FINNISH SOLUTIONS FOR **SMART SHIPS**

COMBINING VAST SHIPBUILDING EXPERTISE WITH STATE-OF-THE-ART INNOVATION AND SMART SOLUTIONS FOR THE FUTURE OF SEAFARING

#FINLANDWORKS

TABLE OF **CONTENTS**

4 THE FUTURE AT SEA IS INTELLIGENT

8 RESEARCH AND EDUCATION

10 CYBERSECURITY
10 5G / CONNECTIVITY
11 SITUATIONAL AWARENESS
12 RELIABILITY AND MAINTENANCE
13 SIMULATION
13 TESTING

14 DIGITAL TECHNOLOGIES

16 SITUATIONAL AWARENESS
18 SIMULATION PLATFORM FOR AUTONOMOUS SYSTEMS
20 CONNECTIVITY
22 DIGITAL BUSINESS PLATFORMS
28 USER INTERFACE TECHNOLOGY
30 MANAGEMENT

32 DESIGN & ENGINEERING AND BUILD

34 DESIGN AND ENGINEERING
38 SOFTWARE
42 SHIPYARDS

50 TECHNICAL OPERATIONS

52 ENERGY, ENVIRONMENT AND PROPULSION SYSTEMS
62 ELECTRICAL SYSTEMS, AUTOMATION AND COMPONENTS
68 SAFETY AND SECURITY, ALARM SYSTEMS
70 NAVIGATION SYSTEMS
72 INSULATION SOLUTIONS
76 TOOLS AND EQUIPMENT
78 SHIP SUPPLY

80 GUEST EXPERIENCE

82 TURNKEY SUPPLIERS
86 B-CLASS CABIN AND INTERIOR DOORS
88 PEOPLE FLOW
92 MATERIALS AND COMPONENTS
94 HVAC SOLUTIONS
96 EMPHATIC BUILDING

98 TESTING THE PERFORMANCE OF YOUR VESSEL

99 AKER ARCTIC ICE MODEL TESTS
100 AALTO UNIVERSITY ICE TANK
102 VTT SHIP PERFORMANCE EVALUATIONS

104 WHY IT'S SMART TO INVEST IN FINLAND

THE FUTURE AT SEA IS **INTELLIGENT**

FINLAND IS AT THE HELM OF CREATING SMART SHIPS, INTELLIGENT SOLUTIONS AND SUSTAINABLE MARITIME OPERATIONS FOR THE FUTURE

Our vision by 2025 is to make every ship smart. By applying digital technology, we have vast opportunities to raise the level of safety in maritime operations, journey into remote and arctic territories, and support sustainable transport at sea.

Finland is a global forerunner in developing digital solutions with world-leading capabilities in artificial intelligence, sensoring and wireless technology. In 2017, the Digital Economy and Society Index ranked Finland as the EU's second most advanced digital economy.

The companies in the Finnish Marine Industries Cluster have the experience, expertise and proven track records to bring about lasting change for smarter, safer and more sustainable maritime operations.

SMART SHIPPING

Rapidly developing digital technologies are connecting people and machines to minimize human error and provide new revenue and value-adding opportunities. Digitalization leads to more efficient operations, user friendliness and effective, streamlined services.

Now the maritime industry stands to benefit from the already proven digital success stories in other land-based industries.

SAFE AT SEA

The world's first autonomous and remotely controlled ferry journeyed from Turku to an archipelago island in Finland in December 2018. Two Finnish companies developed the technology to allow the ferry to show the way for the future of autonomous vessels.

This smart technology increases safety and makes the shipping business more economically viable. Digital connections allow the ship to be steered from a land-based control room, while a captain can take over under demanding circumstances.

SUSTAINABLE VOYAGING

Finnish companies have also gained a global reputation for creating smart and green innovations. Advanced energy management and fleet performance systems reduce emissions and increase fuel savings.

This top-notch technology is chosen for some of the most demanding vessels today, ones that embrace digitalization for peak task performance. For example, 60% of all the world's largest luxury cruise ships are designed in Finland and one third were built by Finnish shipyards. These sleek and spectacular vessels have the technology to allow them to sail into waters with strict emission limits or journey into fragile ecosystem areas.

Finland has also designed about 80% of all icebreakers in the world, with nearly two thirds of them being built by Finnish shipyards. Each Finnish icebreaker is known for its sustainable technology, enabling it to work with maximum efficiency and operational capability, without harming its eco-sensitive surroundings.

IN THIS BROCHURE, YOU CAN DIVE DEEP INTO THE SEA OF SMART FINNISH MARITIME TECHNOLOGIES AND SOLUTIONS – AND THE COMPANIES THAT PROVIDE THEM.

RESEARCH AND **EDUCATION**

CYBERSECURITY

Tampere University – We research secure ship networks with advanced cybersecurity protection for future smart ships, going beyond traditional endpoint protection. We have strong cooperation with NICT Japan (National Institute of Information and Communications Technology).

University of Helsinki – The Department of Computer Science is a leading teaching and research unit in its area in Finland. We address research challenges in data analytics, artificial intelligence, security and privacy. Research related to cybersecurity concentrates on 5G security and trust management, along with privacy, detection and the mitigation of intentional interference of satellite navigation signals.

VTT – Our multidisciplinary research combines cybersecurity, maritime transport and ship technology with future-oriented methodologies. VTT plays a major role in an EU-funded Cyber-MAR project, where maritime actors increase their cyber-awareness level by validating their business continuity management and minimizing business disruption potential.

5G / CONNECTIVITY

Tampere University – In the research of MR-MMTC (multi-radio, massive machine-type communication), which implies the availability and utilization of several RATs (radio access technologies) within a single IoT device, we are able to offer world-class solutions.

University of Helsinki – In the research area of networks, we focus on networked systems and their enablers: interoperability, information networks and service networks. We also carry out research on the development of software, database and interactive systems, as well as research related to teaching programming and learning analytics.

SITUATIONAL AWARENESS

Tampere University – We are actively developing machine learning, signal processing and computer vision algorithms, along with applications for situational awareness. We seek to solve pertinent problems in machine learning and artificial intelligence using novel algorithms. Our key competence in the field of semi-autonomous and autonomous navigation research can be found in the AAWA project.

Åbo Akademi – In digital twin technology, we combine and enhance on-ship sensor data for increased situational awareness, such as current energy usage profiles, component wear and condition.

University of Helsinki – We carry out research on context awareness and ubiquitous computing, autonomous navigation using satellite navigation, sensor fusion, computer vision and 5G signals. We develop computationally efficient, theoretically justified and reliable methods of artificial intelligence, machine learning and data mining.

RELIABILITY AND MAINTENANCE

Aalto Marine Technology – We carry out research on the analysis of safety, risks and the reliability of autonomous maritime ecosystems in different projects, such as AAWA, ÄLYVESI and Design for Value. Safety, risk and reliability are essential independent, but interconnected, fields of research that need to be managed in smart shipping.

Åbo Akademi – By using digital twin technology implemented with Edge computing, onboard ship sensor data can be enhanced to display the real-time condition of on-ship components. This provides enhanced reliability, improved performance and maintenance optimization.

VTT – Our operational and maintenance analytics research focuses on creating operational health indicators for numerous applications. VTT's expertise in data analytics, diagnostics, condition-based monitoring and vibration control supports hybrid and multidisciplinary approaches to develop new solutions for predictive maintenance.

SIMULATION

Aalto Marine Technology – We offer energy flow simulation, energy efficiency analysis and power management. Our focus is on hybrid energy systems, particularly electrical power transmission and batteries.

Åbo Akademi – We combine our simulators with real-time and historical data from ships to provide real-time information on the status of ship components. These simulators are built as software components that can run on-ship computing environments.

TESTING

VTT – We provide various testing services, such as hydrodynamic model tests, sea and ice trials, onboard vibration monitoring for passenger comfort, load monitoring on ship hulls and propulsion, and emission measurements. Supported by VTT's wide expertise in physical phenomena and simulations, the testing analyses provide high-value information to customers.

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DIGITAL TECHNOLOGIES

SITUATIONAL AWARENESS

SIMULATION PLATFORM FOR AUTONOMOUS SYSTEMS

AILiveSim

CONNECTIVITY

DEAL
DEAL COMP OY


DIGITAL BUSINESS PLATFORMS
awake.ai
Basen
WIIMA
LOGISTICS
USER INTERFACE TECHNOLOGY
RIGHTWARE
MANAGEMENT

SITUATIONAL AWARENESS

INTELLIGENT MARITIME AWARENESS

WHAT IS BOQA?

The BOQA (Bridge Operations Quality Assurance) methodology is inspired by its equivalent in the flight industry, and it was first introduced to shipping by large cruise liners some years ago. The need was to have a safety solution, which can provide 24/7 continuous monitoring of sensor data and alarms, and raise alerts if deviations from defined operational limits are noticed. BOQA is also a way to proactively use the data from a ship's voyage data recorder (VDR), as outlined by the Oil Companies International Marine Forum (OCIMF) in 2013.

AUTOMATIC MONITORING OF EVENTS AND PERFORMANCE

BOQA is essentially an automated event tracker, which uses various rules and artificial intelligence techniques to detect anomalies and deviations in operational behavior. Some of the key event types include excessive fuel consumption, charter-party compliance, close encounter detection, under keel clearance, excessive rudder movement, blackouts and crash stops.

SMART AND VISUAL FLEET TRACKING, INCLUDING LIVE VIDEO STREAMING

nauticAi solutions are built on a foundation of simplicity, visualization and high utilization of real-time data. Some of the most sought-after features are the live-video streaming from ship cameras and the fact that these solutions work on any device, from small smart phones to large wall displays. Smart fleet tracking has never been this easy!

AFFORDABLE AND EASY TO IMPLEMENT

nauticAi solutions are what we call "vendor-neutral" or "multi-vendor," which means that all the ships in a fleet can be included and seen in one smart web application, regardless of the type, make or model of ship IoT platform or onboard performance system. This reduces cost, prevents vendor lock-in and makes it much easier to use.

ABOUT NAUTICAI

Founded in 2018, nauticAi is the software as a service (SaaS) brand from the founders of Finland's leading maritime IT startup Fleetrange. nauticAi specializes in intelligent maritime awareness solutions for shipping operators.

REFERENCES

- Inmarsat Global Limited
- Tallink-Silja Oy
- Containerships Oy
- Spliethoff's Bevrachtingskantoor B.V.
- Meriaura Oy

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SIMULATION PLATFORM FOR AUTONOMOUS SYSTEMS

WE BRING AI FORWARD

AILiveSim

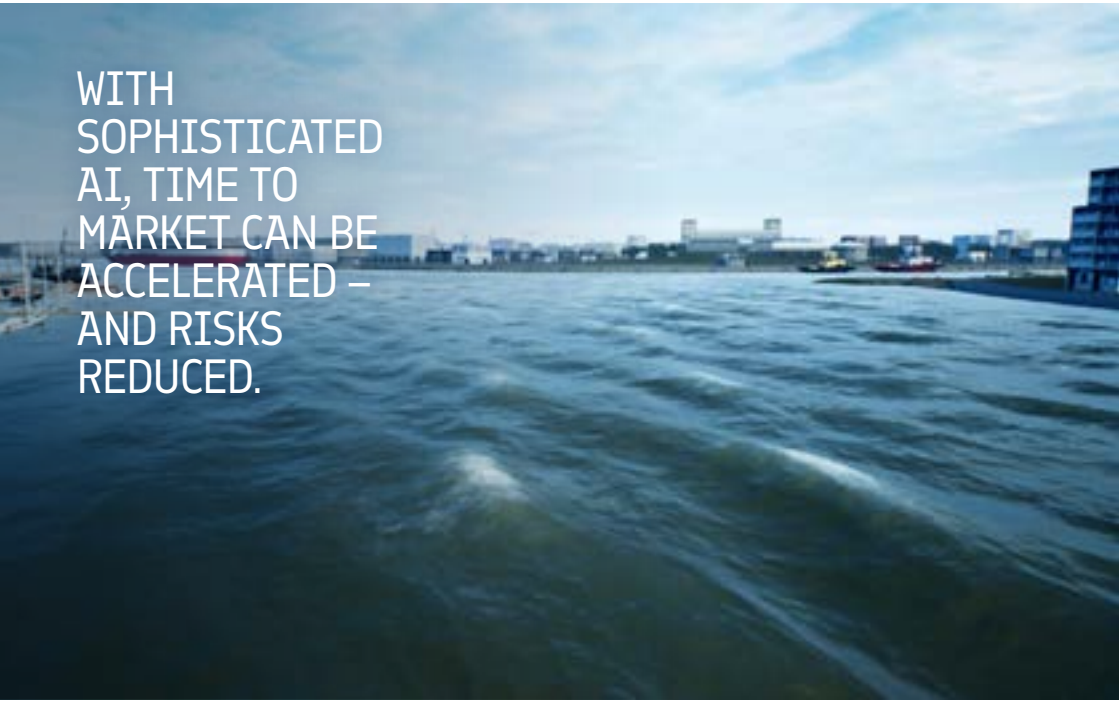
The shipping industry is entering a disruptive transformation driven by electrification, automation and new regulations. Autonomous functions and systems are fundamental building blocks of the new solutions, and their development to market readiness implies significant investments. Time to market and risks can be reduced and controlled with software simulation.

CUSTOMIZED SIMULATION PLATFORM

The AILiveSim simulation platform is easy to onboard with default harbor, coastal areas and maritime scenes that are easy to customize per development or customer-specific projects.

The AILiveSim platform allows research, development and business development teams to accelerate the time to market by:

- Concept and market validation with fast prototyping
- Dataset creation or reinforcement learning for AI systems
- Fast iteration and optimization of algorithms
- Testing and validation in standard or customer-specific conditions
- Customer demonstration and acceptance testing



WITH SOPHISTICATED AI, TIME TO MARKET CAN BE ACCELERATED – AND RISKS REDUCED.

FAST SWITCH TO AUTONOMY

As autonomous mobility and AI begin to disrupt every industry, AILiveSim is the tool that makes the journey to autonomy faster and more reliable. AILiveSim aims to become the global de-facto standard tool for the development and validation of autonomous ships.

AILiveSim was founded in 2018 after two years of intensive development and concept validation. The first platform release in Q3 2018 has been used for several customer projects, including Sandvik and Sensible 4, and the academic institutions of the University of Helsinki, Tampere University and Åbo Akademi.

REFERENCES

AILiveSim is actively contributing to the HeAVEN ecosystem for digitalized ports, researching several crucial issues that deal with understanding the maritime coastal dataset and estimating COLREGs.

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CONNECTIVITY

SECURE AND RELIABLE COMMUNICATION SOLUTIONS

DEAL
DEAL COMP OY

The intelligent router system is able to combine the capacity of multiple connections into one secure connection. Authorities and high-security companies use such state-of-the-art solutions to ensure a good level of connection service for all systems.

SERVING ANY SYSTEM

Connections can be adjusted based on price or transfer capacity and also based on location and available networks. Even if five simultaneous connections such as satellite, 2G, 3G, 4G and 5G are used, the system will only see one IP address. Therefore, the router is capable of serving any system to which it is connected without additional work.

SECURE AND RELIABLE COMMUNICATION IS ESSENTIAL FOR THE INTELLIGENT MARITIME INDUSTRY.

RELIABILITY, SECURITY, DURABILITY

Deal Comp is a supplier of durable and powerful computers and routers for the marine industry. Our solutions are reliable and secure. All products meet the stringent IEC 60945 marine industry requirements.

REFERENCES

- Kvaerner Masa-Yards – M/S Fascination, cruise infotainment terminals
- Kvaerner Masa-Yards – 8 Caribbean cruise ships, time management servers

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DIGITAL BUSINESS PLATFORMS

SMART PORT AS A SERVICE

awake.ai

Awake.ai is a collaborative and open data platform company, enabling collaborative decision-making and efficient port calls. The company is also fostering the growth of a larger smart port ecosystem, enabling a marketplace for selling and buying smart port and ship-related services in the future.

PORT-TO-PORT TRANS-PORT OPTIMIZATION

Due to the lack of transparent information sharing and disconnected processes throughout the supply chain, a lot of time is wasted in inefficient communication, ship operations and sub-optimized port calls.

Awake.ai developed artificial intelligence enhanced predictive analytics and models for key processes in harbor operation, providing a real-time holistic situational awareness of the entire maritime logistics chain.

This can be used to enable just-in-time operational planning and reduce harmful emissions and ship operating costs.

ENABLING AUTONOMOUS SHIP PORT CALLS

Autonomous vessels are the future, and Awake.ai is working closely with key industry partners and authorities preparing the standardization needed for enabling digital handshakes between the autonomous ships and the smart ports. This is empowering the port authorities to build the capability of accepting autonomous vessels in their ports.

SMART PORT AS A SERVICE

Cloud-based platform service enables businesses to build smart port solutions fast and efficiently, leveraging on the API's of pre-built modules – offering superior time-to-market benefits over in-house development approach.

The Awake platform provides the flexibility and the efficiency that are essential for driving business growth, competitiveness and adoption of the smart port capabilities.

Awake.ai's service ensures that not only the ship and port operators, but also every supply chain actor will benefit and generate immediate savings without the need for large investments in capital expenditure upfront.

REFERENCES

Awake.ai is enabling Port of Rotterdam to receive autonomous ships by creating all the needed data standards, APIs, datasets and cloud services between smart ships and smart ports. Awake.ai is also a partner of the Smart Container 42 (https://weare42.io/) ecosystem, driving sustainability and logistical efficiency in the future.

The Awake platform is used by multiple Finnish port authorities and terminal operators and expanding globally.

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MISSION-CRITICAL FULL-STACK PLATFORM

Base^{n}

With its full-stack platform, BaseN takes the complete responsibility for all critical IoT components without any reliance on a third-party cloud, software or even hosting providers. This is one of the key aspects why mission-critical customers from various industries trust BaseN. We bring real-time processing and powerful analytics to your massive data flows.

ENABLING GREEN SHIPPING ON A GLOBAL SCALE

We increase productivity, resource optimization and continuous operations using a platform-as-a-service framework and are ideally suited for the maritime industry's data lake requirements.

Additionally, BaseN provides the integration and connectivity of all legacy and contemporary hardware and software that is necessary for

PHYSICAL OBJECT

DIGITAL REPLICA

DIGITAL TWIN

continuous and secure operations. We enable real-time, bi-directional data flows for the next generation of ships and components, enabling the transformation from digital twins to spimes, the virtual counterpart of any physical thing.

SECURE DATA COMMUNICATION AT ALL TIMES

Our knowledge of security is a significant asset for automation, playing an important role in ocean transport. We ensure smooth data communication from ships in real time, even with low availability.

REFERENCES

- Smart harbor, environmentally friendly ocean transportation 2.0
- Global construction site control
- Smart building and energy
- Datacenters and energy management
- Industrial automation

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SITUATIONAL AWARENESS AS THE BACKBONE FOR SMART AND SUSTAINABLE SHIPPING.

WE MAKE LOGISTICS HAPPEN

WIIMA LOGISTICS

We offer neutral and transparent turnkey logistics management services for shipbuilding projects worldwide. What makes the service truly unique and smart is our digital project logistics management platform combined with true project logistics expertise.

SOLVING LOGISTICS PROBLEMS FOR SHIPBUILDERS

The platform provides users with a live overview of their project's logistics shipment flows. It solves several universal problems for shipbuilding companies and their networks when operating with complex material flows globally.

Wiima constantly develops its platform with modern solutions, intelligent measuring, flexible integrations, actor connectivity with various subsystems and real-time dashboard views.

The most central benefits our project logistics management platform offers are:

- Easy connectivity to all stakeholders (API-boundaries)
- Transparent and neutral among stakeholders
- Real-time, item-based status information
- Connected to all major freight carriers worldwide
- Project material flow optimization
- On-site material management and item tracking

EXTENSIVE EXPERIENCE AND GLOBAL PRESENCE

Wiima Logistics is a one-stop shop for project logistics with extensive maritime experience. We handle all transportation needs of our customers through a single point of contact method. We optimize

and arrange all freight modes – air, sea, road, rail, courier and oversize – including customs clearance, last-mile arrangements and on-site supervision.

We are headquartered in Finland and have offices in Singapore, China, Malaysia, the US and Estonia.

REFERENCES

- Chantiers de l'Atlantique – Celebrity Cruises' M/V Celebrity Summit cruise ship
- Kvaerner Masa-Yards – Royal Caribbean International's M/V Mariner of the Seas cruise ship
- Meyer Werft – Star Cruises' M/V Superstar Virgo cruise ship

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USER INTERFACE TECHNOLOGY

ADVANCED UI TOOLS

RIGHTWARE

TRANSFORMING UI DESIGN

Rightware is the Finnish software company behind Kanzi, the leading HMI design and development toolchain for automotive and other embedded industries. The Kanzi philosophy is based on designer empowerment, prioritizing ease of use, rapid prototyping, workflow efficiency, high performance and cross-platform support.

ADVANCED PRODUCT FAMILY

The Kanzi product family includes the Kanzi Studio visual design tool, which delights designers, the highly optimized Kanzi Runtime and UI framework for superior graphics performance in embedded systems, and the innovative Kanzi Connect platform, which allows data from any application or service to be visualized on any display.

The Kanzi Professional Services team works closely with customers to help them deliver advanced user experiences, providing advanced prototypes and technology demonstrators as well as custom value-added software products.

BRINGING REAL-TIME VISUALIZATION TO MARINE

In maritime applications, Kanzi enables real-time 3D rendering that can be used to visualize anything from ship status or movement to lidar, radar, infrared, map or sonar data. With Kanzi UI, it is easy to visualize the flow of energy, people or goods within the vessel. Kanzi Connect enables sharing of controls and data between different devices, operating systems and displays, even remotely.

Rightware is the market leader in automotive digital instrument clusters, but its Kanzi product family has also been used to power user interfaces in heavy machinery, trucks and yachts. Rightware has been involved in several maritime proof-of-concept projects with Rolls-Royce Marine and others – with many more to come.

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MANAGEMENT

COMPUTER VISION WITH DEEP LEARNING

In IBM cybersecurity projects, we work on remediation plans to mitigate any impacts or risks. We do this by applying best practices in ship and port security and identifying the regulations and legislation involved, such as IMO 2021, NIST, GDPR, CLOUD Act. We define the security standards to be applied, implementing security frameworks, reviewing cyber-security capabilities, creating a business recovery and remediation plan, and more.

AI SHOWCASES IN AUTONOMOUS VESSEL DEVELOPMENT

IBM is pairing IBM PowerAI Vision technology with IBM Power Systems accelerated servers. Such systems enable deep-learning models to be built that are capable of recognizing navigation hazards, which come into view with onboard video cameras.

IBM's Operational Decision Manager software helps decide autono-mously whether to change course, for example. The edge nodes of the project vessel Mayflower are connected to the IBM Cloud, where data is stored in the IBM Cloud Object Storage.

PREDICTIVE ANALYTICS PLATFORM FOR ENGINEERING

Poor outcomes for engineering projects can be indicated by using IBM Cognitive AI tools. Such indications can refer to costs, margins, completion times and safety. These indications are derived from structured and unstructured data in virtual project organizations.

Outcomes of these platforms include pattern analysis, anomaly detection, characterization of project KPIs, early indicators and prescriptive mitigation strategies, to name a few.

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DESIGN & ENGINEERING **AND BUILD**

DESIGN AND ENGINEERING

bluetech FINLAND

ELOMATIC CONSULTING & ENGINEERING

SOFTWARE

CADMATIC

NAPA

SHIPYARDS

HELSINKI SHIPYARD

MEYER TURKU SHIPYARD 1737

RAUMA MARINE CONSTRUCTIONS

DESIGN AND ENGINEERING

FIRST-CLASS MARINE ENGINEERING

bluetech FINLAND

SMART STARTS WITH GOOD DESIGN

Achieving smart starts with good design. We design ships that move and operate efficiently and safely.

Well-designed ships save energy, weight and running costs, properties that benefit the owner and the environment.

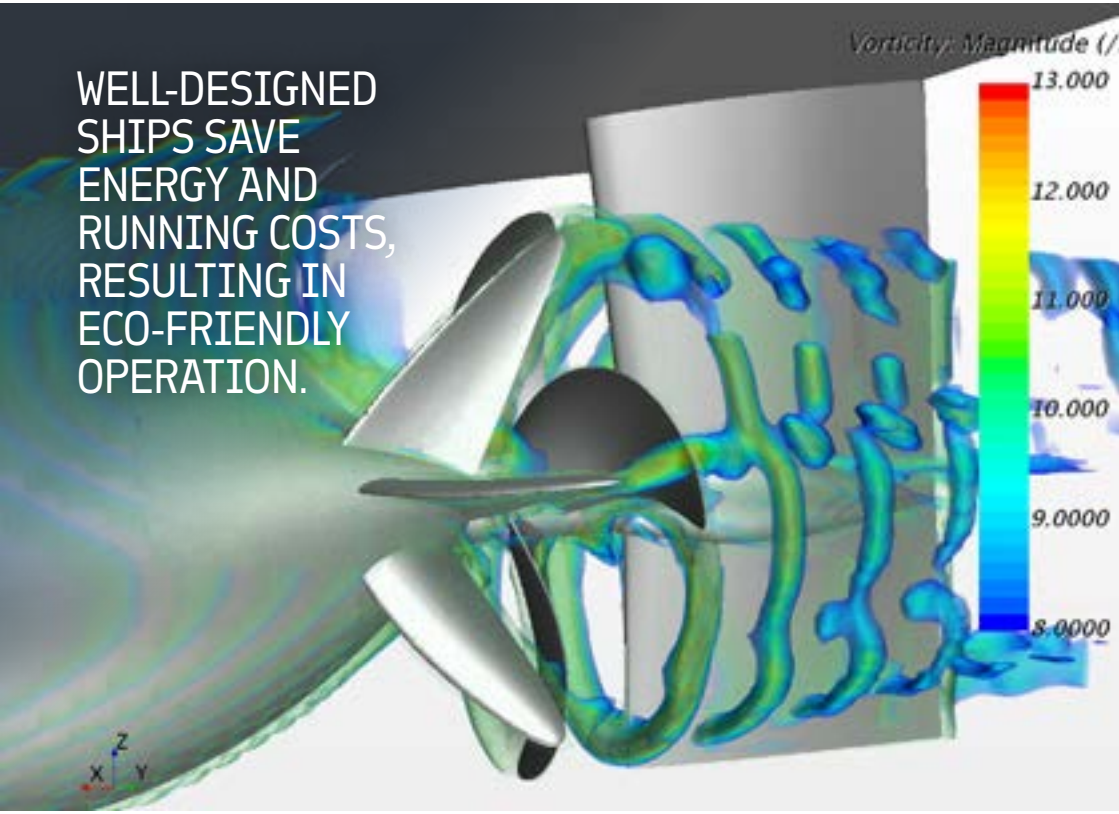
COMPETENCE IS THE CORE

In the end, it all comes down to the designer's competence to apply past experience, engineering skills and numerous tools, including computational fluid dynamics (CFD), finite element analysis (FEA) and various CAD systems. We have the tools marine engineering needs and the knowledge of how to use them.

GLOBAL KNOWLEDGE NETWORK

Our foundation is in expertise and international networking. We have built ourselves a global network of knowledge and resource centers that support the agile business opportunities everyone faces today. We have our own offices and partnerships in Vietnam, India, China and the US.

Bluetech Finland Ltd is a specialist in cruise, RoPax and cargo ship design, offering engineering services for shipowners, shipyards and marine suppliers. Our expertise includes all ship design disciplines. We provide concept, basic and detail design. Currently, the group employs 45 professionals.



REFERENCES

Our references include aero and hydrodynamic work for various vessel types using computational fluid dynamics (CFD) simulations. We have carried out concept, basic and detail design for cruise ships and ferries.

We have developed several world-leading, energy-efficient bulk carriers, from concept to full scope of basic design.

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DIGITAL TWIN – FROM DESIGN TO OPERATION

ELOMATIC
CONSULTING & ENGINEERING

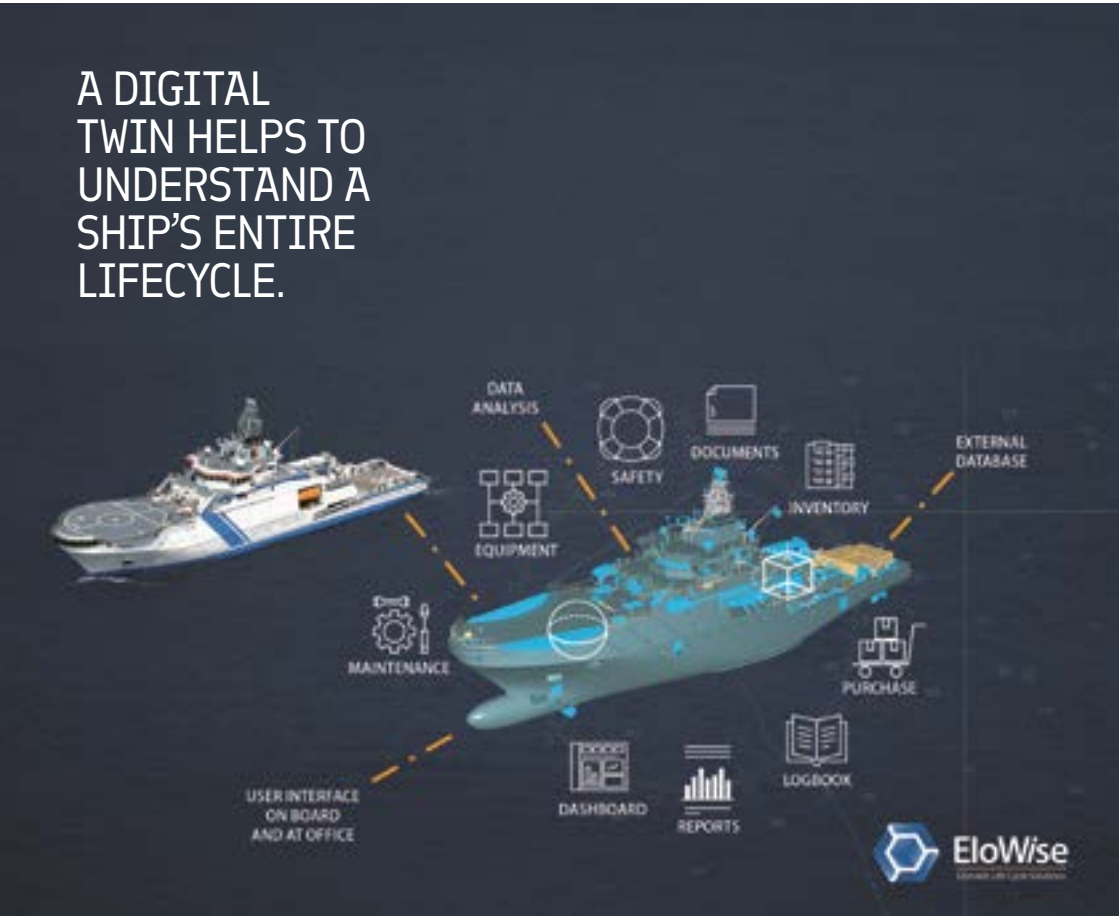
A digital twin is a virtual representation of a physical product or process, which is used to understand and predict the physical counterpart's performance characteristics. At Elomatic, we bring this definition to life and extend it to cover the whole lifecycle of the vessel, from concept phase through to design, building and delivery, and all the way on to the operation of the vessel.

STORING ALL THE RELEVANT DATA

During the traditional shipbuilding process, a lot of information is gathered in the building phase. Only a fraction of this information leaves the yard with the ship. The purpose of Elowise, Elomatic's digital twin software, is to collect all relevant data and store it on a common platform, where it can be further utilized during the operation of the vessel and combined with real-time monitoring of vessel performance. Planned maintenance and scheduled maintenance tasks for various machinery components and systems can also be monitored by the software to ensure safe, reliable and efficient operation.

PERSONALIZED DASHBOARDS

The Elowise user interface consists of dashboards, a CAD model and 360° pictures of the vessel's physical environments. The interface assists with the orientation of the vessel and can be used for crew training purposes as well. Customized dashboards can be created based on operator preferences.



Elomatic is a privately owned Finnish consulting and engineering company with more than 1,000 employees and 50 years of experience.

By integrating technical expertise with knowledge of customer processes, Elomatic improves the business operations of domestic and global passenger and cruise vessel clients.

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SOFTWARE

TAKING SHIP DESIGN TO A NEW LEVEL

CADMATIC

CADMATIC offers a complete solution for shipyards, engineering offices and subcontractors. It reduces design and building times and unleashes the power of data-driven shipbuilding. CADMATIC is the most user-friendly, easy-to-learn, efficient and open software package on the market.

DATA-DRIVEN SHIPBUILDING

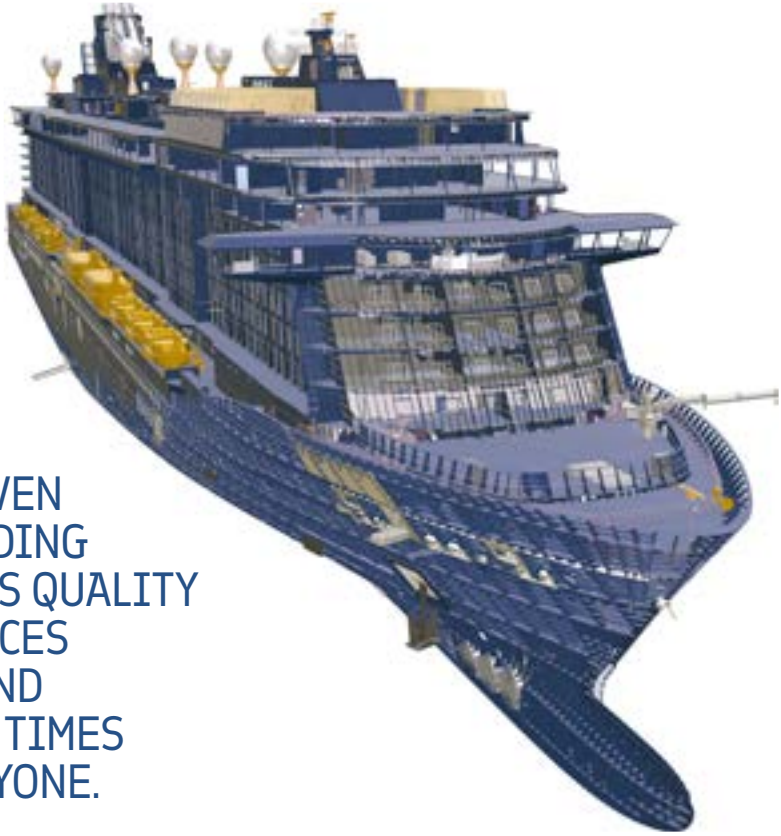
CADMATIC's advanced digitalization shortens project lead times, improves data quality and eases change management. We maximize the automation of data handling, from design to construction, production and operation, leading to paperless operations. The 3D-model data is also used for scheduling, planning, production and maintenance.

CADMATIC ESHARE – DIGITAL TWIN OF A VESSEL IN A WEB PORTAL

CADMATIC eShare is the ultimate ship design, construction and operation information management tool. It integrates, visualizes and shares ship engineering, design, construction and operation information via a web portal. Get the most out of your engineering data assets – step up from file-based thinking to shared online information with eShare.

MOBILE, CLOUD AND AR/VR TECHNOLOGIES

Our virtual and augmented reality applications offer an entirely new interactive design and engineering experience in augmented reality,



DATA-DRIVEN SHIPBUILDING INCREASES QUALITY AND REDUCES DESIGN AND BUILDING TIMES FOR EVERYONE.

where digital 3D models reside in the real-world environment. Our mobile solutions make site visits more effective and bring real mobility to design projects.

SMART DISTRIBUTION OF DESIGN WORK

CADMATIC's design distribution system ensures seamless internet-based and offline sharing of 3D models, regardless of location. New design teams from around the world can be added and start working on a design project in minutes.

REFERENCES

CADMATIC is a globally operating company with over 6000 customers worldwide.

40% of active shipyards use CADMATIC 3D design solutions, including Meyer, specializing in passenger ships, Damen Group, Wärtsilä Ship Design, Ulstein and others.

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SOFTWARE AND SERVICES FOR SHIP DESIGN AND OPERATION

For initial and basic ship design, NAPA's 3D modeling and engineering functionalities are the most powerful in the industry. Our tools for hydrostatics, stability, hydrodynamics and structural engineering are a global industry standard in all ship design.

SAFE, EFFICIENT, SUSTAINABLE

For ship operations, we offer a range of solutions that take safety, fuel efficiency and sustainability to a new level.

NAPA Loading Computer ensures safe and optimal planning of stowage, cargo and ballast. The system covers a wide range of calculations related to hydrostatics, intact & damage stability and longitudinal strength.

NAPA Emergency Computer enables risk monitoring and flooding prediction for officers on board.

NAPA Logbook is an electronic logbook bringing major benefits in terms of time savings, data validation and data sharing.

NAPA Fleet Intelligence combines voyage monitoring, reporting, analysis and optimization for economic and environmental benefits.

NAPA Voyage Optimization enables weather-optimized route and speed profiles with a highly reliable ship performance model.

NAPA participates in R&D programs, such as the FLARE project and INTENS. Read more about the programs at flare-project.eu and intens.vtt.fi.

ABOUT NAPA

In its 30 years of operation, NAPA has become a global leader in software, services and data analysis for the maritime industry, providing best-in-class, data-led solutions for safety, efficiency and productivity in both ship design and operations.

INTELLIGENT SOLUTIONS FOR INCREASED SAFETY, EFFICIENCY AND PRODUCTIVITY IN THE MARITIME INDUSTRY.

NAPA operates globally, with 11 offices across Asia, Europe and the Americas supported by its Helsinki headquarters. To date, NAPA has 420 user organizations for its design solutions and nearly 3,000 installations on board vessels. For more information, visit www.napa.fi.

REFERENCES

- Meyer Turku
- Fincantieri
- Carnival Cruise Lines
- Royal Caribbean International
- Stena Line Scandinavia
- Mitsui O.S.K. Lines

CONTACT

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SHIPYARDS

DEMANDING MARINE TECHNOLOGY AND SHIPBUILDING

HELSINKI SHIPYARD

Implementation of environmentally friendly and clean technologies ensures that your vessel is fully in compliance with all current and known regulations regarding the emissions of sulfur, nitrogen and black carbon emissions in the air. As an example, the icebreaker Polaris was designed specifically for minimal emissions to the air and zero emissions to the sea.

By choosing clean technologies for your vessel, operating costs will be lower and the environment will be cleaner.

PIONEER WITH A HERITAGE IN TECHNICAL INNOVATION

Helsinki Shipyard Oy started its operation in May 2019 when the shipyard was transferred to new ownership. The roots of Helsinki Shipyard Oy date back to year 1865 when Helsingfors Skeppsdocka was established.

Helsinki Shipyard Oy focuses on developing demanding marine technology and building of advanced special products. The shipyard has long experience in designing and building passenger and cruise vessels. Many solutions currently in


arctia.fi

CLEAN TECHNOLOGIES COMPLY WITH REGULATIONS, RESULTING IN GREENER SHIPPING AND LOWER COSTS.

use on cruise vessels originate from Helsinki Shipyard, for example, the first podded propulsion systems on cruise ships were designed, constructed and installed in Helsinki.

We are also known for icebreakers and other special vessels for arctic conditions.

The shipyard's production facilities include:

- A 280-meter-long covered building dock – the only one in Finland
- Outfitting halls
- Painting halls
- Three outfitting quays enabling simultaneous outfitting of several ships at the same time

OUR PRODUCTS

- Ferries
- Cruise ships
- Expedition vessels
- Icebreakers
- Icebreaking emergency and rescue vessels
- Multifunctional icebreaking supply and standby vessels
- Research vessels

NOVEL TECHNOLOGIES PUT TO THE TEST

We are widely acknowledged as the leading provider of icebreakers and other types of vessels for operations in cold and harsh environment. Typically, our ships include the implementation of novel technologies.

The Baltika icebreaking emergency and rescue vessel, delivered in 2014, features an oblique design with asymmetric hull and three azimuthing propulsors. The Polaris icebreaker, built in 2016, is the first LNG-powered icebreaker in the world. As the most environmentally friendly diesel-electric icebreaker in the world, Polaris is fully compliant with all the regulations and requirements regarding emissions in the air or to the sea.

REFERENCES

• An icebreaking emergency and rescue vessel for Rosmorrechflot

• The first LNG-powered icebreaker in the world for the Finnish Transport Agency

• Icebreaking platform supply vessels for Sovcomflot

CONTACT

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FROM INNOVATIVE DESIGNS TO FLEXIBLE PRODUCTION

Meyer Turku is a well-known and reliable partner for designing and building innovative, tailor-made, state-of-the-art cruise vessels and ferries according to customers' needs. Ships built in the Turku shipyard are known to be the safest, most environmentally friendly, comfortable, reliable and energy efficient in the industry.

FORERUNNER IN VESSEL SAFETY

The safety of the passengers has always been of high importance to us. We are known as the forerunners in many new onboard safety features, such as the alternative design procedures of large public areas for passengers, lifeboat arrangements, atriums, firewalls, semi-watertight and light watertight doors.

ENVIRONMENTAL DESIGN

Environmental friendliness and energy efficiency are of high priority to us. Over the last few years, we have built passenger ships featuring the latest technologies, such as LNG-operated vessels with very low emissions, and vessels with scrubbers and catalytic converters for reducing emissions of sulfur oxides and nitrogen oxides. We are also known for building very energy-efficient vessels with outstanding hydrodynamic performance and numerous other energy-saving innovations. In the near future, we will also be exploiting fuel cells as a source of energy.

ON COURSE TO DIGITAL EFFICIENCY

The continuous improvement of efficiency requires a lot of work from us and the introduction of new technologies. Thanks to digital solutions, we can gather increasingly exact information on ship functions and put this data to good use in the design of new vessels.

We are also investing heavily to boost the productivity of the shipyard. Once these improvements have been completed, our shipyard will have one of the world's most modern steel production facilities and a digitally controlled laser-hybrid welding line, which will contribute to reducing cruise ship completion times.

REFERENCES

- Costa Cruises cruise ships
- TUI Cruises cruise ships
- Royal Caribbean International cruise ships
- Carnival Cruise Lines cruise ships

CONTACT

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EFFICIENCY AND GREEN VALUES IN CRUISE SHIP BUILDING REQUIRE INNOVATIVE DIGITAL SOLUTIONS.

CONTINUING THE STORY OF EXCELLENCE

RAUMA MARINE CONSTRUCTIONS

Rauma Marine Constructions (RMC) is the new beginning to an old story. Founded in 2014 as a Finnish maritime cluster company, RMC started a new era for meeting both global and domestic challenges.

The RMC shipyard in Rauma has earned back its position as a leading yard for the design and construction of car-passenger ferries, icebreakers for polar and domestic ice-covered waters, along with naval craft for the Finnish Defence Forces.

WORLD-LEADING EXPERTISE

We represent world-leading expertise in technology for segments that are strongly relied upon by the network, know-how and competitiveness of the Finnish marine industry.

Several major operators of large car-passenger ferries and RoPax vessels are sailing on keels constructed in Rauma. Their recurring return to the shipyard for a next-generation ferry or special vessel is most rewarding for RMC, resulting in natural steps to secure the development, sustainability and energy efficiency for preserving the environment.

THE LONG SHIPBUILDING TRADITION IN RAUMA IS A SOLID BASE FOR SMART VESSELS OF THE FUTURE.

REFERENCES AND ORDERBOOK

- Molslinjen – Hammershus car and passenger ferry
- Finnish Environment Institute – Aranda research vessel conversion
- Kvarken Link – Aurora Botnia car and passenger ferry
- Tallink Grupp – MyStar car and passenger ferry
- Finnish Defence Forces – Squadron 2020 corvette program

CONTACT

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TECHNICAL OPERATIONS

ENERGY, ENVIRONMENT AND PROPULSION SYSTEMS

ABB

AirNow EMISSIONS MONITORING

STEERPROP

YASKAWA

WÄRTSILÄ

ELECTRICAL SYSTEMS, AUTOMATION AND COMPONENTS

HELKAMA

Prometo

Valmet FORWARD

SAFETY AND SECURITY, ALARM SYSTEMS

Marioff

NAVIGATION SYSTEMS

FURUNO FINLAND OY

INSULATION SOLUTIONS

PAROC

SAINT-GOBAIN

TOOLS & EQUIPMENT

TS-EN

SHIP SUPPLY

CARGOTEC

ENERGY, ENVIRONMENT AND PROPULSION SYSTEMS

SOLUTIONS FROM BRIDGE TO PROPELLER FOR MARINE

ABB Marine & Ports is a pioneering maritime organization, which is transforming the industry through electrical, digital and connected solutions. ABB's innovative technologies are redefining the future, bringing new levels of reliability, efficiency and sustainability to shipping and making our ports and terminals safer, greener and more productive.

ABB offers an extensive portfolio of integrated marine systems and solutions that improve the flexibility, reliability and energy efficiency of vessels. By coupling power, automation and advisory, proven fuel-efficient technologies and services that ensure maximum vessel uptime, ABB is in a unique position to improve the profitability of our customers' businesses throughout the entire lifecycle of a fleet.

NOVEL TECHNOLOGIES BRING NEW LEVELS OF RELIABILITY, EFFICIENCY AND SUSTAINABILITY TO SHIPPING.

REFERENCES:

- World's first hydrogen-powered river vessel
- Tycho Brahe and Aurora, the world's largest battery ferries by ForSea
- Over 25 ship types equipped with Azipod® propulsion
- Groundbreaking trial of remotely operated passenger ferry

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EMISSIONS MONITORING

AirNow is a global leader in ship exhaust monitoring for IMO sulfur cap surveillance. Our emission monitoring measures ship emissions in harbors and along ship fairways providing important information for authorities in charge of port state controls.

Remotely operated sniffer stations record the emissions of passing sea vessels. The data gathered is processed and presented in our web-based user interface. AirNow service works unmanned 24/7.

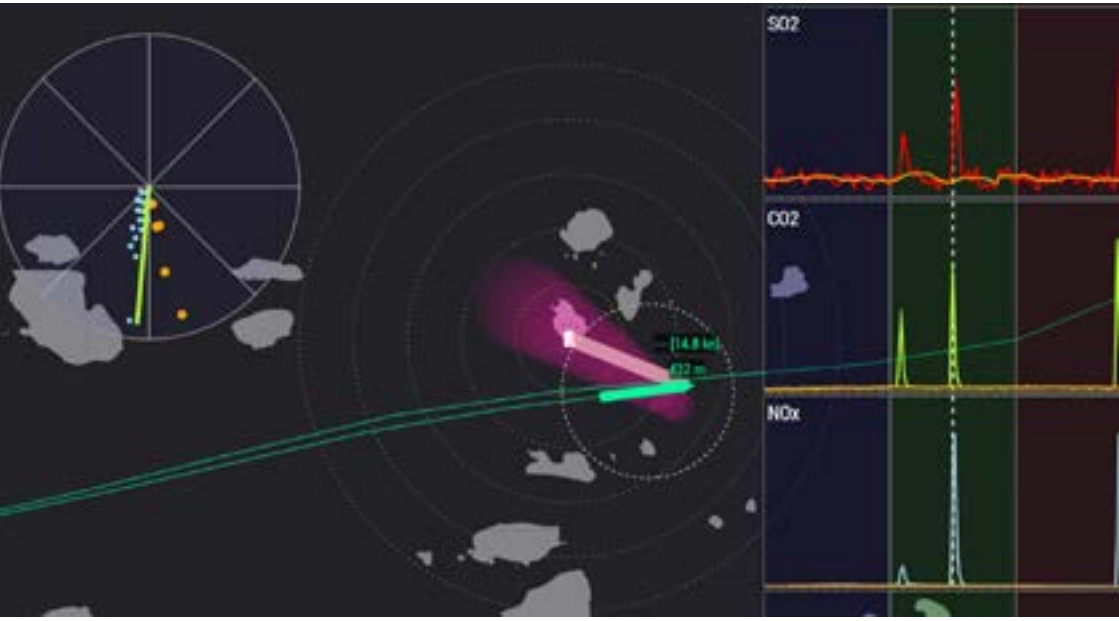
Results are analyzed from measurements and other data, including SO_2, CO_2, $NO+NO_2 + NO_x$, wind, humidity, temperature, ambient air pressure, station position and automatic vessel identification system (AIS).

AirNow shows the Fuel Sulfur Content percent (FSC%) of each vessel, which helps authorities to decide if there is a need for an onboard check.

IMO REGULATIONS IN EFFECT

The FSC limit of 0.5% went into force in all maritime areas of the world on January 1, 2020. Using AirNow service in your maritime areas, you can avoid random spot-checking. You can target your control efforts on ships suspected of breaking the sulfur cap rule.

Green shipping can be achieved with state-of-the-art solutions. You can reduce the environmental impact of shipping in your areas with AirNow service.



SMART EMISSION MONITORING PROVIDES DATA FOR AUTHORITIES AND RESULTS IN GREENER SHIPPING.

SOLID TRACK RECORD

AirNow service has proven its state-of-the-art capability in the Baltic Sea by monitoring over 1,000 km of shoreline in Finland.

Finnish transportation and communications agency Traficom has used AirNow between 2016–2019 to measure emissions from more than 100,000 ships. This cooperation will continue also from 2020 onwards.

CONTACT

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BUILDING THE WORLD'S FINEST AZIMUTH PROPULSORS

STEERPROP

LEAVE A GREENER FOOTPRINT

Steerprop propulsors offer superior reliability. Cloud computing enhanced with machine learning crunches numbers 24/7 for uninterrupted operation. You can monitor your system trends locally and receive system status indication. Or our remote diagnostics provide quick response time and advanced problem-solving capabilities, eliminating unnecessary air travel. Each propulsor offers lower noise and vibration levels for greener sailing.

ENERGY EFFICIENCY IS THE CORE

Steerprop's lifecycle approach lowers costs. Our mechanical powerline from the permanent magnet motor to the propeller is extremely efficient. When combined with a modern power plant and distribution, an electric or hybrid power train creates flexibility fit for future challenges.

LOWEST MAINTENANCE NEEDS

To keep servicing at 1% of lifecycle costs over a 30-year lifetime, we deliver our smart Steerprop Care condition monitoring as standard with every propulsor. This gives detailed information about the propulsor unit and its components. Our overhaul interval is 15 years or 100,000 running hours.

SHAPE THE FUTURE OF MARINE

Our dedication and experience are matched only by our expertise and passion for perfection. Since 2000, we have delivered over 800 propulsors to cruise, arctic, ferries, workboats and offshore vessels. Our solid track record of references

NEW PROPULSION TECHNOLOGIES COMBINE EFFICIENCY WITH ECOLOGICAL THINKING.

includes over 85 ice-class units and deliveries to 10 icebreakers.

Combining efficiency with ecology, our designers have begun a green revolution in the maritime industry – not just to save fuel and improve operational performance, but also to shape the future world of marine.

Let us bring you exceptional value.

REFERENCES

- Shipyard De Hoop – Celebrity Flora expedition mega yacht
- Shipyard De Hoop – Silver Origin expedition vessel
- Arctech Helsinki Shipyard Oy – Baltika icebreaking oil recovery vessel
- Havyard Ship Technology – Esvagt Froude wind farm service vessel
- Vyborg Shipyard JSC – Vladivostok icebreaker

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ELECTRIFYING THE WORLD

YASKAWA

THE SWITCH
A YASKAWA COMPANY

MASTER DC DISTRIBUTION

The Switch DC-Hub offers the world's smartest solution for a multi-megawatt DC power system to ensure stable and secure operation. It increases system availability and redundancy, while eliminating the AC main switchboard. The DC-Hub gives vessels a flexible choice for power generation, energy storage, charging, propulsion and clean power.

SUPERIOR SAFETY

When several DC-Hubs are joined to create a vessel's network, The Switch Electronic Bus Link (EBL) breaker increases redundancy. The EBL guarantees selectivity between DC-Hubs and increases operational safety. In case of a fault, it detects and isolates any possible error in only 10 microseconds, creating redundancy for the vessel, even for DP3 operations.

EXCELLENCE IN EFFICIENCY

The Switch permanent magnet (PM) technology offers vessels unprecedented benefits, including high power density, better reliability and lower operational costs. Each PM machine is more compact and lighter in weight than traditional systems, so the main engine and auxiliary machines can be smaller. PM technology eliminates thermal and excitation losses.

One growing application is the PM shaft generator, where the generator is also used as a redundant propulsion machine, enabling the diesel engine to run at variable speed.

POSEIDON POWER

In more than a decade, we have delivered 1,200 The Switch Poseidon Drives to hundreds of vessels around the world and 50 PM shaft generators.

Whether your vessels are diesel electric, hybrid or full electric, The Switch Poseidon Power portfolio enables you to reach lower or zero emissions, higher profitability and future flexibility.

Now you can make the BIG switch to a bright future.

REFERENCES

- Metal Ships and Docks Shipyard – North Sea Giant offshore construction vessel
- Havyard Ship Technology – France Pélagique commercial fishing trawler
- Jinling Shipyard – M/S Viikki, ESL Shipping's first LNG-fueled bulk carrier
- Samsung Heavy Industries – Teekay shuttle tankers
- Cemre Shipyard – Wightlink's M/V Victoria of Wight hybrid car ferry

CONTACT

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www.theswitch.com

INTELLIGENT POWER SOLUTIONS MEAN LOWER EMISSIONS, HIGHER PROFITABILITY AND FUTURE FLEXIBILITY.

SMART SOLUTIONS FOR EFFICIENT VESSEL OPERATIONS

WÄRTSILÄ

Wärtsilä is a leading technology provider with a portfolio of products, systems and integrated solutions that are unrivaled in the maritime sector. This forms the basis of Wärtsilä's Smart Marine Ecosystem approach, where collaboration and the latest digital technology deliver greater efficiency, better safety and security, and improved environmental performance throughout the lifecycle of the asset.

RELIABLE AND SAFE INTEGRATED SOLUTIONS

In the cruise and ferry sector, the risk of failures that can disrupt operations and play havoc with schedules must be avoided. Wärtsilä's integrated solutions provide reliability, as well as safety for the vessel, its passengers and its crew.

Wärtsilä is also committed to minimizing the environmental footprint of its customers' vessels. The aim is always to go beyond mere compliance with the regulations and to set new standards in sustainability.

GUARANTEED ASSET PERFORMANCE

Operational efficiency and the smooth running of the ship's machinery and systems are critical to creating a positive passenger experience. Wärtsilä offers guaranteed asset performance contracts that ensure efficiency and reduced operating costs.

REFERENCES

- Burrard Dry Dock, Vancouver – BC Ferries LNG-fueled ferries
- Meyer Turku – Carnival Cruises cruise vessels
- Rauma Marine Constructions – Wasaline state-of-the-art ferry
- STX Finland – Viking Grace first LNG-fueled ferry
- Damen – Balearia high-speed catamaran

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ELECTRICAL SYSTEMS, AUTOMATION AND COMPONENTS

SUPERIOR TECHNICAL ADVANTAGE

HELKAMA

ENVIRONMENTALLY FRIENDLY

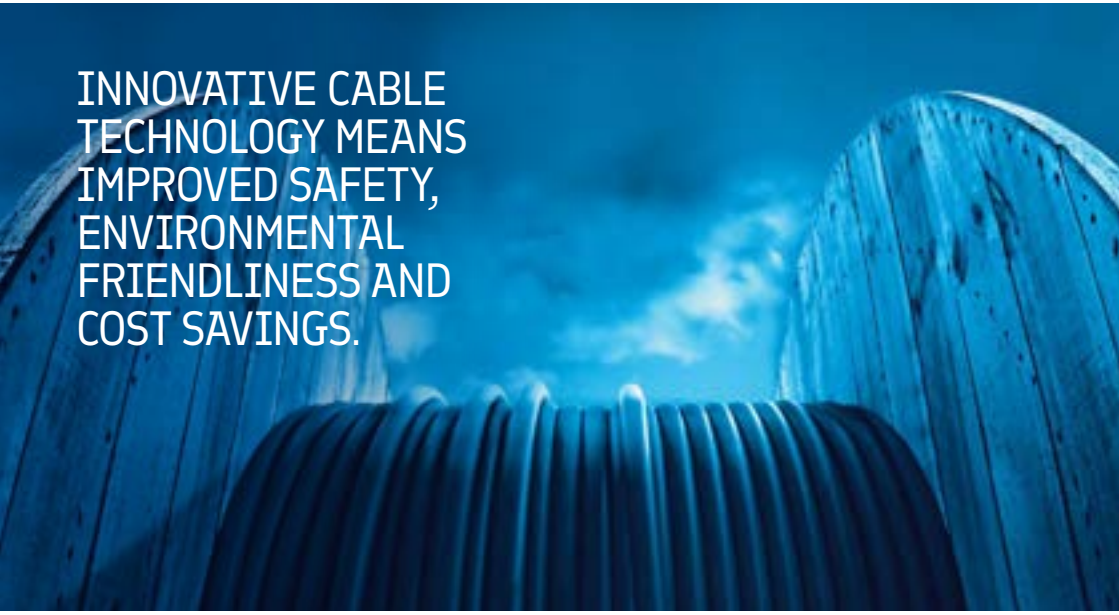
All of the materials used in the production of our cables are recyclable. Nothing goes to waste and everything can be reused.

IMPROVED SAFETY

All of our marine cables are halogen-free, flame retardant and self-extinguishing. They are tested using the highest standards, and we make no compromises on the quality of the materials used in production. Our cables offer improved safety for crew, passengers and builders, because none of the cables exude toxic fumes, and they all have low smoke emissions. Our cables have approvals by all major classification societies, including ABS, BV, CCS, DNV-GL, LRS and RINA.

SAVINGS IN INSTALLATION

Using the latest technology, we focus on reducing cable weight and size as well as increasing cable flexibility, enabling fast and easy installation. A smaller diameter means you can fit more cables and equipment in the same space. Being able to use smaller glands and smaller and fewer cable trays saves money in installation accessories.



INNOVATIVE CABLE TECHNOLOGY MEANS IMPROVED SAFETY, ENVIRONMENTAL FRIENDLINESS AND COST SAVINGS.

Our cables are highly flexible with a smaller bending radius and have slippery sheathing materials, resulting in easier pulling and faster installation on board.

THE REEL DEAL IN THE MARINE INDUSTRY

We have specialized in the development and production of marine cables for over 50 years. Our superior technical advantage has been achieved from years of experience and continuous development together with all our stakeholders. We cover the full range of cabling needs for the entire shipbuilding project and have a wide variety of customized cables to reach an optimal solution for all needs.

Together with our extensive stock, fast delivery times and exquisite customer service, we continue to be the reel deal in the marine industry.

REFERENCES

- Meyer Turku – Mein Schiff 2 and Costa Smeralda cruise ships
- MV Werften – Global I and Global II cruise ships
- MV Werften – Endeavour polar cruise ship
- Fincantieri – Carnival Panorama cruise ship
- Lürssen – luxury yachts

CONTACT

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WHEN EXPERIENCE COUNTS

Promeco

Promeco's services include all steps from design to commissioning.

Our flexible manufacturing supplies customers with mechanical products for engine rooms and machinery. In electrics, our key products are control and automation systems and power products, such as switchboards, variable frequency drives and starters.

OUR OFFERING FOR MARINE INCLUDES

- Electromechanical systems, engineering, services and installations, 3D scanning, SOLAS solutions
- Marine control systems
- Switchboards
- Under 1,000 V control centers
- Group starters
- Exhaust systems for engines and insulation solutions
- Hydraulic and pneumatic products

Lately, products related to LNG and emission treatment technologies have been added to our scope.

SMART SWITCHBOARD TECHNOLOGY

Promeco offers low-voltage switchboards for power distribution and propulsion. Integrated with smart technology, our products give customers the ability to optimize energy flow and fuel consumption.

ENGINE INSULATION

Promeco's engine insulation solutions meet and exceed the demands of the latest SOLAS convention, securing the maximum level of safety in engine rooms.

REWARDS OF LONG EXPERIENCE

Our long experience producing control and automation systems for propulsion has rewarded Promeco self-classifying rights with DNV-GL and Bureau Veritas.

In 2019, Promeco employed 480 professionals.

REFERENCES

- Rauma Marine Constructions – Molslinjen and Wasaline's Aurora Botnia
- Wärtsilä – engine insulations, SOLAS retrofits to engine rooms
- ABB Marine & Ports – control systems & drives
- Kongsberg – control systems, drives & starters

CONTACT

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www.promeco.fi

FRONTRUNNER IN MARINE AUTOMATION & SCRUBBERS

Valmet FORWARD

VALMET DNA SYSTEM – THE ESSENCE OF AUTOMATION

Valmet DNA offers reliability, high availability and smart solutions to control and monitor ship systems. Its advanced and flexible design adapts to any vessel. Valmet DNA integrates control, alarm and monitoring solutions for machinery and systems. Versatile tools analyze the historical performance and status of the controlled and monitored machinery.

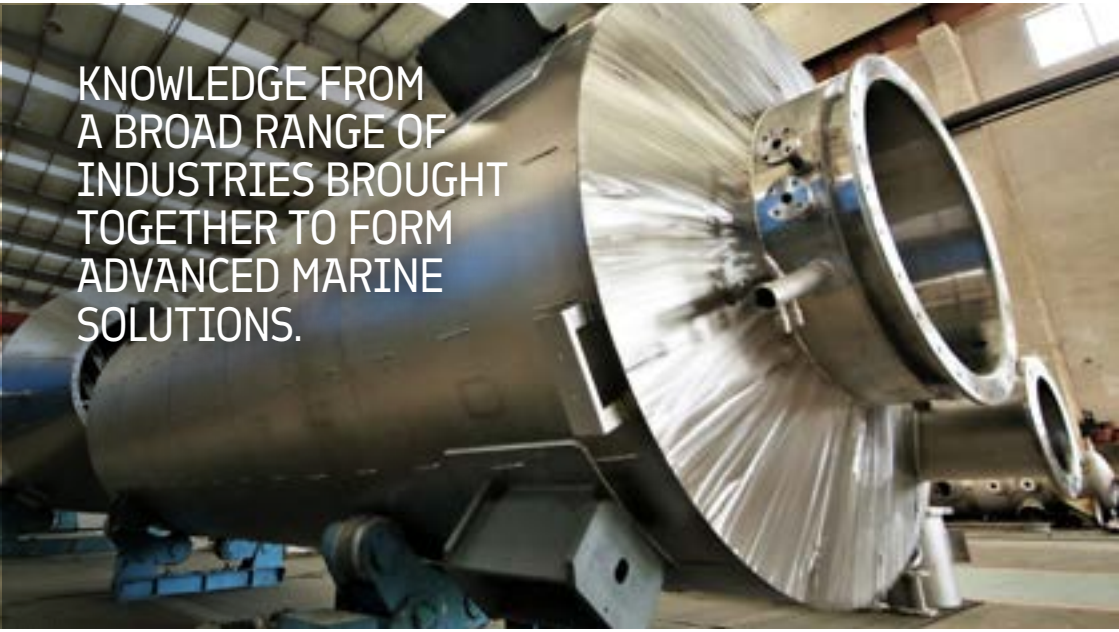
Valmet's Energy Management System optimizes performance, saving fuel and enhancing sustainability. Intuitive graphical displays and dashboards show how efficiently energy is produced, consumed and recovered.

CYBERSECURITY

Based on standards like DNV-GL RP0496, our cybersecurity ensures the highest level for onboard automation systems. We offer secure system network architecture, endpoint security, virus protection and software backup and recovery.

SCRUBBING EXHAUST GAS

Valmet's hybrid scrubber combines open- and closed-loop scrubbers. The special dual-water hybrid mode optimizes chemical, freshwater and electricity consumption. Valmet DNA efficiently controls and monitors emissions to always be within limits.



FLEXIBLY AT YOUR SERVICE

Valmet has more than 130 sales and service offices globally, with technology centers and production units in 33 countries. Our local service experts offer flexible and swift service request handling.

LONG MARITIME HISTORY

Valmet's roots date back more than 200 years in the marine business, starting with small repair yards in Helsinki. Today, Valmet provides reliable marine automation and innovative exhaust gas cleaning solutions globally. As a major player for more than 40 years, our automation systems have been installed on more than 800 ships.

REFERENCES

- Chantiers de l'Atlantique – Symphony of the Seas, world's biggest cruise ship
- Chantiers de l'Atlantique – MSC Grandiosa cruise ship
- Meyer Werft – Spectrum of the Seas cruise ship
- Arctech Helsinki Shipyard – Gennadiy Nevelskoy icebreaker and multipurpose standby vessel
- Rauma Marine Constructions – Hammershus RoPax vessel

CONTACT

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SAFETY AND SECURITY, ALARM SYSTEMS

LEADING MARINE FIRE PROTECTION

Marioff's HI-FOG® is a world-leading fire suppression system currently installed on more than 2,000 vessels, ranging from private yachts to vast cruise ships and navy vessels.

PROTECTING THE ENTIRE VESSEL WITH A SINGLE SYSTEM

The smart architecture of HI-FOG – one panel controls the entire ship's system – allows it to be used quickly and efficiently. Furthermore, it is able to protect every part of the ship, including accommodation, galleys, service areas, Ro-Ro decks and machinery spaces.

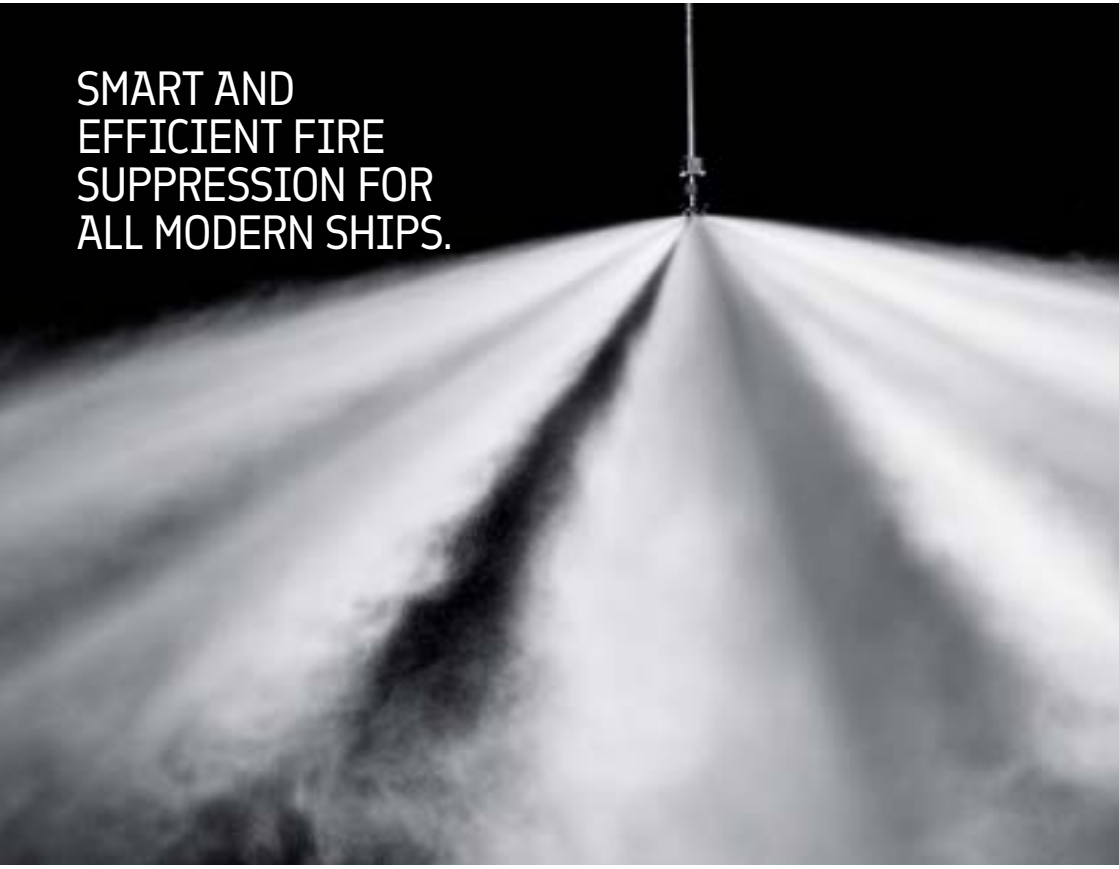
OPTIMAL POWER CONSUMPTION

Enabled by frequency control technology and efficient electric motors that optimize power consumption, the HI-FOG system remains in standby mode most of the time and uses only a very small amount of power. Moreover, environmental effects during system testing and release are close to zero, as the only extinguishing media used is pure water.

Small-diameter HI-FOG tubing can be hidden away in tight spaces, while state-of-the-art sprinkler heads can be artfully installed to blend in with the interior design.

30 YEARS OF INNOVATION AND EXPERIENCE

Marioff is an innovator of high-pressure water mist fire protection technology. We design, manufacture, install and maintain HI-FOG solutions that enhance fire safety on land and at sea globally.



With over 30 years of experience and over 1,800 successfully completed marine projects, Marioff has gained thorough knowledge of its customers' business environment, operating models and needs for fixed firefighting systems at sea.

REFERENCES

- Carnival Cruise Lines
- Royal Caribbean Cruises
- Viking Line
- Helsinki Shipyard
- Meyer Turku

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NAVIGATION SYSTEMS

TECHNOLOGICAL SAFETY AND EFFECTIVENESS

FURUNO FINLAND OY

Furuno Finland Oy is a pioneer in designing, manufacturing and supplying ship navigation systems. The company has long experience in bridge solution deliveries for all types of vessels.

TURNKEY PROJECTS FOR INTEGRATED BRIDGE SYSTEMS

Furuno Finland Oy provides integrated bridge systems as a turnkey delivery. Our expertise covers electrical and mechanical design with mock-up production, console production, installation and commissioning, including the FAT, HAT and SAT processes. We have strong service and maintenance capability, which guarantees a high usability level and low lifecycle cost.

Furuno Finland Oy has its own R&D department for developing efficient navigation solutions. We also deliver surveillance systems developed in-house, including radars, stabilized thermal cameras, oil and ice radars, integrated oil spill detection and system integration.

Furuno Finland Oy delivers navigation systems that improve safety as well as save time and money. The FURUNO brand has received awards in a total of 6 categories of the 2019 NMEA Award, presented at the 2019 NMEA/RTCM Marine Electronics Conference & Expo. FURUNO radar has been awarded 48 times in a row.

RELIABLE NAVIGATION AND SURVEILLANCE, WITH HIGH USABILITY AND LOW COSTS.

POWER IN NAVIGATION

Furuno Finland Oy is a subsidiary owned by Japanese Furuno Electric Co, Ltd. The company employs 50 people and was established in 2002.

REFERENCES

We have built over 100 high-level integrated bridges.

CONTACT

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INSULATION SOLUTIONS

HIGH-QUALITY STONEWOOL INSULATION PRODUCTS

PAROC stonewool is sustainable, high-quality insulation with superior product properties. It meets demands from the marine and offshore industries in terms of sustainability, fire safety and comfort.

SUSTAINABLE AND MANY OTHER BENEFITS

Up to 40% lighter, PAROC Light Marine insulation solutions for A-class fire protection on steel and aluminum constructions offer benefits, such as lower operating costs, reduced weight, increased speed, lower fuel consumption and decreased emissions.

80 YEARS OF QUALITY

PAROC stands for energy-efficient, fire-safe stonewool insulation solutions for new and renovated buildings, marine and offshore, acoustics and other industrial applications. Throughout our 80-year history, PAROC products and solutions have earned a reputation for high performance, technical expertise and sustainability.

PAROC and Owens Corning joined forces in 2018, and PAROC became part of the Owens Corning Insulation Business.

REFERENCES

- Meyer Turku – Mein Schiff 2 cruise ship
- Chantiers de l'Atlantique – MSC Bellissima and MCS Grandiosa cruise ships
- Fincantieri – Costa Venezia cruise ship
- Fincantieri – Carnival Panorama cruise ship

CONTACT

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INNOVATIVE SHIP CONSTRUCTION SOLUTIONS

SAINT-GOBAIN

LESS WEIGHT MEANS MORE EFFICIENCY

Our products comply with the environmental, energy-efficiency, weight-saving, safety, aesthetic and comfort requirements for ships, which are omnipresent in our customers' specifications. Experience our weight-saving and energy-saving solutions and smart appliance of high-performance coatings.

WIDE CHOICE OF INNOVATIVE PRODUCTS AND SERVICES

From the initial stages of a project, Saint-Gobain provides architects, designers, owners and administrative authorities with a choice of innovative products and services for the construction or renovation of ships and offshore installations. These include high-performance glazing, mineral wool insulation, hygienic wall linings, floor systems / deck coverings, fire-retardant plywood, piping products, valves, actuators and coating solutions.

REFERENCES

- STX Finland – Viking Grace ferry
- Meyer Turku Finland – Tallink Megastar ferry
- SMOE Singapore – Ekofisk Accom 2/4Z topside accommodation rig

CONTACT

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INNOVATIVE
PRODUCTS AND
SERVICES FOR
SHIPS AND
OFFSHORE
INSTALLATIONS
SAVE ENERGY AND
THE ENVIRONMENT.

TOOLS & EQUIPMENT

WASHING ROBOTS FOR WINDOWS AND VESSEL SIDES

TS-EN

KEEPING EVERYTHING SHIP-SHAPE

We help owners, shipyards and designers focus on their jobs and succeed in designing magnificent vessels to delight passengers and take them to exotic places.

The vessel plays an essential role in the overall maritime experience of the passengers. They want to take in all the views when cruising and take pride in embarking on a vessel that glistens, truly standing out from other vessels beside them.

Our job is to provide washing robots that keep up a vessel's stellar appearance, both at sea and in port. These robots do the dirty work, so your crew can focus on making sure the passengers have the time of their lives on board.

MORE THAN A DECADE OF EXPERIENCE

Since 2007, TS-EN has been using modern design tools and tapping into the skills of knowledgeable marine industry personnel within our network of cooperating companies to bring our washing robots to vessels sailing around the world.

We focus on the machine systems, aluminum and stainless-steel constructions that work best on each and every vessel.

FROM DESIGN TO DELIVERY

Our scope of work is from design to complete system delivery, autonomous robots with remote monitoring and visual control,

INTELLIGENT WASHING ROBOTS KEEP UP A VESSEL'S STELLAR APPEARANCE.

along with graphical reporting on abnormalities. We have a strong focus on seamless adaptation of our products to your environment with the lowest need for maintenance.

TS-EN robots are built with a compact, lightweight design, which does not interfere with the vessel layout. Each unit is energy and water efficient.

We deliver modular and flexible products per your specifications, allowing a smooth integration into the vessel's design and building process.

Our service keeps TS-EN washing robots in premium condition.

REFERENCES

- Meyer Turku – Mein Schiff 3, 4, 5 and 6 cruise ships
- Meyer Turku (STX) – Viking Grace cruise/RoPax vessel
- Xiamen Shipbuilding Industry – Viking Glory cruise/RoPax vessel
- Kvaerner Masa-Yards – Silja Symphony cruise/RoPax vessel

CONTACT

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SHIP SUPPLY

SMARTER AND BETTER WAYS OF MOVING CARGO

CARGOTEC

Cargotec's business areas Kalmar and MacGregor provide smart, intelligent and sustainable solutions to ports, terminals and at sea. Our Hiab business area is the best-in-class in smart solutions for on-road load handling.

INTEGRATED PORT AUTOMATION AND SYSTEMS

Kalmar's automation solutions support terminal and port operators to reduce their operational costs and use their fleet more efficiently. Kalmar One, the first open automation system for container terminals, enables automated container handling operations regardless of vendor, equipment type, operation mode or level of terminal automation. Kalmar's OneTerminal provides an integrated automation solution that brings together Kalmar and Navis software systems, equipment and services.

Kalmar's cargo handling equipment is largely available with electric power sources. An all-electric Kalmar solution is not only good for the environment, but its total cost of ownership can be significantly lower than that of a diesel-powered one.

DIGITAL INTELLIGENCE FOR MARINE CARGO

MacGregor's maritime solutions include a range of digitally-enabled services to help customers achieve higher levels of operational performance, efficiency and sustainability.

MacGregor Cargo Boost increases earning potential and allows more flexibility to meet operational and market changes. It helps customers to maximize cargo space utilization, efficiency and lowers emissions per transported unit of cargo.

OnWatch Scout helps customers maximize equipment and vessel availability and minimize unplanned downtime. It uses advanced monitoring systems to analyze component condition, predict potential failure and support maintenance planning needs.

REFERENCES

- Kalmar automation – TraPac, USA port and logistics park
- Kalmar electric offering – hybrid shuttle carriers at the Port of Virginia, USA
- MacGregor – Cargo Boost, Breakbulk Optimiser, OnWatch Scout, C-How simulation services

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GUEST EXPERIENCE

TURNKEY SUPPLIERS

MAKINEN

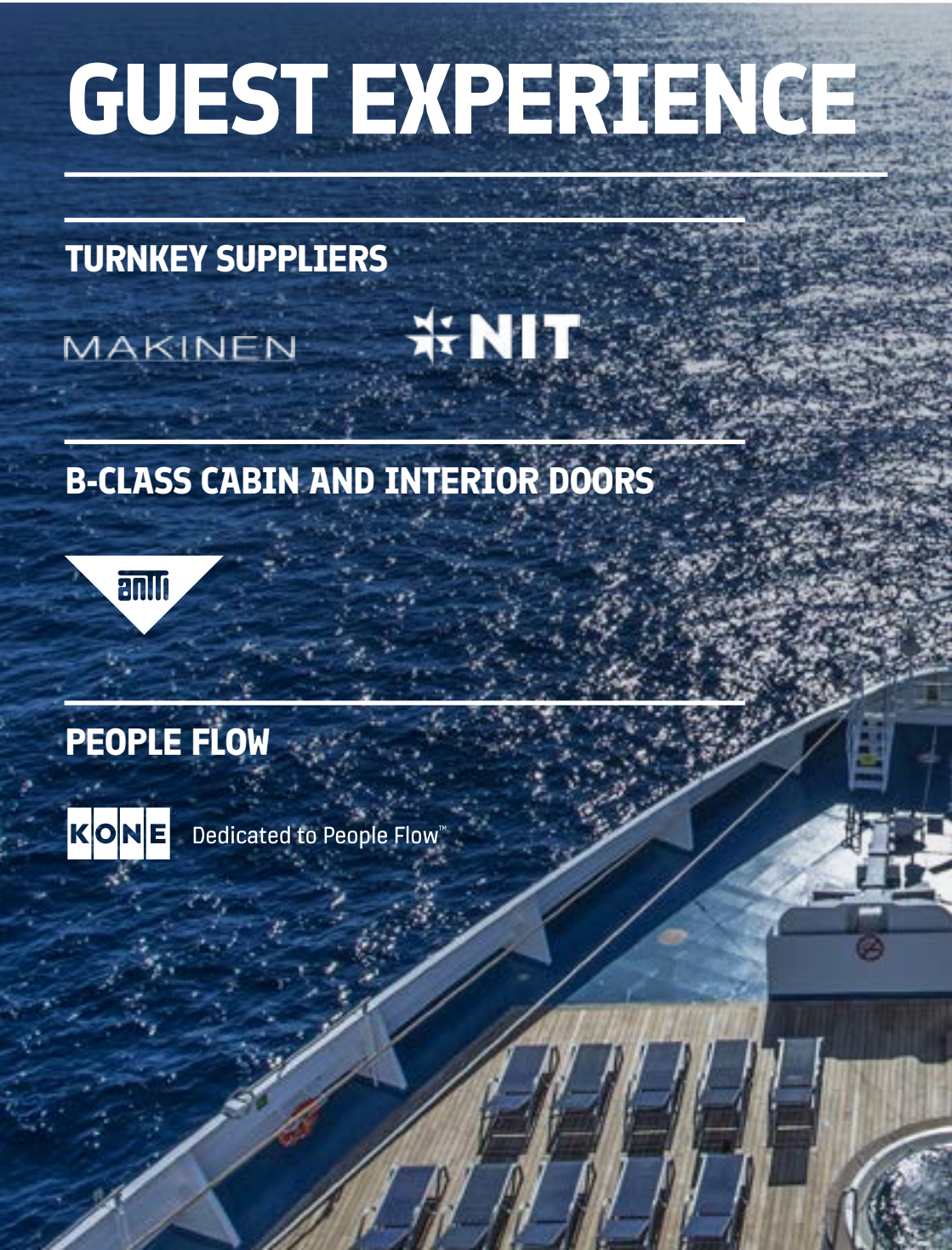
NIT

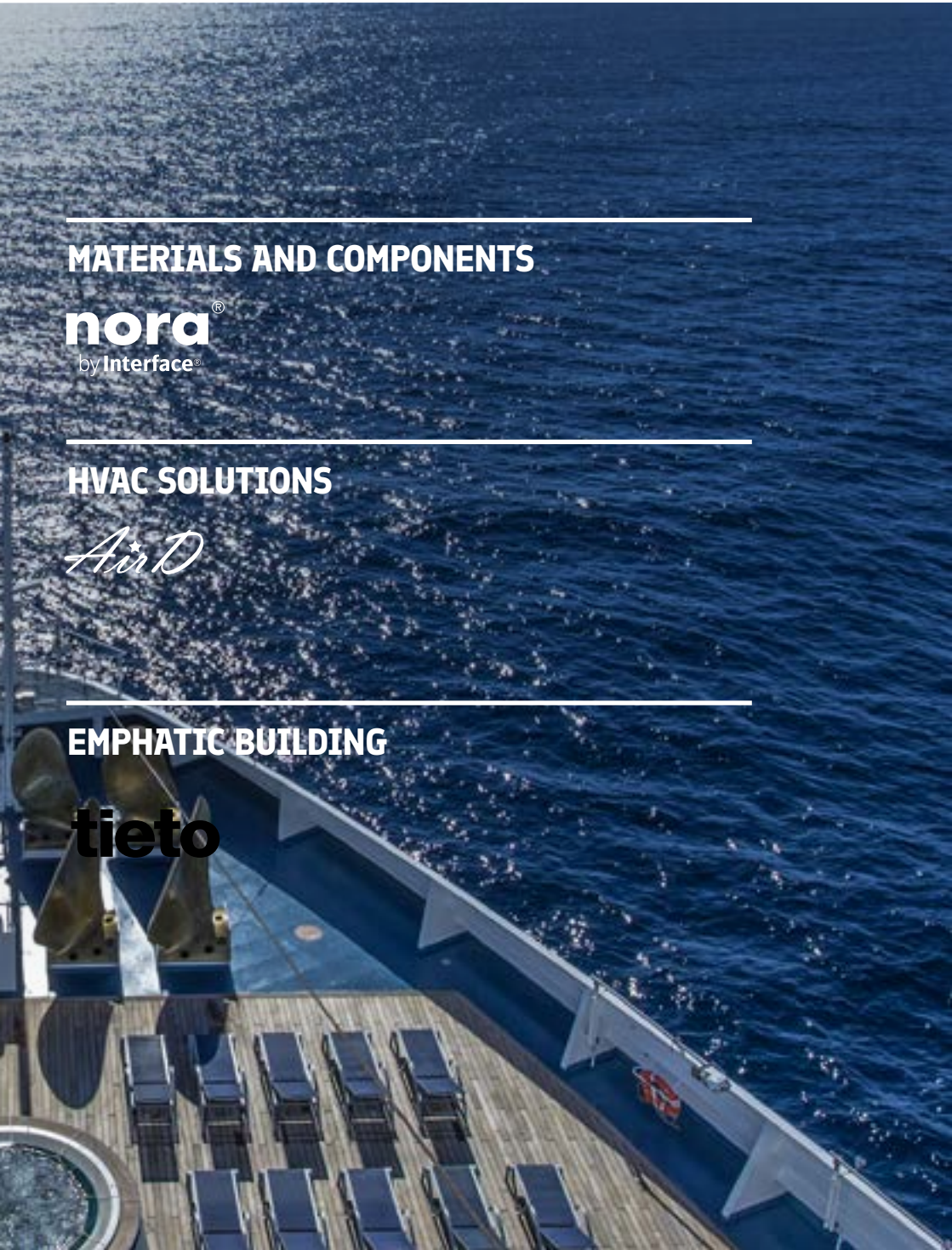
B-CLASS CABIN AND INTERIOR DOORS

antti

PEOPLE FLOW

KONE Dedicated to People Flow™





MATERIALS AND COMPONENTS

nora® by Interface®

HVAC SOLUTIONS

AirD

EMPHATIC BUILDING

tieto

TURNKEY SUPPLIERS

CRUISE SHIP CABIN MODERNIZATIONS

MAKINEN

MAKINEN corporation is known as one of the leading interior turnkey project contractors specializing in cabin refurbishments for cruise ships and passenger ferries operating worldwide. We provide full service for modernization and newbuilds of cabins and public spaces.

PROJECT MANAGEMENT, FULL RESPONSIBILITY

We aim to deliver the best refurbishment experience. We take complete responsibility for the project from start to end – planning, resourcing, purchasing, installation and overall project management.

Our cabin refurbishment projects typically consist of:

- New wall, floor and ceiling surfaces
- Fixed furniture
- Textiles
- Bathrooms
- Technical implementation, such as electricity and piping

OUR UNIQUE SOLUTION: LEAN CABIN REFURBISHMENT

We were the first in the world to implement lean production methodology in cabin refurbishment projects. Lean is a production practice aiming at eliminating all waste of time and resources. Our lean project execution guarantees a steady flow of ready cabins, instant quality control and project planning with an accuracy of within a minute.

The lean solution is cost efficient. We deliver a new high-quality cabin every 7 minutes and shorten dry dock times. The lean approach also ensures that sustainability is at

the highest possible level in cabin refurbishment projects.

LONG-TERM TRUST AND RESPECT

During our long history, we have established an extensive global supplier network. We build close, long-term relationships with our suppliers. Having trust and mutual respect supports our ability to better serve our customers.

MAKINEN, I.S. Mäkinen Oy, was founded in 1992. We have 70 permanent employees, and our offices are located in Finland, the US and China. During the past 15 years, we have refurbished over 40,000 cabins.

REFERENCES

- Royal Caribbean International
- Carnival Cruise Lines
- Crystal Cruises
- Norwegian Cruise Line
- Meyer Turku

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PHOTO KARI PALSILA

BUILDING GREAT SPACES

Our teams design and build interiors from carefully selected materials by paying attention to the environmental load. Choosing sustainability means smart thinking for every solution and having control over the whole process.

INDIVIDUAL QUALITY SOLUTIONS

Innovative solutions are made individually for each situation, which creates tens of thousands of square meters of the greatest spaces for guest experiences. Committed to quality, our versatile service offers smart work from design to installation, from the smallest details to highly specified requirements.

ALWAYS ON TIME

Our work strives for perfection and aims at 100% on-time delivery. To us, creating the highest quality also means honesty, activity and the highest standards of work safety. That's why the process happens in close cooperation with customers and various stakeholders.

Success for us is when you think of our company as your most trusted turnkey supplier in shipbuilding.

GREAT SPACES ON SHIPS

NIT is a Finnish maritime industry company that specializes in turnkey interior design and construction contracts for cruise ships and ferries. We design and build passenger and crew areas, restaurants, nightclubs, spas and saunas, including technical background work, such as insulation, electrical installation, piping and HVAC.

REFERENCES

- TUI Cruises
- AIDA Cruises
- Costa Crociere
- Royal Caribbean International
- Viking Line

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CHOOSING
SUSTAINABILITY
MEANS SMART
THINKING IN
DESIGNING SHIP
INTERIORS.

B-CLASS CABIN AND INTERIOR DOORS

QUALITY, SAFETY AND STYLE

TAILOR-MADE DOORS

The doors made by Antti-Teollisuus are tailored according to customers' needs and the ship designers' plans and visions. Advanced manufacturing techniques and continuous research and development make it possible to create unique surface textures and even the most unusual visual solutions. Our services cover everything from the product to the packaging and the entire process from its beginning to a correctly timed delivery to the customer.

DOORS WITH SAFETY AND INNOVATIVE CONNECTIONS

Safety, in its broadest sense, is a door's most important attribute. Safety is achieved by choosing the correct materials and details – and adding a little ingenuity. The doors Antti-Teollisuus manufactures meet the requirements of all applicable shipbuilding standards. Our doors work just as well in the cold of the north and the heat of the tropics. They protect, insulate and increase comfort – safely.

Antti-Teollisuus offers new innovations that provide added value. Low-maintenance, completely lubrication-free hinges ensure our doors are durable, practical and reliable. Our latest innovation – the lift-on / lift-off e-hinge – provides a concealed ethernet cable connection for online locks – safe and easy.

Antti-Teollisuus has been designing and manufacturing high-quality ship doors in Salo, Finland, since 1992. Antti-Teollisuus has delivered more than 300,000 doors for different cruise ships, ferries and offshore applications. This solid

TAILOR-MADE, SAFE AND SMART DOORS – ESSENTIAL TO MODERN SEAFARING.

history offers us the experience that guides us into the future with fresh ideas, innovative solutions and great products.

REFERENCES

- Meyer Werft – Royal Caribbean Cruises' Odyssey of the Seas cruise ship
- Meyer Werft – Saga Cruises' Spirit of Adventure cruise ship
- Kleven Verft – Hurtigruten's MS Fridtjof Nansen cruise ship
- Meyer Turku – Carnival Cruise Lines' Mardi Gras cruise ship
- Meyer Werft – P&O Cruises' Iona cruise ship

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PEOPLE FLOW

THE SMARTEST LIFETIME PARTNER FOR YOUR VESSEL

KONE Dedicated to People Flow™

Smooth people and material flows are critical to ensure a pleasant, reliable and safe journey for all. KONE solutions combine industry-leading technologies with world-class lifecycle support and are backed by an impressive track record of on-time, on-budget delivery.

WE HELP VESSELS ACHIEVE THEIR FULL POTENTIAL

Assess, plan and design seamless people and material flows with the help of our expertise. We gather and analyze data, and simulate reality, to get insights into what works and what doesn't – and why. We can help your vessel achieve its full potential with new technologies, such as adaptive destination control.

WE HELP YOU KEEP EVERYTHING ON SCHEDULE

Our site teams are at your service at every major shipyard in the world to ensure smooth and on-time installation, while our efficient and flexible installation methods and professional project management skills save time and costs.

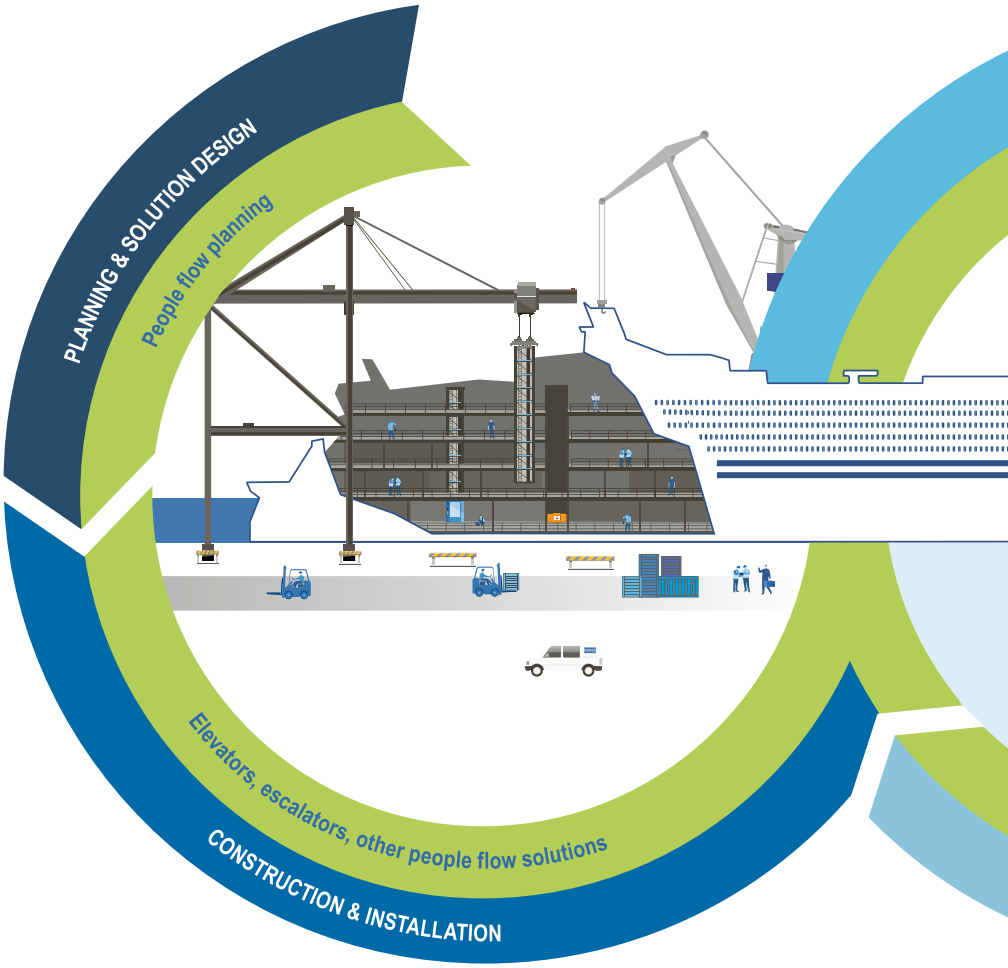

REACH FULL
POTENTIAL AT
SEA WITH SMART
TECHNOLOGIES
THAT ENABLE
SMOOTH PEOPLE
AND MATERIAL
FLOWS.

WE HELP YOU STAY ONE STEP AHEAD

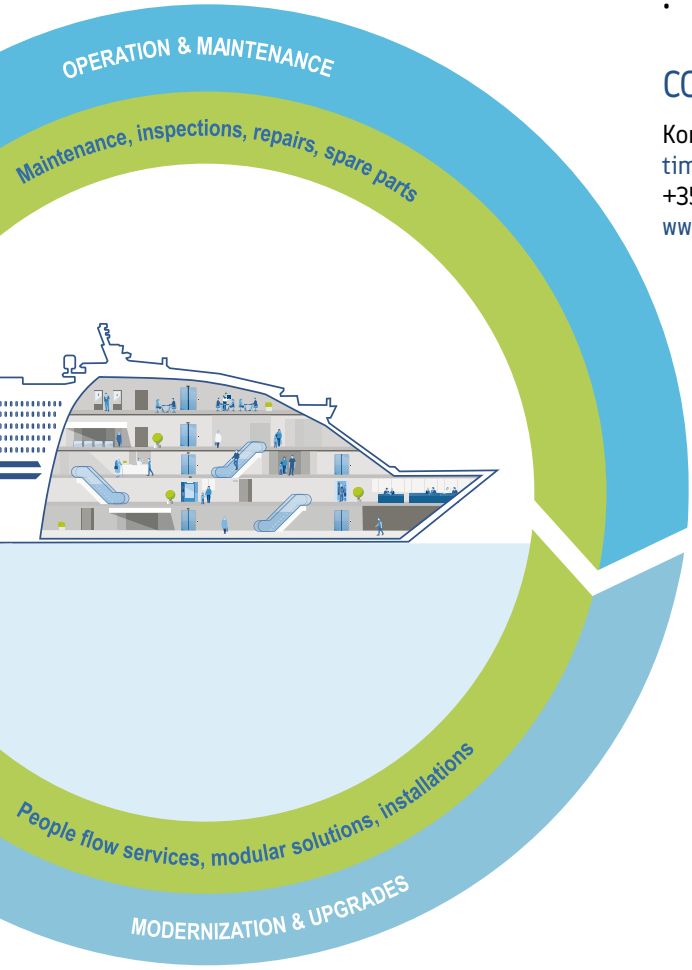
With our new intelligent monitoring and preventive maintenance services, we can now better predict, maintain and take action to prevent breakdowns. This means increased safety, full transparency and peace of mind.

WE'RE THERE FOR YOU WHEN IT'S TIME TO MODERNIZE

Modernization offers a tremendous opportunity to improve the overall people flow in a vessel. Modernizing with KONE improves equipment reliability, increases safety, and cuts energy and maintenance costs.



Our flexible, modular solutions deliver maximum value with minimum disruption to vessel operation. We eliminate guesswork by using sensors to capture the true traffic profile of your vessel.



REFERENCES

- Chantiers de l'Atlantique – Celebrity Edge
- Chantiers de l'Atlantique – Symphony of the Seas, Oasis-class vessel
- Chantiers de l'Atlantique – MSC Grandiosa, Vista-class vessel
- Fincantieri – Sky Princess, Royal-class vessel
- De Hoop – Celebrity Flora, Celebrity Xpedition mega yacht

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MATERIALS AND COMPONENTS

THE WORLDWIDE LEADER IN RUBBER FLOORING

nora® by Interface®

SECURE FLOORINGS EVEN DURING ROUGH SEAS

The shipbuilding and offshore industry demand unique and specific flooring solutions. nora® floor coverings meet the specific demands made on floor coverings for interior use in all types of vessels, such as passenger liners / ferries, cruisers, tankers, container and marine ships, as well as in the offshore industry worldwide. We offer a selection of IMO-certified and coast guard approved flooring solutions to meet the demands of different applications.

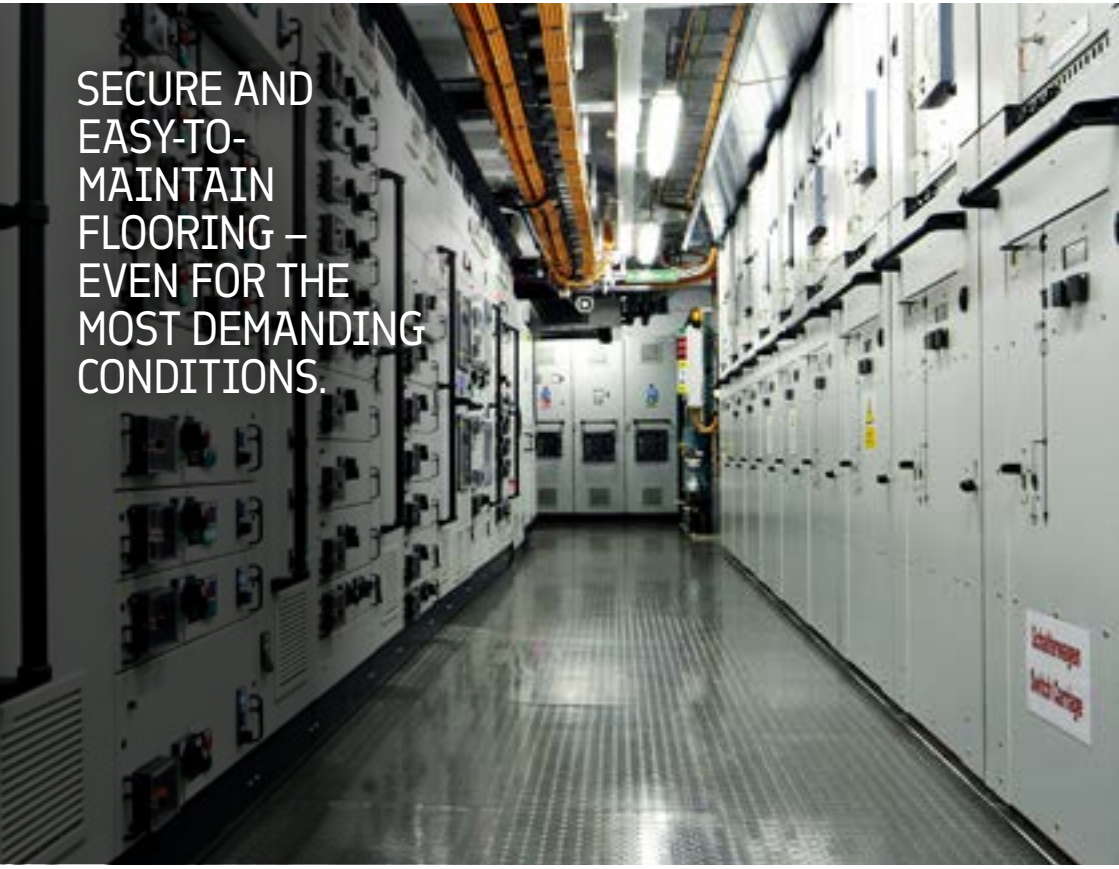
SUITED TO VARIOUS APPLICATIONS

The material properties of nora® rubber floorings are perfectly suited to meet the needs of various applications like crew quarters, control rooms, bridges, stairwells and galley areas. Safety benefits offered by nora® floorings include anti-slip surfaces and excellent fire-protection properties.

FOR DEMANDING ENVIRONMENTS

For particularly demanding environments, such as control rooms, nora systems offer flooring solutions that resist most oils and greases. For high-traffic areas, our floorings are extremely durable as well as ergonomic for walking comfort. For ease of maintenance, the surfaces require no coating to allow fast, efficient cleaning.

For nearly 70 years, nora systems have developed rubber floor coverings that solve the daily challenges



SECURE AND EASY-TO-MAINTAIN FLOORING – EVEN FOR THE MOST DEMANDING CONDITIONS.

faced by customers. Our nora® floor covering solutions are the result of extensive experience in rubber materials and close partnerships with planners and users.

REFERENCES

- Lürssen – Hermann Marwede search and rescue cruiser
- Sonne-Schmidt Marine – Sonne research vessel
- Mitsubishi Shipbuilding – AIDAprima cruise ship
- Meyer Werft – Quantum of the Seas cruise ship

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HVAC SOLUTIONS

THE FUTURE OF VENTILATION DESIGN

AirD

SUSTAINABILITY AND ENERGY EFFICIENCY WITH ON-DEMAND VENTILATION

You can achieve substantial savings in energy and CO_2 emissions by monitoring air quality in the cabins and public areas to accurately know what the levels are. Additionally, temperature and humidity in each cabin and in public areas can be monitored, allowing you to supply fresh air according to demand.

REGULATING FRESH AIR SUPPLY AUTOMATICALLY IN REAL TIME

With AirD smart solution, you can supply approximately 50% less fresh air than with a solution of constant air flow, without compromising the air quality. Supplying less air means less energy spent on heating and cooling that air and less energy spent on circulating air in the cabins.

INFORMATION ON VENTILATION AND AIR QUALITY

AirD allows you to be aware of energy consumption and air flow to regulate and balance fresh air supply and pressure in cabins. The information collected can be used to control smart cabins, hotel services, claims handling and for safety, such as CO_2 regulations, and more. All information collected can be supplied to any system on board or on land.

REFERENCES

- Admares Modular Constructions – Floating Villas ventilation design
- Tallink Silja Serenade – Siljaland vent cover design

CONTACT

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SMART VENTILATION OFFERS SAVINGS AND SUSTAINABILITY.

EMPHATIC BUILDING

ENHANCING END-USER EXPERIENCE ON BOARD

tieto

Our purpose with Empathic Building is to inspire the best possible end-user experience. With our service, we enable a user-friendly way to visualize ship information in real time, facilitating daily decision-making. The service also provides a feedback engine, enabling better service planning and faster response times.

CREATE A DIGITAL TWIN

Tieto Empathic Building service includes a digital twin for the ship that visualizes the space in 3D and 2D on our Empathic Building application. Add whatever content you want on the map of rooms, decks and working areas – menus, lifeboats, timetables, surveys – in the form of text, images, videos, websites and links.

FACILITATING COLLABORATION

Tieto Empathic Building application provides tools to enhance collaboration and co-innovation between the ship's staff and passengers. It is compatible with all types of indoor positioning technologies.

AVAILABILITY, UTILIZATION RATES AND AIR QUALITY

Empathic Building visualizes the space and cabin occupancy for end-users in real time, making the ship's daily life more efficient and user friendly.

It even visualizes air quality data, such as temperature, CO_2 levels, humidity, air pressure, light and

noise levels. End-users can then select an area based on their personal preferences.

REPORT PROBLEMS AND GIVE FEEDBACK

The Empathic Building service ticket module is one of our easy-to-use, software-only components. It is a location-based ticketing system and has a tool for the ship operator to manage the tickets.

Tieto Empathic Building voice module is a real-time feedback channel for office end users. It allows knowing in real-time how ship crew and passenger's feel and their level of satisfaction.

INTERESTED IN EMPATHIC BUILDING FOR YOUR SHIP?

Great user experience lies at the heart of our services. Pick the elements you wish. We can customize colors for the map, layer toolbar, headers and more based on your company's brand color book. Furthermore, we offer key user trainings and deployment.

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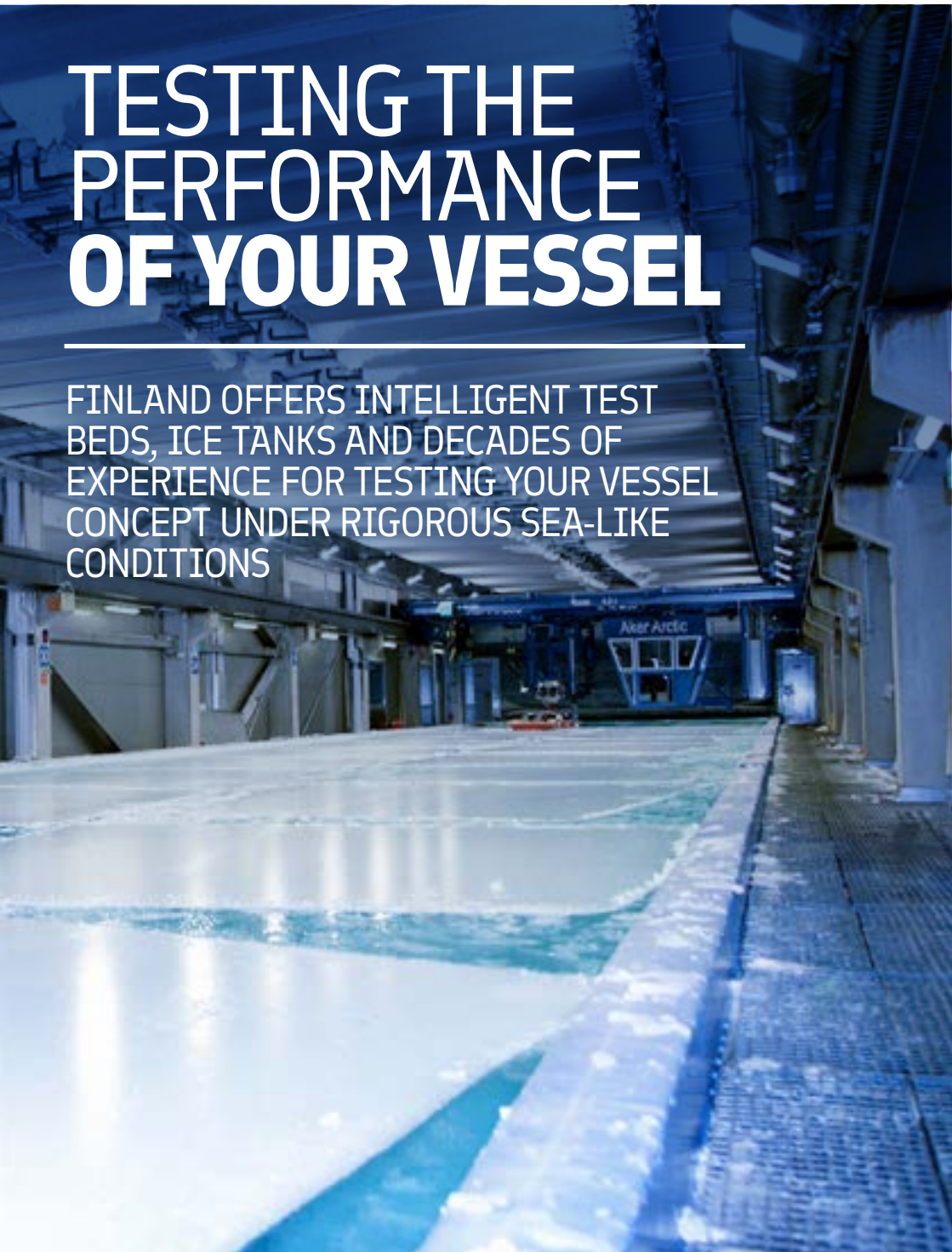
TESTING THE PERFORMANCE **OF YOUR VESSEL**

FINLAND OFFERS INTELLIGENT TEST BEDS, ICE TANKS AND DECADES OF EXPERIENCE FOR TESTING YOUR VESSEL CONCEPT UNDER RIGOROUS SEA-LIKE CONDITIONS



AKER ARCTIC – 50 YEARS OF EXPERIENCE IN ICE MODEL TESTS

Aker Arctic

Knowing how ice behaves around ships, offshore structures or port facilities can be challenging. That's why Aker Arctic started ice model testing 50 years ago and is now at the forefront globally. The company currently operates a testing facility with third-generation technology.

At the testing facility, it is possible to visualize the behavior of the ice and quantify the performance of various design parameters. This helps in selecting concepts or testing a design. Model testing is a cost-efficient tool to determine any risks before project completion.

Aker Arctic's current 75 x 8 meter ice model test basin offers a unique glass bottom for viewing from below. Observation windows are included on both sides. The model ice thickness ranges from 15 to 150 mm, representing ice types from first year to multi-year ridges.

Aker Arctic's ice model basin is fully equipped to test new technologies and automated control systems that will pave the way to autonomous shipping. The company has developed its DIVEC™ framework to enable any existing software and hardware to be easily tested in model scale. Control systems can seamlessly power conventional propulsion, podded propulsion and transverse thrusters, allowing customers to develop any vessel configuration.

With completely wireless control, models are free to move throughout the ice model basin unimpaired by the testing apparatus, providing real insights into the behavior of the vessel. Aker Arctic's model testing services can be used to test autonomous ships, providing an economical and safe way to verify vessel performance.

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AALTO UNIVERSITY ICE TANK – A MULTIPURPOSE BASIN

Aalto University

Built in the early 1980s, Aalto ice tank plays a key role in the university's research and education, both in Finland and internationally. Since 2019, it has been open for research associated with ice and open water navigation for researchers and industrial partners.

Aalto ice tank is unique in Europe because of its large width. The 40 x 40 meter basin has a depth of 2.8 meters and features equipment to make model-scale sea ice and open water tests.

The tank has gone through extensive renovation during the last years and was re-opened in spring 2019 with new cooling systems, a new carriage and updated wave maker.

Typical tests in the Aalto ice tank include resistance, propulsion and maneuvering tests of ships in ice, ice load tests on marine structures and the modeling of natural ice formations, such as ice ridges. In the tank, researchers can also study challenges related to waves with the basin's wave makers. Aalto ice tank offers an excellent context to test innovative design concepts and new technologies, such as automated ship models, and analyze their risks in common and extreme navigational operations.

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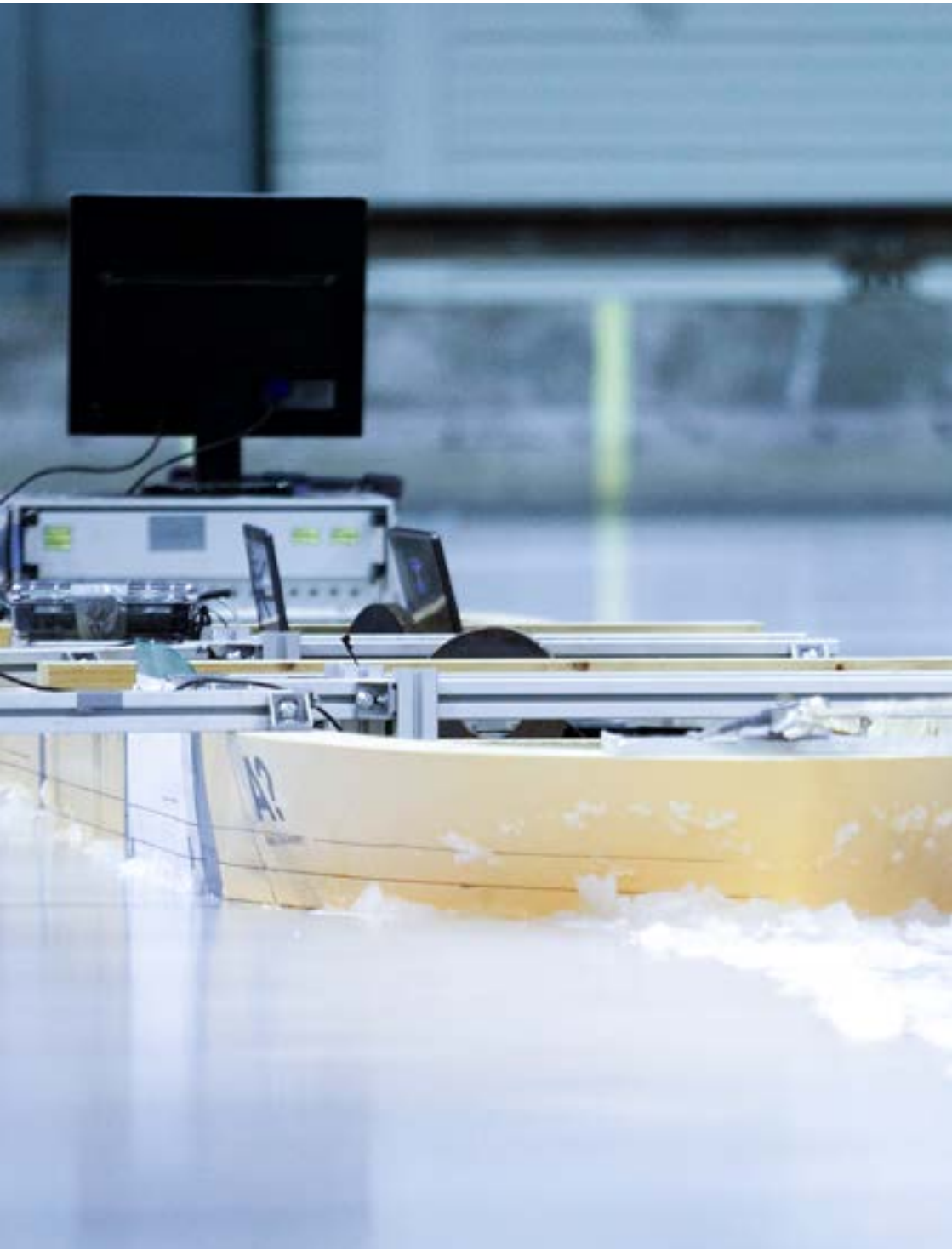

VTT SHIP PERFORMANCE EVALUATIONS

VTT

VTT opened its model test facility at the Helsinki University of Technology's Otaniemi campus in Espoo in the early 1970s with a towing tank. The towing tank is Finland's only open water basin for testing ship models. This tank is 130 x 11 meters large with a depth of 5.5 meters. At one end, a wave maker can create various conditions at sea. Ship models can be up to 9 meters long and weigh 2 to 3 tons. The typical tests in the towing tank include resistance, propulsion, maneuvering and seakeeping tests.

As one of the first research institutes to develop computational fluid dynamics (CFD) methods for marine applications, VTT provides contract research services in hydrodynamics for its customers.

VTT'S SIMULATOR FOR AUTONOMOUS SHIP NAVIGATION

Another special service offered by VTT is its new simulation environment for testing the safe navigation of remotely monitored and controlled autonomous ships. The system is built on top of VTT's ship handling simulator and includes testing and validation in as realistic conditions as possible.

The navigation requires an advanced autopilot system, which is used to control a moving vessel, even when carrying out challenging maneuvers. The system has been designed for testing various autonomous ship navigation systems. Apilot, a specific tool developed by VTT, features three modes – track, heading and slow joystick control for docking. The aim of the research is to make autonomous operations more efficient and safer in the future by implementing the latest technology.

More traditionally, VTT's ship handling simulator is used to study a vessel's maneuvering characteristics at early design stage. For example, the vessel's capability to maneuver through narrow sea routes in challenging conditions has been studied. The maneuvering coefficients for ship hulls are typically determined by model tests in VTT's towing tank.

Contact us to ask how we can help in your RDI activities.

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WHY IT'S SMART TO INVEST IN FINLAND

FINLAND'S SHIPBUILDING HISTORY COMBINED WITH INNOVATION, RELIABILITY AND SMART SOLUTIONS OFFER TOP EXPERTISE TO CREATE SHIPS FOR MODERN SEAFARING

For centuries, shipbuilding has played a crucial role in Finland. Due to the country's isolated geographic location, ships have been key to connect to other countries, link lakeside villages to each other, navigate rivers or break ice to keep ports open throughout the year.

Finland has built some of the world's largest luxury cruise ships, ice-going vessels and icebreakers at its shipyards. Finland also has one of the largest marine system supplier and subcontractor networks in the world. Therefore, foreign investments have been substantial, both in Finnish shipyards as well as the other marine cluster companies.

By investing in a Finland-based company, you get skilled ship design, marine engineering and a digital-savvy workforce. You also gain access to the European markets.

Now, Finland is offering the best of its years of shipping expertise to the world.

RELIABLE RESOURCES

Finland has numerous world-class R&D facilities, countless engineers specializing in areas that are challenging the maritime industry today, one-of-their-kind test beds and is the first in the world to open a 5G network for commercial use.

TOPS IN TECHNOLOGY

Solutions based on IoT, AI and 5G networks are being extensively deployed, also in marine applications. Simultaneously, higher levels of cybersecurity work to keep these masses of data safe.

Finland ranks #3 globally in IIoT. Today, it is one of the most promising business sectors in the country. Key research and commercial platforms are up and running. Additionally, a world-class cluster of machinery companies in Finland is leading the way in utilizing IIoT.

With artificial intelligence (AI), Finland aims to become one of the world's leaders in deploying it for the good of society. The people in Finland know how to optimize algorithms, integrate AI into different sectors, like marine, and are agile-minded and tech savvy. Today, more than 200 Finnish companies in various sizes are applying AI in their business solutions.

5G is already here. It enables super-fast speeds, low latency and a vast amount of connections. For the marine industry, this enables private networks and ultra-quick communications at sea and in port.

Finland provides the ideal incubator for cybersecurity, thanks to an ICT-savvy government and strong support for data privacy. Hackers, cybercriminals and even governments are posing growing security threats that need to be prevented.

Finland is also one of the least corrupt countries, ranking #3 worldwide in transparency. Plus, it has a politically neutral reputation and offers a trustworthy and stable business environment.

PART OF THE EU

As part of the European Union, Finland gives you access to the legislators who are writing the new maritime regulations in the region. This provides insight into upcoming changes and allows you to influence issues that are important to you and your business.

IPR and data security are governed within the EU, giving you more power to protect your rights. What's more, Finland had the lowest corporate tax levels in the EU in 2018 along with very reasonable talent costs.

FINLAND IS OPEN FOR BUSINESS WITH YOU – ON LAND OR AT SEA.

BUSINESS
FINLAND

03.02.2020

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FINNISH EXPERTISE
IN SMART MARITIME

BUSINESSFINLAND.FI

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