





The road towards 2050

Dr. Hideyuki Ando, Senior General Manager MTI (NYK Group) Mr. Tomas Aminoff, Senior Consultant Elomatic



NYK LINE

- Head Office: Tokyo, Japan
- Founded: September 29, 1885
- Business Scope
 - Liner (Container) Service
 - Tramp and Specialized Carrier Services
 - Tankers and Gas Carrier Services
 - Logistics Service
 - Terminal and Harbor Transport Services
 - Air Cargo Transport Service
 - Cruise Ship Service
 - Offshore Service
- Employees: 37,820 (as of the end of March 2017)
- Revenues: \$ 17.4 billion (Fiscal 2018)
- Fleet: 792 vessels(as of the end of March 2019)



MTI (R&D Arm of NYK LINE)

- Established : April 1, 2004
- Equity capital : JPY 99 million
- Stockholder : NYK Line (100%)
- Number of employees : 70 (as of 1st April, 2019)







NYK/MTI's path toward smarter ship and operation

(Hardware) Ship

Operation (Software)



Wind Power Generator Andromeda Leader



Electronic Controlled Engine









MT-FAST Energy Saving Device

ENDORCH MIT





Hybrid T/C Shin Koho

Wind Resistance Reduced

MT-COWL



Air Lubrication System YAMATO, YAMATAI







30% Energy Saving PCTC

Hybrid Electric Power

Supply Auriga Leader



LNG-Fueled Tugboat Sakigake





LNG Bunkering Vessel Delivery in 2016



Innovative

SOYO





2050



Measurement around propeller

Background NYK Super Eco Ship 2050

NYK Super Eco Ship 2050

Continuous **co-operation** since 2009 with NYK Super Eco Vessel 2030 until today with NYK Super Eco Vessel 2050

To prepare a **roadmap** with actions from today towards 2050

Conceptual design to gain attention, provoke discussions and **accelerate** development

Result:

- 35% less resistance
- 70% lower energy demand
- Zero air and water emissions









Lightweight

- **Novel ideas for structures**
- 3D printing, new optimisation methods and new materials will allow for lighter design
- Deck structure optimised by freeform optimisation algorithms
- Lightweight reduced by 30%









Hull form

- Lower lightweight enabled for rethinking of hull
- Hull optimised for displacement and resistance only
 - Hull and superstructure with clean hull design, • minimised resistance
 - Resistance 35% lower than in current ships of same size

- Unstable by design utilising computer controlled active stabilisation devices
 - Stability for all situations ensured by active means: • lowerable pontoons and gyroballs
 - Normally pontoons in sea skimming mode •







Propulsion & Machinery

- **Flapping foil** propulsion
 - Mimic the movement of dolphin •
 - Efficiency beyond 85% •
- **SOFC** fuel cells operating on liquid hydrogen

- Waste Heat Recovery and Cold Recovery
- Solar panels with maximised area, two-axial tracking





NYK Super Eco Ship 2050

Towards carbon free future

ENERGY

EFFICIENCY

35% Lower ship resistance

70% Lower energy demand

ENVIRONMENT

Zero emissions to air and water









Key R&D agenda for 2030 NYK & MTI perspective

Electrification

Research for Fuel Cell

Hull & propulsion

Digitalization





