



# MARTOB



## **MARTOB**

**A New European Community Funded  
Project for  
On-board Treatment of Ballast Water  
and Application of Low Sulphur Fuels**

Presented, on behalf of MARTOB Consortium by

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**Nordic Ballast Water Summit  
MARTOB Presentation 28<sup>th</sup>/29<sup>th</sup> Jan. 2002 Oslo**

# The Birth of MARTOB



**MARFUEL**

**OBTOB**

**MARTOB**

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## The requirement



Europe has the longest coastline of all the continents in the world. Currently, European Economic Area (EEA) ship-owners represent about 40% of the world merchant fleet. 90% of the EU's external trade and 40% of trade by volume between the member States are carried by sea. As a consequence, hundreds of non-indigenous species from different parts of the world have been introduced into European waters, particularly Northern Europe, through ballast water. Although many of them have not had any serious effects on the ecosystem yet, some have created serious problems and incurred considerable costs in remedial actions.

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# MARTOB Objectives: B



1. To investigate methodologies and technologies for preventing the introduction of non-indigenous species through ships' ballast water,
2. To develop design tools and treatment equipment to be used in the further development of ballast water treatment techniques,
3. To assess the effectiveness, safety, and environmental and economic aspects of current and newly developed methods,
4. To develop cost-effective (capital and operating), safe, environmentally friendly onboard ballast water treatment methods which have a minimum impact on ship operations,
5. To produce guidelines for crew training and criteria for selecting an appropriate ballast water management method,
6. To assess the financial, technical and operational effects of a sulphur cap on marine bunker fuel in European waters, and propose a verification scheme ensuring compliance with a sulphur cap from all players in the market,
7. To help to facilitate the introduction of an important sulphur emission abatement measure without unintentional distortion of competition in the shipping market.

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## Partners:



**UNEW-University of Newcastle upon Tyne, UK**

**AAU-Aabo Akademi University, Finland**

**VTT-VTT Manufacturing Technology, Netherlands**

**TNO-Environment, Energy and Process Innovation, Netherlands**

**TME-Institute for Applied Environmental Economics, Netherlands**

**SINTEF- Applied Chemistry, Norway**

**FRS-Fisheries Research Services, UK**

**IFREMER-French Research Institute for the Exploitation of the Sea, France**

**ABC-Association of Bulk Carriers, UK**

**AL-Alfa Laval AB, Sweden**

**BERSON-Berson Milieutechniek B.V., Netherlands**

**EPE-Environmental Protection Engineering S.A., Greece**

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# MARTOB Partners: B



**HW-Van den Heuvel Watertechnologie, Netherlands**

**IT-The International Association of Independent Tanker Owners, UK**

**SOU-Souter Shipping Ltd., UK**

**SSPA-SSPA Sweden AB**

**TQ-Three Quays Marine Services, UK**

**ICS-International Chamber of Shipping, UK**

**BV-Bureau Veritas, France**

**MT-(MARINTEK) Norwegian Marine Technology Research Institute, Norway**

**SMP-Shell Marine Products, Norway**

**WW-Wallenius Wilhelmsen Lines, Norway**

**MAN-MAN B&W, Denmark**

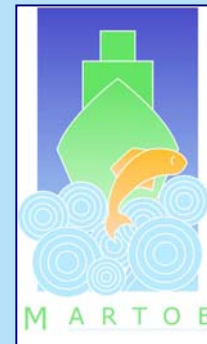
**FT-Fueltech AS, Norway**

**NSA-Norwegian Shipowner Association, Norway**

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# MARTOB Programme:



**a) Data collection and proposed methods**



**b) Further development and demonstration of selected methods**



**c) Installation of large/full-scale systems and sea trials**



**d) Applications, reviews and recommendations**

# MARTOB

## a) Data collection and proposed methods



1- Legislative update and future indication

2- Update of aliens in European water

3- Indirect environmental aspects and risk assessment

4- Current methods and limitations

5- Programme of requirements for ballast water treatment

6- Framework of Evaluation



## **b) Further development and demonstration of selected methods**



**1- Design of system**

**2- Assessment of direct and indirect environmental aspects**

**3- Verification of the conformity of the system design**

**4- Definition and strategy of large and full-scale trials**

## c) Installation of large/full-scale systems and sea trials



1- Validation of system installation

2- System installations and sea trials

3- Assessment of biological effectiveness and direct and indirect environmental aspects

# d) Applications, reviews and recommendations



1- Large scale trials review

2- Summary of direct and indirect environmental aspects

3- Biological justification of developed methods

# Programme for Application of Low Sulphur Fuels:



State of the art- European marine fuel market

Future availability of low sulphur marine fuels

Technical limitations for machinery and systems operating on low sulphur fuels

Operational aspects of a sulphur cap on marine fuels

Verification of compliance with sulphur cap regulations

# a-1) Legislative update and future indication

UNEW, EPE, IT



## Local Regulations

Argentina

Australia

Canada

Chile

Israel

New Zealand

UK

USA

## International Legal Instruments With Programs/ Activities pertaining to Invasive Alien Species

Global Conventions/Treaties

European

North American

African

Asia/Pacific

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# a-2) Update of aliens in European water

AAU, UNEW, TNO, IFREMER, EPE, SSPA



## ALIENS AND THEIR IMPACTS IN EUROPEAN COASTAL WATERS

### REGIONAL OVERVIEW

North-eastern Atlantic coast

North Sea

Baltic Sea

British and Irish coasts

Mediterranean Sea

Black Sea and the Sea of Azov

Caspian Sea

### ECOLOGICAL IMPACTS

### RESOURCES AT RISK

Nuisance Species

Economic Impacts

*General*

*Water-based Technology*

*Fisheries*

*Parasites and Pests on Fish and Shellfish*

*Interference with Research and Monitoring*

Human Health

### RISK ASSESSMENT OF AQUATIC SPECIES INVASIONS

## DATABASES ON BALLAST WATER AND INTRODUCED AQUATIC SPECIES

European Databases

North American Databases

Australian and New Zealand Databases

Global Databases

## BALLAST WATER DISCHARGES AND SHIPPING PATTERN IN EUROPE

European Shipping Pattern

Ballast Water Releases In

European Waters

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## a-3) Indirect environmental aspects and risk assessment

SSPA, AAU, TME



### **METHODS:**

Ballast water exchange

Low Temperature Thermal

Treatment Ultraviolet Irradiation

Filtration

Hydrocyclone

Biocides

Shore-Based Treatment Methods

### **RISK AND SAFETY ISSUES**

Hazards, Risk and Safety Assessment

Assessment of Methods

### **INDIRECT ENVIRONMENTAL IMPACTS**

Assessment of Environmental Impacts

### **NON-ENVIRONMENTAL ASPECTS**

Existing cost data

Identification of data gaps

Potential economic benefits and economic disadvantages

Selection of time horizon and discount rate

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## a-4) Current methods and limitations

FRS, UNEW, IFREMER, BERSON, EPE, TQ



Methods that have been assessed on a pilot or full scale

*Ballast water exchange*

*Filtration*

*Cyclonic separation*

Methods in the first stages of development

*Biocides*

*Gas super saturation*

*Natural air injection*

*Electro-ionisation*

*Use of fresh or treated water*

*Shore based treatment*

Summary of the data



## **a-5) Programme of requirements for ballast water treatment**

**UNEW, VTT, TNO, TME, SINTEF, ABC, AL, BERSON,**  
**EPE, HW, IT, SOU, SSPA**



### **General requirements and basic Data**

#### **Ship requirements and limitations**

- Ship Types and Ballast Water Volumes
- Pump Capacity
- Ballast Tank Sizes and Design
- Equipment Space Requirements
- Vessel Transit Patterns
- Ship requirements

#### **Water quality**

- Water Quality of Ballast Water and Ports
- Water quality in selected ports and coastal areas
- Changes in Water Quality over Time
- Water Quality Standards

#### **Economic and environmental effects**

### **Selected Treatment Methods**

**Thermal Treatment**

**De-Oxygenation**

**UV/US and Ozone Systems**

**Oxicide**

**Hurdle Technologies**

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# a-6) Framework of Evaluation

## TME, UNEW, SSPA, BV



### BOUNDARIES FOR TESTING

Evaluation criteria

### SAMPLING AND TEST PROTOCOL

Water quality Standards

Species selection

Composition of a test mixture

Assessing biological effectiveness

### ENVIRONMENTAL IMPACTS

Direct Environmental Impact

Indirect Environmental Impact

### HEALTH AND SAFETY ASPECTS

Operational Aspects

Storage and Handling of Chemicals and

Residuals

### ECONOMIC VIABILITY

Cost Effectiveness

### ON-BOARD SHIP APPLICABILITY

Criteria for assessment

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## Conclusions



The ballast water regulation has been on the table for some years and could take more time to resolve. As such, more and more countries have adopted local ballast water regulations to prevent the introduction of alien invasive species to their waters. It is with optimism that a foolproof water ballast management programme that is agreed by all, could be reached within the near future.

With the completion of MARTOB programme, it is envisaged that the results of this programme would be able to provide an insight on global ballast water legislative measures and recommendations on probable future ballast water treatment solutions through research and shipboard trials.

In addition recommendations resulting from this programme of research on ballast water management would provide another source of information to various international organisations like IMO, ICES, IOC and other maritime organisations, marine environment agencies and regulatory bodies.

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