Improving Vessel and Supply Chain Fuel Efficiency

MSTRS – 4/19/2012

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Today, a single ship can deliver thousands of tons of cargo for many customers to dozens of ports. But it was not always this way …

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Diesel engines have replaced wind power

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Containers have replaced “break bulk” cargo handling

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Containers are standard sizes: 20', 40' or 45'

- A 40-foot container is the size of a city bus
  - Can hold:
    - 1,500 DVD players
    - 18,000 T-shirts
    - 90,000 lamb chops (what a four-person family would eat in 450 years)
- 45-foot container can hold 28,000 Barbie Dolls

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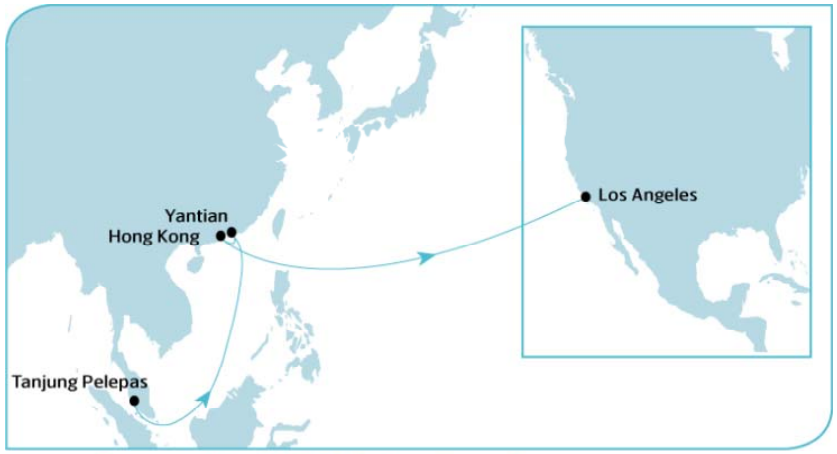
Vessels routes require several weeks.

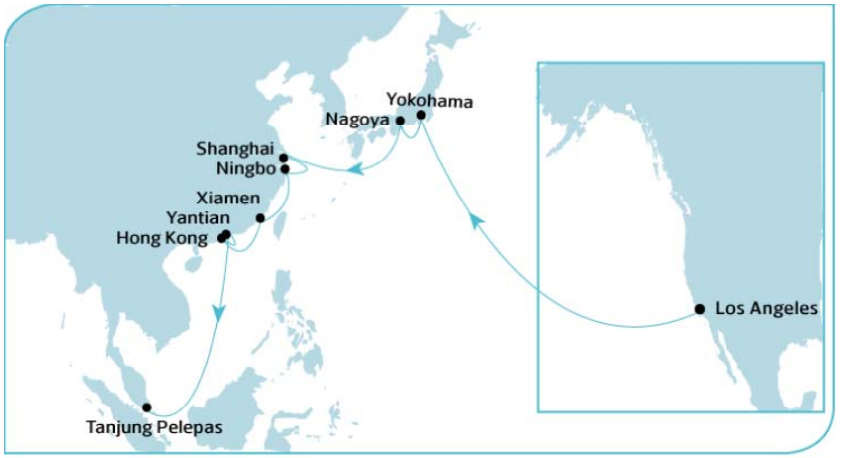
Multiple vessels are scheduled on each route to provide regular (weekly) service.



Transpacific 6 (TP6) – Eastbound

PORT	ARRIVES	DEPARTS	TRANSIT
Tanjung Pelepas, Malaysia	MON 1900	WED 0300	--
Yantian, Mainland China	FRI 2100	SAT 2200	2
Hong Kong, Mainland China	SUN 0400	MON 0400	4
Los Angeles, CA, USA	FRI 1800	TUE 0200	16

Note: Weekly Service



Transpacific 6 (TP6) – Westbound

PORT	ARRIVES	DEPARTS	TRANSIT
Los Angeles, CA, USA	FRI 1800	MON 1700	--
Yokohama, Japan	THU 0100	THU 1600	17
Nagoya, Japan	FRI 0800	FRI 1800	18
Shanghai (YS), Mainland China	SUN 1700	MON 0700	20
Ningbo, Mainland China	MON 1900	TUE 0600	21
Xiamen, Mainland China	WED 1300	THU 0001	23
Hong Kong, Mainland China	THU 2000	FRI 0700	24
Yantian, Mainland China	FRI 1200	SAT 0200	25
Tanjung Pelepas, Malaysia	MON 2100	WED 0400	28

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A 14 week round trip requires 14 vessels on that route.

Sample Vessel Schedule: Georg Maersk on TP-6

Port Name	Arrival Date		Departure Date	
Hong Kong	18 Apr 2010	04:00	19 Apr 2010	04:00
Los Angeles	30 Apr 2010	18:00	03May 2010	17:00
Yokohama	20 May 2010	01:00	20 May 2010	16:00
Nagoya	21 May 2010	08:00	21May 2010	18:00
Shanghai	23 May 2010	17:00	24 May 2010	07:00
Ningbo	24 May 2010	19:00	25 May 2010	06:00
Xiamen	26 May 2010	13:00	27 May 2010	00:01
Hong Kong	27 May 2010	18:00	28 May 2010	11:00
Yantian	28 May 2010	17:00	29 May 2010	07:00
Tanjung Pelepas	01 Jun 2010	09:00	02 Jun 2010	16:00
Jeddah	11 Jun 2010	23:00	12 Jun 2010	23:00
Suez Canal	15 Jun 2010	01:00	15 Jun 2010	17:00
Barcelona	19 Jun 2010	08:00	20 Jun 2010	08:00
Valencia	21 Jun 2010	02:00	22 Jun 2010	08:00
Algeciras	23 Jun 2010	08:00	24 Jun 2010	14:00
Port Tangier Mediterranee	25 Jun 2010	00:01	26 Jun 2010	02:00
Suez Canal	01 Jul 2010	19:00	02 Jul 2010	17:00
Tanjung Pelepas	17 Jul 2010	02:30	18 Jul 2010	10:30
Vung Tau	20 Jul 2010	08:00	21 Jul 2010	08:00
Yantian	23 Jul 2010	15:00	24 Jul 2010	22:00
Hong Kong	25 Jul 2010	04:00	26 Jul 2010	04:00
Los Angeles	08 Aug 2010	18:00	12 Aug 2010	03:00

14 week round trip

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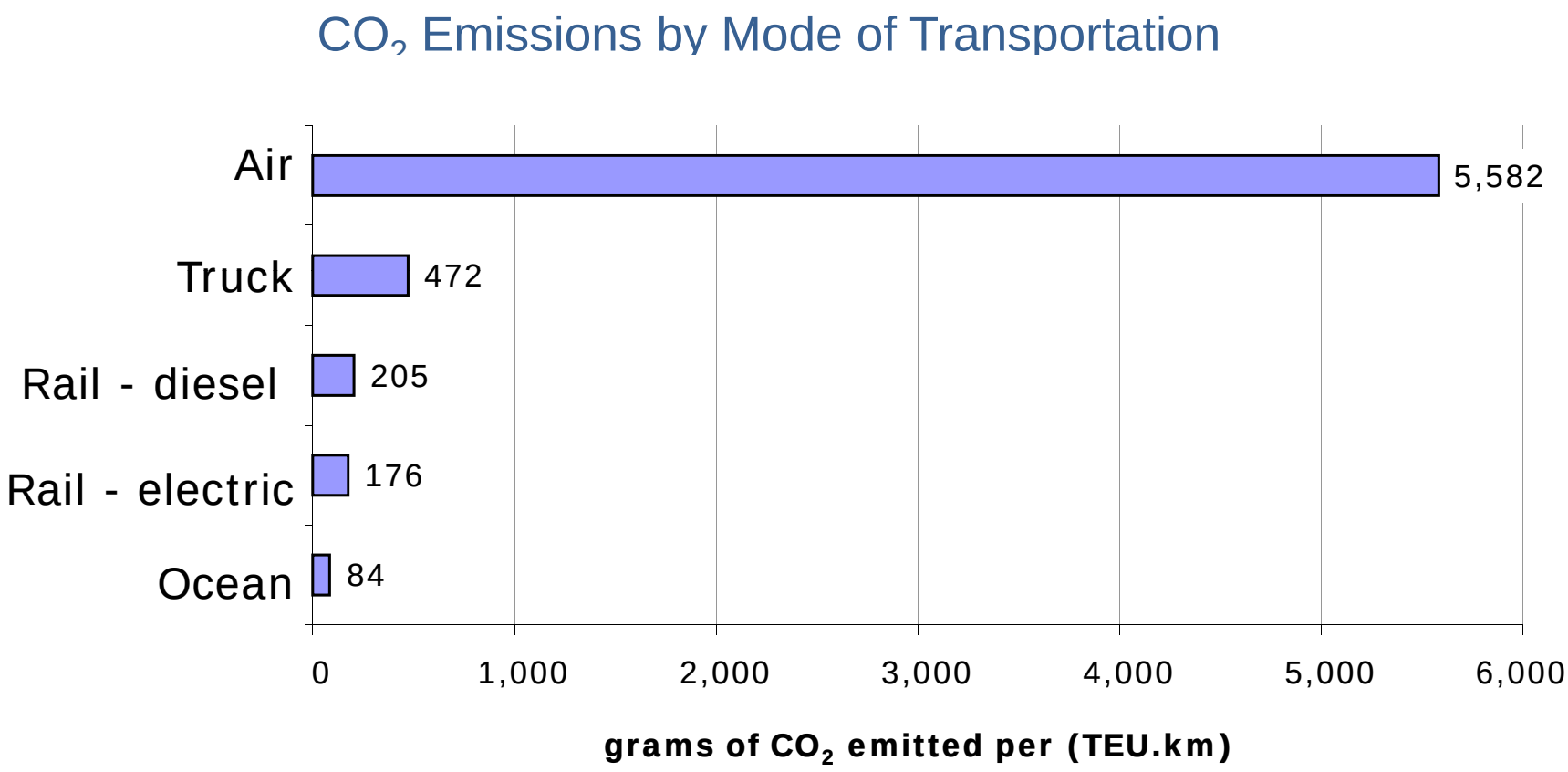
Ocean shipping has the lowest environmental impact for long distance transportation.



90% of all goods transported globally are carried by ship.

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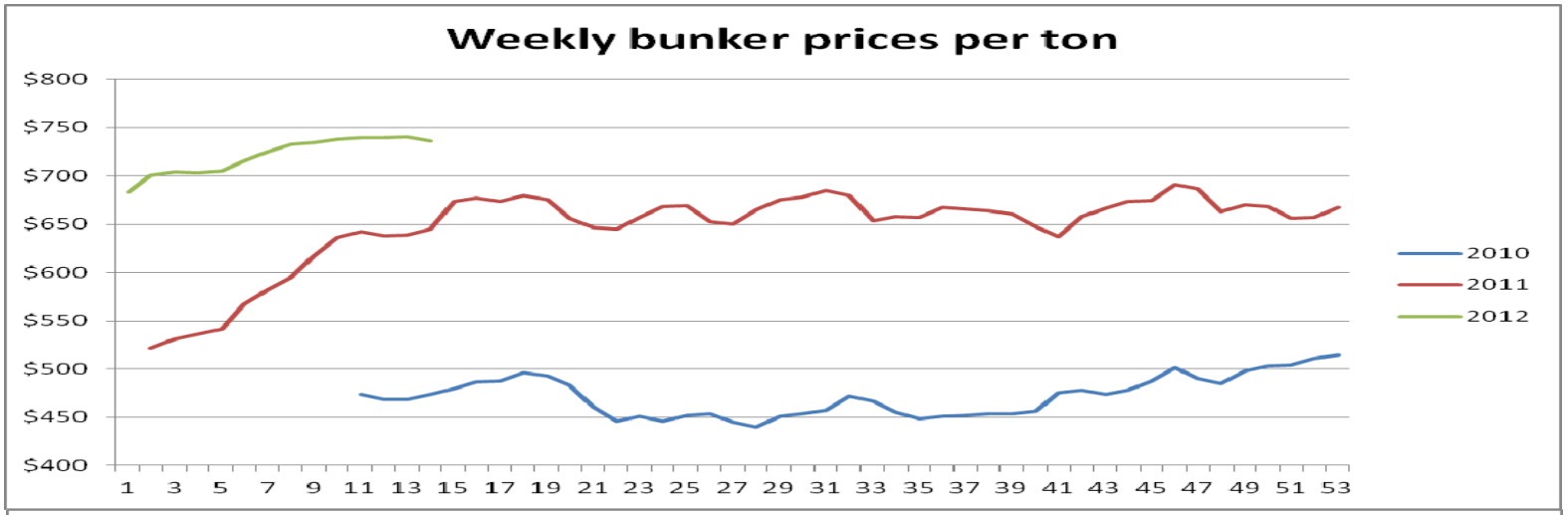
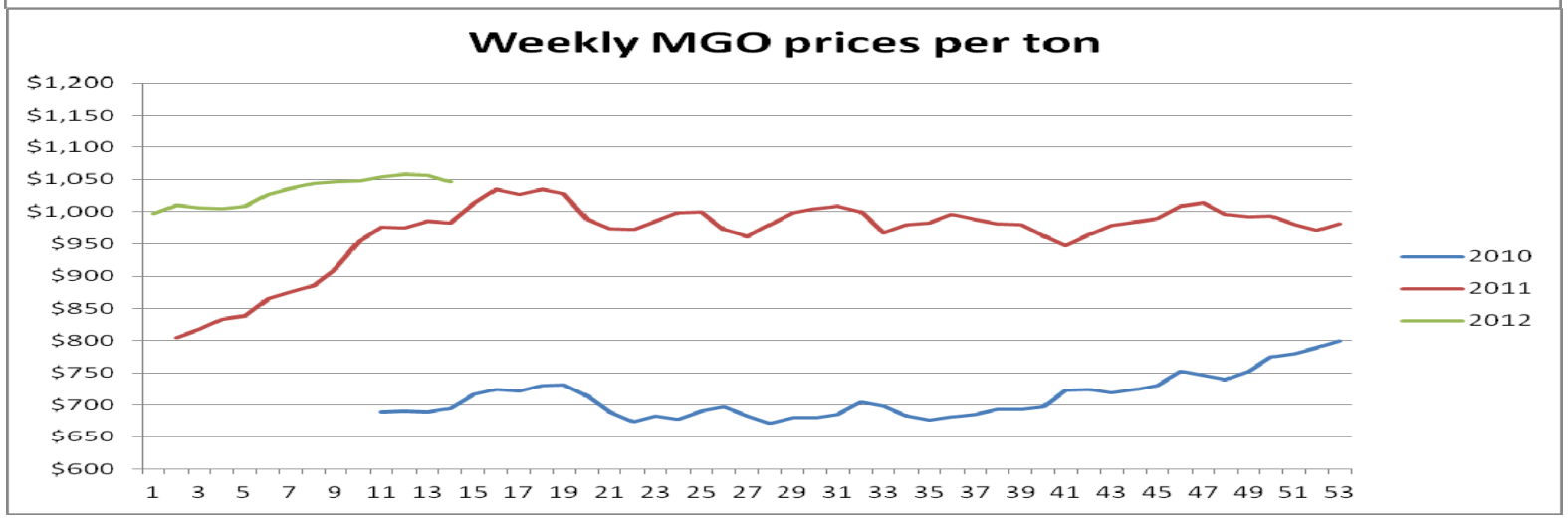
Vessel fuel costs have soared since 2009.





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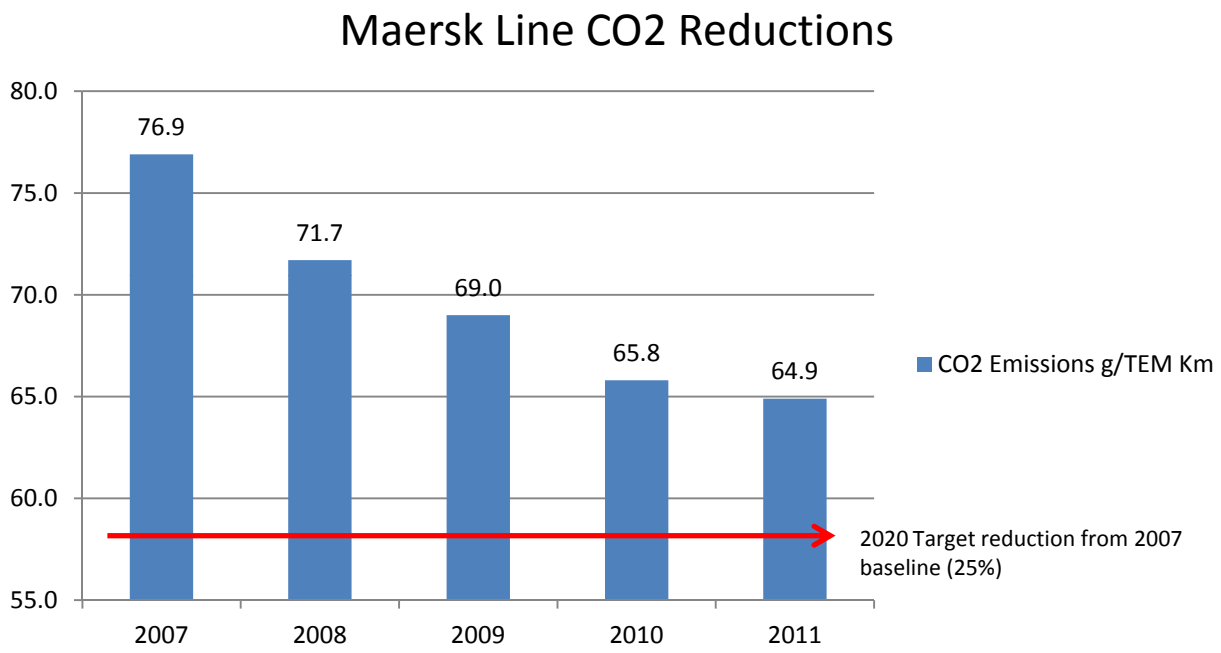
Vessels are becoming more fuel efficient.
This reduces fuel use and air emissions.



- 15.6% per TEU km since 2007
- Due to vessel size, technologies, operations
- Reduction target for 2020 is 25%

Verified by: Lloyd's Register 250 YEARS OF SERVICE

Innovation is essential for sustainability

- *Propeller, hull & trim optimization*
- *Waste heat recovery system*
- *Slow steaming and super-slow steaming*

Other Initiatives

- *Alternative fuel tests*
- *New propulsion technologies*
- *ISO 14001 certified*
- *Crew awareness and engagement*
- *Maintenance of hull and propeller*
- *Voyage Efficiency System (VES)*
- *Trim optimization*
- *SOx scrubber studies*
- *Antifouling hull paint*
- *QUEST: Low energy chilled containers*
- *Modified bulbous bow*
- *Micro bubbles*
- *Ballast water optimization and treatment systems*

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All Maersk Line new builds are more energy efficient, and some being delivered today are 28 to 50% better.

Triple E – 18,000 TEU
- **Coming in 2013**
- **50% more efficient**

WAFMAX class – 4500 TEU
- **28% less CO2 per TEU**
- **10 in service (2011)**
- **12 more delivered by 2012**

SAMMAX class – 7500 TEU
- **50% less CO2 per TEU**
- **6 vessels in service in 2011**
- **10 more by 2012.**

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Vessel environmental improvements take time and partnerships.

New vessels

- Optimize vessels for intended services
- Potential energy efficiency improvements 20-50%
- Work with shipyards, equipment and fuel suppliers
- Long-term view plus short-term impact

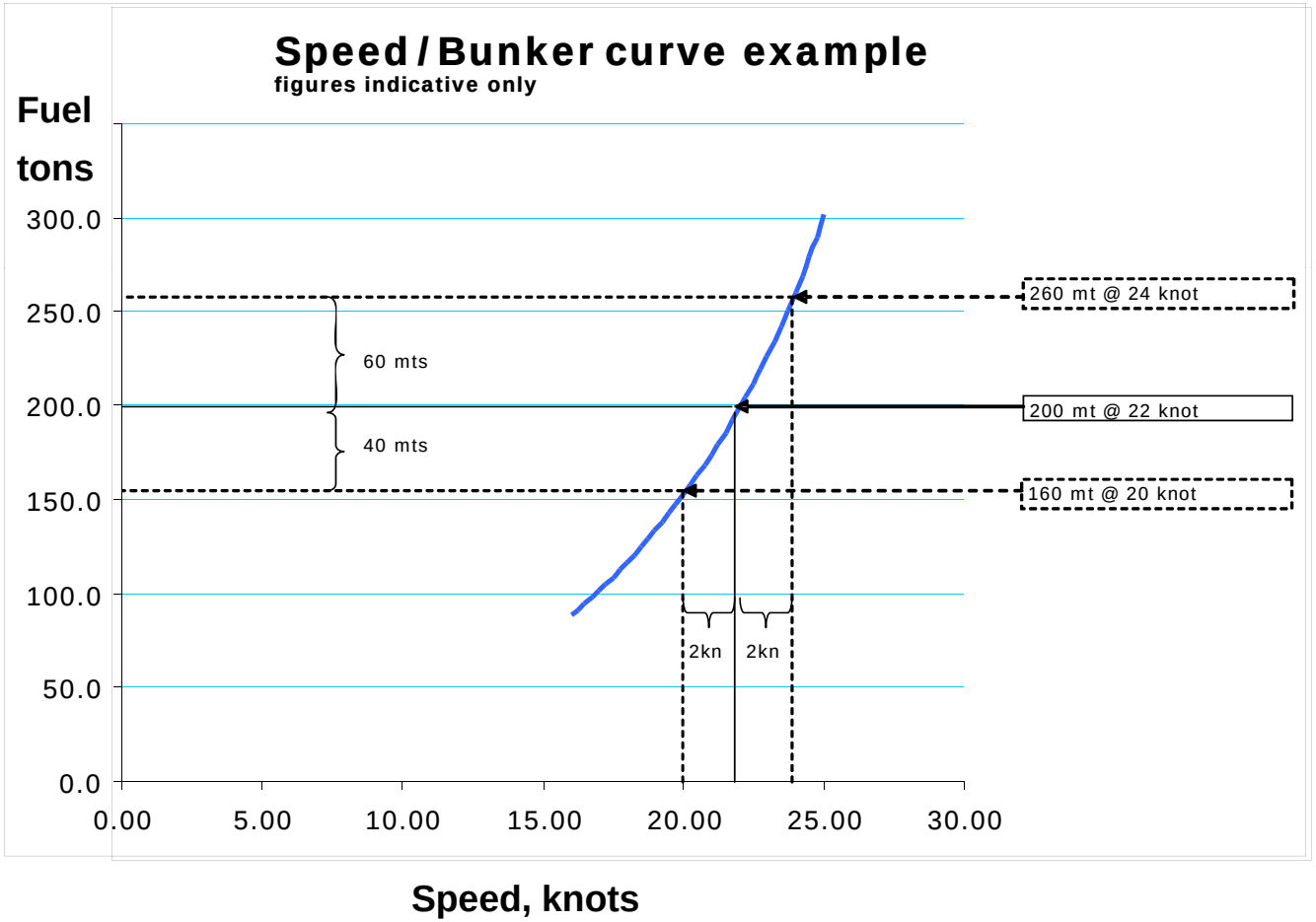
Existing fleet

- Identify or develop technologies
- Work with Charter vessel owners
- Partner with technology, software and engine suppliers
- Identify the right mix for each vessel

Personnel

- Vessel crews
- Shore side teams
- Structures, metrics, idea sharing

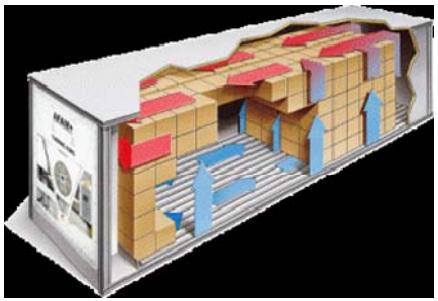
Fuel use and costs increase exponentially at higher speeds



- 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**

Improvements go beyond the vessels

- Reefers – a new, innovative control system reduces energy consumption by 50% (some by 63%).
- Dry Containers - flooring is now recycled plastic, bamboo or FSC certified timber.
- Slow or “steady” steaming – voyage efficiency systems improve on-time delivery at the same time they are minimizing fuel usage.
- Testing alternative fuels and propulsion.
- Using our vessels to assist ocean scientists.



Study Period	On-time %	Ranking Among Top 20
3Q11	83	1
2Q11	76	1
1Q11	66	3
4Q10	70	1
3Q10	79	1
2Q10	77	1
1Q10	69	1
4Q09	63	1
3Q09	71	2
2Q09	79	1
1Q09	78	1
4Q08	77	1
3Q08	68	1
2Q08	76	1

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Industry Efforts to Measure and Reduce Environmental Impacts

clean CARGO Sustainable Transportation

www.bsr.org

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

- Standardized footprint calculation tools
- Annual environmental performance survey and benchmarking
- Working to harmonize environmental calculations globally
- Emissions factors published by trade lane.

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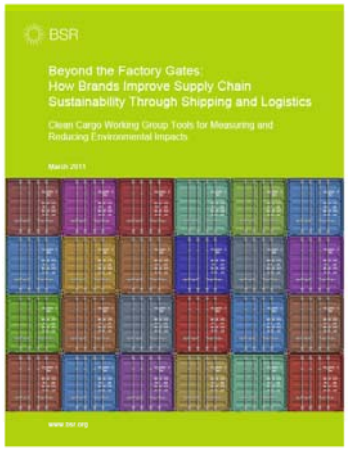
CCWG publishes CO2 methods and industry averages by trade lane.



CCWG average emissions per trade lane are based on:

CUMULATIVE - weighted average gCO_2/TEU-km

	Dry	Reefer
Intra-Americas (Caribbean)	102.28	133.41
Europe (North & Med)--Oceania (via Suez / via Panama)	101.52	128.62
North America--Oceania	100.48	126.67
North America--Africa	97.37	139.65
Asia--Oceania	92.80	120.34
Europe (North & Med)--Africa	88.67	122.65
Europe (North & Med)--Latin America/South America	87.33	114.91
North Europe--North America EC (Incl. Gulf)	85.41	112.46
North America--South America (EC/WC)	84.96	112.84
Asia--Africa	84.87	110.51
North America EC--Middle East/India	84.20	108.59
Asia--South America (EC/WC)	80.57	104.40
Mediterranean--North America EC (Incl. Gulf)	80.03	108.63
North Europe--North America WC	79.81	104.64
Other	78.55	108.51
Asia--North America EC	78.15	97.44
South America (EC/WC)--Africa	77.81	97.79
Europe (North & Med)--Middle East/India	76.19	105.10
Intra-Asia	76.14	100.67
Asia--North America WC	74.20	97.13
Asia--Middle East/India	73.72	103.50
Intra-Europe	72.75	102.59
Asia--Mediterranean	67.52	96.71
Asia--North Europe	67.26	93.91
Mediterranean--North America WC	59.69	89.93

- Methods based on fuel efficiency
- Enable CO2 benchmarking and supply chain CO2 calculations
- Verification guideline

http://www.bsr.org/en/our-work/working-groups/clean-cargo

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These factors allow us to compare routes for CO_2 emissions.

Route	Data source	From	To	Distance (km)	Emission Factor	Emissions Factor Units	Kilograms of CO2 per FFE
Ocean to Miami, truck to Atlanta GA							
Ocean - Industry average	CCWG 2009 Intra-Americas Industry Average	GTSDCTM	USMIATM	1533	102.28	g CO2/TEU/Km	314
Truck	SmartWay default factor	USMIATM	Atlanta	1041	1148	g CO2/km	1195
Total				**2575**			**1509**
Ocean to Savannah, truck to Atlanta							
Ocean - Maersk Line Intra-America average	2010 Maersk Line CCWG factor (verified)	GTSDCTM	USSAVGC	2228	100.3	g CO2/TEU/Km	447
Truck	SmartWay	USSAVGC	Atlanta	373	1148	g CO2/km	429
Total				**2601**			**876**
						per FFE CO2 Savings	**633**
						% Reduction	**42%**

Note 1. Clean Cargo Working Group report "Beyond the Factory Gates: How Brands Improve Supply Chain Sustainability Through Shipping and Logistics" page 6, 2009 data, http://www.bsr.org/reports/CCWG_Report_Mar_2011_FINAL.pdf

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Changing the way we think about shipping:

- **It isn't only the biggest ships -- it's the right ships.** This means optimizing the ships for the service, and upgrading the whole portfolio -- new, existing and charter.
- "**Steady Steaming**" delivers more environmental benefits than just slow steaming.
- **Reliability / On-time delivery** benefits the customer and can also benefit the environment.
- Leading in **transparency** -- publishing every vessel's performance using global standard methods, and third-party verification.
- Sustainability is the right thing to do and also **makes good business sense**.

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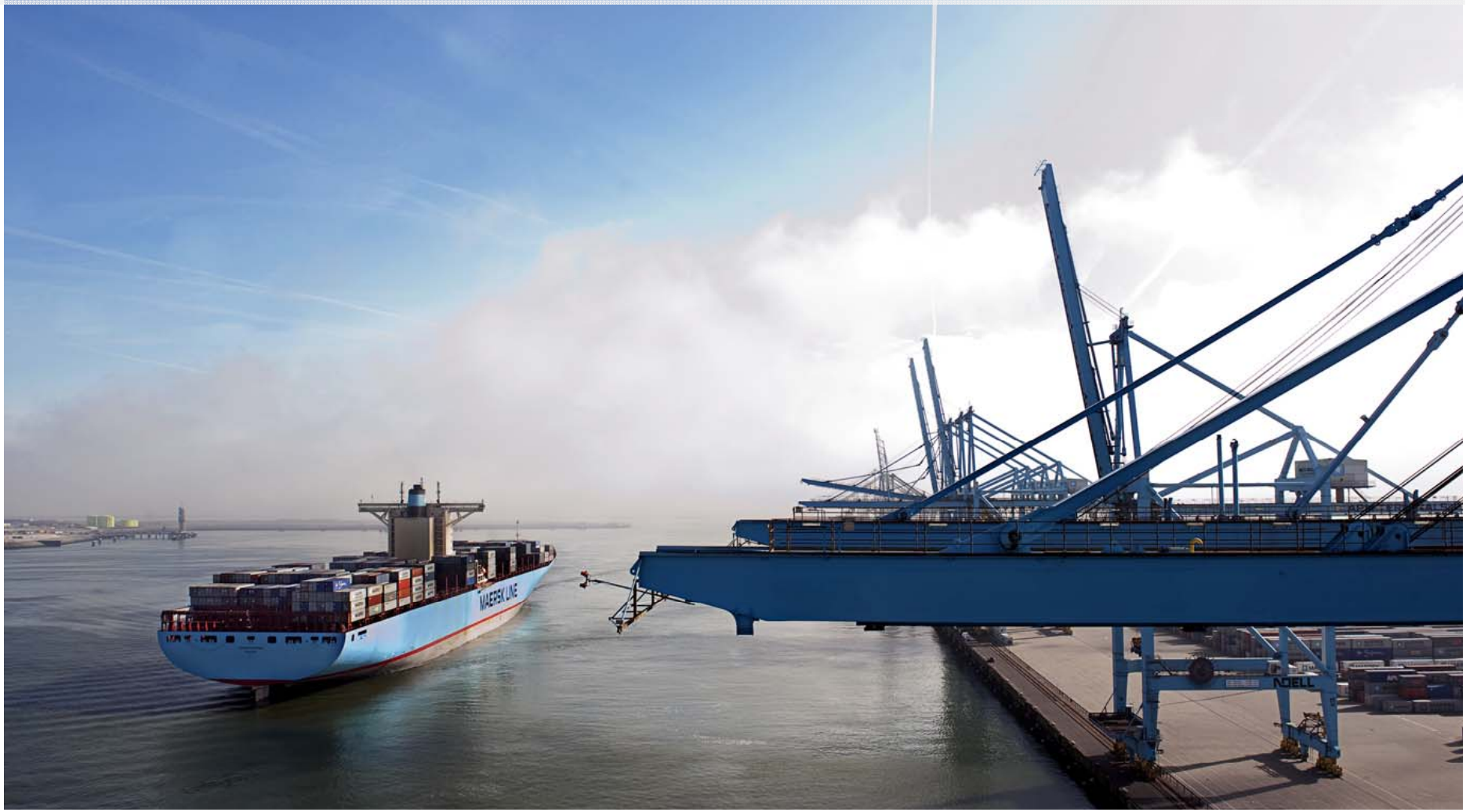
Thank you



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