Improving Green Fresh Water Supply in Passengers Ships Using Waste Energy Recovery

M. Morsy, El-Gohary and Hossam H. Othman
Maritime Studies department, Faculty of Marine Science, King Abdulaziz University, Jeddah, Saudi Arabia.

Abstract. The maritime industry is seeking sustainability solutions. Pressure at an international level has added a line item to the signature coding for each ship to now include their status on “green” criteria. The ISO 30000 series standards cover ship recycling management systems, Green supply chain management (GSCM) has emerged as a key approach for enterprises seeking to become environmentally sustainable, especially in maritime transport sector which run 90% of the world trade. Nation’s top freight transportation, the global supply chain management and the major ships designers gathered to provide the research, resources and education necessary to: The first, use less energy, including fuel and electricity, the second use less fresh water, plastic, paper and other consumables and the third reduce emissions that reduce the quality of its air. The main objective of this paper is to enhance the overall performance of Marine Diesel Engine power plant on board passenger ships through a proposed fresh water generator and combined heat and power system which minimize the fuel emission and improve the maritime supply chain transportation network. Fresh water produced will be used for drinking, cleaning and washing purposes contributing to the high demand consumption particularly on board passenger ships. The main idea for proposed fresh water generator is to use the waste heat recovered from scavenging air to provide the heat required to evaporate sea water under vacuum converting it into steam. Energy conservation system for exhaust gases in container ships has a lot of advantages which include, reducing fuel consumption for ships, increasing the overall efficiency, reducing the pollutant emissions which go out into the atmosphere, and saving lost money. Which minimize the fresh water supply by 8 tons/day. This amount will be sufficient for 20 persons per day. For a number of diesel engines equipped with the proposed fresh water generator the specific fresh water generation was found about 100 gm/hp/h.
Introduction

According to (Beamon, 1999), he categorized “green” into 3 types depending on the different perceptions of the environment among different stakeholders involved: Scientific green, government green, and customer green. In scientific green, life cycle assessment (LCA) was used to determine the environmental impact of products, processes, and systems. However, it concerned only the emissions, not other aspects. In government green, several factors were involved such as population density, geographical position, and the availability of energy sources. These factors affected the government agenda to maintain or improve quality of life. For customer green, the perceptions of green were strongly linked to emotions that were directly impacted to people, especially health and safety, than resources or emissions. In (Beamon, 1999), define the current supply chain with the integration of environmental constraints through the concept of “Supply Chain Environmental Management”. Several papers provided green practices such as (Walton, 1998), suggested some practices including reducing energy consumption, recycle and reuse, using biodegradable and non-toxic materials, minimize harmful emissions, and minimize or eliminate waste (Postel, 1994 and Frank, 1999).

Global energy consumption in the last 50 years has increased at a very rapid rate. Renewable energy resources, such as solar energy, wind, and biomass, are also expected to increase their share of the energy use. In terms of volume, the spare capacity for oil production has decreased from 3 million barrels a day (mbd) in December 2002 to just 1.7 mbd in December 2004. This is a result of the low investments in oil exploration in the 1990s which, in turn, was due to the less real prices of oil during that period (Eckert, 1978, Wharton, 2003 and Wibur, 2008).

With limited global supply chain of oil and gas and mounting worries about green house gas emissions, the race to find an ideal green transportation fuel is gaining urgency. In terms of CO₂ emissions transporting one tone of cargo on a fully loaded ship produces only a fraction of the pollution in comparison with other freight transport. However research is still needed to improve energy efficiency and
capture harmful emissions. Fuel consumption can be reduced by improving hull design to reduce drag and making efficiency gains in onboard power generation and management. Improved fuel treatment and better exhaust gas scrubbing combined with robust exhaust gas monitoring equipment will optimize engine performance and emissions. In the longer term research on new forms of power generation, such as use of Hydrogen technology, will further improve environmental performance.

Both the Maritime Emission Trading Scheme (METS) and the International Compensation Fund for GHG Emissions from Ships (ICF) are cost-effective policy instruments with high environmental effectiveness. They have the largest amount of emissions within their scope, allow all measures in the shipping sector to be used and can offset emissions in other sectors. These instruments provide strong incentives to technological change, both in operational technologies and in ship design as illustrated in Table 1. The environmental effect of the METS is an integral part of its design and will therefore be met. In contrast, part of the environmental effect of the ICF depends on decisions about the share of funds that will be spent on buying emission allowances from other sectors. With regard to cost-effectiveness, incentives to technological change and feasibility of implementation, both policy instruments seem to be quite similar.

<table>
<thead>
<tr>
<th>Category</th>
<th>Variable</th>
<th>Related elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economy</td>
<td>Shipping transport demand (tonne-miles/year)</td>
<td>Population, global and regional economic growth, modal shifts, shifts in scrotal demand</td>
</tr>
<tr>
<td>Transport efficiency</td>
<td>Transport efficiency (MJ/tonne-mile) – depends on fleet composition, ship technology and operation</td>
<td>Ship design, advances in propulsion, vessel speed, regulations aimed at achieving other objectives but that have consequences for emissions of GHG</td>
</tr>
<tr>
<td>Energy</td>
<td>Carbon fraction of the fuel that is used by shipping (g of C/MJ of fuel energy)</td>
<td>Cost and availability of fuels (e.g., use of residual fuel, distillates or bio-fuels</td>
</tr>
</tbody>
</table>

Currently, the price of crude oil barrel has been escalated, see Fig. (1). Thus, in view of these high prices, a diesel engine with low fuel consumption will be highly appreciated.
Diesel Engine Heat Balance

The energy in the exhaust gas forms the largest amount of losses (approx. 25% of the fuel input) and is considered, the most attractive for recovery of the diesel engine losses. The energy loss from the engine cooling water and the charge air cooler are less than the exhaust gas loss, however recovery process is considered economical in the light of recent high oil prices.

Parameters of Waste Heat Recovery (WHR)

There are three sources for waste heat; these are: Exhaust gas 220-265°C, air coolers (air temperature 130- 170°C at MCR), and fresh water jacket cooling (65-80°C). Relative percentages are shown in Fig. (2) for a typical diesel engine.

The proposed fresh water generator (using waste heat from scavenging air) in addition to conventional fresh water generator (using waste heat from cooling water) will be sufficient for the required amount of water in passenger ships. Introducing a fresh water generator in the scavenge air system is expected to raise the overall thermal efficiency of the marine diesel engine. Waste Heat Recovery Systems include fresh
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water generation, combined heat and power, shaft generator, and turbocharger.

**Fig. 2. Heat balance of a Sulzer 12RTA96C engine (Heinrich, 2004).**

**Scavenging Air Heat Recovery**

The air amount and temperature before the air cooler, and thus the heat recovered by means of a well designed water recovery element (WHR element) depends primarily on the following conditions:

1. Part load conditions
2. Ambient air temperature
3. Hot water temperature
4. Hot water flow

**Jacket Cooling Heat Recovery**

The fresh water heat is normally removed by sea water cooled fresh water cooler. The fresh water outlet of the cooler is fitted with a thermostatically controlled regulating valve which maintains a temperature of 75-80°C at the cooling water outlet of the main engine (Burgharted, 1981 and Elgohary, 2009)

By locating heat exchangers in the jacket cooling water system, part of the heat or all of the heat can be utilized for heating of accommodation, tanks and fresh water generators. The heating capacity of the fresh water system depends particularly on the engine load and the fitted of water cooled.

**Air Mass Flow Rate Calculation**

In modern two-stroke turbocharged engines a charge air cooler is necessary. Compression will raise the air temperature and a charge air
cooler is fitted to reduce the temperature of the air between the turbocharger and the engine inlet manifold, causing increased air density at lower induction temperature. The engine is maintained at safe working temperatures and the lower compression temperature reduces stress on piston rings, piston and liner. The mass flow rate of air passing through proposed fresh water generator can be calculated from:

\[ m_{\text{air}} = m_f \frac{A}{F} \lambda \]  

(1)

**Design of Proposed Fresh Water Generator Evaporator**

In the sea water evaporator, sea water passes in the tubes and hot air passes outside the tubes. Considering the double-pipe heat exchanger, the fluids may flow in counter flow, and the temperature profiles for this case.

The theoretical heat transferred from scavenging air to sea water in the evaporator can be determined from the following equation:

\[ Q = \dot{m}_{\text{sw}} C_{p\text{sw}} \Delta t_{\text{sw}} = \dot{m}_{\text{air}} C_{p\text{air}} \Delta t_{\text{air}} \]  

(2)

The heat transfer from hot air to sea water can take the form

\[ Q = U_e A_t \Delta T_m \]  

(3)

where,

\[ \Delta T_m = \left( \frac{T_{h1} - T_{c1}}{\ln \left( \frac{T_{h1} - T_{c1}}{T_{h2} - T_{c1}} \right)} \right) \]  

(4)

![Fig. 3. (T-A) Chart for temperature profiles counter flow in double-pipe heat exchanger (in evaporator) (Hollman, 1981).](image-url)
Fresh Water generator efficiency can be calculated based on the absorbed heat and added heat which can be calculated from the following equation (5).

\[
\text{Fresh water generator efficiency} = \frac{Q_{\text{absorb}}}{Q_{\text{added}}} \times 100\% \quad (5)
\]

**Drinking Water**

Fresh water can be produced from sea water in the foregoing distillation plants. This produced water can be used for drinking:

1. If it is boiled at temperatures above 70°C – most of the low pressure plants operate at temperatures ranging from 40 to 60°C.

2. Additives to diesel engine cooling water are not harmful. Those not allowed for health reasons are the chromates.

3. Inhibitors which are sometimes added to sea water systems to prevent fouling by the growth of marine organisms must not be used if the sea water is used in part for supplying the evaporator.

4. The evaporator is not used within the limits from the coastline to about 50 miles from it. (Boks, 2007).

**Case study**

The following case study is used to illustrate the procedure explained in the previous sections. Consider a ship propelled by a 2-stroke 4 cylinders diesel engine, (MAN B&W members(2004)(S46MC), having an output power/ cylinder = 1310 kW, specific fuel consumption at max continues rating of 174 g/kw.h and have a speed of 129 r.p.m. Other particulars pertaining to operating conditions are given in the following Table (2).

<table>
<thead>
<tr>
<th>Table 2. Operating conditions for the selected case study.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air fuel ratio A/F</strong></td>
</tr>
<tr>
<td><strong>Air inlet temperature to the evaporator T_{h1}</strong></td>
</tr>
<tr>
<td><strong>Air outlet temperature from the evaporator T_{h2}</strong></td>
</tr>
<tr>
<td><strong>Sea water temperature before entering condenser t_2</strong></td>
</tr>
<tr>
<td><strong>The quantity of sea water passes through evaporator ton/day</strong></td>
</tr>
<tr>
<td><strong>Air flow rate</strong></td>
</tr>
<tr>
<td><strong>Tube diameter d</strong></td>
</tr>
</tbody>
</table>

The engine particulars and the associated operating conditions yielded the following results concerning the amount of water generated as well as evaporator and condenser dimension.
Table 3. Design parameters for MAN B&W S46MC evaporator and condenser.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air flow rate in 1.781 kg/s</td>
<td>400.4 ton/day</td>
</tr>
<tr>
<td>Quantity of sea water passes through evaporator</td>
<td>1.386 kg/s</td>
</tr>
<tr>
<td>Quantity of fresh water generated</td>
<td>1.254 kg/s</td>
</tr>
<tr>
<td>The quantity of sea water passes through condenser $m_{csw}$</td>
<td>0.1386 kg/s</td>
</tr>
</tbody>
</table>

**Cost of Fresh Water Generator**

Having designed the fresh water generator, it would be necessary to examine the facility of installing the propulsion system. The cost of different element of the proposed fresh water generator (evaporator, condenser, pumps, etc.) was estimated based on the local market price in the year 2008. It was found that the total cost of the proposed fresh water generator reaches about 2600 US$. This generator will produce about 12 ton/day of fresh water. Based on a 20 US$/ton of water, the generated water produced annually (270 days) will save about 65,000 US$, which is almost 2.6 times the initial cost of the fresh water generator.

**Effect of Installed Proposed Fresh Water Generator on Overall Efficiency**

Consider a SULZER 12 RT FLEX 96C engine, having output power of 68640 KW, at MCR, the engine specific fuel consumption 172g/kw.h using heavy fuel oil with calorific value = 42720.8 kj/kg. A typical energy distribution in diesel with waste heat recovery is illustrated in Fig. (4).

![Fig. 4. Total heat recovery for 12RT FLEX 96C engine showing the 12% gain in overall efficiency for the total heat recovery plant (Heinrich, 2004).](image-url)
scavenge air system will result in the overall efficiency increase by about 1%. This is illustrated in Fig. (5).

Fig. 5. Relationship between power per cylinder and quantity of fresh water generated.

In addition to the case study, a number of diesel engines producing power ranging from 722 to 5490 kW/cylinder are examined and the amount of fresh water generated with the proposed generator is calculated and plotted on Fig. (6). A new parameter is introduced denoted as specific fresh water generated in analogy to specific fuel consumption. For the range of power tested an average value of 108 g/kW.h was obtained.

Fig. 6. SULZER12 RT- flex 96C engine after fresh water generator installation.
**Fresh Water Generated Versus Fuel Consumed Fresh Water Generated**

The relation between the amount of water generated (using the proposed fresh water generator) and the engine power (or amount of fuel consumed) is given in Fig. (7). Depending on the power installed one can use such a chart to determine the expected amount of water generated. Alternatively, for a certain required fresh water on board (particularly for passenger ships), one can examine the needed power to generate such amount. Typically, for a 20 board, about 8 ton of fresh water per day will be needed (based on 400 lit/person/day). An engine power of 3350 hp equipped with fresh water generator will be required for this tank.

![Figure 7. Relation between fresh water generated and weight of fuel consumed at sea water temperature 20°C for different engine room temp. (Temperatures in °C).](attachment:image.png)
From Fig. (8) we found that, by increasing sea water temperature at the same engine room temperature the weight of fresh water generated will be increased as shown in Fig. (8).

**Proposed Fresh Water Generator Economy**

The proposed fresh water generator design (using waste heat from scavenging air) with the old fresh water generator (using waste heat from cooling water) will be enough for great consumption of water in passenger ships which mean saving in voyage cost. Today, the price of fresh water ton is from 20 to 60US$ and depends on the country and the area for different engines, the daily and annual saving can be calculated as shown in Table (4). Consider the annual operating time for all engines is 6500 h which equals 270.833 days.
Table. 4. Daily and annual saving for proposed F.W.G for different engines at MCR.

<table>
<thead>
<tr>
<th>Engine type</th>
<th>Power Kw/cyl</th>
<th>Number of cylinder</th>
<th>Quantity of F.W generated Ton/day</th>
<th>Saving per Day US$</th>
<th>Annual saving in US$</th>
</tr>
</thead>
<tbody>
<tr>
<td>B&amp;W</td>
<td>1310</td>
<td>4</td>
<td>13.928</td>
<td>278.56</td>
<td>75,443.24</td>
</tr>
<tr>
<td>S46 MC-C</td>
<td>8</td>
<td></td>
<td>27.861</td>
<td>557.22</td>
<td>150,913.56</td>
</tr>
<tr>
<td>MITSUBISHI UEC37LS11</td>
<td>772</td>
<td>5</td>
<td>5.6</td>
<td>112</td>
<td>30,333.3</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td>16.524</td>
<td>330.48</td>
<td>89,504.89</td>
</tr>
<tr>
<td>52LSE</td>
<td>1705</td>
<td>4</td>
<td>9.0431</td>
<td>180</td>
<td>48,749.94</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td></td>
<td>52.2</td>
<td>1044</td>
<td>282,749.65</td>
</tr>
<tr>
<td>60LSE</td>
<td>2255</td>
<td>5</td>
<td>18.7013</td>
<td>374</td>
<td>101,291.54</td>
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<tr>
<td></td>
<td>8</td>
<td></td>
<td>45.755</td>
<td>915.1</td>
<td>247,839.28</td>
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<tr>
<td>68LSE</td>
<td>2940</td>
<td>5</td>
<td>24.414</td>
<td>488.28</td>
<td>132,242.34</td>
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<tr>
<td></td>
<td>8</td>
<td></td>
<td>59.294</td>
<td>1185.88</td>
<td>321,175.44</td>
</tr>
<tr>
<td>SULZER RTA60C</td>
<td>2360</td>
<td>5</td>
<td>20.6723</td>
<td>413.446</td>
<td>111,974.82</td>
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<tr>
<td></td>
<td>8</td>
<td></td>
<td>49.0391</td>
<td>980.782</td>
<td>265,628.13</td>
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<tr>
<td>RTA50C/RT-FLEX50C</td>
<td>1620</td>
<td>5</td>
<td>14.2437</td>
<td>284.874</td>
<td>77,153.28</td>
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<tr>
<td>RTA84T-B</td>
<td>4100</td>
<td>5</td>
<td>33.86</td>
<td>677.2</td>
<td>183,408.11</td>
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<tr>
<td></td>
<td>9</td>
<td></td>
<td>47.425</td>
<td>948.5</td>
<td>256,885.1</td>
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<tr>
<td>RTA 84T-D</td>
<td>4100</td>
<td>5</td>
<td>89.442</td>
<td>1788.8</td>
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<td></td>
<td>9</td>
<td></td>
<td>50.11</td>
<td>1000</td>
<td>270,833</td>
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<tr>
<td>RTA 68T-B</td>
<td>2940</td>
<td>5</td>
<td>94.7163</td>
<td>1894.32</td>
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<td></td>
<td>8</td>
<td></td>
<td>36.16</td>
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<td>195,866.43</td>
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<tr>
<td>RTA 84 C</td>
<td>4050</td>
<td>6</td>
<td>60.7316</td>
<td>1214.26</td>
<td>328,861.68</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td></td>
<td>61.631</td>
<td>1232.6</td>
<td>333,828.76</td>
</tr>
<tr>
<td>RTA 96C old</td>
<td>5490</td>
<td>6</td>
<td>126.976</td>
<td>2539.52</td>
<td>687,785.82</td>
</tr>
<tr>
<td>Rating</td>
<td>5490</td>
<td>6</td>
<td>82.34</td>
<td>1640</td>
<td>444,166.12</td>
</tr>
<tr>
<td>RTA 96C</td>
<td>5490</td>
<td>6</td>
<td>85.4719</td>
<td>178.34</td>
<td>48,300.35</td>
</tr>
</tbody>
</table>

Conclusions

Because of the increasing on demand of the fossil fuel and the increase in its prices in the last period in addition to the decrease of the international reserves of the fossil fuel and the researches done proved that the international oil reservoirs will vanish at 2050. So scientists goes towards making the best use of the energy in the fuel through make use of the exhaust energy which called energy conservation.

There are a lot of losses which come out from the engines every day in addition to pollutant gases which spread in the atmosphere, so this lost energy needs to be conserved. Energy conservation system has a lot of advantages which include:
i) Reducing fuel consumption for ships
ii) Increasing the overall efficiency
iii) Reducing the pollutant emissions which goes out into the atmosphere
iv) Saving lost money

Based on the case study (passenger ship) outlined in this paper a number of remarks are observed.

1. It has been increasing in consciousness of the environment and the role of sustainable green transportation in the last few decades.
2. The inclusion of fresh water generator utilizing scavenging air in a marine diesel engine power plant will contribute to the overall thermal efficiency.
3. An outlined method was developed for estimating the amount of fresh water generated for a typical installed diesel engine power plant.
4. The proposed fresh water generator was found quite feasible. Economic study undertaken in the present study revealed this fact.

Finally, more work is required to enhance the performance of marine diesel engines through examining the different parameters affecting their operation.

**Recommendations**

It can be expected that the existing heat recovery systems will be inevitably further improved

- In proposed fresh water generator hot sea water after exit from sea water evaporator, passes through vacuum zone so that part of sea water will convert into steam, the other part as brine.

The brine will pass to over board and steam will stays condensate in steam condenser converting into fresh water. The fresh water generated has 1% of the overall efficiency and the brine has 12% of overall efficiency.

So we recognize to use brine in heating purpose or use this losses energy in next study.
Hydrogen is seen as one long-term solution to transport energy issues which could impact the global transportation network and supply chain environment. Hydrogen is one of the most abundant elements on Earth. It is high in energy and when burnt in a conventional engine or converted into electricity via fuel cell technology produces almost no pollution - its main ‘waste’ component being water.

The constantly expanding global demand for energy and the simultaneous warning in respect of the continuously diminishing oil reverse have led to a growing interest in the utilization of using solar energy and wind energy to save the electrical power requirement for a ship that coincide with the current international trends toward pollution prevention.

Nomenclature:
- **A** Surface area in m²
- **A/F** Air fuel ratio
- **BHP** Break horse power (hp)
- **Cp** Specific heat for air at constant pressure = 1.005 kJ / kg
- **Cp_exh** Exhaust gases specific heat in kcal/(kg.k)
- **Cp_cw** Cooling water specific heat in kcal/(kg.k)
- **m_air** Air flow rate in kg/s
- **m_f** Mass of fuel consumed ton/day
- **m_sw** The quantity of sea water passes through evaporator ton/day.
- **m_cw** cooling water circulation in kg/s
- **m_st** steam mass flow rate in kg/s
- **Q** Theoretical heat transfer from scavenging air to sea water in W
- **Q_rad** radiation heat losses in kW
- **Q_cw** cooling water heat in kW
- **Q_exh** exhaust heat in kW
- **T_1** Engine room temperature in k
- **T_2** Temperature after turbo charger in k
- **T_c1** Sea water outlet temperature from the evaporator in °C
- **T_c2** Sea water inlet temperature to the evaporator in °C.
- **T_c1=T_sw_out** Sea water outlet temperature from condenser in °C
- **T_c2=T_sw_in** Sea water inlet temperature to condenser in °C
Th1  Air inlet temperature to the evaporator in °C
Th2  Air outlet temperature from the evaporator in °C
Thc1  Steam inlet temperature °C
Thc2  Fresh water outlet temperature in °C
\( t_2 \)  Sea water temperature before entering condenser
Uc  Overall heat transfer coefficient, for steam condenser
U  Sea water velocity in m/s
X  Dryness fraction
\( \Delta T_m \)  Log mean temperature difference (LMTD) in °C.
\( \Delta T_{mc} \)  Log mean temperature difference in °C
\( \lambda \)  Excess air factor

References


تحسين أداء إمداد سفن الركاب بالمياه العذبة باستخدام نظام استعادة الطاقة

محمد مرسي الجوهي، و حسام عثمان
قسم الدراسات البحرية، كلية علوم البحار، جامعة الملك عبد العزيز
جدة - المملكة العربية السعودية

المستخلص: تبحث الصناعة البحرية عن حلول دائمة، نتيجة الضغط من الهيئات الدولية وبإضافة إلى التوقع على بنذ تفعيل رمز لكل سفينة لتشمل وضعها على المعايير "الخضراء" و البيئة النظيفة ومعايير الأزو 3000 والخاصة بنظام تدوير السفن، وإدارة سلسلة الإمداد الخضراء بوصفها نهجاً رئيسيًا للشركات التي تسعى إلى أن تصبح بيئياً نظيفة. وخاصة الشركات التي تعمل في قطاع النقل البحري والتي تساهم ب 90% من نقل البضائع والأفراد من خلال التجارة العالمية.

وتهتم سلسلة الإمداد العالمية وهيئة مصرى السفن العالمية لتوفر البحوث لاستخدام كميات أقل من الطاقة، بما في ذلك الوقود والكهرباء والمياه العذبة بنسبة أقل واستعمال نسبة أقل من البلاستيك والورق والمواد الاستهلاكية الأخرى وخفض الإنبعاث التي تقلل من جودة الهواء. والهدف الأساسي من هذه الورقة هو تحسين الأداء العام لمحتلة توالي القدرة البحرية بتصميم محرك مياه عذبة على متن سفن الركاب من خلال مولد المياه العذبة المفتوحة والجمع بين الحجارة ونظام الطاقة المستوردة ويتسمح أداء شبكة النقل البحري وسلاسل الإمداد البحرية وإنتاج المياه العذبة من أن أهل إن تستخدم...
لأغراض الشرب والتطهير والغسيل والتي تسهم في ارتفاع التكلفة بشكل خاص على متن سفن الركاب. والفكرة الرئيسية المقترحة هي تصميم مولد المياه العذبة لاستخدام حرارة العادات المستخرجة من كسح الهواء لتوفير الفراغ اللازم لتبادل مياه البحر في ظل فراغ تحويلها إلى بخار ويعتبر نظام حفظ الطاقة لغازات العادم في سفن الحاويات والركاب بما لديها الكثير من المزايا التي تشمل الحد من استهلاك الوقود للسفن، وزيادة الكفاءة العامة، والحد من الانبعاثات الملوثة التي تخرج في الغلاف الجوي، وتوفير الأموال المفقودة التي تقلل من إمدادات المياه العذبة بنسبة 8 طن/يوم. سوف تكون هذه الكمية كافية لـ 20 شخصًا في اليوم الواحد والقادرين على توليد المياه العذبة بحوالي 100 جم/ساعة لعدد من محركات الديزل مزودة بمولد المياه العذبة المقترح.