Greening the Global Logistics Chain
The Shipping Line’s Perspective

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Health, Safety & Environment
The A.P. Moller–Maersk Group

A.P. Moller-Maersk Group
HQ: Copenhagen, Denmark

- 2009 Revenue: USD $48.5 b in Shipping, Energy, Retail and Banking.
- 115,000 employees, 130 countries.
A.P. Moller-Maersk transportation businesses in North America

- Maersk Line Limited – US-flagged vessels
- Maersk Line North America – Sales, operations & inland transportation contracting (rail & trucking)
- APM Terminals Americas – Marine terminals
- Maersk Equipment Services – Equipment and maintenance
- Direct ChassisLink – NEW Neutral chassis leasing business
- Bridge Terminal Transport – Trucking and dray
- Maersk Distribution Services Inc. – Warehousing & logistics
- Gilbert – Warehousing & logistics
- Damco – Third-party logistics
Maersk Line – Container Shipping

- Operations
  - 500+ vessels
  - Moves approx. 1.8 million containers
- 90% of all goods transported globally is done by ship
- Maersk Line represents approx. 4% of worldwide shipping
- 16% of the container segment
- Consumes over 10 M tonnes of heavy fuel oil annually
Multiple vessels are scheduled on each route to provide regular (weekly) service.

**Transpacific 6 (TP6) - Eastbound**

<table>
<thead>
<tr>
<th>PORT</th>
<th>ARRIVES</th>
<th>DEPARTS</th>
<th>TRANSIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanjung Pelepas, Malaysia</td>
<td>MON 1900</td>
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<tr>
<td>Yantian, Mainland China</td>
<td>FRI 2100</td>
<td>SAT 2200</td>
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<td>MON 0400</td>
<td>4</td>
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<tr>
<td>Los Angeles, CA, USA</td>
<td>FRI 1800</td>
<td>TUE 0200</td>
<td>16</td>
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</tbody>
</table>

*Note: Weekly Service*

**Transpacific 6 (TP6) - Westbound**

<table>
<thead>
<tr>
<th>PORT</th>
<th>ARRIVES</th>
<th>DEPARTS</th>
<th>TRANSIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles, CA, USA</td>
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<td>MON 1700</td>
<td>--</td>
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<tr>
<td>Yokohama, Japan</td>
<td>THU 0100</td>
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<td>17</td>
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<tr>
<td>Nagoya, Japan</td>
<td>FRI 0800</td>
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<td>18</td>
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<td>MON 0700</td>
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<td>Ningbo, Mainland China</td>
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<td>TUE 0600</td>
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<td>Xiamen, Mainland China</td>
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<td>Tanjung Pelepas, Malaysia</td>
<td>MON 2100</td>
<td>WED 0400</td>
<td>28</td>
</tr>
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</table>
## Vessel schedule: Georg Maersk on TP-6

<table>
<thead>
<tr>
<th>Port Name</th>
<th>Arrival Date</th>
<th>Departure Date</th>
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<tbody>
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<td>Hong Kong</td>
<td>18 Apr 2010</td>
<td>19 Apr 2010</td>
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<td>30 Apr 2010</td>
<td>03 May 2010</td>
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<td>Nagoya</td>
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<td>Shanghai</td>
<td>23 May 2010</td>
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<tr>
<td>Xiamen</td>
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<td>Yantian</td>
<td>28 May 2010</td>
<td>29 May 2010</td>
</tr>
<tr>
<td>Tanjung Pelepas</td>
<td>01 Jun 2010</td>
<td>02 Jun 2010</td>
</tr>
<tr>
<td>Jeddah</td>
<td>11 Jun 2010</td>
<td>12 Jun 2010</td>
</tr>
<tr>
<td>Suez Canal</td>
<td>15 Jun 2010</td>
<td>15 Jun 2010</td>
</tr>
<tr>
<td>Barcelona</td>
<td>19 Jun 2010</td>
<td>20 Jun 2010</td>
</tr>
<tr>
<td>Valencia</td>
<td>21 Jun 2010</td>
<td>22 Jun 2010</td>
</tr>
<tr>
<td>Algeciras</td>
<td>23 Jun 2010</td>
<td>24 Jun 2010</td>
</tr>
<tr>
<td>Port Tangier Mediterranee</td>
<td>25 Jun 2010</td>
<td>26 Jun 2010</td>
</tr>
<tr>
<td>Suez Canal</td>
<td>01 Jul 2010</td>
<td>02 Jul 2010</td>
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<tr>
<td>Tanjung Pelepas</td>
<td>17 Jul 2010</td>
<td>18 Jul 2010</td>
</tr>
<tr>
<td>Vung Tau</td>
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<tr>
<td>Yantian</td>
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<td>24 Jul 2010</td>
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<td>Hong Kong</td>
<td>25 Jul 2010</td>
<td>26 Jul 2010</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>08 Aug 2010</td>
<td>12 Aug 2010</td>
</tr>
</tbody>
</table>
Maersk Alabama

- US flagged ship
- Operates near Africa delivering US food aid.
Burning hydrocarbon fuel creates air emissions.

- CO₂
- SOx
- NOx
- H₂O
- PM
- Black carbon
Transportation does have a significant impact on the environment, but…

... we are doing something about it.
Fuel switching provides immediate air quality improvement.

**Vessels change fuels:**
- From Bunker: avg. 2.7% sulfur
- To Distillate: avg. 0.12% sulfur

**Emissions reduction:**
- SOx: 95%
- PM: 86%
- NOx: 6 to 12%

**Locations:**
- California – from 24nm
  (1.5/0.5% required since 7/2009)
- WA & BC – at dock
- Houston – demo 11/09, DERA grant

Mærsk Mc-Kinney Møller stands on the dock at Pier 400 in Los Angeles with the Sine Maersk at berth behind him. The vessel was the first to perform a fuel switch as part of a Maersk Line pilot environmental initiative in California.

-- March 21, 2006
Typical Fuel Switch Map

Fuel Switch Locations:
1. Auxiliary Engine Entry
2. Main Engine Entry
3. Port of Los Angeles
4. Main Engine Exit
5. Auxiliary Engine Exit

Data by ENVIRON
Fuel switch costs and implementation

• Little or no capital investment required – vessel or port
• Mobile solution – travels with the vessel
• Rapid implementation (weeks vs. years)
• Does not shift emissions to other power sources or locations
• Minimal personnel safety or training issues

BUT:
• Fuel cost differential is substantial
• Cost of Program to Maersk to date is over USD 20 million
• Some care needed in switching
Vessels are becoming more energy efficient, emissions are reduced

Due to

• Technologies
• Operations
• Speeds
• Vessel size

• Reduced over two million tonnes CO₂ plus other emissions
• Reduction target for 2017 is 20% below 2007 levels
Maersk-owned container vessels – CO₂ emissions

- 15% decrease in fuel consumption and CO₂ emissions (per TEU x km)
- Reduced over two million tonnes CO₂
- Reduction target for 2007 – 2017 is 20%
Maersk Container Vessels -- NOx Emissions

- Decrease in NOx largely due to reduced fuel consumption
- Large and increasing number of vessels built after 2000, so NOx certified
Technical innovation is essential for sustainability

- Waste Heat Recovery System (10%*)
- Electronically controlled engine (0.5%*)
- Adjusting main engines (1%*)
- Antifouling paint and maintenance of hull and propeller (1.5%*)
- QUEST: Low energy reefer containers (0.5%*)
- Voyage Efficient System (VES) (1%*)
- Ballast water optimisation (1%*)
- Trim tests for all classes of vessels (1%*)

*CO₂ emission saving potential

Source: Maersk Line Sustainability Department
Fuel use and costs increase exponentially at higher speeds

- The speed/fuel use curve is exponential.
- Speeding up will cost more fuel than what we save by slowing down.
- Lowest constant speed is best.
Designing schedules to reduce consumption

8 x 6,000 TEU vessel
Weekly capacity: 6000 TEU

- To create a weekly schedule:
- 8 vessels means a full rotation time of **56** days

9 x 6,000 TEU vessels
Weekly capacity: 6000 TEU

- To create a weekly schedule:
- 9 vessels means a full rotation time of **63** days

Asia-Europe example

- **35** days for ocean crossings and **21** days for Asia and Europe port loops

- **42** days for ocean crossings and **21** days for Asia and Europe port loops
Adjusting main engines to economical speed

- Traditionally, vessels are optimized for high speed
- Lower economical speed allows for de-rating of the main engine
- Maximum engine power is restricted
- Significantly lower fuel consumption at medium power
Super Slow Steaming Initiative

- Study started in 2007, covered 110 vessels
  - Maersk collaborated with engine manufacturers
- Results:
  - OK to operate as low as 10% engine load
  - Traditional range is 40 – 60%
  - Manufacturers have changed recommendations
- Over 100 vessels used since 2007, resulting in
  - More flexible voyage & schedule planning
  - 10 – 30% fuel savings and reduced CO\textsubscript{2}
  - Significant savings:
    - Post panamax: 3500 MT fuel, 10,000 MT CO\textsubscript{2}
    - $1 million
- Sustainable Shipping Operator of The Year - 2009
Working with the industry and customers to reduce impacts

- Clean Cargo Working Group is a business-to-business forum with the goal “to promote more sustainable product transportation”

- Members are shippers and ocean liner companies including:
  - APL, CMA CGM, COSCON, Hamburg Sud, Hanjin, Hapag Lloyd, Hyundai, K Line, Li & Fung, Maersk Line, NYK Line, OOCL, Safmarine, Shell Marine, UPS, Yang Ming

http://www.bsr.org/consulting/working-groups/clean-cargo.cfm
carrier Name:

**TABLE 1 - OVERALL PERFORMANCE**

<table>
<thead>
<tr>
<th></th>
<th>% of Fleet Reported On</th>
<th>Max Score Possible</th>
<th>Carrier Score</th>
<th>Carrier Score as % of Max</th>
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<tr>
<td></td>
<td>Owned</td>
<td>Time-Chartered</td>
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<tr>
<td>CO2 Emissions (across all trade lanes)</td>
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<td>--</td>
<td>50</td>
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<tr>
<td>SOx Emissions</td>
<td>--</td>
<td>--</td>
<td>15</td>
<td>--</td>
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<tr>
<td>NOx Emissions</td>
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<td>Environmental management systems</td>
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<td>Transparency</td>
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<td>Overall Performance</td>
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*Score not available until "CCWG Average" is calculated for each trade lane*

**TABLE 2 - DETAILED CO2 PERFORMANCE**

<table>
<thead>
<tr>
<th>CO2 Emissions - by trade Lane</th>
<th>% of Fleet Reported On</th>
<th>TEU-km</th>
<th>grams CO2/ TEU-km</th>
<th>Score</th>
<th>grams CO2/ TEU-km</th>
<th>Score</th>
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<tbody>
<tr>
<td></td>
<td>Owned</td>
<td>Time-Chartered</td>
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<td>Asia--South America (EC/WC)</td>
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<td>Asia--Oceania</td>
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<td>Asia--North Europe</td>
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<td>Asia--Mediterranean</td>
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</table>
Case study: Nike

Visibility on supply chain carbon emissions to help accomplish 30% reduction target for 2020
Greener can also be cheaper

Case studies at www.damco.com

CarbonCheck projects with Boots, a leading international chain of pharmacy and health and beauty stores.

Since 2004, focus on these analyses have enabled Boots to
- reduce CO2 emissions by 29% and
- reduce logistics costs by 21%
in their inbound supply chain from Asia to their distribution centre in England.

"It goes to show that if you review and optimize your supply chain end-to-end from a green perspective, great savings can be made."

-- Erling Johns Nielsen
Supply Chain Development Team
Maersk Logistics
Thank you

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NAMHSEMNG@maersk.com