Business as usual is not an option

- Sulphur emissions is a recognised problem
- Shipping is a main contributor to $\text{SO}_x$ emissions, especially in the most sensitive areas
- Business as usual will aggravate the situation
Sulphur Emission Control Areas, SECA

Baltic & North Sea, 200 nautical miles out from North America
European Sulphur Directive
Switch Fuels or clean the exhaust

– Low Sulphur Residual Fuel (LSFO):
  - Limited availability

– Low-Sulphur Destillates (MGO):
  - Similar to automotive fuel
  - Expected European supply shortage in 2015
  - Current price premium: approx. 50%

– Gas (LNG/CNG):
  - Natural Gas prices expected to remain low
  - Limited but growing infrastructure for bunkering
  - Bunker cost currently on par with MGO
  - Higher equipment cost
  - Also reduces NOx emissions

– High Sulphur Residual Fuel (HFO) with scrubbing:
  - Business as usual
  - Low overall CO2 footprint
Scrubbing is a cost-effective solution

Return on investment

Payback time

Payback time (years)

Annual Fuel Consumption in ECA

Fuel price differential
- $250,000
- $350,000
- $500,000
- $750,000
- $1,000,000

10 MW Main Engine, 3x0.5 MW Aux. Engines, Total investment cost USD 3,000,000
Market potential

Gradual phase-in

- Approximately 8,000 vessels affected by current ECA regulations
- Fuel is a dominant part of the operating expense
- Range of compliance methods will be adapted
- Trading volumes will remain, may see shift in sailing patterns
- Newbuilding market
- Global cap will affect an estimated 40,000 vessels
**Market is in place**

Scrubber manufacturers

- 4 critical success factors
  - Know-how on scrubbing
  - Know-how on marine applications
  - Resources and manufacturing base to meet and serve expected demand
  - Market reach

- Only a few companies with sufficient resources and experience
Wärtsilä is the market leader

- Unique to Wärtsilä
  - Full-scale test and training centre
  - Full range of wet scrubbing technologies
  - Installed base
  - Operational experience
  - Engineering and Installation capability and experience
  - Running business
Key Features

- Full portfolio of technologies
- More than 2000 scrubbers delivered for Inert Gas
- Low running costs
- Simple and reliable
- Module based
- Flexible
- Standardised designs
- Tried and tested
Wärtsilä’s unparalleled reference list

- Pride of Kent
- Zaandam
- Jolly Diamante (Ignazio Messina)
- Jolly Perla (Messina)
- Jolly Cristallo (Messina)
- Jolly Quarzo (Messina)
- APL England
- HHI Hull 2516 TBN (Solvang)
- HHI Hull 2517 TBN (Solvang)
- MV Tarago (Wilhelmsen)
- MT Suula
- Containerships VII
- Nantong Mingde / Algoma (8 vessels)
- Passenger vessel (2 vessels)
- Mein Schiff 3 & 4
- Passenger Vessel

- From 1-40 MW
- Single and Combined scrubbers
- Open, Closed and Hybrid solutions

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Wärtsilä set to win

Far ahead of the competition

• Legislation is in place
• Abatement is an economical solution
• Large market growth, both near and long-term
• Wärtsilä is the clear market leader
• Prepared for aggressive growth
Owner: Ignazio Messina & C S.p.A.

Vessel: DSME NB Hull 4465/66/67/6

EGCS System:
New building, Operate Italy, along African coast & Middle East
20 scrubber units

Open loop system

“MV Jolly Diamante” delivered Dec. 2011
EGCS onboard DNV/RINA approved

Performance:
Cleaning 4.5%S fuel down to 0.1%S
60-80% Particulate Removal
Prepared for main engine scrubbing
EGCS hybrid system for

1 x 22.89 MW main engine
4 x 1.84 MW auxiliaries
1 x 2 500 kg/h boiler

• **Owner:** Ignazio Messina & C SPA

• **Yard:** STX Offshore & Shipbuilding Co. Ltd
  NB no: S3027/3028/3029/3030

• **Delivery:**
  September 2013   October 2013
  February 2013    February 2013
Owner: Wilh. Wilhelmsen ASA

Vessel: MV Tarago

EGC System:
Retrofit during dry-dock
Operate Europe, America and Asia
1 x 25 MW 3 inlet scrubber for main engine and auxiliaries
1 x 6MW 1 inlet scrubber for auxiliaries in port
Hybrid system

Delivery equipment: Q4 2012

Ship in dock: Q1 2013

Performance:
Cleaning 3.5%S fuel down to 0.1,%S
Up to 85% Particulate Removal

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Example alkalinity in the Baltic Sea

- Open sea alkalinity
- Surface data (0… 15 m)
- Data from 2001-2005

- Typical open sea alcalinity outside Baltic Sea is ca. 2200 – 2400 µmol/L
Owner: Solvang ASA

Vessel: HHI hull 2516 / 2517 (VLGC)

EGC System:
New build at Hyundai Heavy Industries
1 x 15 MW 1 inlet scrubber for main engine
1 x 4MW 3 inlet scrubber for auxiliaries
Open loop system, but prepared for hybrid retrofit

Delivery equipment:
Q1 2013
Q2 2013

Ship delivery:
Q4 2013
Q1 2014

Performance:
Cleaning 3.5%S fuel down to 0.1,%S
Up to 85% Particulate Removal

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Owner: APL

Vessel: APL England – Container vessel

EGC System:
Retrofit during dry-dock
Operate between America and Asia
1 x 8 MW 3 inlet scrubber for auxiliaries
Open loop system

Delivery equipment: January 2011

Ship in dock: Summer 2011

Performance:
Cleaning 3.5%S fuel down to 0.1,%S
Up to 85% Particulate Removal

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