

# Results of the Arctic Seas – programme 2014-2017

Project examples  
20.1.2017

# Floating structures rapidly and cost-efficiently



- Containers are transformed into standard floating units. By joining them up, fairly large floating platforms can be created.
- The demand for floating structures is constantly increasing in areas such as arctic regions and developing countries where the conditions are challenging.

“The steering group of our project includes a Tekes expert, who has provided us with valuable feedback and guidance.

**Pasi Peho**

*Director  
Nextbase Offshore Oy*

**Tekes**

**Arctic Seas**

# Arctia Shipping – Ice Management in Oil Recovery (IMOR)

Idea: To adopt *ice management* – the manoeuvring of a vessel and use of its propeller flow – in oil recovery.

Impact: The credibility and effectiveness of mechanical oil recovery will increase. Arctia will consolidate its position as a responsible Arctic operator with diverse expertise.

**Tekes**



“This project will make mechanical oil recovery from icy waters truly possible for the first time”

**Kari Patrakka**

*Senior VP  
Technical Services  
Arctia Shipping Ltd*

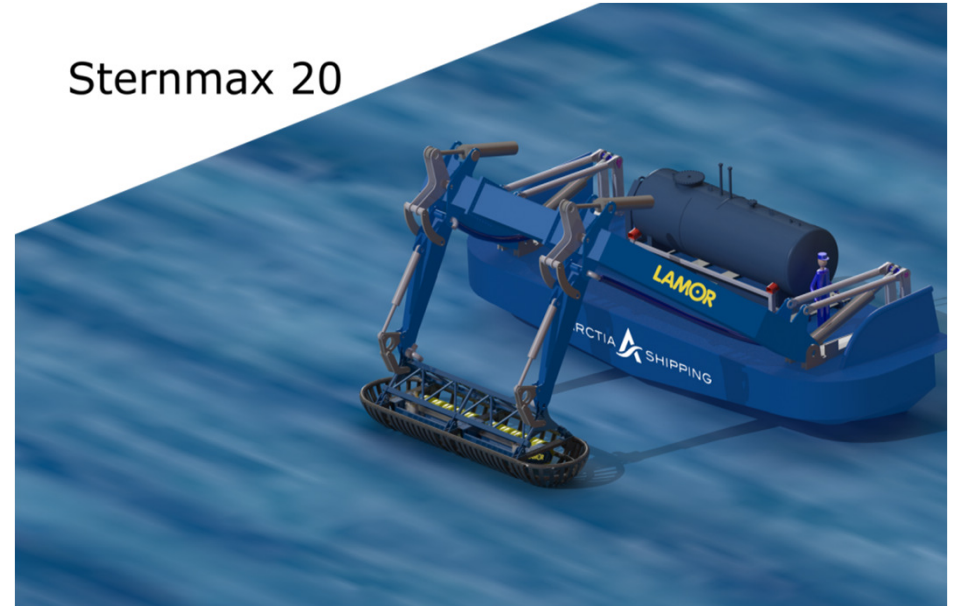
**Arctic Seas**

# Lamor enabling high capacity Arctic oil spill response services

**Idea:** Develop the next generation ice-breaker based large capacity oil spill response system and the business platform for Arctic oil spill response services together with ice breaker fleet operators.

**Impact:** With increasing activities in the Arctic areas, sustainable processes and standards need to be developed. With the development of partner-based oil spill response operations in ice covered waters, the best technology and operational solutions, new goals can be reached.

Sternmax 20



“Tekes has been a reliable partner for Lamor through the history of the company. With the support of Tekes encouraging Research & Development activities and broadened networks, Lamor has reached an undisputable market leader position in the global oil spill community.

**Rune Högström**  
COO  
*Lamor Corporation*

**Tekes**

**Arctic Seas**

# Eira Shipping - developing new ice classed and eco- efficient tanker

**Idea:** There is demand for new ice classed eco-tankers, due to present high energy consumption and existing fleet being unable to meet new environmental standards. New t-24 tankers will be designed to fulfill all present and planned international and local regulations.

**Impact:** New t-24 tanker will have competitive edge due high level environmental and energy efficiency. In addition, dual-fuel engines give an opportunity for flexible fuel optimization

**Tekes**



T-24 tanker will have an option for pre fitting oil recovery system

*Mauri Harki  
Eira Shipping Ltd*

**Arctic Seas**

# Ice propellers take Tevo into Arctic markets



**Idea:** Growing transportation needs and economic activity in northerly sea areas are increasing demand for ship equipment designed for sub-zero conditions. Environmental norms are creating new markets for propulsion solutions suitable for Arctic sea areas

**Impact:** The independently developed propeller must be unique, in order to enable the growth and expansion of business into areas which the subcontracting manufacturer has been unable to penetrate.

**Teves**

“Through the Teves project, we are developing a unique ice propeller product family. This new innovation will reduce the fuel consumption, emissions and noise created by vessels, thereby meeting requirements for the protection of Arctic sea areas.

The solutions will be developed in collaboration with Aker Arctic, a top expert in polar sea engineering, and VTT.”

*Esko Ahtiainen*

*Development Manager, Tevo Ltd*

**Arctic Seas**

# A responsible decommissioning service for Oil & Gas

**Idea:** To provide sustainable, responsible but yet economical solution for decommissioning and recycling of the offshore installations, with special focus on Arctic.

**Impact:** Scandinaval was able to test the concept and develop the marketing strategy and business model. Networks, contacts and co-creation form the key stone of global growth. Scandinaval continues developing the sustainable decommissioning service in co-operation with other Arctic experts.



“ Heading to the Arctic needs balance, flexibility and courage. Tekes funding helped us to concentrate on investigating the markets and creating the network.

**Mikko Siitonen**

*Business Development Manager  
Scandinaval Finland Oy*

**Tekes**

**Arctic Seas**

# Wega Enviro Oy – tailor-made environmental services

**Idea:** To assist our customers to meet the changing operational environment and to maintain their competitiveness. Our core expertise includes environmental matters, shipping, alternative fuels and arctic issues. We are also specialised to offer the project management for the EU co-funding application processes.

**Impact:** Wega Enviro continues to develop its business model and looking for new growth, as well as increase benefits for its present and future clients.

**Tekes**



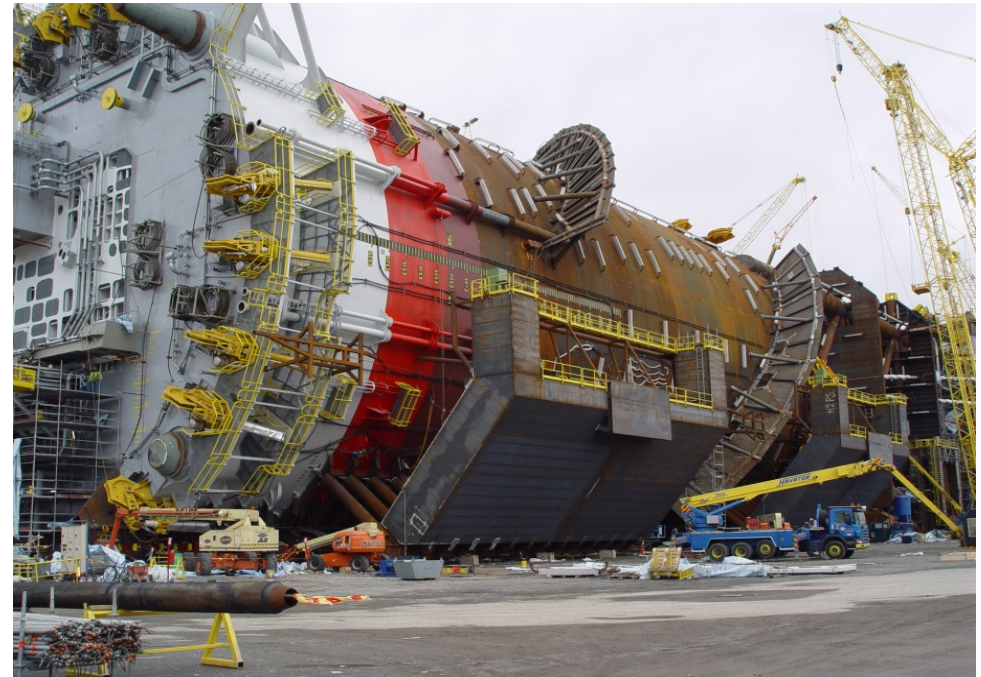
“Tekes and the Arctic Seas programme have made it possible to investigate the market for a flexible and easily modified tool for shipowners to produce carbon emission based indicators. Without Tekes funding this development project would not have been possible for us.

**Eija Kanto**  
*Managing director*  
*Wega Enviro Oy*

**Arctic Seas**



# Technip Offshore Finland Oy



**Idea:** To gain knowledge of design requirements and solutions of arctic fixed offshore structures.

**Impact:** Technip Offshore Finland Oy is specialized in design and construction of demanding offshore structures. Structures designed for ice loaded conditions will complement Technip's offshore technologies.

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Deeper knowledge of design of ice loaded offshore structures is a result of Tekes funded research project executed in cooperation with VTT.

*Technip Offshore Finland Oy*

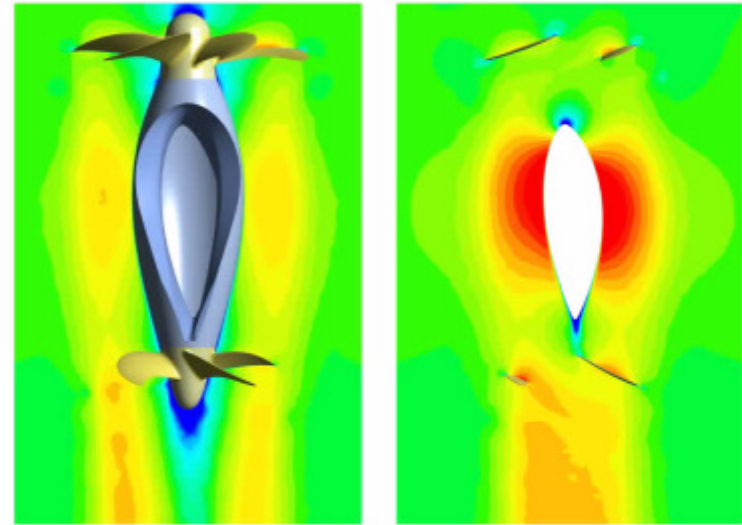
**Tekes**

**Arctic Seas**

# Process Flow Solution – towards virtual sea trials in full scale

**Idea:** Develop a 3D simulation based environment for optimizing and testing propulsion equipment in full-scale ship models.

**Impact:** The innovation reduces development costs and time-to-market by facilitating such realistic propeller performance analyses which were previously only possible by means of extensive sea trials on physical models.



“The concept aims to integrate the hull and the propulsion equipment in full scale, thus significantly reducing the need for actual sea trials.

**Eero Immonen**  
*Process Flow Ltd*

**Tekes**

**Arctic Seas**

# SET targets for shipping more energy efficiently in Arctic seas

**Idea:** To utilize new energy-saving technologies and to employ innovative methods to develop novel energy efficient concepts for various ship types.

**Impact:** The project aims to improve ship overall energy efficiency especially in arctic shipping and to increase the Finnish long-term competitiveness and competence in the global shipping industries.

**Tekes**



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Given the great opportunity in the Tekes Arctic Seas programme , we are able to form the SET research consortium (Aalto University, ABB Oy, Aker Arctic Technology Inc., Alfa Laval Aalborg Oy, Deltamarin Ltd and VTT Ltd) to enhance our knowledge and practices in ship energy efficiency technologies.

**Kari Tammi**

*Research Professor, VTT Ltd*

**Arctic Seas**

# Ice Loads on Arctic Structures and Ice Load Portal (ARAJÄÄ)



**Idea:** The need for better understanding of ice loads is crucial due to an increase in offshore operations on ice-covered seas.

**Impact:** Ice loads and ice mechanics are studied from the viewpoint of industrial applications and an ice load portal for Arctic offshore wind energy will be developed. Project yields insight and tools that help in designing of more safe and efficient Arctic offshore operations.

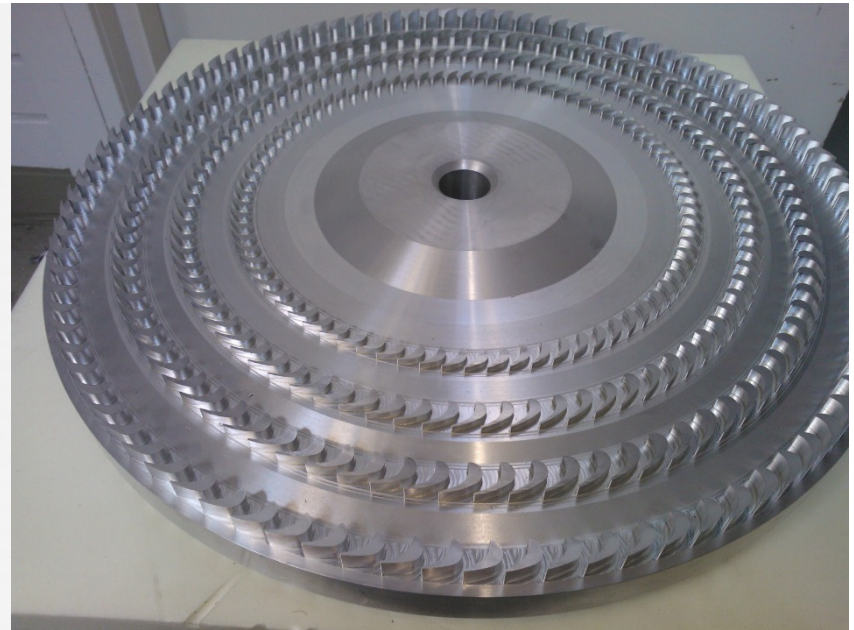
“Better understanding about ice loads and ice mechanics helps to meet the challenging safety, energy efficiency and economic aspects in the Arctic operations.”

**Arttu Polojärvi**

*Assistant professor,  
Aalto University*

*ARAJÄÄ Partners: Aalto University, Finnish Meteorological Institute and VTT Technical Research Centre of Finland Ltd*

# Business utilizing sustainable integration of Novel Energy Systems - B.U.S.I.N.E.S.



**Idea:** The main goal of the project is to speed up the development of the know how and capability to create new, agile energy solutions for marine use, in challenging marine environment.

**Impact:** Novel design and concept know how the new generation integration of power production will create new business opportunities in Finland.

**In this research project we are seeking new energy solutions together with Finnish marine experts.**

**Janne Nerg**

*Associate professor, LUT*

**Samuli Nikkanen**

*Senior lecturer, Saimaa University of Applied Sciences*

Consortium: LUT, Saimaa University of Applied Sciences and companies

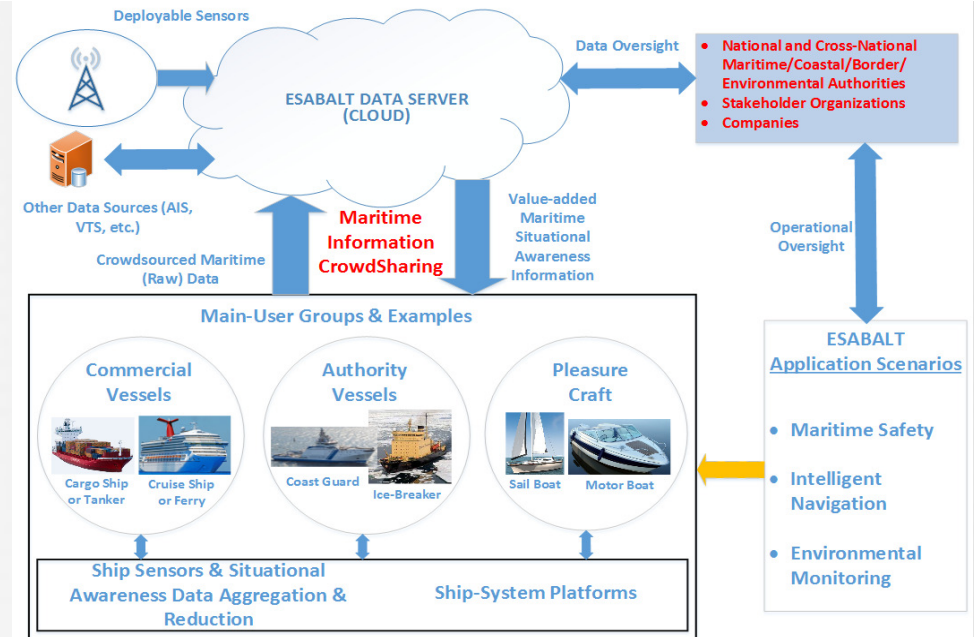
**Tekes**

**Arctic Seas**

# Enhanced Situational Awareness to Improve Maritime Safety in the Baltic (ESABALT)

**Idea:** To determine the feasibility and implement a proof-of-concept demonstrator of a real-time integrated software platform offering new user-driven information services for optimal decision-making towards the marine environment, safety and security in the Baltic Sea area.

**Impact:** ESABALT provides a totally new type of navigation information system, as it learns from users' navigation experiences to provide intelligent and energy-efficient route plans, efficient emergency response and real-time navigational updates. It also improves information sharing between all stakeholders in the improvement of the overall Baltic Sea maritime situational awareness.



Maritime University of Szczecin



[www.ESABALT.org](http://www.ESABALT.org)

# ICEYE – Radar microsatellites for quick-response imaging



**Idea:** The pilot project launches ICEYE's proof-of-concept satellites – the world's smallest and lowest cost satellites capable of SAR imaging – into space. This demonstration constellation paves the way for a commercial constellation of around 20 satellites.

**Impact:** A new near-real-time data service enables sea ice and vessel tracking in an unprecedented way, increasing the safety and efficiency of shipping and offshore operations.

*"Small satellites enable access to space for an entirely new industry and we aim to be at the forefront of this. Our services, in turn, enable access to space-based data for entirely new use-cases and users. We believe that real-time access to this remote sensing data enables businesses and governments to make better decisions, which will eventually save lives, money and the environment."*

**Pekka Laurila**

Co-founder, ICEYE Oy

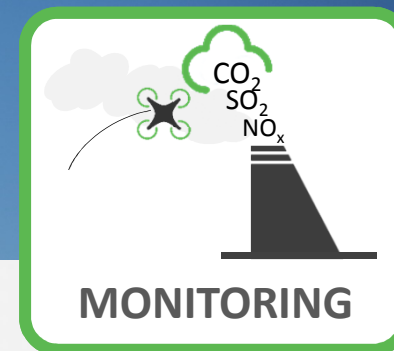
**Tekes**

**Arctic Seas**

# Aeromon – Airborne Emission Monitoring

**Idea:** To prove the feasibility of the cost effective sensor technology connected to 1) a mobile platform and 2) a real time cloud reporting infrastructure in emission monitoring.

**Impact:** The vessel (exhaust) emissions are increasingly regulated. States must have a credible method for emission monitoring to enforce the Marpol Annex VI regulation and to prevent the market from being distorted by non-complying companies.



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“This project demonstrates the applicability of the ultra light Aeromon BH-8 sensor module and the real time reporting tool, Aeromon Cloud service in emission monitoring.”

**Matti Irjala**  
*Director of R&D*  
*Aeromon Oy*

**Tekes**

**Arctic Seas**



# Norsepower harnesses wind energy to serve world's shipping logistics



**Idea:** To take wind back into use in shipping as an auxiliary source of propulsion power. To modernize the old invention of Flettner rotor in large scale with state-of-art materials, IT and arctic knowledge, making auxiliary wind propulsion a natural choice for ships.

**Impact:** Offering an easy to use, push button hybrid solution for saving fuel and answering to the global and EU-level challenge of reducing cargo vessel emissions. The solution is suitable for both retrofitting and new-building. The global long-term market potential for the technology is more than 20 000 vessels and 30 B€.

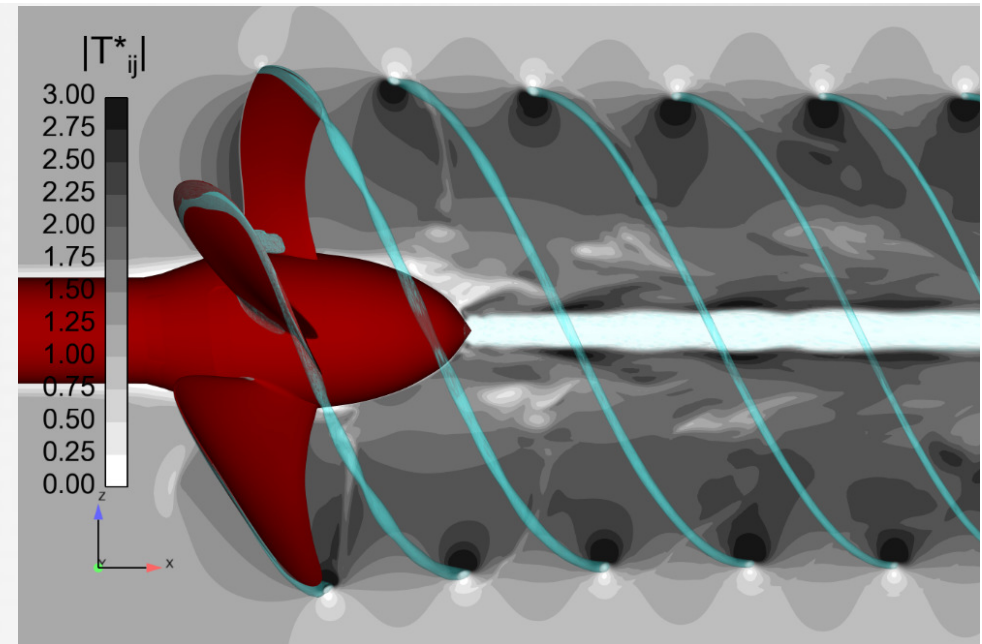
"With the Tekes project we are able to accelerate the development and demonstration of very large rotor sails and to include multi-functional features, which probably would have been left out of the scope without the support of Tekes. This project also speeds up our "time to market" with the new product."

**Jarkko Väinämö**  
CTO  
*Norsepower Oy Ltd*

**Tekes**

**Arctic Seas**

# Propeller induced low and high frequency noise



**Idea:** To develop and validate numerical methods to predict underwater noise emitted from ship propellers.

**Impact:** The project develops methods to predict underwater noise emitted from ship propellers. This gives technological and commercial advantage to the Finnish maritime sector companies whose products operate in vulnerable sea regions.

“We have a highly ambitious project with great competences combining hydrodynamics, mechanics and acoustics as well as modelling and measurements. It focuses on an interesting and important topic of under water noise for the companies in the marine industry.

**Johannes Hyrynen**  
*Vice President*  
*VTT Ltd*

# Shipping Emissions in the Arctic (Black Carbon) SEA-EFFECTS BC



**Idea:** More reliable measurement methods for black carbon emissions from ships are defined.

**Impact:** Finnish businesses and industry can prepare to meet tightening international environmental regulations. More precise information on the emissions of different technologies help developers of fuel and engine technology to reduce BC emissions. This will set a basis for improved accuracy of ship emission models and inventories.

“Finnish research groups at VTT, FMI, TUT and UT together represent world-class expertise in this field of research.

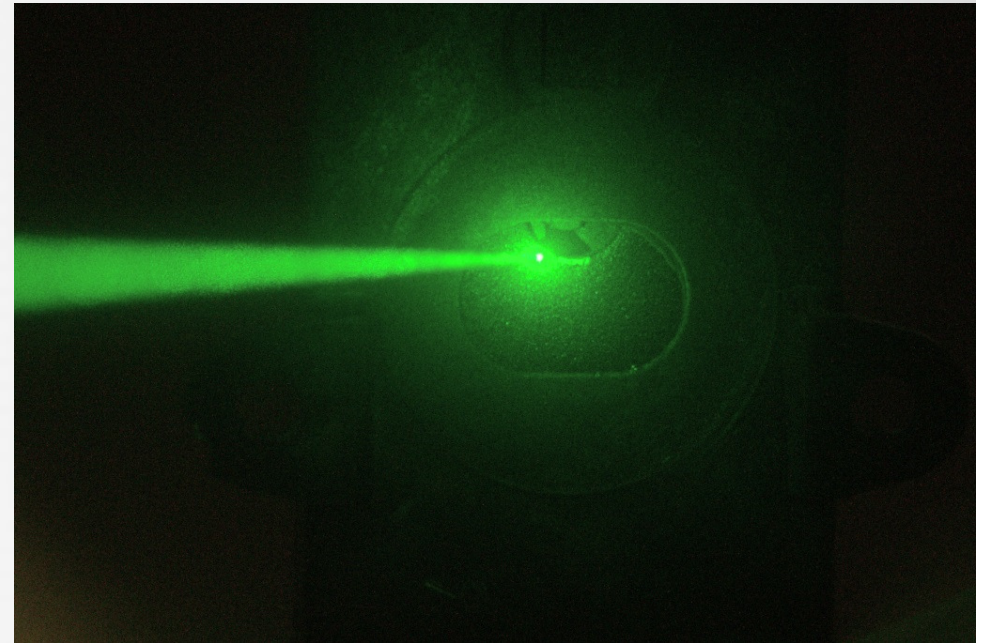
**Päivi Aakko-Saksa**

*Principal researcher  
VTT*

# Fast and accurate prototype of 3D geometry measurement device for the arctic environment

**Idea:** Current commercially available 3D shape measurement devices have insufficient accuracy or speed for underwater applications. Our aim is to develop a measurement system that is capable in mm-level accuracy and can operate even in turbid waters.

**Impact:** Fast and precise measurement technology would enable numerous monitoring applications that create new product and service concepts. Special interest areas are inspection of underwater materials and mechanical structures.



Globally top performance laser measurement technology is applied to demanding subsea applications.

We have also built up a unique Finnish consortium (Agentprof Ltd, Aquamarine Robots Ltd, Meritaito Ltd, Senop Ltd, Noptel Ltd, Port of Kemi Ltd, Prismarit Ltd, TimeGate Instruments Ltd, University of Oulu, University of Turku, VTT Ltd) to create new underwater measurement products and business.

**Jussi Paakkari**  
*Vice President, Sensing and integration*  
VTT Ltd

# Sustainability and Transparency in Shipbuilding Networks



**Idea:** Project focuses on collecting, combining and utilizing of sustainability information of materials and manufacturing processes for creating sustainability based value in shipbuilding.

**Impact:** To expand the use of sustainability arguments in shipbuilding business from operational use to the whole lifecycle and to generate new business through opening the sustainability data to the general public.

“” The shipyard as a system integrator and its supplier network have to cover larger part of the value chain with transparent sustainability.“

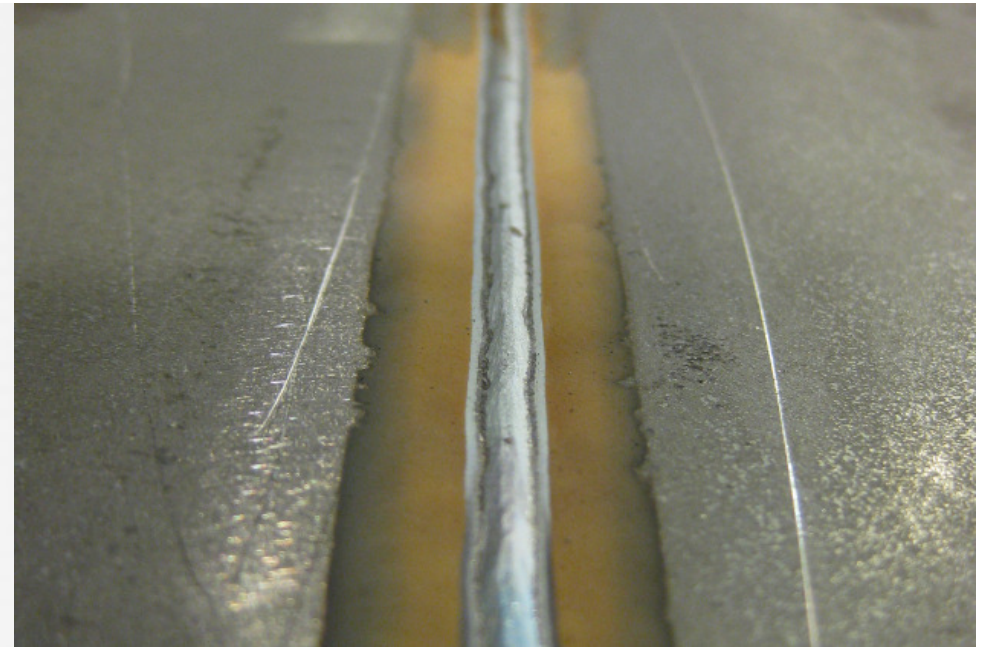
-Jaana Hänninen  
*Environmental manager*  
*Meyer Turku Ltd-*

Tekes

MEYER TURKU  
SHIPYARD 1737

Arctic Seas

# WeldArc -Improvement of productivity and quality of welding on special steels in arctic condition



**Idea:** To reach a new level in know-how related to the arctic welding and to develop collaboration between steel producers, Lapland downstream enterprises as well as research and educational institutes.

**Impact:** The context for the project is based on the needs of the participant enterprises linked to the global arctic welding technology development.

“This project gives results and know-how to research and educate welding in arctic conditions.

**Kimmo Keltamäki**

Project Manager, MSc (Tech)

Lapland University of Applied Sciences

# Arctic Structures – JAMK

**Idea:** To widen the knowledge of behavior of different structures in arctic environment considering dynamic loads, low temperature and corrosion as well as to create an arctic portal to collect research results of this area.

**Impact:** Created knowledge can be utilized as new design guidelines leading more profitable products for arctic environment.

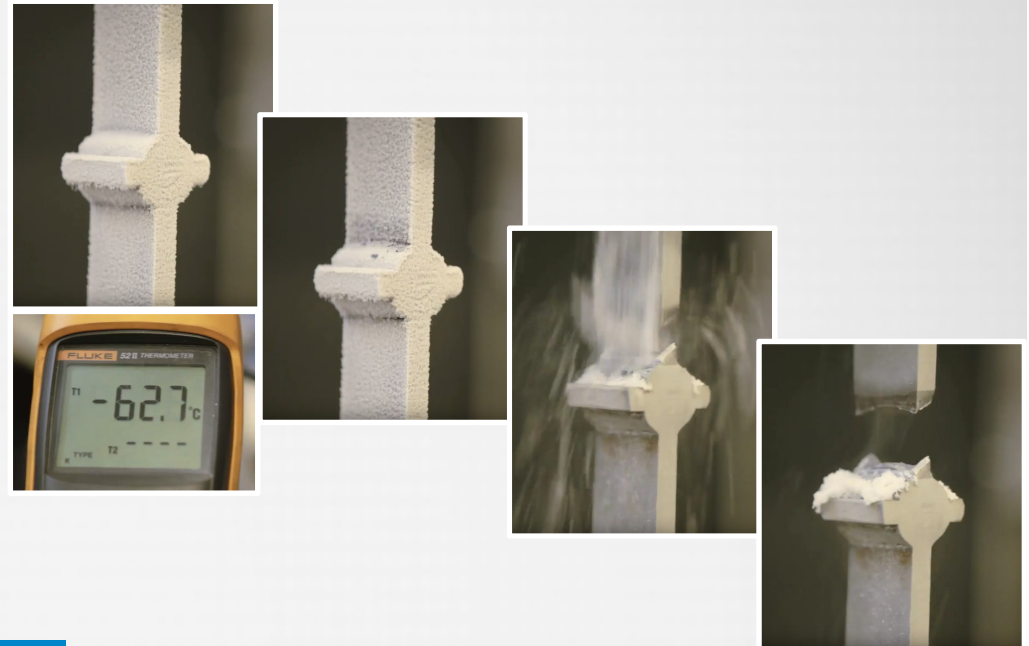


This Tekes funded project executed in cooperation with Lappeenranta University of Technology deepens the knowledge of the effect of corrosion to the endurance and strength of steels as well as the effect of low temperature to the strength and fatigue of differently manufactured steel products, especially welded structures.

**Jorma Matilainen**

Principal Lecturer  
JAMK University of Applied Sciences

# Arctic Structures – LUT



**Idea:** To perform experimental tests and numerical analyses for welded joints and structures in low temperature in order to expand the knowledge of structural durability of high and ultra-high strength steel weldments in arctic conditions.

**Impact:** The outcome and novel results gained from the project can be applied in design and manufacturing processes of demanding welded structures operating in arctic environment and applications.

“LUT Laboratory of Steel Structures has a long-term and internationally acknowledged history of teaching, testing and analyzing different types of welded structures for demanding applications. By means of the co-operation with Tekes, research institutes and industrial partners, it is possible to develop Finnish metal and workshop products and thus, the whole export industry and economy.

Timo Björk

*Professor*

*Laboratory of Steel Structures*

*Lappeenranta University of Technology*

**Tekes**

**Arctic Seas**



# EN ROUTE - NO MATTER WHAT

Our mission is to provide sea route management systems to keep ships moving safe and efficiently no matter what comes their way.

**Idea:** Weather, Sea and Ice forecasting, reliable forecasting of weather and sea conditions with satellite based data

**Impact:** The MareCast® weather, sea and ice forecast tool has a user friendly interface. You can see the current situation and forecasts, as well as observations and warnings; all in one view. You can modify the view according to your needs; hide or add features just by clicking the mouse.

Real-time, reliable weather observations and forecasts are offered by The Finnish Meteorological Institute (FMI), which ranks among the top Met Institutes in the world.



”

MareCast® tool analyse your fuel consumption on the route. It helps you observe patterns, averages, variances, and anomalies, which you can use for guiding your operators and for adjusting and improving your business.

**Janne Tolonen**

*VP*

*TestLab Finland Oy*

**Tekes**

**Arctic Seas**

# GRACE- Integrated oil spill response actions and environmental effects



**Idea:** The objective of this project was to prepare a successful proposal for the Horizon2020, which aims at developing, comparing and evaluating the efficiency of oil spill response technologies for cold climate

**Impact:** The successful proposal ensured Finnish coordination of the H2020 GRACE project, which aims to manage on-line under water oil observation, strategic decision making for alternative oil response actions and produce knowledge and solutions that can be used in transnational oil response preparedness.

“ - A new EU Horizon 2020 project started in spring 2016. The project, "Integrated oil spill response actions and environmental effects" [www.grace-oil-project.eu](http://www.grace-oil-project.eu), is lead by the Finnish Environment Institute (SYKE) and will run from 2016 through 2019. 13 partners from 9 different countries are involved as partners. Support from Tekes for the proposal preparation was of vital importance.

**Kirsten Jørgensen**

*Leading Researcher , Marine Research Center,  
Finnish Environment Institute SYKE*

**Tekes**

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# Ship Recycling in Finland



**Idea:** Assess and establish ship recycling business ecosystem in Finland boosted by new EU Ship recycling -regulation.

**Impact:** Ship recycling business will create new expertise and innovations for dismantling processes and circular economy. Ship recycling knowhow increases also knowledge in sustainable shipbuilding



*Turku Repair Yard Ltd (TRY) is developing an exclusive recycling program with responsible Finnish companies (Meriaura, Pesupalvelu Hans Lanh and Delete), in addition to various ship recycling experts who are capable and willing to put the intended standards into action.*

**Kim Kangas**  
*CEO, Finnish Turku Repair Yard Ltd*

# Roll-to-roll fabrication of advanced slippery liquid-infused porous surfaces for anti-icing applications (ROLLIPS)



Kuva: donaldb <http://www.shipspotting.com/gallery/photo.php?lid=151995>

**Idea:** Preventing of ice accretion on different surfaces in variety of industrial sectors by cost-efficient R2R fabrication of advanced slippery lubricant-infused surfaces (SLIPS)

**Impact:** Current mechanical and chemical anti-icing and de-icing solutions cannot guarantee satisfactory performance. ROLLIPS project studies cost-efficient R2R fabrication of advanced SLIPS to be used in large-area applications.

International ROLLIPS project funded by TEKES focuses on the development of novel SLIPS solutions for anti-icing applications. One strength of the project is the multidisciplinary research consortium, which connects academic research and industrial know-how from different sectors.

**Jurkka Kuusipalo**

*Professor*

*Tampere University of Technology*

**Tekes**

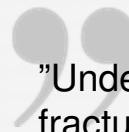
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# Scaling of Ice Strength: Measurements and modelling (ICESCALE)



**Idea:** We know that the scale affects the ice loads measured in an experiment including ice failure. We develop deep insight on ice failure and on the use of the laboratory-scale experiments to predict full-scale ice loads.

**Impact:** Comprehensive understanding of ice failure is crucial for the safety of the increasing operations on the Arctic.



”Understanding how the sea ice behaves and fractures in different scales, and being able to estimate the ice loads related to the sea ice fracture, enables the design of safer future ships and marine structures.”

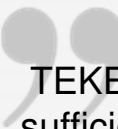
**Arttu Polojärvi**

*Assistant professor,  
Aalto University*

# Restin – Smart accommodation: Privacy, Peace and Safety – Rapidly

**Idea:** Comfy accommodation when and where it is needed. Restin modular accommodation can be provided in existing buildings like offices, storehouses or first buildings of worksite areas. The buildings can be restored to their original purpose when accommodation is no longer needed.

**Impact:** Restin concept is ecologically sustainable. Buildings can have alternative use, modules and materials are recyclable, commuting times will shorten and the whole solution is cost effective. Restin can help the workforce settle into a new site with ease.



TEKES Pilot Funding enabled us to create a sufficiently large Restin demonstration. Innovative Rest Inn Raisio has convinced our clients, accommodation operators and city authorities.

**Seija Hirvonen**

*Project Director  
E.U.-Adhoc Project Oy*

**Tekes**

**Arctic Seas**

# NOSOx –

The new wave in marine environmental technology for flue gas treatment.



**Idea:** NOSOx-technology is a dry scrubbing process for simultaneous SO<sub>2</sub> and NOx removal where no waste is generated.

**Impact:**

Ships may continue to burn fuel oil of higher sulphur content.

SO<sub>2</sub> reduction >97%, NOx reduction > 75%

Process converts toxic emissions in commercial grade fertilizer with commercial value while gaining CO<sub>2</sub> offsets.

”

This electron beam system is characterized by low capital requirements and low maintenance costs. The system generates no waste and there are no requirements for water + sludge handling.

**Marco Lemström**  
CEO  
Polynova Oy

**Tekes**

**Arctic Seas**

# Underwater Internet (VIN)

Alleco Oy



**Idea: Functioning internet-, GPS, and touchscreen tablets for underwater use**

**Impact:** The project will benefit scientific work being conducted in the region, as well as mapping etc. related to planning and implementation of large infrastructure projects in the Arctic. The products are also useful to shipping-, offshore oil and gas, as well as mining operations in the Arctic. With the products the users will be able to collect data directly into an electronic format and make their work faster, safer, more precise and more resource efficient.

”

Alleco’s solutions are disrupting the way work is conducted underwater and in harsh environments. It allows for modern ICT solutions to customers previously deprived of such solutions.

**Dennis Hamro-Drotz**

**Commercial Director, Alleco Oy**

**Tekes**

**Arctic Seas**



# Creating Arctic Thruster Ecosystem (ArTECo)



**Idea:** To create new international co-creation ecosystem and innovative network around ship propulsion to fulfil needs arising from increasing arctic sea operations.

**Impact:** Catalyze solutions for the management of ice loads and vibrations as well as develop sensor technologies for the identification of critical operational and loading stages

”

“Industrial target is to increase power density, adapt new validated methods for sizing and to increase product reliability. In Finland partners participating the project are Wärtsilä, gear manufacturers ATA Gears and Katsa. Research partners are VTT and TUT.”

*-Senior Scientist Jari Halme, VTT-*

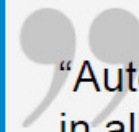
# AAWA Initiative Advanced Autonomous Waterborne Applications Initiative



Photo: Rolls-Royce

**Idea:** The project develops both autonomous and remote operation for ship navigation, machinery and other onboard operating systems. Safety, economical aspects and legislative restrictions are also taken into account.

**Impact:** New era of autonomous and remote technology will be the biggest game-changer during our lifetime in the shipping.



“Autonomous vehicles are becoming reality in all industries.

AAWA is developing groundbreaking ship technology and leading the way for autonomous shipping.”

*-Karno Tenovuo  
VP Ship Intelligence  
Rolls-Royce-*

The HyperGlobal - based on the absorption of electromagnetic radiation, and innovative gas sensors



**Idea:** Establish innovative and cost-effective instruments and solutions for the monitoring of global maritime emissions with a value network approach.

**Impact:** Enabling the authorities to establish a level playing field for maritime emissions, and providing tools for industry-level transparency.

“The HyperGlobal project builds a bold, forward-looking value network to address one of the greatest challenges of maritime transport in our time.”

*-Tapani Stipa, Adjunct professor, Finnish Meteorological Institute-*

# Development of novel bristle material for arctic oil skimmers - ArcMaDe



**Idea:** to improve business competence of the companies by evaluating different bristle materials for selected oil types and in various temperatures.

**Impact:** more advanced response options to improve the society's capability to react to different accidents thus enabling better management of environmental risks.

”

The outcomes of the project give detailed information on oil skimming efficiency of different bristle materials. This will support the participating companies in their present and future R&D activities.

**Seppo Kivimaa**

*Senior Principal Scientist*

*VTT Technical Research Centre of Finland Ltd*