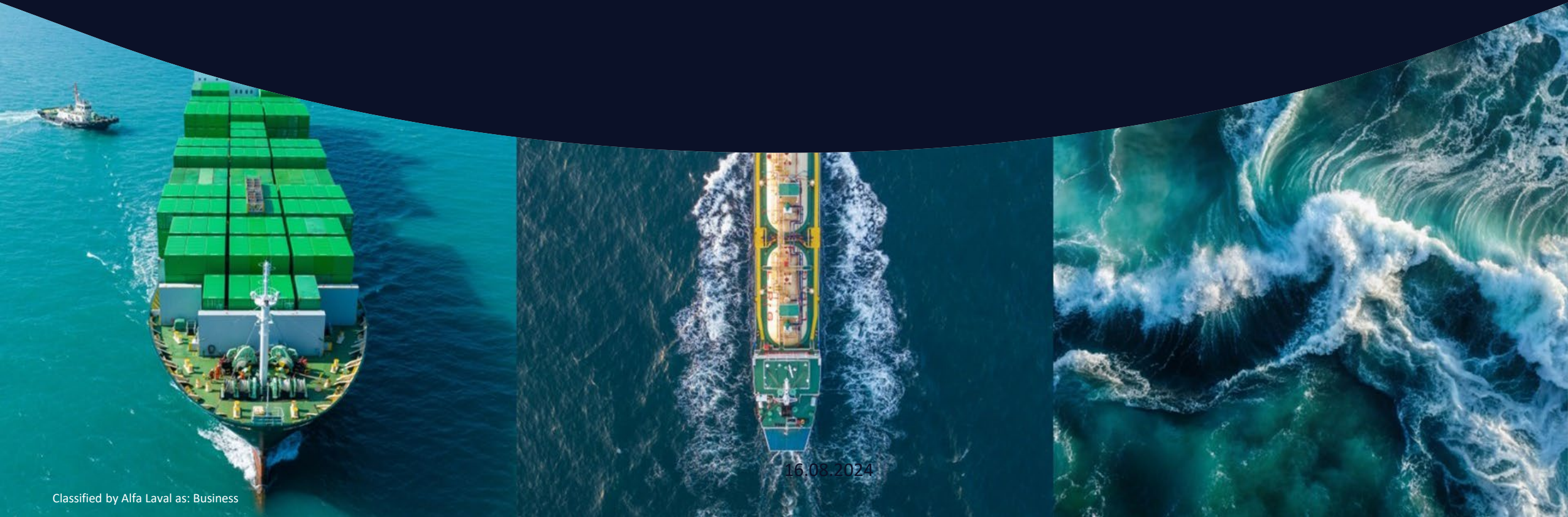




Alfa Laval Marine Solutions Optimizing your existing Ship's Energy Efficiency

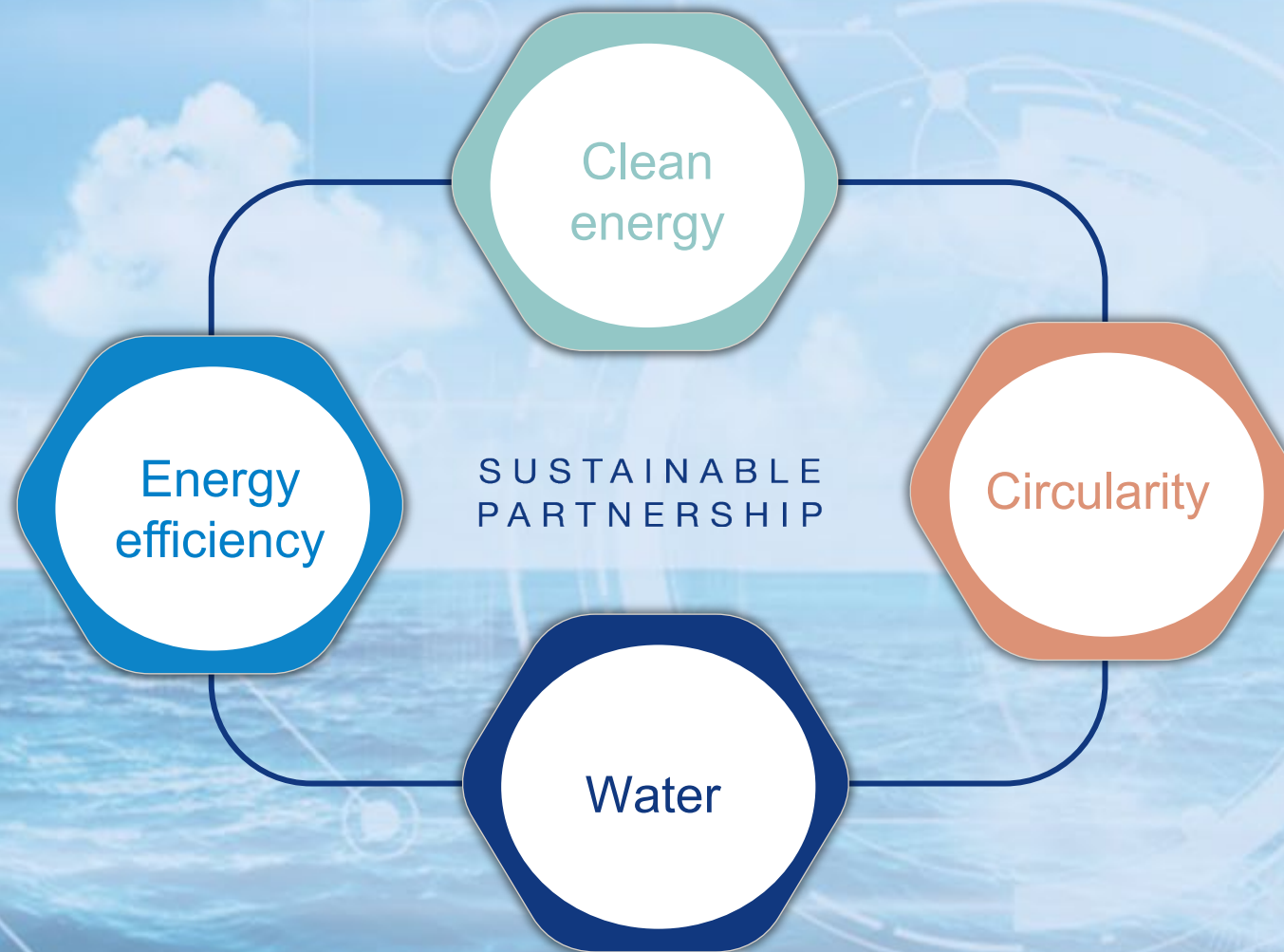
Host- Shekkappan Kannan
Regional Business Manager , HKG
Shekkappan.Kannan@alfalaval.com



16.08.2024

Together for sustainable shipping

– Our sustainable solutions



From bow to stern

- 100 years in the marine industry – with energy and emissions in focus



Enabling the future today



Wind propulsion
Through Oceanbird, a joint venture with Wallenius, Alfa Laval is enabling wind-assisted and wind propulsion.



Voyage optimization
Part of Alfa Laval, StormGeo is reducing fuel use and carbon emissions through digital services for optimized routing.

Today's topic



Welcome Address

Penny Peng

Head of Service Division
Alfa Laval China



AQUA Blue E2 Fresh Water Generator

Jerry Francis

Service Development Manager
Heat Transfer



EGCS – Energy Reduction mode

Jeroen Onstwedder

Regional Business
Manager Service



Boiler – Low Load Optimization

Shekappan Kannan

Regional Service Business Manager
Hong Kong



Waste Heat Recovery solutions

Vineesh Ajaykumar

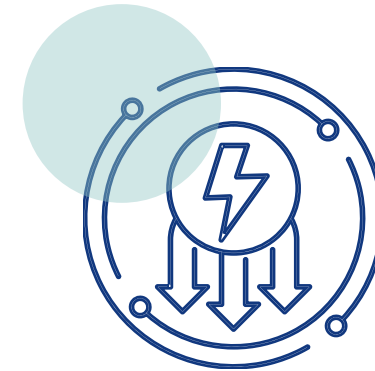
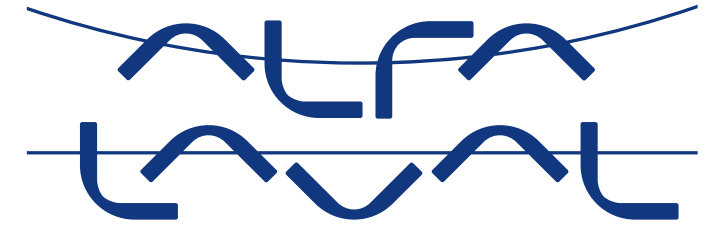
Regional Business
Manager Service



Note of Thanks

Weizhen Dong

Head of Marine Services
Alfa Laval China



Alfa Laval Aalborg Low-Load Optimizer Kit

The optimal fuel economy – at any load

Shekkappan Kannan

Regional Business Manager

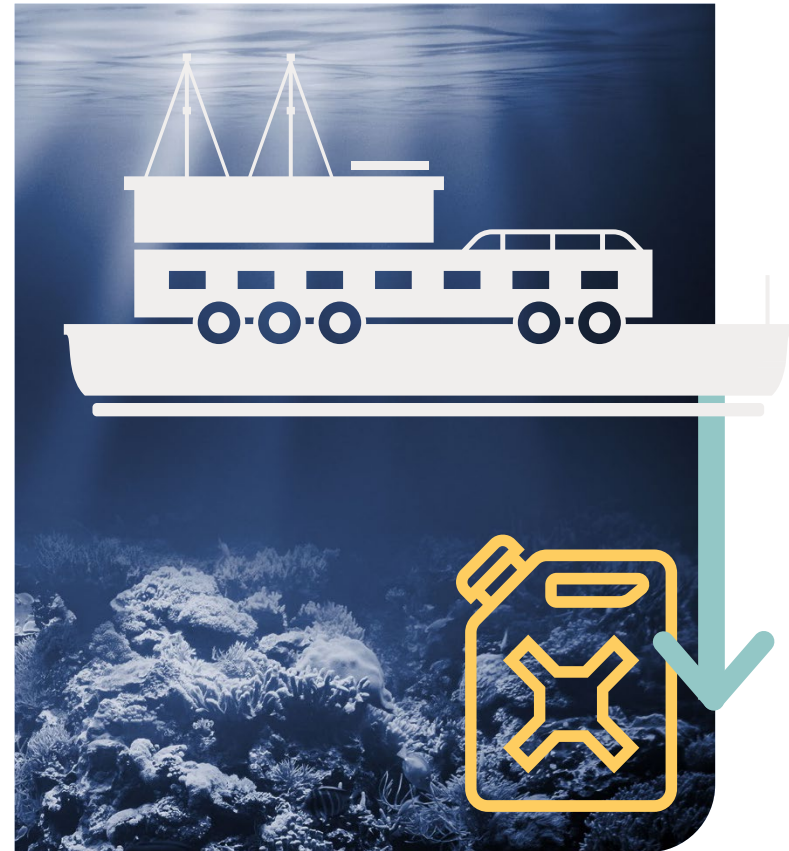
Enhance boiler fuel efficiency and overall vessel energy performance.

With the Alfa Laval Aalborg Low-Load Optimizer Kit



- Optimized boiler energy consumption
- Wider operating range for your existing oil-fired boiler
- A better match for slow steaming and low steam needs
- Reduced fuel costs, boiler maintenance costs and lifetime OPEX

It thereby offers a **smart and cost-effective** addition to greenhouse gas (GHG) reduction strategies for a wide range of tankers and larger LNG carriers.

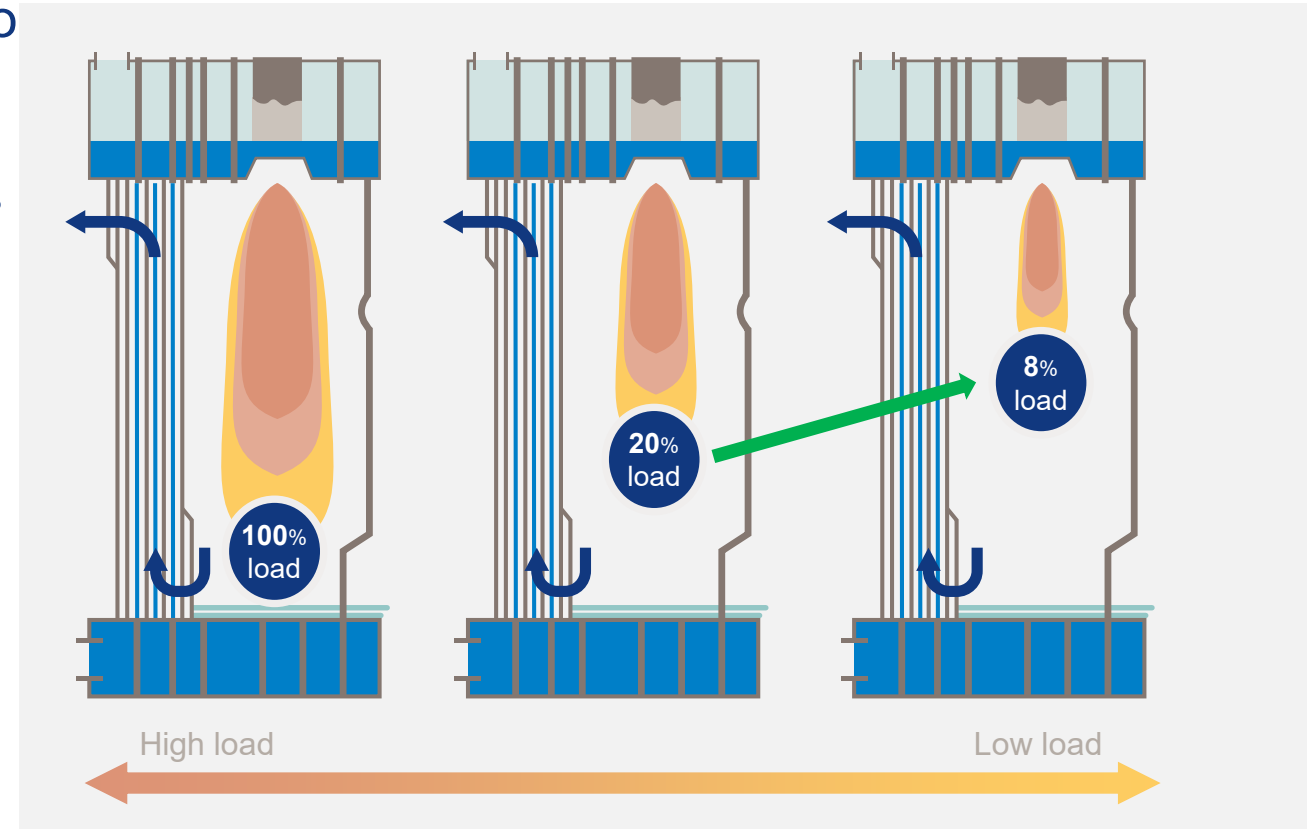


Solution: optimization of the boiler system

Technology to support low load needs

- The standard burner can normally reduce load to only around **15-20%**
- This can create efficiency challenges for tankers in a few common situations:
 - When slow steaming
 - When the steam demand is lower than the minimum load
 - When anchored or in port

Alfa Laval's Low-Load Optimizer Kit widens the operating range to cover loads from **8%-100%**

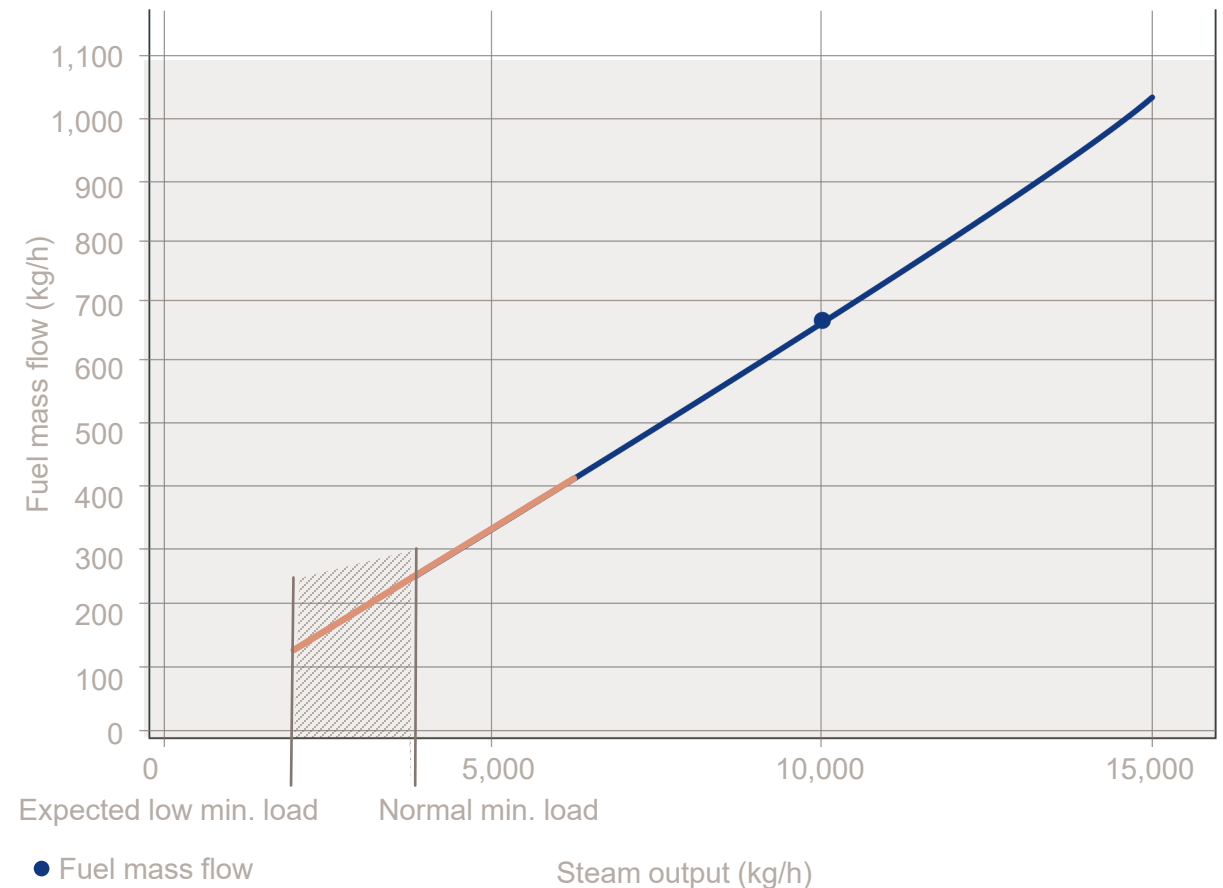


Optimized fuel consumption thanks to wider boiler load range



– Results of boiler operation with the Low-Load Optimizer Kit

- Full operational control in the low-load range (8–30% of design load)
- Better match for slow steaming or situations with low steam needs
- Optimized fuel consumption and lower operational costs with minimized need for stops and starts
- Positive impact on the vessel's CII rating





A variety of cost savings

For rapid ROI

Fuel savings

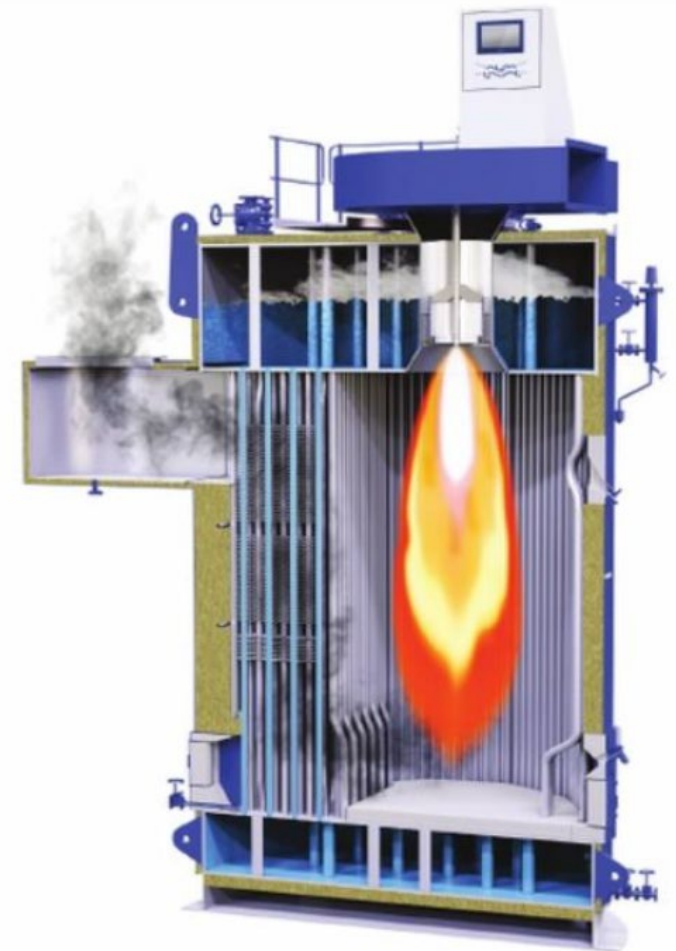
– Cooling effect of Pre and Post Purge



Each boiler stop purges the burner lance with steam, causing a loss of **2-4 liters** of fuel per purge.

Installing a low load kit reduces the burner's minimum firing position, allowing the boiler to run longer at lower loads. This **minimizes start-stop cycles and reduces losses from cooling effects.**

We've implemented a soft starter that eliminates the need for a second auxiliary engine to handle high starting currents. Additionally, the VFD regulates the FD fan speed to match the burner's load, leading to **reduced electrical power consumption.**



Test Protocol and Savings Validation

– Results from a test case with the Low-Load Optimizer Kit



Test conditions:

- Vessel at anchorage, with stable steam consumption
- Master steam modulation set point = 4.3 bar / start = 6.2 bar / stop = 8.7 bar
- Boiler run on auto with normal lance first and low-load lance after, each for 3 hours

Results:

- Potential reduction in number of starts/stops from 48 to 24 per day **(50%)**
- Average fuel consumption reduced from 178.5 kg/h to 147 kg/h (**~17.7% savings**)
- In other words, potential savings of **756 kg/day**
- Assuming 60 days of low-load operation per year □ total fuel saved = 45,9 t/yr
- Assuming VLSFO price = 650 €/t □ 29.835 €/yr

Vessel Testimonial



Good day,

Vessel used Low Load mode aprox.one month, as you can see below diferent between Normal mode and Low mode **0,7 mt/day**

Consumption with Normal mode - 4.8 mt/day

Consumption with Low Load mode - 4.1 mt/day

The above is applied for Boiler only. There is no difference in consumption for AE's.

BEST REGARDS

CHIEF ENGINEER MT 

Payback time in less than two years

Combined savings ensure rapid ROI

- The combination of cost reductions ensures that the Low-Load Optimizer Kit can deliver a short payback time and significant lifetime savings
- ~15% savings in average fuel consumption, based on real cases
- The calculated payback time could be:

Payback time without
ALTC retrofit:

10-18 months



Payback time with addition of
ALTC system:

18-24 months

Summary: Alfa Laval Aalborg Low-Load Optimizer Kit



The optimal fuel economy – at any load

Improved vessel energy efficiency for a better CII rating

- A better match for slow steaming and low steam needs
- Optimizes boiler energy consumption
- Minimizes boiler stops and starts
- Improved energy efficiency lowers GHG emissions

A variety of cost savings for rapid ROI

- Reduces fuel costs, boiler maintenance costs, and lifetime OPEX
- The combined result is payback time that's often less than 2 year!

A simple, easy addition to your GHG strategy

- Fast retrofit installation on board with minimal interruptions to vessel operations
- Easy to switch between low- and normal-load modes
- Minimal training needed for operators

AQUA Blue

E2

AQUA Blue E2

Energy efficient solution

Lower electric Power Consumption per ton of water compared with:

Single stage: same

Conventional type : approx. less 50%

Almost 50% less thermal heat & jacket water flow compared with single stage Freshwater Generator

E2 use almost 50% less waste heat than E1 (AL single stage)

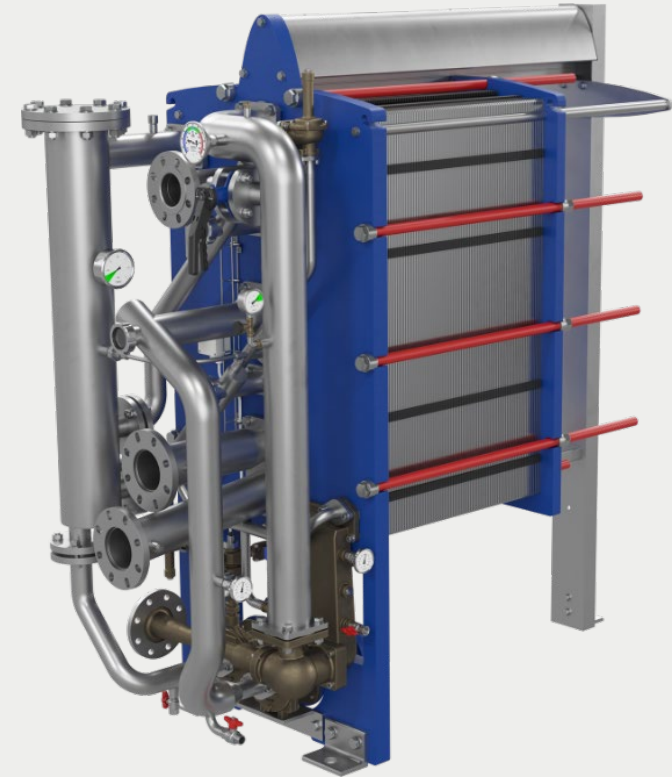
Smaller footprint compared with (m²):

Single stage (AL): less 15%

Conventional units: less 40% to 70%

Lower weight 10% to 60% compared with conventional types

10 to 50% **Lower sea water flow** compared with conventional competitor types



AQUA Blue E2

Energy efficient solution

Lower electric Power Consumption per ton of water compared with:

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Generator

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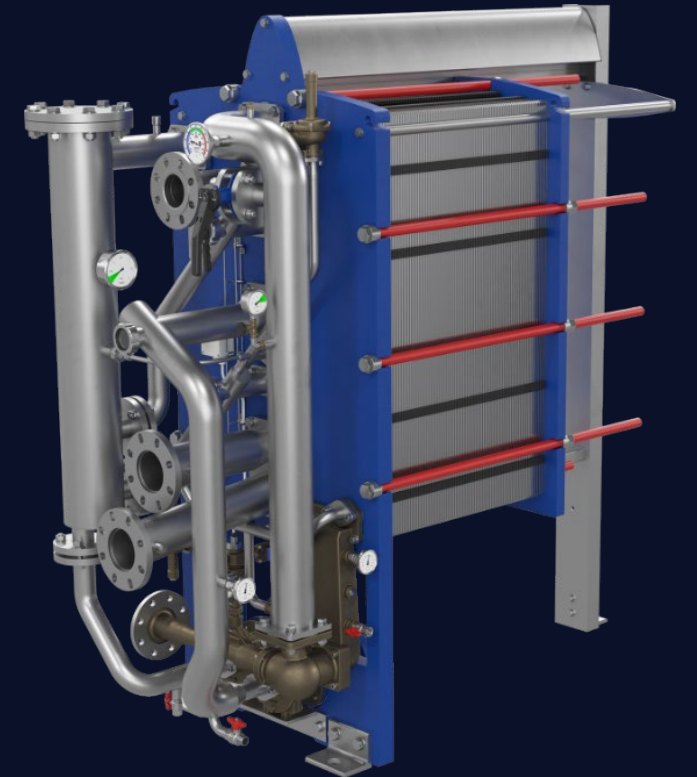
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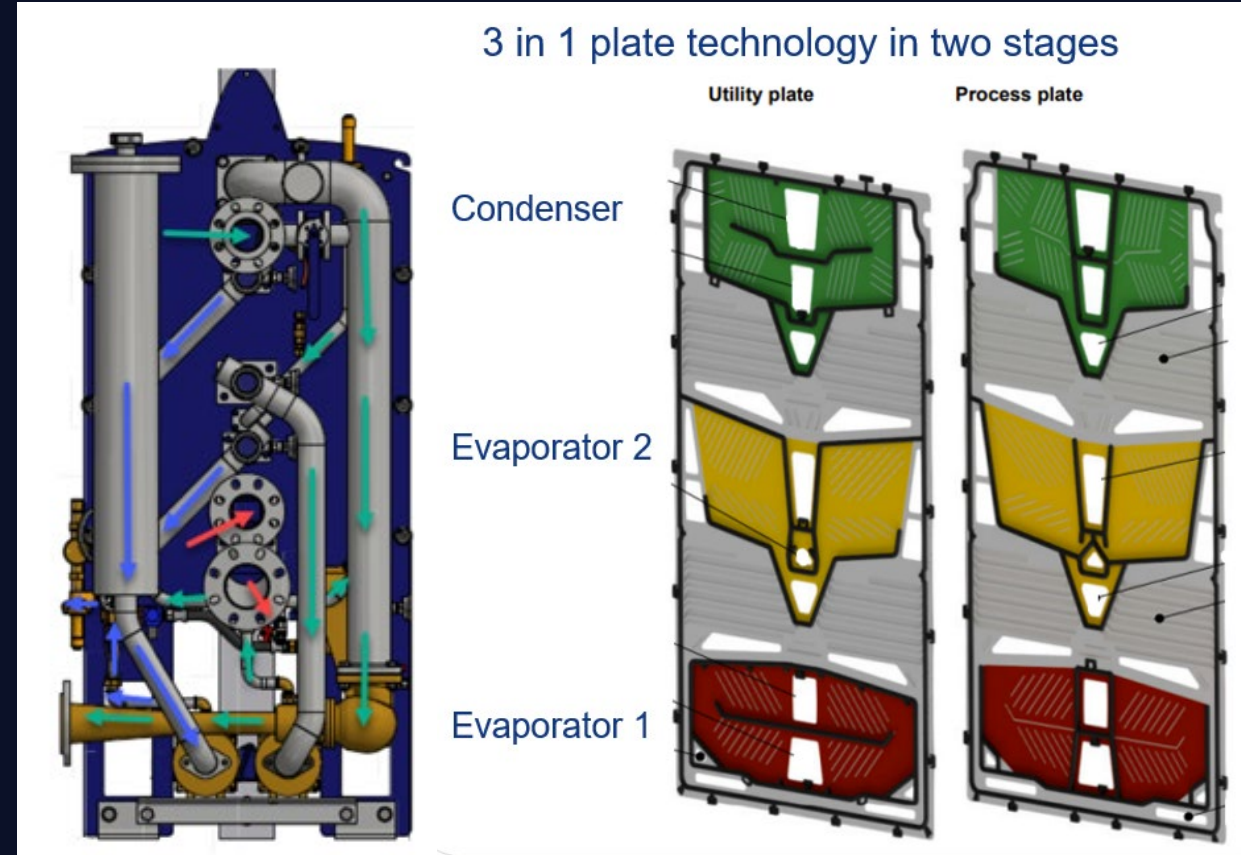
10 to 50% **Lower sea water flow** compared with conventional competitor types



AQUA Blue E2

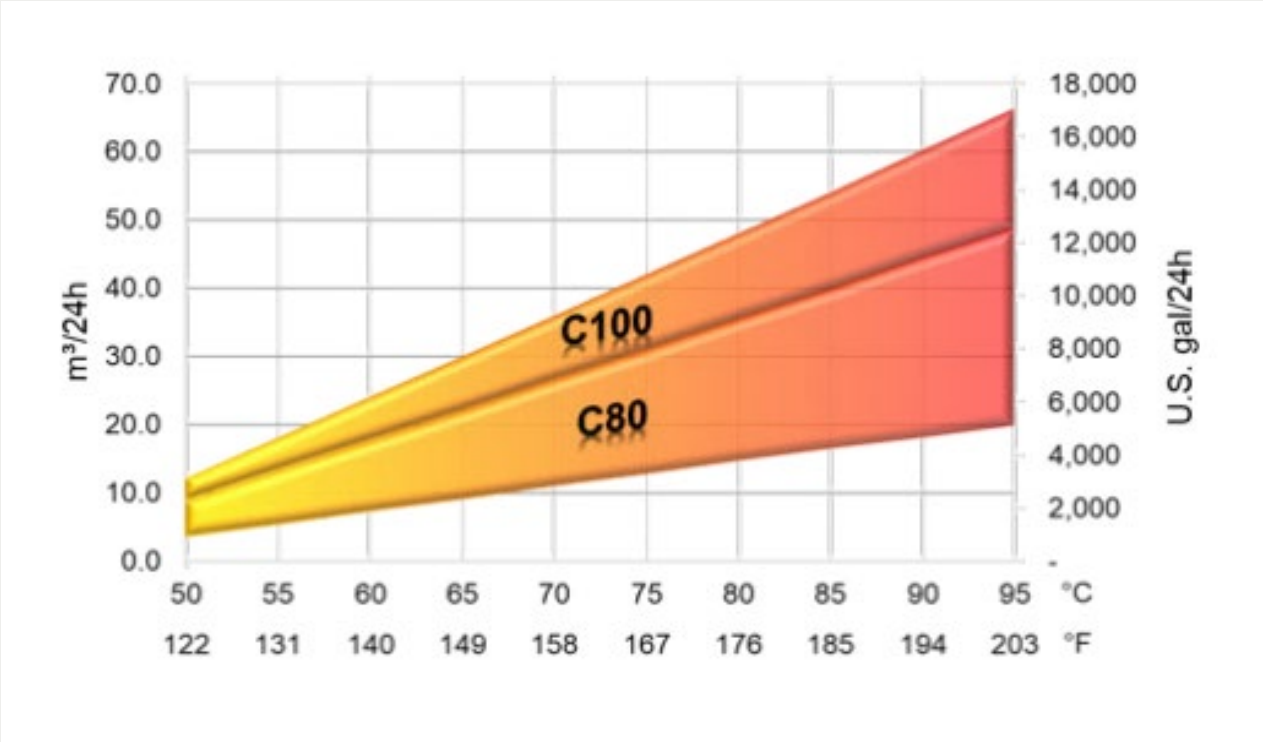
Features

- High Energy Efficiency
 - Thermal heat
 - Electric power consumption
- 3 in 1 plate technology – in two stages
- Non-glued gaskets
- Lower seawater flow
- Smaller components and pipe dimensions
- High quality of water (less than 2 ppm)
- Small footprint
- Lower weight (to other two stage)
- Ease of operation & maintenance
- Reliable & proven operation

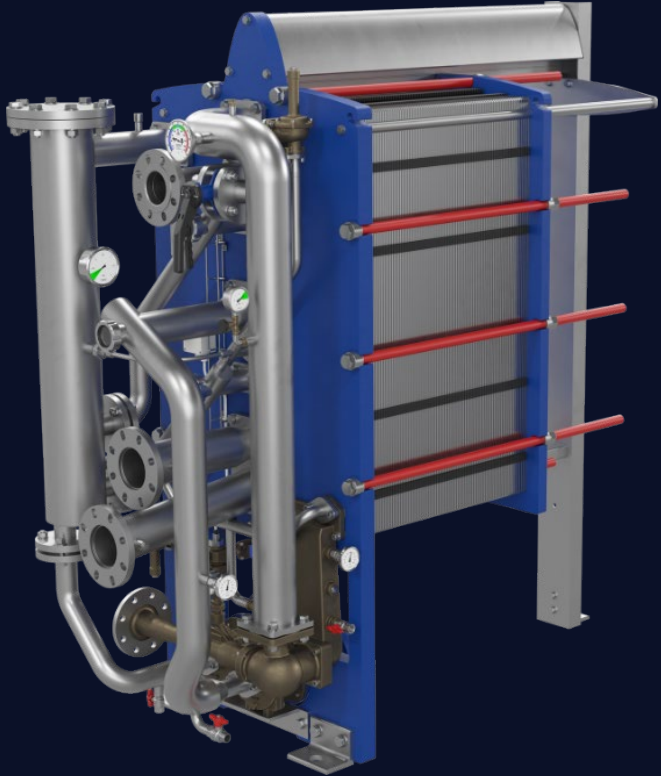


AQUA Blue E2

Application



- Capacity 20 – 60m³/24hrs
- For any type of vessel, SW : 0 to 32°C



AQUA Blue E2

CO₂ Savings

18 to 50 tons per year

- Based on conventional types of 30 m³/24 hr
- Operating parameters ; HW: 85 °C, SW: 32°C
- Considered 5000 operating hours yearly
- 1 kWh is equivalent to 0.6 kgs of CO₂





AQUA Blue E2

21

Return Of Investment (ROI)

- **2 to 5 years (considering savings on kW)**
- Comparing Conventional types of 30 m³/24 hr
- Operating parameters ; HW: 85 °C, SW: 32°C
- Considered 5000 operating hours yearly
- Fuel cost considered 0.2 Eur per kWh

AQUA Blue E2

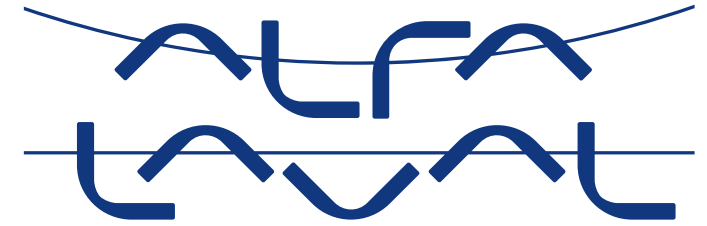
Case Story

To navigate the dual challenges of limited waste heat from the engine and the 'water in methanol' operation, Maersk has installed the newly launched Alfa Laval AQUA Blue E2.

“We are excited to have Alfa Laval as our collaborator in providing solutions for our pioneering methanol-fuelled container vessel,” says Ole Graa Jakobsen, Head of Fleet Technology, A.P. Moller-Maersk. “Alfa Laval's products not only address our immediate operational needs but also align with our long-term commitment to sustainable and efficient shipping practices.”

The installed Alfa Laval equipment features technology that helps to lower the vessel's energy consumption, improving its Energy Efficiency Design Index (EEDI) and Carbon Intensity Indicator (CII) ratings by effectively reducing its carbon footprint.





Waste heat recovery solutions

Reliable, flexible and future-proof waste heat recovery solutions for any steam need and engine room

Vineesh Ajaykumar
Regional Business Manager

Alfa Laval's approach

– Finding the best waste heat recovery solution for your vessel



Your steam requirements.

Your amount of exhaust gas.

Your working pressure and temperatures.

Your vessel.

Combining a wide portfolio of waste heat recovery economizers with a holistic approach and 40+ years of experience, we help you identify the optimal, most energy-efficient waste heat recovery solution for your vessel and system.

The portfolio



The portfolio

– Different designs to suit your requirements



Smoke Tube



Aalborg XS-2V/7V

After main and auxiliary engines



Aalborg XS-TC7A

After auxiliary engines

- Dual inlet available (XS 2V/7V)
- Low maintenance
- Replaceable tubes
- Fuel flexibility – ready for the future

Water Tube



Aalborg Micro

After auxiliary engines

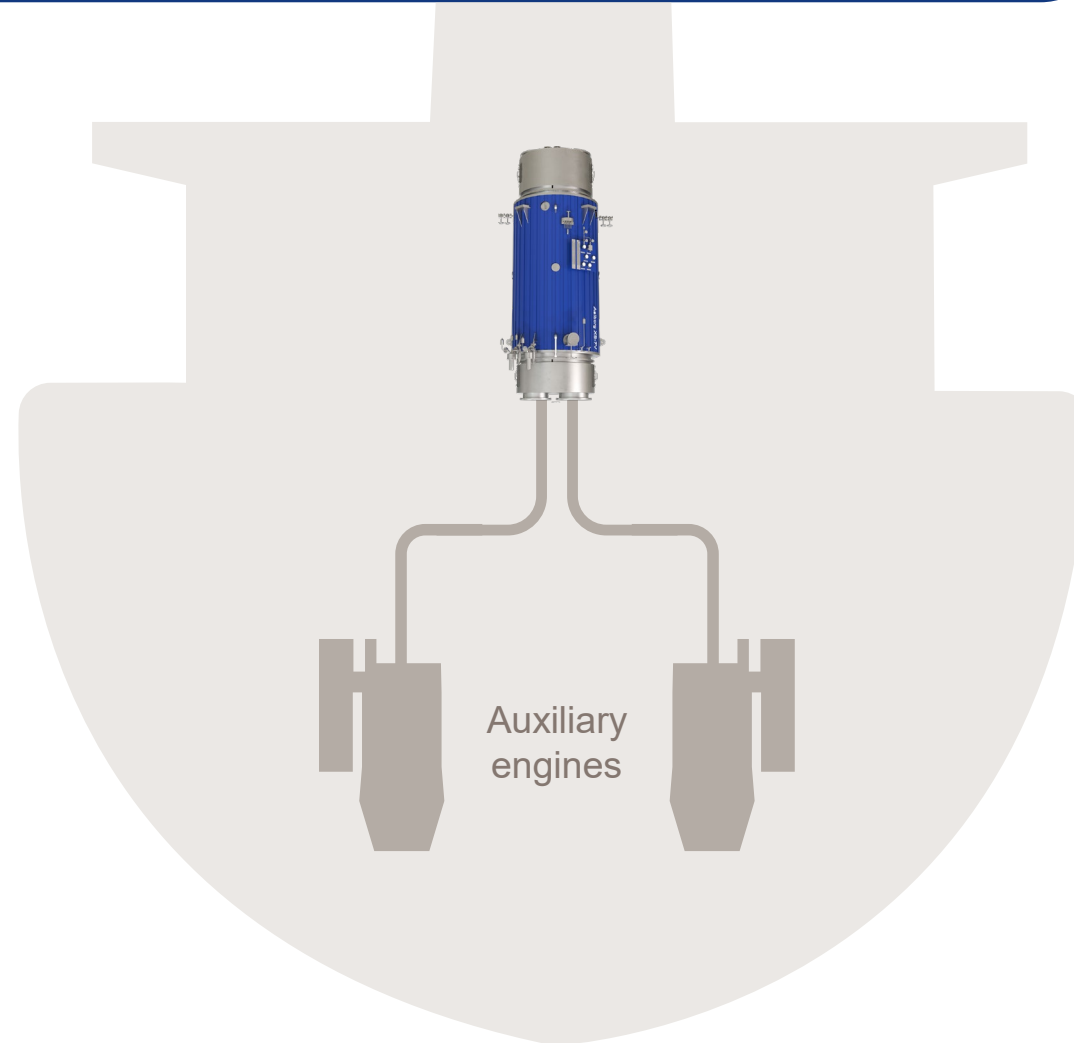
- Coiled fin tubes
- Large heating surface for high efficiency
- Compact design
- Fuel flexibility – ready for the future

Simplicity: Dual inlets

– Connect two engines to one boiler



- Handle two engines in one boiler
-> reduced CAPEX
- Inlet/outlet boxes are divided into different sections



Aalborg XS-2V/XS-7V

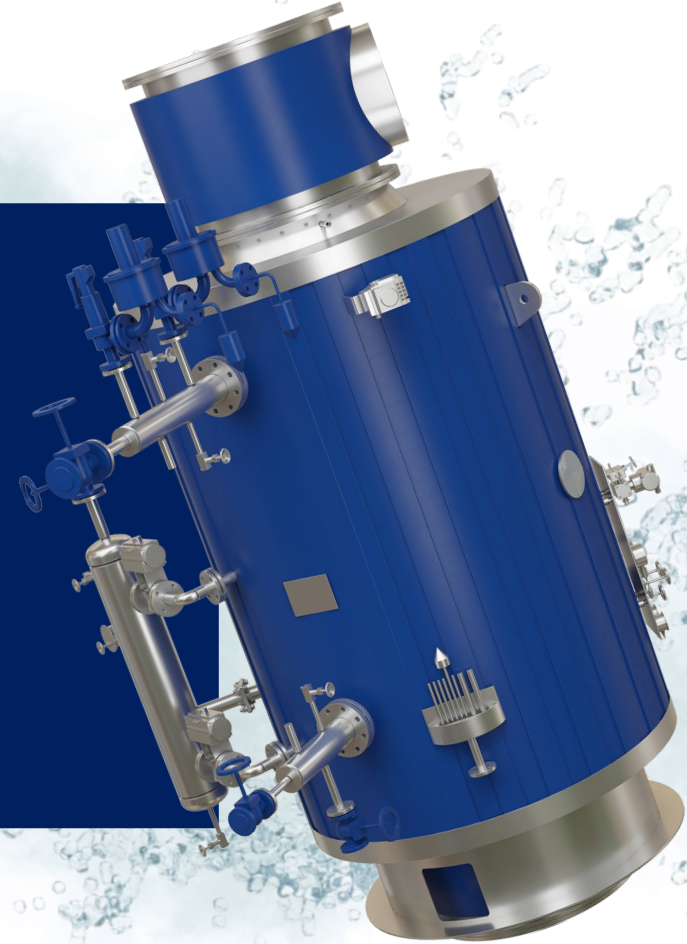
Aalborg Micro

– Save fuel. Get more steam.



The Aalborg Micro combines high steam output with a small environmental footprint.

Its small size allows it to fit in locations and vessels where no other exhaust gas economizers can be installed.

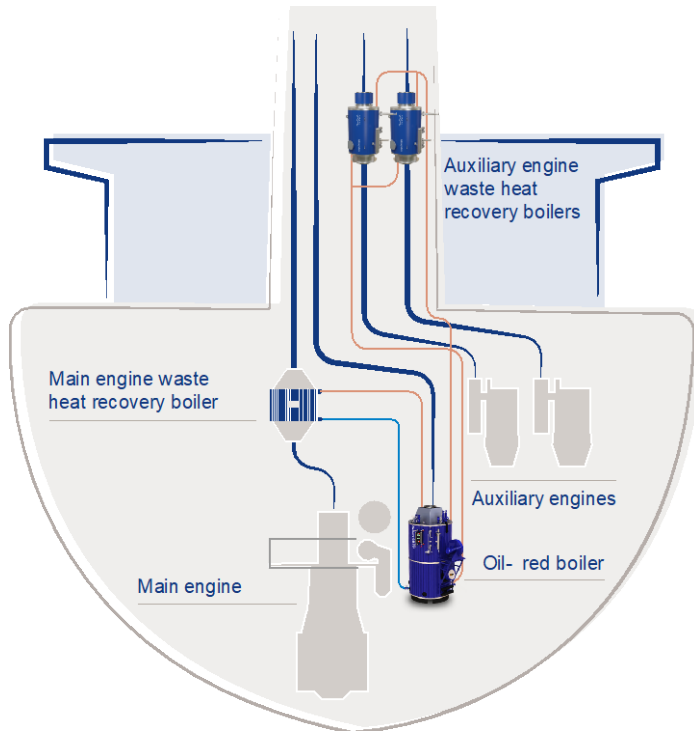


Flexibility – engine room

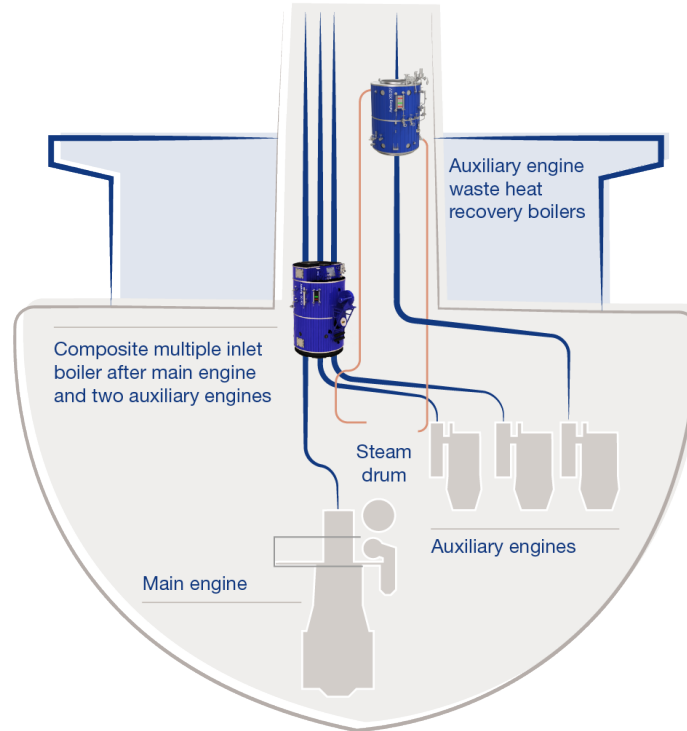
– Finding the perfect fit



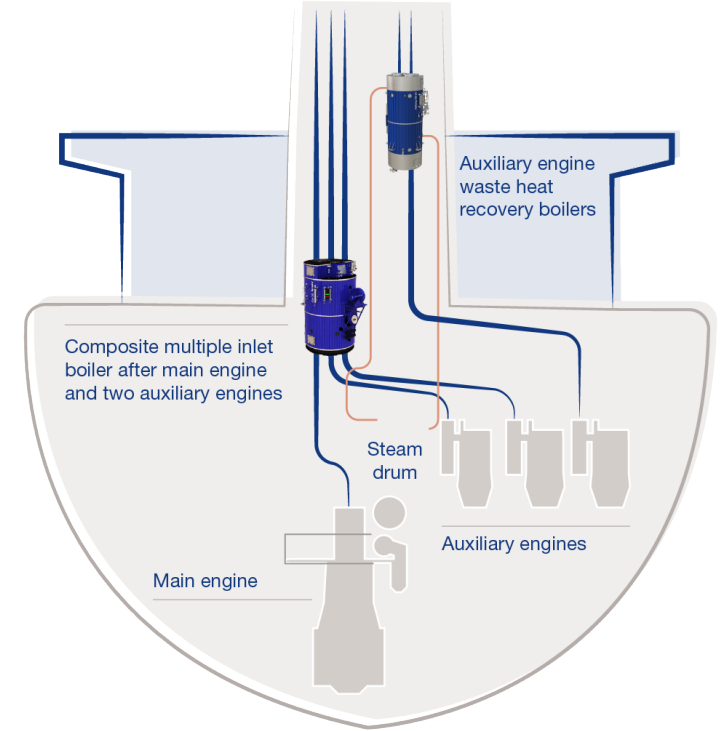
Steam plant optimization through waste heat recovery from auxiliary engines



Full redundancy for existing steam plant



Dual inlet – handle two engines in one boiler



Performance: Cost-efficiency

– ROI case multi-inlet XS-7V

Container vessel

Proposed Auxiliary engine with XS-7V MI: 2 x 2.4 MW engine

Estimating 140k€ total installation cost for n. 1 WHR unit

Waste Heat Recovery – Auxiliary Engines

Estimated product price

WHR boiler, total	102 000 €
Installation costs, total	140 000 €

Est total investment 242 000 €

Basic Settings:

FO / Evaporation ratio	13,0
Steam pressure	7,0 bar g
Feed water temp	80 °C

HFO price:
590 €/t



MGO price:
780 €/t

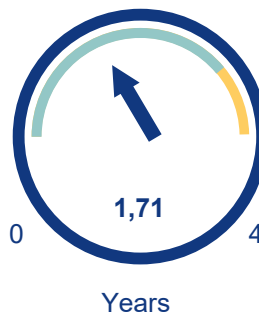


HFO/MGO:
100%



ROI

Payback period



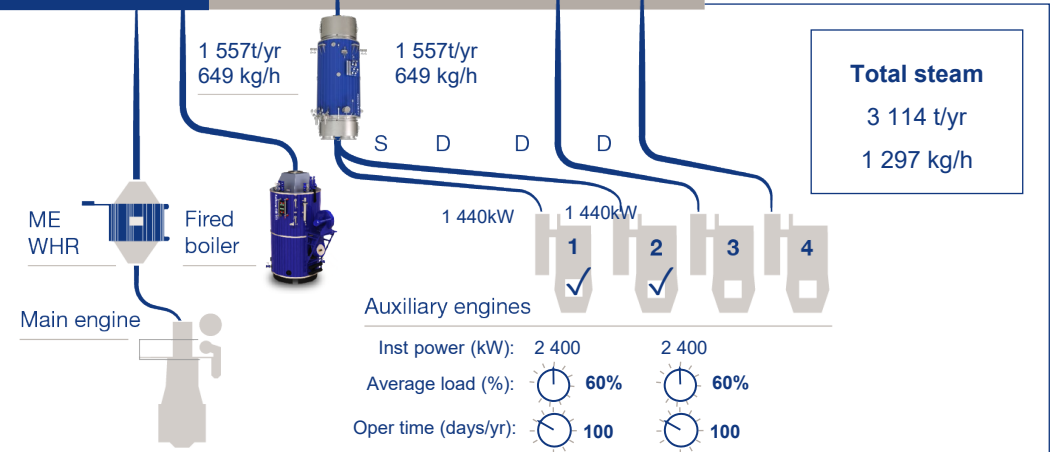
Savings 141 314 € / yr

Saved fuel oil 240 t / yr

Reduction in CO2 742 t / yr



Operational philosophy



Performance: Cost-efficiency

– ROI case XS-TC7A

Shuttle Tanker

Proposed Auxiliary engine with XS-TC7A: 1 x 1.6 MW engine

Operating profile: 110 days off hire/anchorage/port stay

Estimating CAPEX including installation: 185.1k€ for n. 1 WHR unit

Waste Heat Recovery – Auxiliary Engines

Estimated product price

WHR boiler, total	75 129 €
Installation costs, total	110 000 €

Est total investment 185 129 €

Basic Settings:

FO / Evaporation ratio	13,0
Steam pressure	7,0 bar g
Feed water temp	80 °C

HFO price:
590 €/t



MGO price:
780 €/t

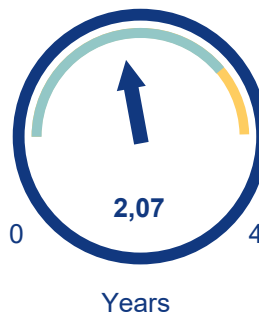


HFO/MGO: 80%



ROI

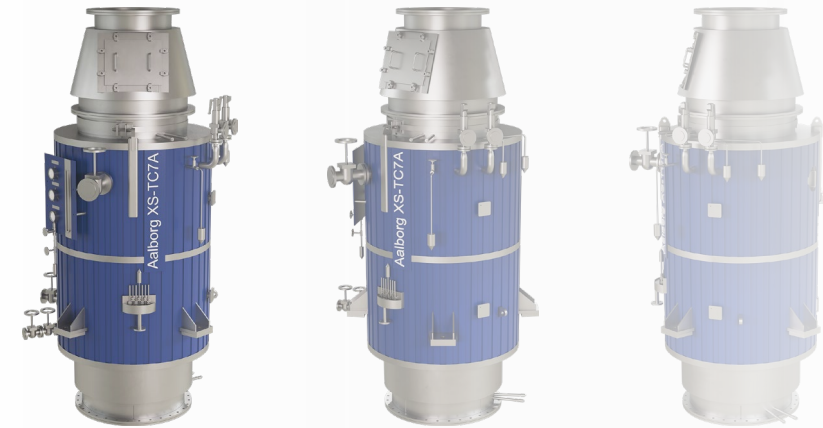
Payback period



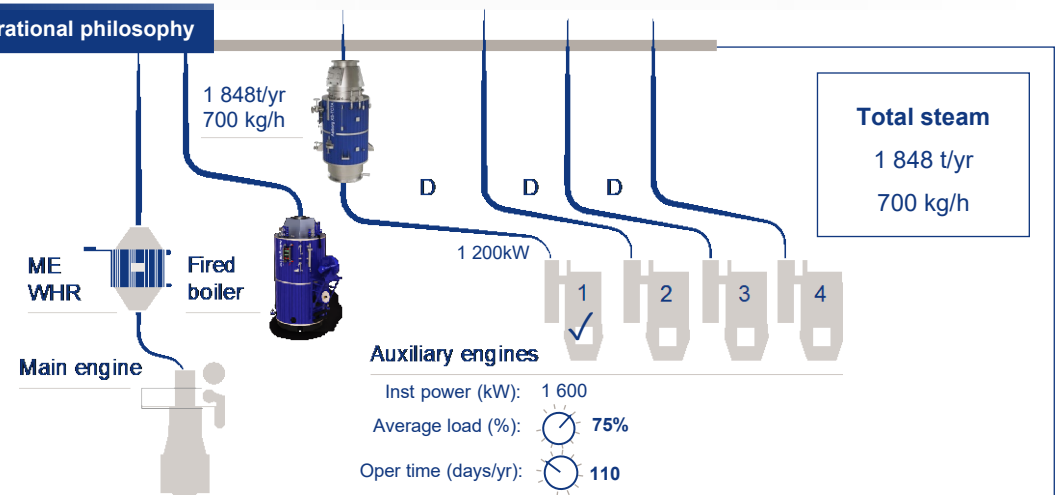
Savings 89 273 € / yr

Saved fuel oil 142 t / yr

Reduction in CO2 441 t / yr



Operational philosophy



Long term cost benefits

– Protect asset value



- A high CII rating improves your competitiveness – and earning potential
- With more expensive fuel alternatives, it becomes increasingly important to utilize the fuel as much as possible
- Future-proof investment in your asset



Vessel Testimonial



“ In an Aalborg Micro, you have only around 200 kilos of water ... That makes the Micro very, very light and compact compared to conventional systems. ”

Jan Blak, Superintendent at DFDS

“ As soon as we start saving fuel, we start saving money but also minimize our emissions. Compared to many other emission-reducing initiatives, the Aalborg Micro has a really good business case. ”



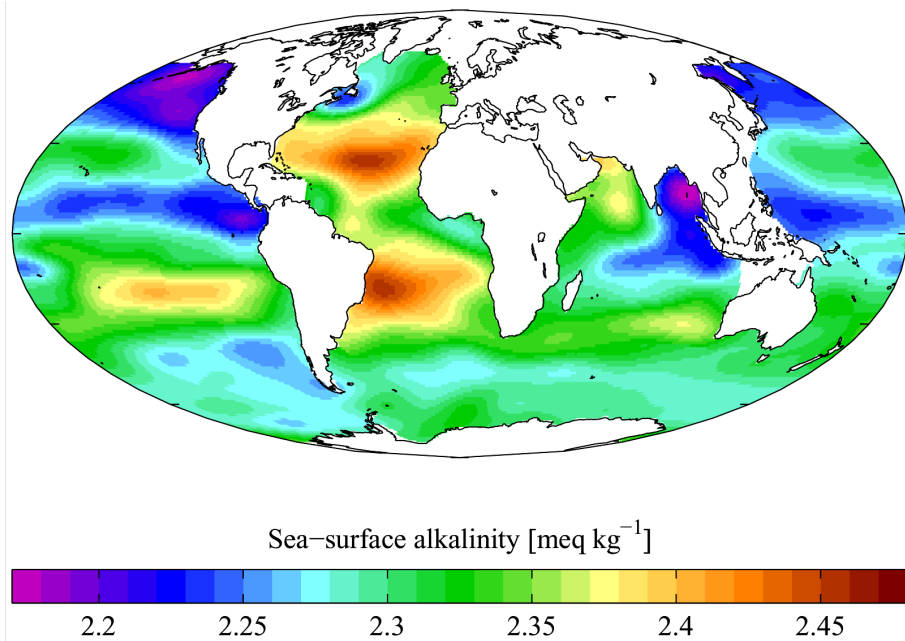


PureSOx Energy Reduction Mode

Jeoren Onstwedder
Regional Business Manager

Energy Reduction Mode

– Background



Values for seawater alkalinity depend on geographical location and seasons. Seawater alkalinity has an impact on scrubber performance

- Most of the energy a scrubber consumes in open loop is related to pumping
- The waterflow required to ensure compliance depends on different variables such as:
 - Fuel sulphur content
 - Seawater alkalinity
 - Seawater temperature / climate
- PureSOx scrubbers are designed to ensure compliance at the maximum parameters of all these variables.

Energy Reduction Mode

– How it works



- ERM is activated upon **steady engine load**
- ERM reduces water flow **automatically** by reducing both number of sprayer layers used and sprayer pressure
- Due to our 3 sprayer layer scrubber design we can **seamlessly** match the required water flow
- Reduction stops once the specific thresholds are met
- When load changes, it reverts to original set point, **always guaranteeing** compliance



Alfa Laval PureSOx uses multiple sprayer layers in the jet and absorber sections for optimal control of the scrubber water flow

Energy Reduction Mode

– Benefits



- Energy savings of up to 25%
- Compliance guaranteed
- No additional maintenance work for crew
- Reduction of mechanical deterioration, damage and cavitation on pumps & nozzles

Energy Reduction Mode

– Scope of service



- ERM is a software upgrade available for all recent Alfa Laval PureSOx open-loop and hybrid models
- Installed and activated by an Alfa Laval International Service Engineer in less than 4 hours



Case 1: Capesize bulker



	Design condition	Impact less Sulphur	Impact lower SW temp	Combined
	SW temp = 32°C S% = 3,5%	SW temp = 32°C S% = 2,5%	SW temp = 20°C S% = 3,5%	SW temp = 20°C S% = 2,5%
Washwater (m3/h)	700	600	640	520
Possible reduction	~ 26%			

Case 1: Savings calculation



Capesize		
Annual fuel consumption (MT/Y)		12.000
Scrubber energy consumption		1,5%
Scrubber related fuel consumption (MT/Y)		180
ERM saving		20%
HSFO cost per tonne (€)	€	410
Annual saving (€)	€	14.760

Case 2: Large container vessel



	Design condition	Impact less Sulphur	Impact lower SW temp	Combined
	SW temp = 32°C S% = 3,5%	SW temp = 32°C S% = 2,5%	SW temp = 20°C S% = 3,5%	SW temp = 20°C S% = 2,5%
Washwater (m3/h)	2.600	2.200	2.250	1.950
Possible reduction	~ 25%			

Case 2: Savings calculation



Large container vessel		
Annual fuel consumption (MT/Y)		30.000
Scrubber energy consumption		1,5%
Scrubber related fuel consumption (MT/Y)		450
ERM saving		20%
HSFO cost per tonne (€)	€	410
Annual saving (€)	€	36.900

Thank you for your patience!

Queries & Feedback
Shekkappan.Kannan@alfalaval.com

