Absolute Aeration
The Blue Frog™ System

Biological Sludge Control
Absolute Aeration

• The patented **Blue Frog System Technology**
• **Mimic’s natures’** sustainable practices
• Customized **hybrid modular system**
What is a Blue Frog System?

- **Anaerobic** digestion system
- **A Hybrid** aeration system
- **Digests** organic sludge in situ
- **Increases** capacity
**Blue Frog Unit**

- **Circumference:** 8’
- **Total height:** 5’ 3”
- **Total Weight:** 520 lbs.
- **Motor:** 3 HP
- **Motor Mfg:** Nord Gear Drive
Blue Frog Unit

Chassis Composition:
Low Density Polyethylene with UV protection.

Nord Motors: 3 hp, 3 phase

Shaft Speed: 144 RPM, 1,720 motor RPM
12:1 gearbox reduction = 143.333

Amps: 4.5 Amps / 460 Volt, 9.0 Amps / 230 Volt
Mimicking Natures’ Sustainable Practices

• Moving water horizontally mimics the natural transfer of water flow.
• Horizontal movement of water generates a layering effect that creates 3 distinct zones.
• The zones naturally transfer substrate (food) to the anaerobic zone; keeping the microbes in constant contact with the food.
• The result is the incubation of high-quality microbes that are distributed throughout the lagoon.
Layering Lagoons

Layered Lagoon System

<table>
<thead>
<tr>
<th>LAGOON SURFACE</th>
<th>LOW DENSITY TOP LAYER</th>
<th>ROBUST PYCNOCLINE</th>
<th>LAGOON SURFACE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTIVE HORIZONTAL MIXING ZONE</td>
<td>SOLIDS SETTLE OUT</td>
<td>GAS OCCLUDES TO SOLIDS AND THEY RISE</td>
<td>GAS RELEASED AT PYCNOCLINE &amp; SOLIDS SETTLE TO BOTTOM OF LAGOON CAUSING PASSIVE VERTICAL MIXING</td>
</tr>
<tr>
<td>PASSIVE VERTICAL MIXING ZONE</td>
<td></td>
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<tr>
<td>VISCIOUS BOTTOM SLUDGE LAYER</td>
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</table>
Continuously Stirred Tank Reactor

• The science behind bio dredging is to select for bacteria that are already present and adapted to the local conditions and wastewater substrate.

• An engineered 30-in. floating boom is used to redirect the horizontal flowing water downward from the lagoon’s surface to the anaerobic zone at the bottom.
Yellow Frog

• An efficient aerator used in dirty conditions where the oxygen is consumed rapidly by aerobes.
Gold Frog

- Fine bubble impingement aeration creates intense cavitation.
- Used in a CSTR for final clarification & rapid oxidation of soluble BOD.
Applications

• Aerated lagoons
• Facultative lagoons
• Stabilization ponds
• Industrial wastewater ponds
• Sludge storage ponds
• Equalization basins or tanks
Blue Frog System

- Eliminates Dredging
- Eliminates Lagoon Shut Down
- Eliminates Solids Accumulation
- Increases Lagoon Capacity
- Reduces Energy Consumption
Results

Clearlake CA Sludge Depth

- 55% Sludge Reduction
- 49% Sludge Reduction

Sludge Depth (ft)

10/1/14 11/1/14 12/1/14 1/1/15 2/1/15 3/1/15 4/1/15
Example Design

GPD: 500,000
Total HP: 76.5

<table>
<thead>
<tr>
<th># of Units</th>
<th>Unit Type</th>
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</thead>
<tbody>
<tr>
<td>7</td>
<td>Blue Frogs</td>
</tr>
<tr>
<td>10</td>
<td>Yellow Frogs</td>
</tr>
<tr>
<td>1</td>
<td>Gold Frog</td>
</tr>
</tbody>
</table>
Municipal Water Quality Results

At Installation

Results within 4 Months
Municipal Water Quality Results
Municipal Water Quality Results

Project Objectives:
1) Meet permitted discharge requirements.
2) Eliminate dredging.
Municipal Water Quality Results

Final Discharge
Summary

- Adaptable
- Affordable
- Modular
- Easy to install
- Low Capital Costs
- Energy efficient
- Reduces annual O & M cost
- Proven documented results
- Performance based guarantees