



COMPACT RELIQ

REVOLUTIONARY PRODUCT BASED ON PROVEN TECHNOLOGY

GROWING LNG BUSINESS REQUIRES MORE FLEXIBLE SOLUTIONS

- It will be a boost in new built of large LNG carriers.
- Reliquefaction systems has become a standard feature on large LNG Carriers
- With the changing LNG supply chain new sizes and type of vessels enter the market
- LNG becoming a common accepted fuel, increasing the use of Small Scale LNG Carriers
- Retrofit market requires compact solutions that fits 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



**Developing with the
market**

PROPER BOG RELIQUEFACTION – CONTROLLING TANK PRESSURE IN THE MOST FLEXIBLE AND ENERGY EFFICIENT

- A portion of the BOG may be utilized as fuel for the ship engine
- Excess BOG is liquefied and sold together with the LNG in the cargo.
- Keeping cargo cool to increase holding time

**Market Leader -
50 + BOG Reliquefaction
References**



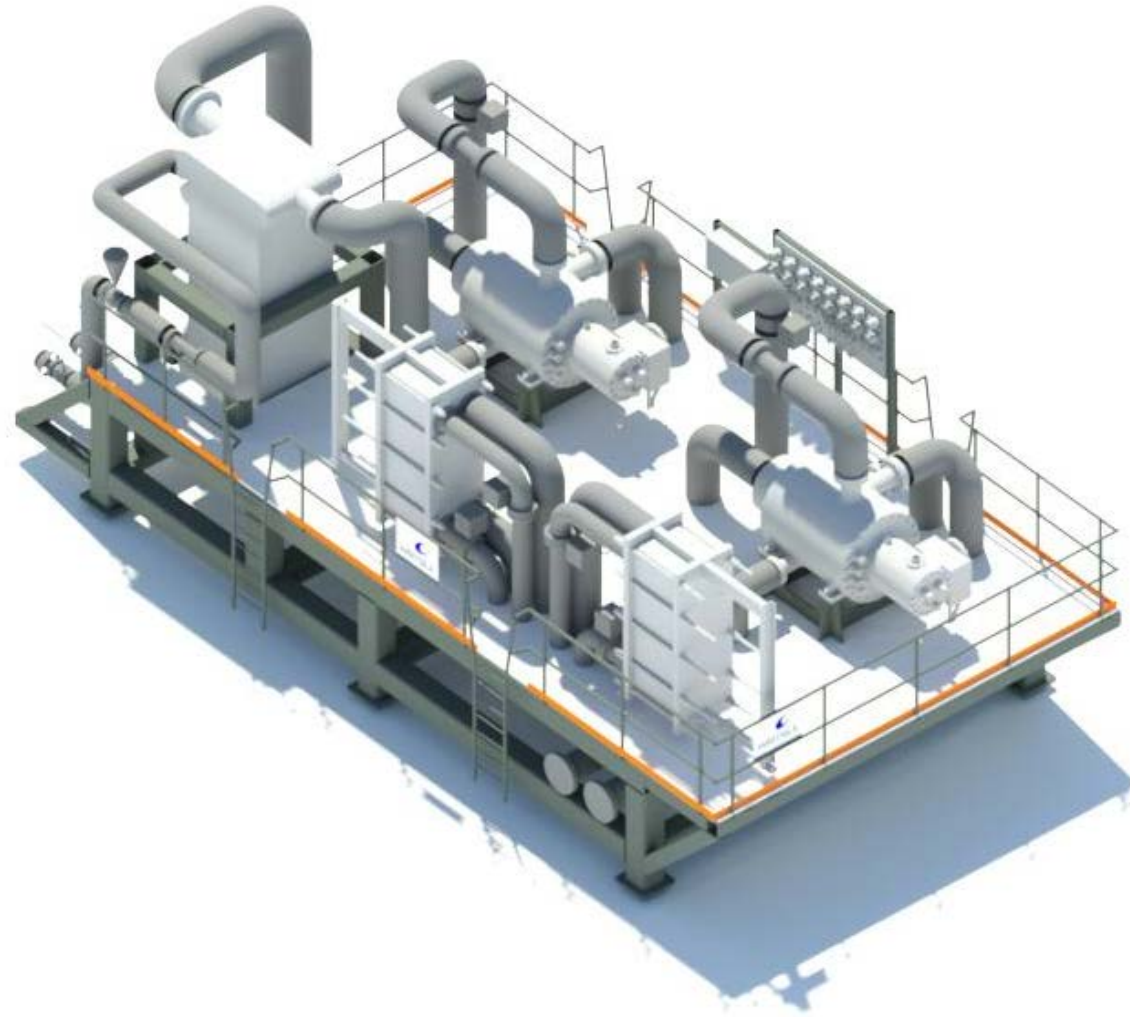
LNG Carrier cargo tank BOG handling

The LNG in the cargo- or storage tank is at it's boiling point and will produce boil off gas (BOG) which is reliquefied and returned to the storage tank.



On-shore storage tank BOG handling

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



CR 1 700
Capacity –
1600 – 1800 kW

WÄRTSILÄ INTRODUCES COMPACT RELIQ

- **BASED ON BRAYTON TECHNOLOGY** proven technology in a vast amount of industrial applications
- **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
- **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.
- **COMMERCIAL GRADE NITROGEN AS REFRIGERANTS:** Easy obtainable refrigerant and provides **safe operation**
- **DYNAMIC SIMULATION** The system is design verified and **parameter tuned** by dynamic simulator.

Model	CR 850	CR 1 700
Capacity (kW)	800 - 900	1600 – 1800
Efficiency kW/kg LNG	Better than 0.95	Better than 0.95

Wärtsilä - The
Pioneer in BOG
reliquefaction

WÄRTSILÄ INTRODUCES COMPACT RELIQ:

- **MODULARISED COMPACT DESIGN:** All equipment on one single skid unit including compander, drive motor, heat exchangers, valves control, instrumentation, panel.
- **EXCELLENT TURNDOWN:** Turndown to near 0% with **rapid capacity** changes.
- **INTEGRATED MAGNETIC BEARING COMPRESSOR** Centrifugal with compressors and expander on a single shaft. **Hermetically** sealed with low voltage integrated motor. Industry leader in **robust and compact** compressor solutions has signed an agreement with Wärtsilä.
- **HEAT EXCHANGERS:** Main heat exchanger is a plate fin type. Other heat exchangers are standard plate type.
- **FLEXIBLE SHIP OPERABILITY:** Wärtsilä BOG reliquefaction systems provides **full BOG reliquefaction** with low temperatures tanks in both laden and ballast voyage. The ship can run at any speed and still have reliquefaction.
- **EASY INSTALLATION – PLUG AND PLAY:** Minimal amount of interface connection points - cooling water, electricity and gas in/out, **small footprint.**
- **INTERFACE WITH SHIP PMS:** Wärtsilä has a unique position with the extended port folio to help customers fully integrate the reliquefaction system into the PMS to provide **optimal ship operation.**

THE BEST JUST MADE MORE COMPACT

Model	CR 850	CR 1 700
Length	10 000	11 000
Width	4 500	5 500
Height	4 000	4 500
Weight	50	70

Dimensions: mm

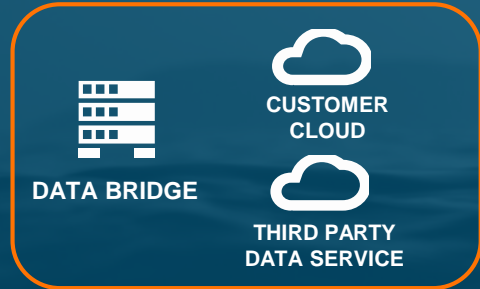
Weight: ton



What is OPERIM[®]

Operational Performance Improvement & Monitoring

Data Collection Capabilities



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

Operim Cloud Service



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)

Smart Services



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