INTRODUCING WÄRTSILÄ SHIP DESIGN

Your ship designer & LNG technology partner for maximum efficiency
CONTENTS:

- Wärtsilä - Your ship designer & LNG technology partner
- Why Choose Wärtsilä Ship Design?
- Small Scale LNG carrier solutions
- Small Scale LNG carrier Ship Designs
Our business areas

ENERGY SOLUTIONS

MARINE SOLUTIONS

SERVICES
Let the leader in LNG enable your smooth transition to gas. We have the expertise, experience and offering you need. Our offering covers integrated solutions*, EPC turnkey delivery**, services and products for all phases of the LNG lifecycle.
A Comprehensive product portfolio

AUTOMATION

BALLAST WATER MANAGEMENT

ENGINES & GENERATING SETS

EXHAUST GAS CLEANING

GAS SYSTEMS

INERT GAS SYSTEMS

NAVIGATION

OIL SEPARATION

POWER ELECTRIC SYSTEMS

PROPULSORS & GEARS

PUMPS & VALVES

SEALS, BEARINGS & STERN TUBES

SHIP DESIGN

THRUSTERS

WASTE, OIL & FRESH WATER MANAGEMENT
GLOBAL PRESENCE

• Global strategic footprint to meet customers’ demands

• Close to the customer anywhere

• Proven track record with over 4,000 vessels built, including the most advanced LNG powered ships

• 40 years experience in Merchant market

• Leading experts in LNG as fuel
FLEXIBILITY AND INTEGRATION

• Freedom in shipyard selection

• Nearly 400 tankers, 200 container ships and a large selection of gas tankers designs ready to go or be adapted to your needs

• Flexibility to meet upcoming regulations
  - **Basic** (HFO)
  - **Environmental** (HFO+Scrubber+SCR)
  - **Clean** (LNG)

• On-site assistance at the yard
MAXIMIZE PROFIT AND ASSET VALUES

• Our new ship designs are committed to improve:
  
  o **Fuel efficiency** by a significant margin compared to market standards
  
  o **Fuel flexibility** as a result of Wärtsilä pioneering the Dual Fuel Market
  
  o **Cargo capacity** to the absolute maximum while maintaining vital operational demands
  
  o **Redundancy** to extent needed to achieve optimal operational and safety targets
  
  o **Lowest emissions** in the market without compromising the performance requirements

• Giving you a competitive edge in a highly competitive environment.
COMPLETE DESIGN PACKAGE

1. Initial Design
   - General arrangement
   - Building specification
   - Hull form and hydrodynamics
   - Stability
   - Lightship
   - Structural arrangement

2. Basic Design
   - Structural drawings
   - Arrangement drawings
   - Ship common systems
   - Final stability

3. Detail Design
   - Production design
   - NC cutting info
   - Spool drawings
   - Coordination drawings
A comprehensive small scale LNG carrier design portfolio

**LNG BUNKERING SOLUTIONS**
- WSD59 1K
- WSD59 3K
- WSD59 5K
- WSD59 6.5K
- WSD59 7.2K
- WSD59 7.5K
- WSD59 8K
- WSD59 10K

**LNG FEEDER SOLUTIONS**
- WSD59 7.5K
- WSD59 12K
- WSD59 15K
- WSD59 13.5K
- WSD59 16.5K
- WSD59 18K
- WSD59 20K
- WSD59 40K
Risk Management & efficiency

Product & Engineering
- Less interface points
- E&A - fully integrated cargo handling & ship control
- Coordinated vessel and product development
- Wide range of BOG management solutions

Project execution
- Avoid change order after contract
- Core competence of Gas Handling Systems within Wärtsilä Ship Design Team
- Wartsila as single project partner
- Save time by optimizing the engineering schedule

Vessel operations
- Streamlined digital operating system
- Userfriendly manual operations
- Fully automated engine management and cargo handling online performance reporting
ADDITIONAL CUSTOMER BENEFITS WITH A SINGLE SUPPLIER

• Collective knowledge of the wider Wärtsilä group and affiliates, to overcome technical challenges
• Access to extensive data and information on engine and equipment as well as research and development
• Integrated environmental solution and energy saving devices
• Single project management contact with local execution capabilities
• Responsibility centralized on a single supplier for equipment and design

→ Entire design scope performed by the same company improves quality, efficiency, communication, flexibility and integration
# WSD50 5K – LNG Carrier

## Main particulars and capacities

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length o.a., LOA</td>
<td>99.99 m</td>
<td>m</td>
</tr>
<tr>
<td>Main engine (W8L34DF)</td>
<td></td>
<td>kW</td>
</tr>
<tr>
<td>Length b.p., LBP</td>
<td>94.50 m</td>
<td>m</td>
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<tr>
<td>Service speed @ T&lt;sub&gt;d&lt;/sub&gt;, 90% MCR</td>
<td>14.0 kn</td>
<td>kn</td>
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<tr>
<td>Breadth, B / Depth, D</td>
<td>19.20 / 9.30 m</td>
<td>m</td>
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<tr>
<td>LNG fuel cons.</td>
<td></td>
<td>t/d</td>
</tr>
<tr>
<td>Draught design T&lt;sub&gt;d&lt;/sub&gt; / max</td>
<td>5.00 / 5.20 m</td>
<td>m</td>
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<tr>
<td>MDO fuel cons.</td>
<td></td>
<td>t/d</td>
</tr>
<tr>
<td>Deadweight @ T&lt;sub&gt;d&lt;/sub&gt;</td>
<td>3,050 t</td>
<td>t</td>
</tr>
<tr>
<td>MDO capacity</td>
<td></td>
<td>m&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>Deadweight @ T&lt;sub&gt;max&lt;/sub&gt;</td>
<td>3,350 t</td>
<td>t</td>
</tr>
<tr>
<td>LNG Cargo capacity, 100% fill</td>
<td>5,100 m&lt;sup&gt;3&lt;/sup&gt;</td>
<td>m&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

### Key Information

1. Tier II compliance with Wartsila 34DF main engine and L20DF gen-sets.
2. Elevated manifold for bunkering big ships and operation in big LNG terminals.
### WSD50 7.5K – LNG Carrier

<table>
<thead>
<tr>
<th>Main particulars and capacities</th>
<th>Details</th>
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</thead>
<tbody>
<tr>
<td>Length o.a., LOA</td>
<td>115.10 m</td>
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<tr>
<td>Length b.p., LBP</td>
<td>110.60 m</td>
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<tr>
<td>Breadth, B / Depth, D</td>
<td>18.60 / 10.15 m</td>
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<tr>
<td>Draught design T&lt;sub&gt;d&lt;/sub&gt; / max</td>
<td>5.50 / 6.00 m</td>
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<tr>
<td>Deadweight @ T&lt;sub&gt;d&lt;/sub&gt;</td>
<td>3,800 t</td>
</tr>
<tr>
<td>Deadweight @ T&lt;sub&gt;max&lt;/sub&gt;</td>
<td>4,100 t</td>
</tr>
</tbody>
</table>

#### Key Information

1. Long vertical side and elevated manifold for operation in big and small terminals + bunkering ships like Afra-/Suezmax DF tankers
2. LNG carrier with bunkering features – “Gas bunker” DNVGL notation
CUSTOMER BENEFITS

• Efficient cargo handling arrangement and minimized ballast capacity

• Smart maintenance and reduced operating costs

• We have a reference list of design work for close to 400 tankers, including the conversion of the first ever LNG powered tanker in the world. With this experience we are equipped to meet our customers unique needs.
WSD42 111K DF - Aframax

Main particulars and capacities

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tr>
<td>Length o.a., LOA</td>
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<td>Main engine (W6X62DF)</td>
<td>10,400 kW</td>
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<td>Length b.p., LBP</td>
<td>242.00 m</td>
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<td>Service speed @ T_d,90% MCR</td>
<td>14.5 kn</td>
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<td>Breadth, B / Depth, D</td>
<td>44.00 / 20.80 m</td>
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<td>LNG fuel cons.</td>
<td>31.3 t/d</td>
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<td>Draught design T_d / max</td>
<td>13.60 / 15.00 m</td>
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<td>HFO fuel cons.</td>
<td>41.2 t/d</td>
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<td>Deadweight @ T_d</td>
<td>97,350 t</td>
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<tr>
<td>LNG capacity</td>
<td>2 x 720 m3</td>
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<tr>
<td>Deadweight @ T_max</td>
<td>110,670 t</td>
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<tr>
<td>Cargo capacity, 100% fill</td>
<td>125,600 m3</td>
</tr>
</tbody>
</table>

Key Information

1. High efficiency optimised design
2. Superior hull-form, CFD optimised, knuckle-type skeg design
3. Extensively validated through model-tests
4. Usage of about 40% of HTS
CUSTOMER BENEFITS

• With a reference list of design work for more than 200 container vessels including the world's first LNG powered Con-Ro we have the experience and knowledge needed to meet our customer's unique needs.

• We offer fuel performance evaluations and equipment comparisons,

• Focus on operational aspect and fuel performance.
WSD84 2400 DF – Dual Fuel ConRo

**Main particulars and capacities**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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</thead>
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<td>Length o.a., LOA</td>
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<td>Main engine (W8X72DF)</td>
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<td>Length b.p., LBP</td>
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<td>77% MCR 21.0 Kn</td>
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<td>32.24 / 18.00 m</td>
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<tr>
<td>LNG Fuel Cons, service speed</td>
<td>66.8 t/day</td>
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<tr>
<td>Draught design T\text{d} / max</td>
<td>9.50 / 10.00 m</td>
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<tr>
<td>LNG capacity, 100% fill</td>
<td>2,300 m³</td>
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<tr>
<td>Deadweight @ T\text{max}</td>
<td>26,500 t</td>
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<tr>
<td>MDO capacity, 100% fill</td>
<td>1,690 m³</td>
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<tr>
<td>Car capacity</td>
<td>370 cars</td>
</tr>
<tr>
<td>Endurance (LNG)</td>
<td>6,000 NM</td>
</tr>
</tbody>
</table>

**Key Information**

1. First LNG-driven containership in the world
2. Most compact and flexible arrangement of various sizes of containers: 40’, 45’, 48’ and 53’ ft
3. Large garage for 370 cars
4. Extensive powering and sea-keeping model tests