NEW GENERATION
Shipboard Energy
AND
Emissions Management

QUANTIFICATION • LIFE CYCLE ANALYSIS
VESSELS • OFFICES • FACILITIES • TERMINALS
Developing A Ship Energy Efficiency Management Plan (SEEMP)

Presented By:
Mike Gaffney, C.E.M., C.E.A.
USCG Licensed Chief Engineer
Exec VP, Engineering, Alaris Companies
Presentation Overview

- Objectives of the SEEMP
- Alaris’ Approach: Four steps to develop a SEEMP
SEEMP OBJECTIVE

“...to establish a mechanism for a company and/or a ship to improve the energy efficiency of a ship’s operation.”

(MEPC.1/Circ.683
17 August 2009)
SEEMP Four Step Plan

- Incorporate four steps into existing management systems
- SEEMP adopted by IMO MEPC 62nd session
- SEEMP requirement begins 1 Jan 2013
Step 1: Planning

• Most crucial stage of the SEEMP
• Two Phases
  ➢ Phase 1: Develop a Baseline
    ❖ Determines current status of ship energy usage
    ❖ Determines expected improvement of ship energy efficiency
  ➢ Phase 2: Select most appropriate, effective (ECMs) and implementable plan
**Baseline** Energy Usage and Cost

Identify Losses and Useful Work
Baseline Measure Energy Consumption: Shaft Torque and Thrust
Baseline
Measure
Energy
Consumption: Electrical Consumers
Component of a completed baseline distribution of energy by group is known.

Distribution of electrical energy in port consumption:
- Propulsion and Steering (Engine Heaters): 48%
- HVAC: 17%
- Auxiliary Machinery: 14%
- Hotel: 7%
- Lighting: 7%
- Command & Surveillance: 4%
- Safety and Environmental: 2%
- IC & Ships Electronics: <1%
- Receptacles: <1%
- Deck Machinery: <1%

New Generation Shipboard Energy and Emissions Management
**Component of a completed Baseline**

Energy cost at the equipment level is known

<table>
<thead>
<tr>
<th>Consumer</th>
<th>Annual Consumption (kWh)</th>
<th>Estimated Annual Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air Conditioning Plant #1</strong></td>
<td>325,944</td>
<td>$ 42,033</td>
</tr>
<tr>
<td><strong>Chilled Water Circ Pump #1</strong></td>
<td>124,786</td>
<td>$ 16,092</td>
</tr>
<tr>
<td><strong>Seawater Cooling Pump #1 AMR</strong></td>
<td>113,880</td>
<td>$ 14,686</td>
</tr>
<tr>
<td><strong>Hot Water Heater #1</strong></td>
<td>63,949</td>
<td>$ 8,247</td>
</tr>
<tr>
<td><strong>Hot Water Heater #2</strong></td>
<td>49,757</td>
<td>$ 6,417</td>
</tr>
</tbody>
</table>
Planning: Phase 2

Select ECMs: Cultural and Technical

- Ship-Specific Measures
- Company Specific Measures
- Human Resource Development (Training)
Analyze Selected ECMs

- Financially
- Environmentally
- Ease of Implementation
- Goal

**INSTALL A PREMIUM EFFICIENCY MOTOR AND VFD**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Investment</td>
<td>$5,660</td>
</tr>
<tr>
<td>First Year Savings</td>
<td>$4,582</td>
</tr>
<tr>
<td>Payback Period (yr)</td>
<td>1.24</td>
</tr>
<tr>
<td>ROI</td>
<td>86%</td>
</tr>
<tr>
<td>Net Present Value</td>
<td>$44,558</td>
</tr>
<tr>
<td>CO₂ Savings (MT)</td>
<td>32</td>
</tr>
</tbody>
</table>
Step 2: Implementation

Establishment of Implementation System

- Define person responsible for implementation
- Define task required for implementation
- Define period for implementation and evaluation
Step 2: Implementation

Implementation and Record-Keeping

• Appoint an officer as Vessel Energy Manager (VEM)
• Track all ECMs
  ➢ Implemented ECMs
  ➢ Non Implemented ECMs
Step 3: Monitoring

• Identify Quantitative Metrics
  ➢ Measure improvement macro level
  ➢ Measure improvement micro level

• Select metric to quantitatively measure specific ECM improvements.

• Select metrics based on per unit of energy/ emissions per unit of useful work.
Monitoring Macro Metric

Energy Efficient Operational Indicator (EEOI)

- IMO recommended monitoring tool for SEEMP
- Establishes benchmarks for different fleets by ship type and size
- Fuel index can be utilized as well (kg of fuel per unit of useful work)

\[
\text{EEOI} = \frac{\text{actual CO2 emission}}{\text{performed transport work}}
\]
IMO’s central database created a GHG module to develop ship segment benchmarks.

**Fuel Consumption**
- HFO
- LNG
- MDO

**Cargo Quantity**
- Tonnes
- Number of TEU/cars
- Number of passengers

**Distance**
- Nautical miles of transport work done

**CO2 Emission Calculations and Voyage EEOI**
Step 4: Self Evaluation and Improvement

- Periodically evaluate SEEMP and ECMs
- Evaluate: what ECMs worked and what did not
- Evaluate: were goals achieved, if not why not
- Evaluate: SEEMP improvement
- Begin Cycle again, Step 1: Planning
SEEMP Summary

- Planning is most crucial stage
  - Baseline Current Energy Usage and Cost
  - Select Best ECMs
- Implement Selected ECM
- Monitor ECMs with Metrics
- Self Evaluation and Improvement

Enjoy the Energy Cost Savings
Thank You!