENERGY SAVING INDUSTRIAL WASTEWATER TREATMENT PROJECT FOR RUBBER INDUSTRY” AT PT.A FACTORY IN PALEMBANG,
OUTLINE OF JCM PROJECT

The improvement of AN Industrial wastewater treatment plant

**WWTP1 Aerating Tank** 3,134 m³

- Wastewater 4,725 m³/D
- BOD 790mg/L → 20mg/L
- COD 3,305mg/L ⇒ 100mg/L
- BOD-volume-loading 0.7kg-BOD/ m³ .D
- BOD-SS-loading 0.24kg-BOD/kg.MLSS.D

Necessary Oxygen requirement 2,256kg-O2/D

Necessary amount of Aerator 214p

**WWTP2 Aerating Tank** 12,500 m³

- Wastewater 14,000 m³/D
- BOD 1,294mg/L → 20mg/L
- COD 2,711mg/L ⇒ 100mg/L
- BOD-volume-loading 1.44kg-BOD/m³.D
- BOD-SS-loading 0.50kg-BOD/kg.MLSS.D

Necessary Oxygen requirement 9,522kg-O2/D

Necessary amount of Aerator 288p

Due to the obstruction of the Diffuser, it was necessary to change it in 1 - 2 years. Aerator R1 can expect no maintenance for more than 10 years.

Replacement work without draining drainage

WWTP2 Aeration Tank
OUTLINE OF JCM PROJECT

- Applied technology of aerator
  - High efficiency aerator draws water mixed with bottom sludge into the air diffuser (1.3ton/min).

- Benefits of aerator
  - 30–50% Reduction of electricity consumption
  - Maintenance free more than 10 years
  - No sludge on the bottom of tank (no sludge deposit)
  - Improvement of sedimentation ability
  - Reduction of residual sludge
  - No odor from aeration tank

### Specification of aerator

<table>
<thead>
<tr>
<th>Dia. (mm)</th>
<th>Len. (mm)</th>
<th>Materials</th>
<th>Weight</th>
<th>Unit air capacity</th>
<th>Aeration area per unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>125</td>
<td>680</td>
<td>SUS, ABS</td>
<td>8kg</td>
<td>0.7-1.4 m³/min</td>
<td>6.0 m³</td>
</tr>
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</table>
NEDO PROJECTS IN VIETNAM

As a technology transfer project to the Institute of Environmental Technology of Vietnam, the company provided technical guidance in wastewater treatment using strong oxidative decomposition bacteria. Japanese enterprises expanding to Vietnam in the future will have the option of wastewater treatment equipment designed in Japan with manufacturing and maintenance done in Vietnam at lower cost, which will develop into a new business model.

As part of the NEDO ODA program, conducted research on the rapid treatment of UASB-processed wastewater using rapid oxidative decomposition bacteria together with the Institute of Environmental Technology of Vietnam. At the same time, technical guidance was provided as environmental technology transfer (from August 2006 to March 2008).

At Kyodai Katsura Venture Plaza

- Sludge acclimation/propagation of strong oxidative decomposition bacteria and continuous wastewater treatment test
- Isolated propagation and performance test of new strong oxidative decomposition bacteria for UASB wastewater decomposition

At a Vietnamese brewery

- Guidance for installation, start, and operation of wastewater treatment equipment using strong oxidative decomposition bacteria
  ① Start using strong oxidative decomposition bacteria/sludge (from late August)
  ② Start using an isolated group of new strong oxidative decomposition bacteria (from mid-November)
- Data acquisition, compilation and analysis, and data transfer to Japan by the researchers of the Institute of Environmental Technology as well as guidance in operation management

Dr. Chinh of the Institute of Environmental Technology of Vietnam receives technical guidance in the Kyodai Katsura Venture Plaza.

Checking useful bacteria using a biological microscope
1ST YEAR:

Energy (methane) recovery from brewery effluent using the UASB method

2ND YEAR:

Continuous rapid wastewater treatment using strong oxidative decomposition bacteria
### DATA ACQUISITION AND EXPERIMENT AT KATSURA VENTURE PLAZA

#### Continuous wastewater treatment experiment

#### Experimental data of beer effluent treatment performance using strong oxidative decomposition bacteria

#### Accomplished CODcr 7.523 kg/m³/d

## Acclimation of rapid oxidative decomposition bacteria

## Rapid oxidative decomposition bacteria complex

<table>
<thead>
<tr>
<th>Strong Oxidation Decomposition Treatment</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>COD Load per Vol.</td>
</tr>
<tr>
<td></td>
<td>kg/m³/d (g/L/d)</td>
</tr>
<tr>
<td>Average of 11/12 - 11/18</td>
<td>1.993</td>
</tr>
<tr>
<td>Preparation and adjustment for the new system of treatment.</td>
<td></td>
</tr>
<tr>
<td>Average of 11/19 - 11/23</td>
<td>4.429</td>
</tr>
<tr>
<td>1st step: the treatment with basic COD of the inlet.</td>
<td></td>
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<tr>
<td>Average of 11/23 - 12/08</td>
<td>4.965</td>
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<tr>
<td>2nd step: the treatment with a higher COD of the inlet.</td>
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<tr>
<td>Average of 12/09 - 12/12</td>
<td>7.523</td>
</tr>
<tr>
<td>3rd step: the treatment with a higher COD of the inlet.</td>
<td></td>
</tr>
</tbody>
</table>
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