Wallenius Marine

Leading the way towards truly sustainable shipping

Carl Fagergren
Project Manager
Ship design & Newbuilding
Family owned company
Established 1934
Operating globally
The vessels

Built: 2011
Yard: DSME
Engine power: 19,000 kW
Speed: 20 kn

Length: 228 m
Beam: 32.3
Capacity: 7,900 cars

WM has designed and managed the newbuilding process for 70 vessels since the mid 90’s
25 Managed vessels
What we offer
“Leading the way towards truly sustainable shipping”
ZERO (Zero Emission RORO)

Roadmap towards the zero emission vision
Basis for our future ship designs
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<td>Steam turbines</td>
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<td>Batteries</td>
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<td>Flywheels</td>
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<td>Others</td>
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<td>Energy saving technologies for the habitat</td>
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<td>Flettner rotors</td>
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<td>Kites</td>
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**Biofuels**
- Methanol
- Ethanol
- Biodiesel
- Biogas
- Synthetic fuels
- Hydrogene
- Biochar
- Pellets

**Fossil fuels**
- Liquefied Natural Gas, LNG

**Energy storage**
- Batteries
- Flywheels

**Others**
- Carbon hydrates cracking to hydrogen
- Transformation of carbon dioxide into carbon-neutral liquid fuels
- Skin friction elimination
- IGBT Converter
ENERGY STORAGE – M³/DAY, PCTC @ 19 KNOTS

- Lead-acid batteries: 5,100 m³/day
- Hydrogen in MgH₂
- Lithium-ion batteries
- Domestic waste
- Zinc-air batteries
- Wood - pellets
- Fluid hydrogen, 20K
- Methanol
- Coal
- Ethanol
- LNG
- Petrol
- HFO
- U235: 14 ml/day
SLOW PROGRESSIVE SCENARIO

- **Emissions**
  - 2020: HFO
  - 2030: HFO 0.5% S
  - 2040: LNG
  - 2050: Biogas
  - 2060: Wind, Solar

- **Energy consumption**
  - 2020: 100%
  - 2060: 0%

- **Energy savings**
  - 2020: 0%
  - 2060: 100%

- **Energy carriers**
  - HFO
  - HFO 0.5% S
  - LNG
  - Biogas
  - Wind
  - Solar

- **Emission free**
  - 2060: 0%
DISRUPTIVE SCENARIO

Energy consumption

- Energy savings
- Emission free

Emissions

Energy carriers
- HFO
- HFO 0.5% S
- LNG
- Biogas
- Solar
- Wind

Energy consumption

- 100%
- 0%

- 100%
- 0%

2020 2030 2040 2050 2060
EMISSION FREE ENERGY (EXTRACTABLE)

Sun < 0.5 MW

Wind < 3 MW

Waves < ? MW

∑ ≈ 3 MW
SPEED – POWER (8000 CARS PCTC)
WIND POWER

Average speed 10 knots
8,000 m² wing sails
Electric hybrid propulsion
>90% reduced fuel consumption
Bio-fuel => Emission neutral
CONCLUSIONS

It is fully possible to build an emission free ship today, with existing technology.

It is NOT only about new technology!
ROADMAP

Road map for....:

- operation
- energy carriers
- technology
- Wallenius ships
- energy consumption
- emissions
- Wallenius Marine competence
# ROADMAP FOR SHIPS

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
<th>2045</th>
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<tbody>
<tr>
<td><strong>Capacity</strong></td>
<td>Multi purpose roro 8000 cars</td>
<td>Multi purpose roro 8000 cars</td>
<td>Multi purpose roro 6000 cars</td>
<td>Multi purpose roro 6000 cars</td>
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<tr>
<td><strong>Speed</strong></td>
<td>17 knots</td>
<td>16 knots</td>
<td>14 knots</td>
<td>12 knots</td>
<td>11 knots</td>
<td>10 knots</td>
<td>10 knots</td>
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<tr>
<td><strong>Range</strong></td>
<td>42,000 nm</td>
<td>20,000 nm</td>
<td>18,000 nm</td>
<td>15,000 nm</td>
<td>15,000 nm</td>
<td>18,000 nm</td>
<td>20,000 nm</td>
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<tr>
<td><strong>Hull concept</strong></td>
<td>Monohull Low friction paint</td>
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<tr>
<td><strong>Primary energy carrier</strong></td>
<td>HFO</td>
<td>HFO 0.5% LNG</td>
<td>LNG Biofuel Batteries</td>
<td>LNG Biofuel Batteries</td>
<td>Biofuel Hydrogen Batteries</td>
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<td>Hydrogen Batteries</td>
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<td><strong>Energy carrier 2</strong></td>
<td>MGO LNG Biofuel Batteries</td>
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<td><strong>Energy carrier 3</strong></td>
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<td><strong>Propulsion</strong></td>
<td>Two stroke diesel Fixed pitch propeller</td>
<td>Two stroke DF diesel Fixed pitch propeller</td>
<td>2 stroke gas diesel Fixed pitch propeller</td>
<td>2-stroke gas diesel Fixed pitch propeller</td>
<td>Hybrid machinery Wings</td>
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<tr>
<td><strong>Auxiliary 1</strong></td>
<td>Diesel engines</td>
<td>DF engines</td>
<td>Gas engines</td>
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<tr>
<td><strong>Auxiliary 2</strong></td>
<td>Shaft generator</td>
<td>Shaft generator</td>
<td>Biofuel engines</td>
<td>Fuel cells</td>
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<tr>
<td><strong>Auxiliary 3</strong></td>
<td>Photovoltaic panels</td>
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Thank You for listening!

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