Two regulations require action from ship-owners

- **SO$_x$**
  - Acid rains
  - ECA 0.1% (2015)
  - EU 0.5% (2020)
  - Global 0.5% (2020 or 2025)

- **NO$_x$**
  - Acid rains
  - Ozone depletion
  - Tier II (2011)
  - Tier III in ECA (2016?)

- **PM**
  - Impact on air quality
  - Along with SO$_x$ reduction

- **GHG**
  - Global warming
  - Under evaluation by IMO

- **BALLAST WATER**
  - Damage to local ecosystems
  - IMO Global ballast convention
  - USCG Regulation

LEONARDO SONZIO
© Wärtsilä
14 November 2013
Ballast water regulation update

Global

- Not yet ratified
- Proposal to delay enforcement

37
30
Countries
World GT

30.38%
35%

All ships > 400 GT trading internationally

US (Local)

2013 VGP in place

in force from Dec 2013

All ships > 300 GT operating in US waters
Market potential for BWMS unchanged

- Overall market potential:
  - Over 40,000 existing ships
  - Newbuilds sailing between different ecosystems

- Retrofit market:
  - Circa 12,000 ships sailing to US over next years
  - Rescheduling of IMO regulations could delay peak demand by 2-3 years
  - Ship owners prioritizing their green credentials will continue ordering ahead of deadlines

- Contract value per vessel:
  - Small UV system: equipment value ca. 100-400 k€
  - Large EC system: equipment value ca. 400-1,000 k€
  - Retrofitting costs of similar magnitude
Development of Wärtsilä AQUARIUS®

AQUARIUS® UV
- IMO Type Approval 2012
- AMS status 2013
- Testing & US Type Approval 2015 (target)

AQUARIUS® EC
- IMO Final Approval May 2013
- IMO Type Approval 2013 (target)
- Undertake testing for US Type Approval
- US Type Approval early 2015 (target)

Wärtsilä aims at being a frontrunner in the US through early certification
Wärtsilä AQUARIUS® unique selling points

- Only player offering a technology choice

- **Partnership** program with customers:
  - Selection of technology based on customer needs
  - Retrofit services (engineering, installation, turnkey)
  - Global lifecycle support

- **AQUARIUS READY** is an intermediate step to prepare the ship for later installation of the system
Wärtsilä is in a good position

- Unique selling points attracting customers
- Robust design and thorough validation process
- Delays in IMO implementation may push small suppliers out of market
- US Type Approval could be an additional hurdle for small players
- Roll-out of industrialization plans
  - Ramp-up of production in the Delivery Centre Suzhou
  - Strategic partnerships for key components to secure cost efficient ramp-up
  - Phased ramp-up of project management and engineering resources for retrofits
Updated market potential for exhaust gas cleaning

Relevant vessels operating in Emission Control Areas: Baltic Sea, North Sea and North America

Around 16,000 ships

Market potential depending on fuel price difference
Relevant commercial vessels with <5 years pay-back time

Between 1,500-2,000 ships

- No relevant changes to legislations in 2013
- Updated calculation of market potential for current Emissions Control Areas based on historical ship movements data
- IMO global sulphur cap to be introduced in 2020 or 2025 will affect around 40,000 vessels
- 0.5% cap in European waters from 2020, irrespective of IMO fuel review
Updated market potential for Exhaust Gas Cleaning

Contract value:

- Equipment varying between ca. **1,500 k€** and **5,000 k€** per ship

- As a rule of thumb, equipment and installation each represent 40% of the total price for a turnkey retrofit
Technology review and references

Wärtsilä Open Loop Scrubber
• Tens of thousands of running hours

Wärtsilä Closed Loop Scrubber
• Thousands of running hours
• System onboard Containerships 7 successfully completed tests and achieved approvals by Class and Flag State in October 2013

Wärtsilä Hybrid Scrubber
• First system in operation since summer 2013
• Several other systems to be delivered in coming months

Key development activities
• Space efficient system for retrofit applications

Total number of references (deliveries and orders, as of October 2013)
38 ships and 83 systems
Our strategy for the retrofit market

Dedicated organization for retrofit projects taking care of customers’ needs

- Engineering
- Planning and project management
- Installation plan approvals by Class or Flag
- Prefabrication and onboard preparations to shorten docking time and costs
- Installation and construction works
- Site management
Retrofit contract
TT-Line Green Ship MS “ROBIN HOOD”

• Modern RoPax Ferry (passenger and freight) operating between Travemünde, Germany and Trelleborg, Sweden

• Order in October 2013 → delivery in Q3 2014

• Turnkey contract including:
  – 4 x hybrid scrubbers
  – Complete retrofit design (basic and detail)
  – Plan approval coordination with Class and Flag
  – Pre-fabrication
  – Installation
Exhaust Gas Cleaning – manufacturing footprint

Wärtsilä Moss, Norway
• Products: scrubbers and auxiliaries
• Medium scale production

North and East Europe
• Products: scrubbers and auxiliaries
• External fabricators
• Large scale production

Wärtsilä Suzhou, China
• Products: scrubbers and auxiliaries
• Large scale production

Existing site
Ongoing expansion
## Updates on competition – exhaust gas cleaning

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<td>• Low price strategy</td>
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<tr>
<td>• Closed loop</td>
<td>• Turnkey provider?</td>
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</table>

- Other players: Belco DuPont, Couple Systems, AEC Systems, Saacke
- Small newcomers entering the market
Wärtsilä is well positioned to be the market leader

- Full range of wet scrubbing technologies
- Several references across all main ship types
- Running hours onboard and at laboratory in Moss
- Unique retrofit capabilities
- Market reach and capability of rapidly ramping up deliveries