The economic and environmental impact of slow steaming

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Rationale

• Need to optimise ship economic performance in these difficult times (high bunker prices and low freight rates)

• Increased emphasis on environmental considerations

--> Enhanced role of ship speed!
Slow Steaming: Definition

Legal (BIMCO) definition

**Slow-steaming** is defined as operating at a speed above the cut-out point of the ship’s auxiliary blowers and that it will not result in the engine being operated outside the manufacturer’s recommendation.

**Ultra slow-steaming** operating at a speed either above or below the cut-out point of the ship’s auxiliary blowers and will not result in the engine being operated outside the manufacturer’s recommendation.

Practical definition

Operating a vessel at an average speed that is well below the design speed.
The role of SPEED

• Has always been important
• Increasingly important in recent years
  • Economic considerations
  • Operational considerations
  • Environmental considerations

SPEED REDUCTION

• An obvious way to reduce emissions
• Killing 3 birds with one stone?
  – Pay less for fuel
  – Reduce CO2 (and other) emissions
  – Help sustain a volatile market

• Win-win-win?

MAN PrimeServ 2012 survey
200 representatives of container and bulk shipping
149 implementing slow steaming

<table>
<thead>
<tr>
<th>Main advantages of slow steaming</th>
<th>Considerers</th>
<th>Implementers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel cost savings</td>
<td>93.7</td>
<td>94.7</td>
</tr>
<tr>
<td>Greater utilisation of existing capacity</td>
<td>22.5</td>
<td>34.2</td>
</tr>
<tr>
<td>Avoidance of idling costs</td>
<td>29.7</td>
<td>28.9</td>
</tr>
<tr>
<td>Schedule reliability</td>
<td>10.0</td>
<td>15.8</td>
</tr>
<tr>
<td>Service and maintenance savings (e.g. longer TBO)</td>
<td>17.1</td>
<td>18.4</td>
</tr>
<tr>
<td>Lower emissions</td>
<td>36.0</td>
<td>42.1</td>
</tr>
</tbody>
</table>

*Table 3: Main advantages of slow steaming as perceived by Considerers and Implementers (percentages). Respondents were able to provide more than one answer.*
Effect of slow steaming on time & fuel consumption

At sea: (before the reduction)
Fuel consumption $F_0$ (tonnes per day)

After reducing speed $V_0 \rightarrow V$

\[
\frac{F}{F_0} = \left(\frac{V}{V_0}\right)^n
\]

N=3 ('cubic law') $V<20$ kn
N=4.5 (Man B&W) for containers

NOTE THAT IN PRACTICE NO LAW EXISTS!

Constant port time (t) = WE NEED MORE SHIPS (f.e. case of liners)
Decrease port time (t) = NO NEED FOR MORE SHIPS (maybe)

Total Bunker cost = $p($/tn) x Fuel consumption

Emissions = Emission Factor x Fuel consumption
Is it always win-win?

• NOT NECESSARILY!

• Adding more ships to maintain same throughput will entail a cost

• Delaying cargo delivery will increase inventory costs

• Shrinking fleet supply may increase freight rates

• Ships going slower may shift cargo to other modes, possibly increasing overall CO$_2$

• Building more ships to match throughput will increase CO2 due to shipbuilding and scrapping!
Dual targeting

**Operational**

- Operate existing ships at reduced speed
- Derate engines
- Slow steaming kits etc

**Strategic (design)**

- Design new ships that cannot go very fast (have smaller engines)
In practice

- (not a new ‘phenomenon’: tankers during oil crisis in 1970)
- beginning of 2007: 110 Maersk Line **container** vessels super slow steaming @10% of engine ME power
- norm on the Asia-Europe and Transpacific routes, 78% and 53% respectively of all strings in slow steaming mode (Alphaliner, May 2010)
- beginning of 2011: 110 Maersk **tanker** vessels slow steaming @8.5 kn (on ballast leg) instead of a normal speed of 13 kn.

![Graph showing ship operation costs for Europe–Far East trade with different vessel speeds.](image)
**Slower and larger vessels**

### Asia-North Europe Ship Size (teu)

<table>
<thead>
<tr>
<th></th>
<th>1Q09</th>
<th>1Q10</th>
<th>1Q11</th>
<th>1Q12</th>
<th>1Q13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ave no. ships per service</td>
<td>7,000</td>
<td>7,500</td>
<td>8,000</td>
<td>8,500</td>
<td>9,000</td>
</tr>
<tr>
<td>Ave ship size (teu, right axis)</td>
<td>7,000</td>
<td>7,500</td>
<td>8,000</td>
<td>8,500</td>
<td>9,000</td>
</tr>
</tbody>
</table>

### Slower and larger vessels

<table>
<thead>
<tr>
<th></th>
<th>2Q 2009</th>
<th>2Q 2010</th>
<th>2Q 2011</th>
<th>2Q 2012</th>
<th>2Q 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>WB (teu)</td>
<td>8,100</td>
<td>8,700</td>
<td>9,000</td>
<td>9,200</td>
<td>10,500</td>
</tr>
<tr>
<td>EB (teu)</td>
<td>17.0k</td>
<td>14.8k</td>
<td>14.8k</td>
<td>14.8k</td>
<td>14.8k</td>
</tr>
</tbody>
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### Notes:
- Assumed average vessel utilisation WB 85%, EB 55%.
- Cost of diesel excluded
- Source: Drewry Maritime Research

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**Sizing Up The Trends**

- **Average tanker size up by 1%**
- **Average bulker size up 44%**
- **Average container ship size up 71%**

**Source:** Clarkson Research Services
**Taxonomy of SPEED REDUCTION Incentives**

- **NEED TO REDUCE SPEED**
  - **Economical reasons**
  - **Need to Cut-off Emissions**
    - **Voluntary measures (CSR)**
    - **Regulations**
  - **Higher Fuel Costs**
  - **Savings in other costs (f.e. Port dues, taxes)**
  - **Low Timecharter Rates**
  - **Overcapacity**

- **Emissions = f (Fuel Consumption)**
- **Fuel Consumption = f (Speed)**

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DTU Transport, Technical University of Denmark
Economical Reasons
High Fuel Costs

- Volatile market
- Need to use ‘cleaner fuel’ (=more expensive)
  e.g. MARPOL Annex VI ECA Areas, EU directive 2005/33/EC
Economical Reasons
Reduced freight rates and Overcapacity

Timecharter rates go down due to low demand and overcapacity.
Slow steaming absorbs capacity due to the need of adding more ships to maintain same throughput which leads to higher TC rates.

Not for all ship type and routes!

<table>
<thead>
<tr>
<th></th>
<th>LOW Bunker Price</th>
<th>HIGH Bunker Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW Freight Rate</td>
<td>12 knots</td>
<td>10 knots</td>
</tr>
<tr>
<td>HIGH Freight Rate</td>
<td>14 knots</td>
<td>12 knots</td>
</tr>
</tbody>
</table>

REALITY:
NO REACTION!
Charter parties

Baltic and International Maritime Council

voyage charter: owner pays fuel cost

Time charter: owner manages the vessel but the charterer pays for bunkers

C/P speed may not be the optimal one

BIMCO ‘slow steaming clause’ for dry cargo and tankers (June 2011)

Voyage C/P is more challenging than Time C/P
(a) The Owners shall be entitled to give instructions to the Master to reduce speed or RPM (main engine Revolutions Per Minute) provided that the Vessel’s speed, basis good weather conditions, shall not fall below XXX knots.

(b) Where the Vessel proceeds at a reduced speed pursuant to Sub-clause (a), this shall constitute compliance with, and there shall be no breach of, any obligation requiring the Vessel to proceed with utmost and/or due despatch (or any other such similar/equivalent expression).

(c) The Charterers shall ensure that the terms of the bills of lading, waybills or other documents evidencing contracts of carriage issued by or on behalf of the Owners provide that the exercise by Owners of their rights under this Clause does not constitute a breach of the contract of carriage. The Charterers shall indemnify the Owners against all consequences and liabilities that may arise from bills of lading, waybills or other documents evidencing contracts of carriage being issued as presented to the extent that the terms of such bills of lading, waybills or other documents evidencing contracts of carriage impose or result in the imposition of more onerous liabilities upon the Owners than those assumed by the Owners pursuant to this Clause.

(d) This Clause shall be without prejudice to any other express or implied rights under this Charter party entitling the Vessel to proceed at speeds below the minimum speed stated in Sub-clause (a).
Virtual Arrival

is a process that recognizes known inefficiencies in the supply chain (f.e. avoid spending time at anchor awaiting a berth) and reduces the use of fuel and associated emissions by implementing a mutually-agreed reduction in a vessel’s speed on passage in order to achieve an agreed arrival time at a port.

A ‘win-win’ scenario

Oil Companies International Marine Forum (OCIMF)
International Association of Independent Tanker Owners (INTERTANKO)
The role of ports

Time issues

- Port Congestion

- Service Time

NEED FOR MORE EFFICIENT TERMINAL OPERATIONS

Liner passenger shipping: reduction of time at port can be easily implemented! Due to the existence of slack time in a ship’s schedule (under the assumption that the speed reduction will only lead to a small increase in total time so that passengers will still prefer using a ferry instead of other transportation modes)
What about other players?
Shippers and their customers

- What impacts have slow steaming had on your supply chain?

- Are the economic and environmental benefits of slow steaming worth the cost and inconvenience to shippers and their customers?

- How should ocean carriers use the cost savings realized from slow steaming?

Centrix consulting unit and St. Joseph’s University
Challenging traditional practices

To compensate for longer transit times in global supply chains, companies are

- conducting advance planning to synchronize delivery and production schedule
- choosing multiple carriers in the same trade lanes
- increasing inventory levels to offset costs and transit charges.

Is it the end of just-in-time?

OTHER LOGISTICAL CONSIDERATIONS

THE FUTURE: paperless transportation, supply chain integration, synchromodal networks

Synchromodality: Making optimal use of all modes of transport and available capacity, at all times, as an integrated transport solution.
Conclusions

• There is no doubt that slow steaming can be beneficial both for companies and the environment.

• It is very difficult to predict the market (fuel prices, freight rates etc.)

• Slow steaming is probably here to stay, especially in liner shipping.

• There is a need for additional considerations such as:
  • the role of ports (incl. congestion and port operations)
  • the role of other players (shippers)
  • Other logistical considerations (e.g. synchromodality)
Thank you very much!

http://www.staff.dtu.dk/kontova/Publications

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