COMPACT RELIQ

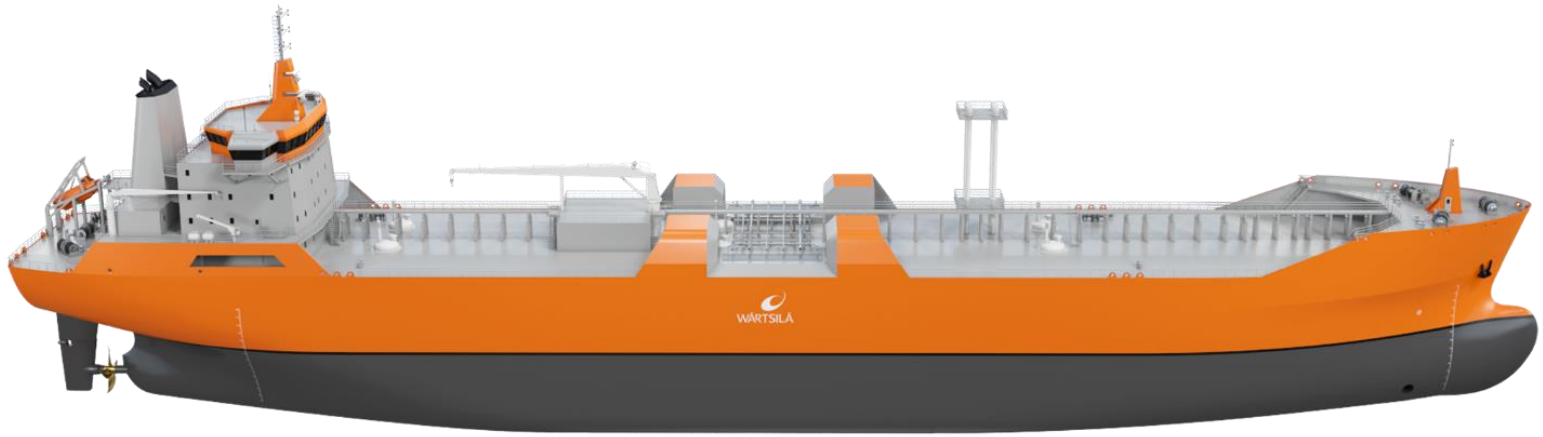
REVOLUTIONARY PRODUCT BASED ON PROVEN TECHNOLOGY



GROWING LNG BUSINESS REQUIRES MORE FLEXIBLE SOLUTIONS

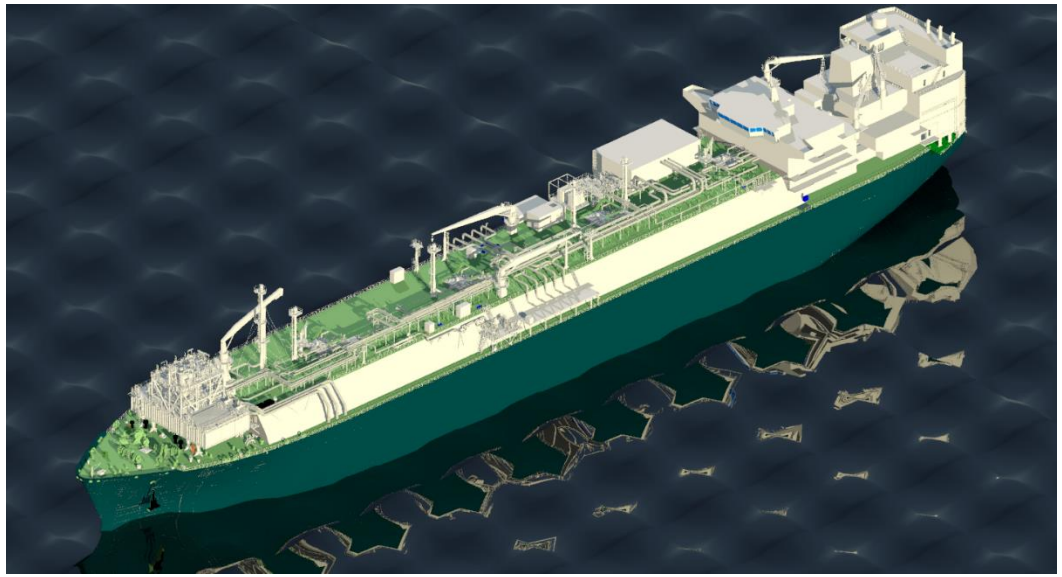
Market Leader -
Developing new solutions

- The LNG market is rapidly expanding creating the need for new large LNG carriers
- Reliquefaction system has become a standard feature on large LNG Carriers to answer environmental and economical needs.
- With the changing LNG supply chain new sizes and type of vessels are entering the market
- LNG is becoming a commonly accepted fuel, increasing the use of Small-Scale LNG Carriers
- Retrofit market requires compact solutions that fit well on existing ships.
- Compact Reliq is attractive to Bunkering operations due to proper BOG reliquefaction
- Being the pioneer in BOG reliquefaction Wärtsilä has continued to develop with the market



WARTSILA COMPACT RELIQ – NEW DESIGN

- **WELL KNOWN PROCESS** Based on Brayton technology used in a vast amount of industrial applications
- **EXCELLENT TURNDOWN:** Turndown to near 0% with **rapid capacity** changes
- **FLEXIBLE SHIP OPERABILITY:** Wärtsilä BOG reliquefaction systems provides **full BOG reliquefaction** with low temperature tanks in both laden and ballast voyage. The ship can run at any speed and still have reliquefaction.
- **DYNAMIC SIMULATION:** The system is design verified and **parameter tuned** by dynamic simulator.
- **COMMERCIAL GRADE NITROGEN AS REFRIGERANT:** Easy obtainable refrigerant and provides **safe operation.** Nobel gases are not used in the refrigerant.
- **SMART MARINE READY with OPERIM** instrumented for remote operations, health monitoring and online operational supports. The system will be delivered with Wärtsilä **OPERIM** health program.



Developed based on experience from 60+ LNG BOG reliquefaction systems delivered

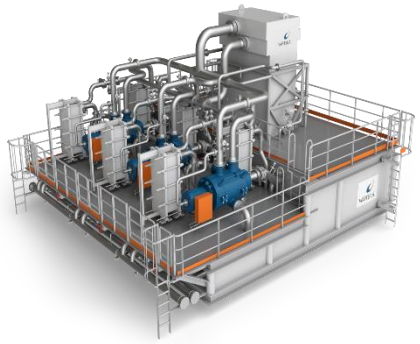
LONG TIME EXPERIENCE AND PROVEN TRACK RECORD NOW TRANSLATED IN A COMPACT, RELIABLE MODULE

Market Leader -
Simplified design

Compact Design	Compact Reliq Single (+Booster)	Compact Reliq Double (+Booster)	Compact Reliq Triple (+Booster)
Longitudinal [m]	10.5	7.2	10
Transverse [m]	4.5	11.5	11
Height [m]	4.2	5.9	6.5
Footprint [m^2]	47	83	110
Weight [tons]	45	93	121





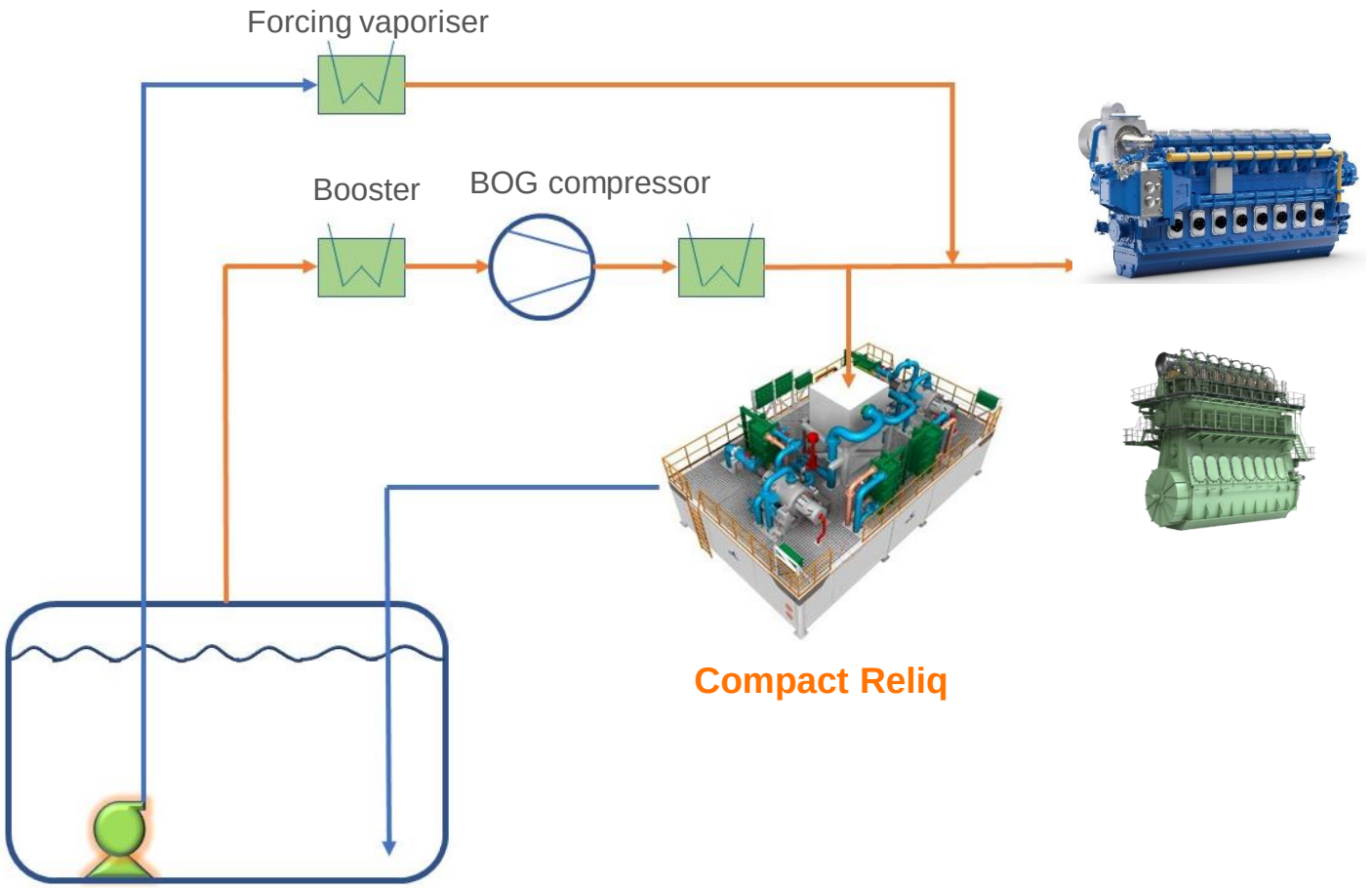


COMPACT DESIGN TRANSLATED INTO OPTIMIZED CAPACITIES WITH MARKET-LEADING EFFICIENCY

Market Leader -
Best efficiency

Model	Cooling Data		
	Capacity (kg/h)	Net Cargo refrigeration duty (kW)	Efficiency (kW/kg LNG)
CRS	850	133	1.02
CRS + Booster	1 500	234	0.59
CRD	1 700	266	1.04
CRD + Booster	2 350	374	0.74
CRT	2 550	398	1.01
CRT + Booster	3 200	500	0.82

Market Leader - Best flexibility



Compact Reliq

Main Principles

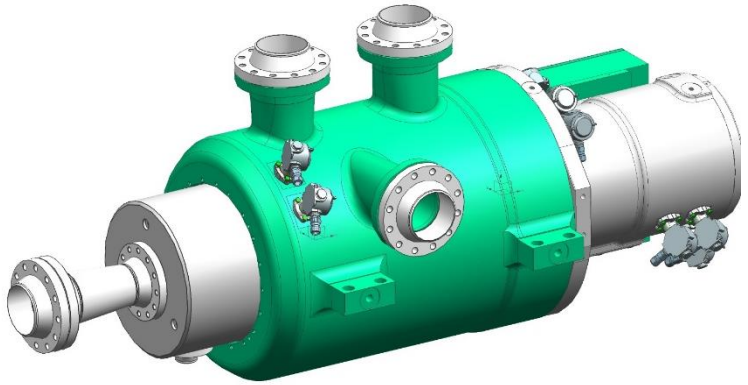
- Compressed BOG is de-superheated and reliqufied in the cryogenic heat exchanger allowing proper BOG handling in all ship operations.
- Reliquefied BOG is returned to cargo tanks bottom.

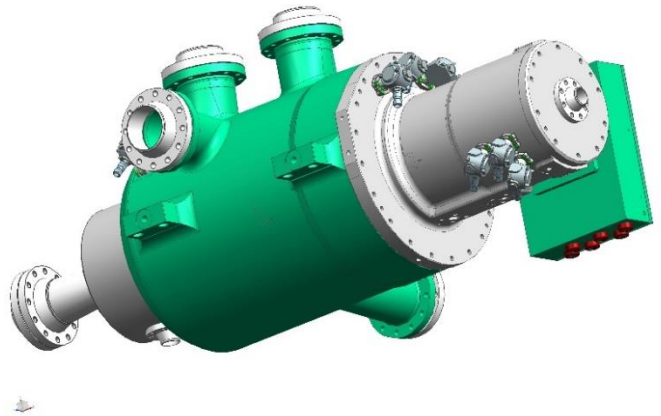
Advantages of BOG Reliquefaction

- BOG Reliquefaction external to cargo tanks
  - → no build-up of N2
  - → No performance limitation due to superheated vapour space
- BOG has less heavy hydrocarbons → less risk of freezing in recondenser
- BOG reliquefaction is not dependent on liquid levels tank → optimized / minimum heel required on return voyages

WARTSILA COMPACT RELIQ – OPTIMIZED FOR SIMPLICITY AND LOW OPEX

- **MODULARISED COMPACT DESIGN:** All equipment on one single skid including compressors, expander, drive motor, heat exchangers, valves control, instrumentation and VDU panels.
- **EASY INSTALLATION – PLUG AND PLAY:** Minimal amount of interface connection points - cooling water, electricity and gas in/out, **small footprint.**
- **INTEGRATED MAGNETIC BEARINGS:** Centrifugal compressors and expander on a single shaft. **Hermetically** sealed with low voltage integrated motor from Vendor who is Industry leader in **robust and compact** compressor solutions.
- **OIL-FREE COMPONENTS:** no oil-separation system / components prone to failure, unstable refrigerant mix or maintenance
- **HEAT EXCHANGERS:** Main heat exchanger is a plate fin type same as in all Wärtsilä reliquefaction plants. Other heat exchangers are standard plate type.
- **LOW MAINTENANCE:** Minimal maintenance between docking – No scheduled maintenance on rotating equipment. Magnetic bearings - no oil change. Only few moving parts - Low maintenance cost during docking every fifth year. Major compressor overhaul only after 10 years of operation.





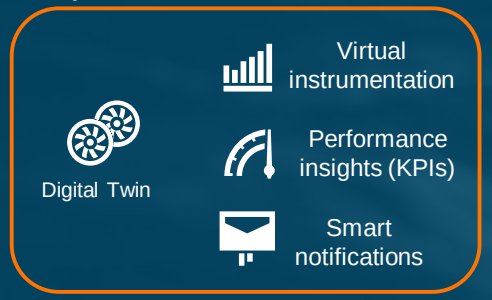
What is OPERIM®

Operational Performance Improvement & Monitoring

Data Collection Capabilities



Operim Cloud Service



Smart Services



Digitally enabling Wärtsilä products:

- Data Acquisition: Data collection capabilities from multiple sources
- Data Management, Modelling and Validation
- Online Visualisation: Dynamic dashboards, process visualisation, account management

Analysis using Wärtsilä's unique competence:

- Digital Twin: Mathematical representation of the Process models
  - Virtual Instrumentation: Calculation of derived properties
  - Performance Insights: Efficiency calculations: Analysing the plant performance
  - Smart Notifications, (Human based, Partial automation)

Value Added Services

- Performance optimization: ensure the asset operates at its optimal point.
- Asset health monitoring: preventive notifications and anomaly detection.
- Remote support: faster and more comprehensive support


WÄRTSILÄ