

# Ballast Water Treatment

Using The **CAKE™**

**Capture and Kill Effect  
Process**

# Existing Technologies

- 💧 Use High Flow Cyclonic Separation Followed by Ultraviolet Light Disinfection
- 💧 Use High Flow Automatic Backwashing Screens Followed By Ultraviolet Light Disinfection

These Technologies Are Highly Inefficient Because...

# Cyclonic Separators

Are Designed To Remove

- 💧 Large Particles
- 💧 Heavy Particles

**However...**

- 💧 Marine Organisms Are Small
- 💧 Marine Organisms Are Light

**And...**

- 💧 The Few Marine Organisms Separated Are Discharged Overboard And
- 💧 The Remaining Organism Population Cannot Be Effectively Disinfected By Ultraviolet Light

# Automatic Backwashing Screens

- ◆ Do A Far Better Job Than Cyclonic Separators In Removing Marine Organisms

**But...**

- ◆ Discharge Marine Organisms Overboard, And
- ◆ The Remaining Organism Population Cannot Be Effectively Disinfected By Ultraviolet Light

# UltraViolet Light

- 💧 Is Highly Ineffective Technology On Colored Ballast Water
- 💧 Is Generally Ineffective Technology On Other Ballast Waters
- 💧 UV Light Tubes Lose About 50% Of Their Initial Biocidal Effectiveness In 6 Months
- 💧 UV Light Tubes Must Be Replaced Annually As Their Mercury Fuel Becomes Fully Depleted
- 💧 UV Light Tubes Are Expensive
- 💧 UV Light Tubes Carry Mercury Disposal Considerations

# Existing Technologies

- 💧 Are designed for on-board use only
- 💧 Require the use of the ship's existing de-ballasting pumps
- 💧 Require the modification of the ship's existing de-ballasting pumps
- 💧 Apply ballast water treatment only during de-ballasting operations
- 💧 Are High-Flow Treatment Devices

# The CAKE™ Process

## Features

- 💧 Around-The-Clock Low-Flow Rate Treatment In
- 💧 The Capture And Killing Of Marine Organisms
- Utilizing ...**
- 💧 Steam Autoclaving and
- 💧 Biocidal Ozone

# The CAKE™ Process

## Effectively Treats

- 💧 Salt And Fresh Waters
- 💧 Heavy And Light Organism Loadings
- 💧 Clear And Colored Ballasts
- 💧 All Organism Concentrations
- 💧 Temperatures From 1-35°C (34-95 °F)
- 💧 Salinities From 500-45,000 mg/L TDS
- 💧 Dissolved Oxygen From 0.5-13.4 mg/L
- 💧 Dissolved Iron From 0-85µg/L

# The CAKE™ Process

- 💧 Does Not Require the Modification of the Ship's Existing De-ballasting Pumps
- 💧 Does Not Require the Use of the Ship's Existing De-ballasting Pumps
- 💧 Can Be Used On-board As Well As A Mobile Port-Based Treatment System

# The CAKE™ Process Consists Of

- 💧 50-Micron Bag Filtration Followed By
- 💧 1-Micron Bag Filtration Followed By
- 💧 Biocidal Ozone Addition

The Bag Filter Captured Marine Organisms Are Subsequently Killed By Steam Autoclaving At +300°F (~150 °C) For 1 Hour

Marine Organisms Escaping Filtration Are Subsequently Killed By Ozone Biocide Treatment

# Difficult-To-Filter Ballast Waters

- 💧 Are Made Quite Filterable By Applying A Very Conservative Filtration Rate
- 💧 Can Be Conditioned To Be More Filterable By Adding Filter Aid As a Body Feed

# Site Generated Ozone

- 💧 Is Made From Site Generated Oxygen Using Pressure Swing Adsorption Technology
- 💧 Is Introduced To The Ballast Water In An Educator Where Intense Mixing Occurs
- 💧 Is Thereafter Additionally Mixed With Ballast Water In A Downstream Static Mixer Where Significant Mixing Occurs
- 💧 Site Generated Ozone Eliminates The Necessity For Its Transportation To The Use Site

# Bag Filters

- Are Provided in Duplex Sets to Permit Continuous Treatment While Steam Autoclaving And Subsequent Bag Filter Maintenance Is Accomplished

# The CAKE™ Process Is User Friendly

- ◆ Fully Automatic Operation Except For Filter Bag Removal And Replacement
- ◆ Little Operator Skill Required

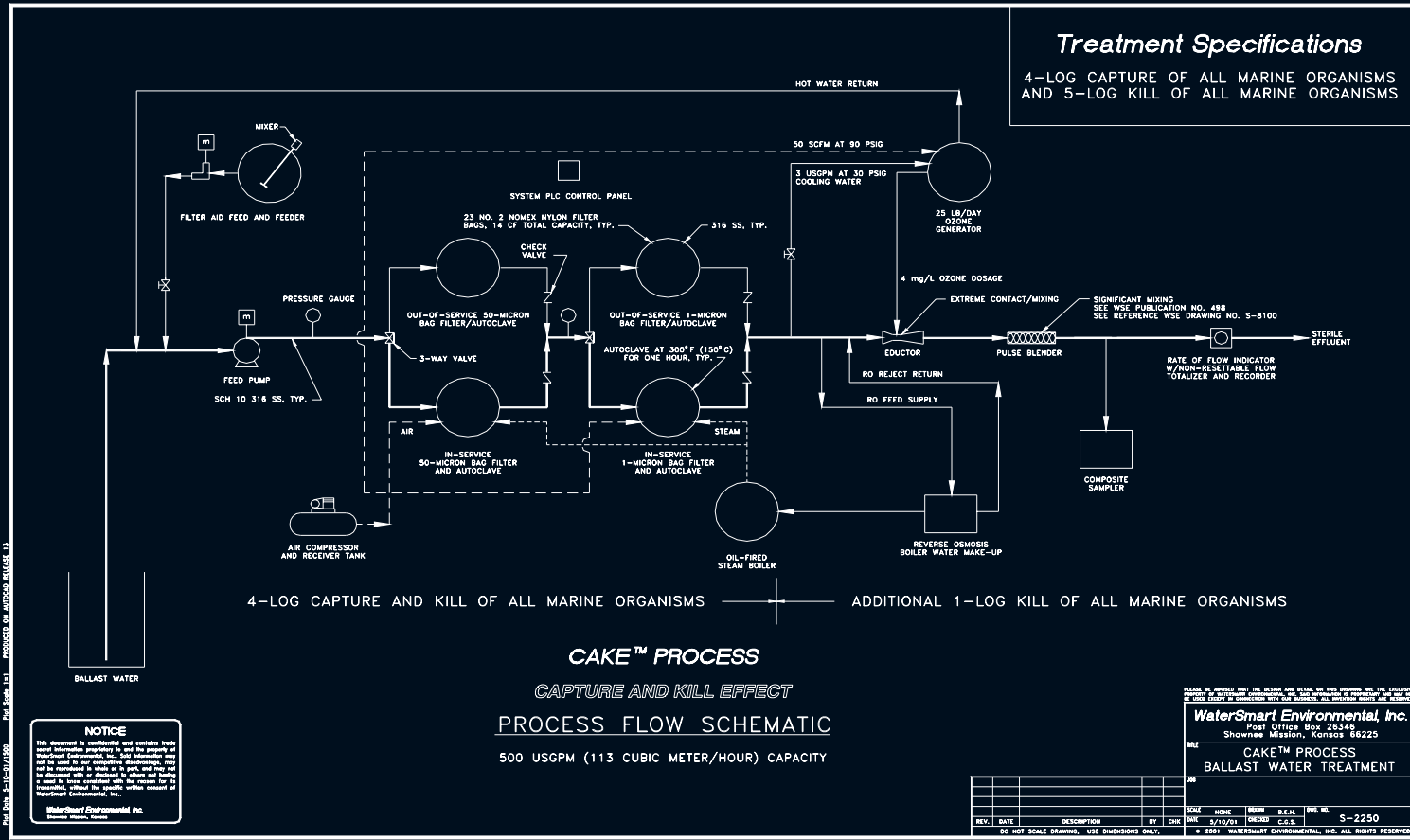
# Operational Requirements

- 💧 Onboard Treatment:  
4-6 Hours/Day For Each 500 USGPM Unit
- 💧 Barge/Mobile Based Treatment:  
2 Full-Time Operators/8-Hour Shift For Each  
4,000 USGPM Treatment Capacity

# The CAKETM Process

## Treatment Specifications

4-LOG CAPTURE OF ALL MARINE ORGANISMS  
AND 5-LOG KILL OF ALL MARINE ORGANISMS



4-LOG CAPTURE AND KILL OF ALL MARINE ORGANISMS ———— | ———— ADDITIONAL 1-LOG KILL OF ALL MARINE ORGANISMS

### CAKE™ PROCESS

CAPTURE AND KILL EFFECT

### PROCESS FLOW SCHEMATIC

500 USGPM (113 CUBIC METER/HOUR) CAPACITY

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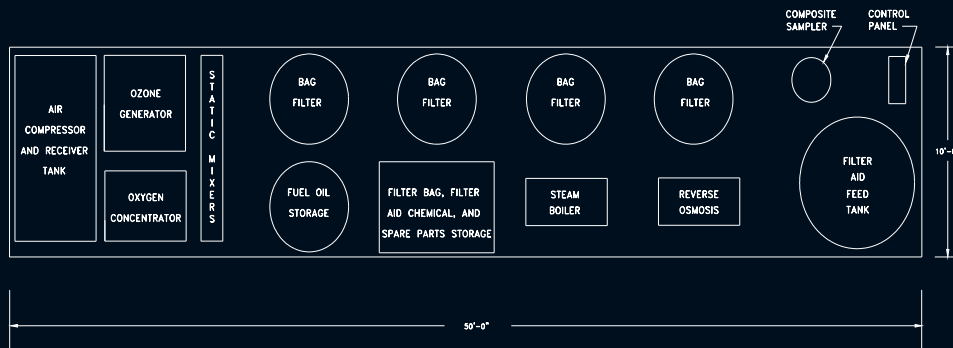
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# Mobile Barge Based 4,000 USGPM Unit

## Equipment Specifications

SHIPPING WEIGHT: 40,000 LBS  
 OPERATING WEIGHT: 75,000 LBS  
 REQUIRED HORSEPOWER: 50  
 DIMENSIONS: 10' X 50' X 10' H  
 WSE DRAWING REFERENCE: S-2250



## CAKE™ PROCESS

CAPTURE AND KILL EFFECT

## SKID MOUNTED EQUIPMENT LAYOUT

500 USGPM (113 CUBIC METER/HOUR) CAPACITY

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 BALLAST WATER  
 PACKAGE TREATMENT PLANT

REV.	DATE	DESCRIPTION	BY	CHK	DATE	SCALE	BY	CHK	DATE	SCALE	BY	CHK	DATE	SCALE

Plot Date: 5/14/2013 11:52:17 AM  
 Plot Scale: 1:1  
 Project: 2013050101 - Ballast Water Treatment Plant  
 Drawing: 13

# **CAKE™ Process**

## **Proprietary and Confidential**

**Strictly Controlled Disclosure To  
Architech/Engineer Consultants,  
Governmental Agencies, And End Users**

# Additional Information

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