Two Ballast Water Treatment Technologies

Presented By:
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Hyde Marine, Inc.
Hyde Marine’s Parallel Path

- **Ballast Water Treatment System**
  - Filtration & Disinfection

- **SeaKleen®**
  - A natural biocide
Hyde Marine BWT System

CORAL PRINCESS

Disk Filter

Medium Pressure UV
Hyde Marine BWT System

SEA CHEST → DISC FILTRATION → UV DISINFECTION → OVERBOARD

BALLAST TANKS

FILTER BACKWASH → MECHANICAL BYPASS
Hyde Marine BWT System

BALLAST MODE

SEA CHEST  →  DISC FILTRATION  →  FILTER BACKWASH  →  UV DISINFECTION  →  OVERBOARD

MECHANICAL BYPASS

BALLAST TANKS
Hyde Marine BWT System

DE-BALLAST MODE

SEA CHEST → DISC FILTRATION → UV DISINFECTION → BALLAST TANKS → OVERBOARD

FILTER BACKWASH → MECHANICAL BYPASS

BALLAST TANKS
Hyde Marine BWT System
Full Scale Testing

- Great Lakes Ballast Technology Demonstration Project Barge Testing
  - 1998 Screen Filtration
  - 2000 Screen Filtration/Cyclonic Separation/UV
  - 2001 Arkal Disk Filtration and UV
- 2000 Testing on “Regal Princess”
- 2001 “Cape May” Testing of UV/Filtration
- 2001-03 Multi-Ship Testing
- 2004 “Coral Princess” STEP Testing
- 2004-06 Baltimore Harbor
Hyde’s Installed Systems

- UV Treatment with Cyclonic Separation
  - April 2000 – “Regal Princess” – 200 m³/hr
  - Aug. 2001 – “Sea Princess” – 220 m³/hr
  - Mar. 2002 – “R. J. Pfeiffer” – 350 m³/hr
  - Feb. 2002 – “Star Princess” – 255 m³/hr
  - Apr. 2002 – “Stolt Aspiration” – 250 m³/hr

- UV Treatment with Filtration
  - May 2003 – “Coral Princess” – 250 m³/hr
  - Oct. 2006 – “Celebrity Mercury” – 210 m³/hr
# USCG STEP Results

<table>
<thead>
<tr>
<th>Type of Test and Date Performed</th>
<th>Percentage removal of &gt;50μm organisms</th>
<th>Citation</th>
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Hyde Marine BWT System

- Capacities to meet any requirement
  - Small Footprint – Modular Construction
  - New Builds or retrofit in service
- Simple Operation
  - Fully automatic
  - Safe – No Chemicals
  - Minimal Maintenance
- MEETS USCG and IMO STANDARDS
SeaKleen® A Natural Biocide

SEABULK MARINER

GREAT LAKES BALLAST WATER CONFERENCE
September 27, 2006 Cleveland OH
SeaKleen® A Natural Biocide

- Cost Effective – 10 to 20 cents per tonne
- Highly Soluble in Fresh and Salt Water
- Not Corrosive to Piping or Ballast Tanks - Unlike Oxidizing Biocides
- Delivered in Safe Powder Form – Can be Stored on Board and Handled by Crew With No Special Training
- Low Affinity for Particulate Matter and Sediment
SeaKleen® A Natural Biocide

- Particularly Suitable for Bulk Carriers and Tankers with Large Ballast Volumes
- Naturally Degrades And Is Quickly Diluted To Non-toxic Levels
- Straightforward Dosing Under all Ballasting Conditions Including Gravity Ballasting
- Tested aboard the Seabulk Mariner in August 2006
SeaKleen® A Natural Biocide

- 2001 “Cape May”
- 2004-06 Baltimore Harbor
- 2006 “Seabulk Mariner”
SeaKleen® A Natural Biocide

Full Scale Test Results from Seabulk Mariner

- Zooplankton densities per m³ in untreated (1S) ballast tank (8 taxonomic groups)
  - >50um : 17,585 ± 2,182
  - <50um : 1,150 ± 468

- Zooplankton densities per m³ in treated (5P) ballast tank (1.52mg/L SeaKleen) – 0

- Zooplankton densities per m³ in treated (5S) ballast tank (0.75mg/L SeaKleen) – 0
Baltimore Harbor Test Facility

MPA Pier 1 Baltimore Harbor
Hyde H-136
Ballast Tank Mud Remover

- Proven for over 40 years
- Increases Cargo Capacity
- Helps eliminate invasive species in ballast tanks
- Low dosage rates
- Safe handling and easily injected
Hyde Marine Ongoing Activity

- Continuing Development and Refinement of BWT Technologies
- New Applications for Shipboard UV Treatment Systems
  - Waste Water Treatment Effluent Disinfection
  - Potable Water Disinfection
- Ballast Water Management Systems
QUESTIONS??

THANK YOU FOR YOUR ATTENTION