OceanGuard® BWMS——The Right Solution
Approval

1. IMO Final Approval
2. Full-Scale DNV Type Approval
3. CCS Type Approval
4. USCG-AMS Certificate
5. RINA Type Approval

Approval in Progress

Blue Ocean
YOUR DREAM, OUR MISSION
03/04
Full-Scale DNV Type Approval
Treatment Process of OceanGuard® BWMS

1 **Step1- Filtration**  
   50 microns precision filtration; Automatic backflush and filtration at the same time;

2 **Step2- Advanced Electro-catalysis Oxidation Process (AEOP)**  
   Electro-Catalysis in the EUT Unit produces ·OH radicals with perfect sterilization performance; The final products of reaction are CO₂, H₂O and traces of inorganic salt without any hazardous residuals—zero-pollution emissions.

**Ballasting: step1+step2**  
**Deballasting: step2**
Advantages of OceanGuard® BWMS

1. **Higher Requirements Compliant**
   - IMO D-2 Regulation, California Requirement and USCG Standard.

2. **Single Treatment**
   - Single Treatment, suitable for all kinds of ballast water drainage system.

3. **Small Size, Easy Installation**
   - Size of OceanGuard® BWMS is among the smallest in the world. The small footprint and compact design makes the installation easy and flexible.

4. **Energy-saving**
   - Low operating costs. Energy consumption is only appr. 17kwh for the treatment of 1000 m³ of ballast water.

5. **High Sterilization Efficiency**
   - Hydroxyl radicals produced in the process of AEOP will disappear within several nanoseconds. These radicals have high sterilization efficiency, which are able to kill different organisms in ballast water effectively in a chained mode.

6. **No Corrosion to Ships**
   - Through the AEOP, concentration of total residual oxidation (TRO) is within 2 mg/L. According to results of long-term operation, OceanGuard® BWMS is proved safe and reliable, and water treated causes no corrosion to the hull.

7. **Explosion-proof**
   - OceanGuard® BWMS has obtained Explosion-proof approval.

8. **Tested in Norway NIVA Facility, QualityTrustworthy**
   - OceanGuard® BWMS is tested in NIVA—one of the most famous test facilities, with strict test procedures and integrated data.
Auto-Back Flushing Filter of OceanGuard® BWMS

OceanGuard® BWMS adopts fully auto-back flushing filter with 50μm filtration precision, realizing the operation of filtration and back flushing at the same time, removing organisms larger than 50μm in ballast water to prevent microorganisms and sediments entering ballast tank.

Unique Features of OceanGuard® Filter

1. Specially design for usage of ballast water management system;
2. Perfect back flushing performance, long-running without blockage has been proved from test results in different waters;
3. Low pressure loss.

Filter Technical Specification of OceanGuard® BWMS

<table>
<thead>
<tr>
<th>Model</th>
<th>Element Model</th>
<th>Element QTY</th>
<th>Volume (L)</th>
<th>Dimension (mm)</th>
<th>Capacity (m³/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMT-100F</td>
<td>A2</td>
<td>11</td>
<td>120</td>
<td>650<em>565</em>1445</td>
<td>10~150</td>
</tr>
<tr>
<td>HMT-200F</td>
<td>A2</td>
<td>20</td>
<td>205</td>
<td>800<em>670</em>1600</td>
<td>10~250</td>
</tr>
<tr>
<td>HMT-300F</td>
<td>A2</td>
<td>28</td>
<td>300</td>
<td>900<em>780</em>1705</td>
<td>50~400</td>
</tr>
<tr>
<td>HMT-500F</td>
<td>A3</td>
<td>16</td>
<td>450</td>
<td>980<em>780</em>2210</td>
<td>50~550</td>
</tr>
<tr>
<td>HMT-600F</td>
<td>A3</td>
<td>24</td>
<td>650</td>
<td>1060<em>895</em>2330</td>
<td>50~700</td>
</tr>
<tr>
<td>HMT-800F</td>
<td>A3</td>
<td>28</td>
<td>860</td>
<td>1180<em>1015</em>2380</td>
<td>50~900</td>
</tr>
<tr>
<td>HMT-1000F</td>
<td>A3</td>
<td>32</td>
<td>1100</td>
<td>1300<em>1115</em>2530</td>
<td>50~1100</td>
</tr>
<tr>
<td>HMT-1500F</td>
<td>A3</td>
<td>50</td>
<td>1490</td>
<td>1440<em>1230</em>2610</td>
<td>100~1600</td>
</tr>
<tr>
<td>HMT-2000F</td>
<td>A4</td>
<td>34</td>
<td>1900</td>
<td>1500<em>1230</em>3260</td>
<td>100~2100</td>
</tr>
<tr>
<td>HMT-3000F</td>
<td>A4</td>
<td>44</td>
<td>2500</td>
<td>1700<em>1455</em>3480</td>
<td>100~3100</td>
</tr>
<tr>
<td>HMT-4000F</td>
<td>A4</td>
<td>54</td>
<td>4000</td>
<td>1900<em>1675</em>3600</td>
<td>100~4500</td>
</tr>
<tr>
<td>HMT-5000F</td>
<td>A4</td>
<td>72</td>
<td>5900</td>
<td>2100<em>1915</em>4050</td>
<td>100~5500</td>
</tr>
</tbody>
</table>
The core of OceanGuard® BWMS includes Electro-Catalysis Unit and Ultrasonic Unit; Electro-Catalysis produces -OH radicals with perfect sterilization performance.

EUT Unit needs no daily cleaning or maintenance, because Ultrasonic Unit cleans the inside, keeping the long-term treatment effectiveness of the electro-catalysis material.

### EUT Unit Technical Specification of OceanGuard® BWMS

<table>
<thead>
<tr>
<th>Model</th>
<th>Capacity Range (m³/h)</th>
<th>Power (kw)</th>
<th>Dimension (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMT-50E</td>
<td>10~85</td>
<td>0.8</td>
<td>386<em>411</em>1041</td>
</tr>
<tr>
<td>HMT-100E</td>
<td>10~150</td>
<td>1.5</td>
<td>386<em>555</em>1041</td>
</tr>
<tr>
<td>HMT-200E</td>
<td>10~250</td>
<td>3</td>
<td>386<em>555</em>1376</td>
</tr>
<tr>
<td>HMT-300E</td>
<td>50~350</td>
<td>4.5</td>
<td>386<em>555</em>1701</td>
</tr>
<tr>
<td>HMT-450E</td>
<td>50~500</td>
<td>6.8</td>
<td>416<em>601</em>1821</td>
</tr>
<tr>
<td>HMT-600E</td>
<td>50~700</td>
<td>9</td>
<td>465<em>631</em>1957</td>
</tr>
<tr>
<td>HMT-800E</td>
<td>50~900</td>
<td>13</td>
<td>465<em>781</em>1957</td>
</tr>
<tr>
<td>HMT-1000E</td>
<td>50~1100</td>
<td>17</td>
<td>565<em>676</em>2123</td>
</tr>
<tr>
<td>HMT-1200E</td>
<td>100~1400</td>
<td>21</td>
<td>565<em>786</em>2123</td>
</tr>
<tr>
<td>HMT-1500E</td>
<td>100~1700</td>
<td>25</td>
<td>625<em>786</em>2208</td>
</tr>
<tr>
<td>HMT-2000E</td>
<td>100~2200</td>
<td>34</td>
<td>625<em>926</em>2208</td>
</tr>
<tr>
<td>HMT-2500E</td>
<td>100~2700</td>
<td>42</td>
<td>655<em>1054</em>2212</td>
</tr>
<tr>
<td>HMT-3000E</td>
<td>100~3500</td>
<td>52</td>
<td>655<em>1054</em>2222</td>
</tr>
</tbody>
</table>

### AEOP Technology of EUT Unit

1. **Treatment Principle:** to kill the microbes, bacteria and viruses in the water and reduce other organics by destroying the cell membrane of the microbe, using hydroxyl radicals (-OH) made from water molecules under electron excitation of the special semiconductor materials.

2. **Hydroxyl radical (-OH):** is one of the most active substances with very strong oxidizability, extremely fast reaction rate and strong negative charge affinities.

3. **The final products of reaction are CO₂, H₂O and traces of inorganic salt, zero-pollution emissions.**

4. **The generating and existing time of hydroxyl radicals is less than 10⁻¹² s,** and the reaction rate with organics is over 10⁹ L/(mol·s), guaranteeing the high efficiency and effectiveness of OceanGuard® BWMS.
Installation Reference

OceanGuard® BWMS on board COSTA ROMANTICA
COSTA ROMANTICA: Cruise Ship, RINA

OceanGuard® BWMS on board ALICE FS415
ALICE FS415: Dry Bulk Cargo, BV

OceanGuard® BWMS on board BOA 34
BOA34: 140m Barge, DNV

OceanGuard® BWMS on board KE XUE
KE XUE: Science & Investigation Ship, CCS
Installation Reference

OceanGuard® BWMS on board FORTUNE OCEAN SHIPPING
FORTUNE OCEAN SHIPPING: 82,000 Bulk Carrier, ABS
Installation: seven engineers, only 4 days.

OceanGuard® BWMS on board MV SITC YOKOHAMA
MV SITC YOKOHAMA: Container Ship, ABS

OceanGuard® BWMS on board SEA PIONEER
SEA PIONEER: 50,000 Tanker, DNV
Asia-America-Europe three service centers, radiation arrives 120 service bases in 56 countries and regions, forming a complete global service network, guaranteeing after-sale service and support.