



TECHNOLOGIES FOR FUTURE PROOF DESIGN

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MARINE TREND: GHG REDUCTION

Society is demanding action

Green House Gas emission reduction





Environmental ambitions

reduction of Green House Gas (GHG) emissions





GHG emissions from international shipping

CO₂ emissions per transport work

* * * * * EU * * * *

The European Green Deal "Fit for 55 package" Levels compared to 1990 levels



2030

CLIMATE NEUTRAL

2050

-50

GHG emissions



IMO GHG regulations





Fuel transition





Industry Challenges





Future proof container feeder concept

Highly efficient

Low emissions

Prepared to meet future market and regulatory demands

AIP FROM DNV





Fuel flexibility and upgrade options

3 + 1 low carbon fuel options!

Fuel options from start

- LNG as primary fuel and MGO/LSFO as back-up
- 3 x low carbon fuels:
 - 1. HVO (Hydrotreated vegetable oil)
 - 2. LBG (Liquified bio gas)
 - 3. LSNG / e-LNG (Liquified synthetic methane)

Ammonia ready

- Possible to convert existing fuel tanks and engine to use ammonia
- Space reservation for 2 additional tanks (2 x 190 m³) without impact on cargo intake
- Further tanks can be retrofitted in forward cargo holds

LNG as a starting fuel will provide the greatest flexibility for future adoption of low carbon fuels

2 x additional tanks without impact of cargo intake

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Possible to extend fuel capacity further by adding tanks in forward cargo holds



Machinery solution

 Hybrid Shaft Generator (HSG) system with power take off (PTO) and boost (PTI) (3.1 MW)

- 3 x gensets (2 x 1 700 kW + 1 x 1 100 kW)
- Shore power
- Energy storage system (ESS)
 - ~0,5 MWh (as standard)
 - ~10 MWh (option for zero emission port entry and exit)
- Eco-Adviser

When integrated, the solution optimize performance, efficiency, safety and environmental footprint



Multidrive feed to e.g Tunnel Thruster, Deck Machinery etc



Design features

Rotor sails (option with 3 rotor sails)

NORSEPOWER ROTOR SAILS

- 3 x rotor sails (24 x 4 m and 28 x 4 m)
- 12% annual fuel saving on typical North European route
- 18% reduction in propulsion demand on average*
- Tiltable rotors
 - Do not interfere with container cranes in port
 - Reduce resistance in head winds



*Dependent on operating speeds and route



Machinery study

Machinery options in study

COBALT BLUE

LNG + PTO

BENCHMARK REFERENCE







LNG + PTO

PTO

 3 x gensets LNG

COBALT BLUE LNG + PTO + WIND



Ref. MGO

- Conventional vessel
- Single screw FPP
- 4 x genset

Ref. LNG

- Conventional vessel
- Single screw FPP



LNG + PTO + WIND

LNG + PTO + Large battery

LNG + PTO + Large battery + Wind

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CAPEX Machinery system

CAPEX

Engine: Main engines, aux engines (genset excl. generator)

Prop package: Propeller, rudder, steering gear, tunnel thrusters

Elec Package: MSWB, generators, transformers, drives, motors

LNG system package: LNG tanks



Indicate prices only, actual pricing needs to come from KM Sales as official quotes



OPEX

Relative OPEX (fuel, shore power, engine maintenance, other OPEX)

RELATIVE OPEX

Cobolt Blue novel concept design offers OPEX savings 23% savings compared to a reference design

LNG contributes to ~7% OPEX saving driven by fuel price

PTO contributes to OPEX savings of ~9% with higher loading on ME and fewer running hours on aux



Energy prices MGO \$800/ton (\$19.8/mmBTU), LNG \$17/mmBTU



Annual cost

ANNUAL COST

OPEX: Fuel, engine running hour maintenance

Other OPEX: Manning, spares, management etc.

CAPEX: Financing 10 years at 6%, with 50% residual value



Energy prices MGO \$800/ton (\$19.8/mmBTU), LNG \$17/mmBTU



Payback



Energy prices MGO \$800/ton (\$19.8/mmBTU), LNG \$17/mmBTU



Industry Challenges

KM solution





RECENT DEVELOPMENTS ENABLING THE GREEN MARITIME TRANSITION

