SEAM – MARTOB JOINT NEWSLETTER

Assessing concepts, systems and tools for Safer, Efficient and Environmentally Aware and Friendly Maritime Transport

On Board Treatment of Ballast Water and Application of Low-sulphur Marine Fuel

BACKGROUND

There is a growing concern about the impact of shipping and port operations on the marine environment. Three of the main issues are ballast water discharge, antifouling coatings and fuel quality and emission.

The ballast water discharge may cause damage to aquatic ecosystems caused by transferring **non-indigenous** species. It is estimated that more than 10,000 million tonnes of ballast water is transported by shipping activities annually, and ballast water has been recognised as a major vector for the transplant of aquatic species across bio-geographical boundaries.

The IMO is committed to ban the use of **ant-fouling paints**, which contain organotins, such as TBT.

Another important environmental issue is **fuel quality and related air emissions** (SOx, NOx and CO2). Studies are underway, based on national incentives and environmental analyses of impact from shipping where choice and present status of quality of marine bunker fuel has become an important issue.

MARTOB and SEAM are two European Projects, which work on all (SEAM) or some (MARTOB - does not deal with anti-fouling paints) of these three issues. This common Newsletter is intended to describe their respective role and action and their clustered activities.

Both are 3-year Research Project, partly funded by the **European Commission, Directorate-General for Energy and Transport** under the 5th Programme for R&D (GROWTH Programme) and both started in April 2001.

The dissemination of the results of both projects intend to have a special focus on the promotion of ideas for positive exploitation of the project's findings, and will highlight the potential for further future research.

OBJECTIVES

SEAM focuses on formulating safety and environmental measures and procedures to mitigate the impact of three key elements of shipping operations on the marine environment.

The objectives are to:

- Assess the negative environmental impact of the 3 above-mentioned elements of shipping operations.
- Provide solutions and procedures to mitigate this negative environmental impact.

More specifically, SEAM will deliver:

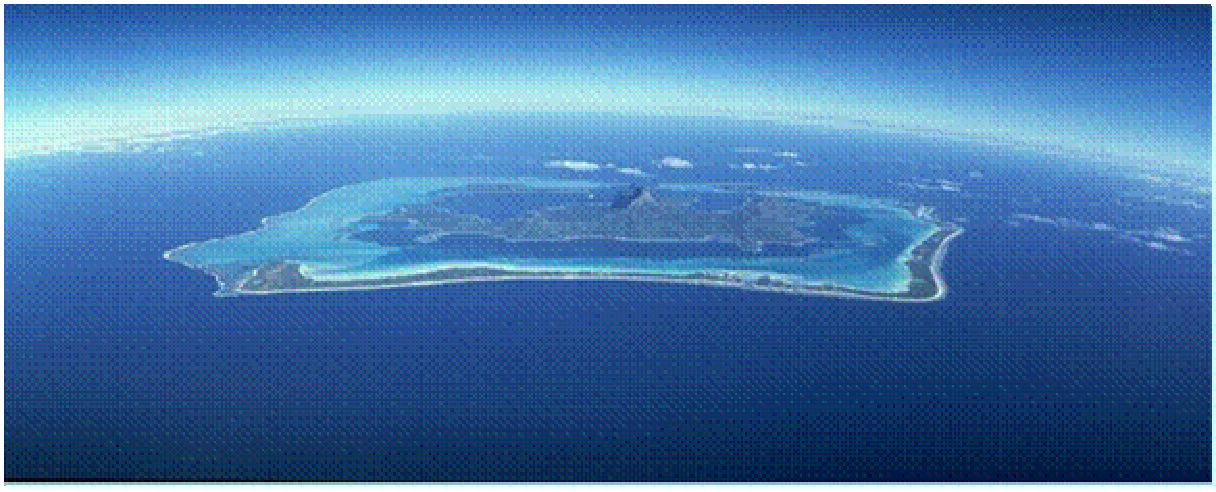
- Technical and operation solutions for treating ballast water.
- Assessment of existing anti-fouling paints as well as environmentally friendly alternatives.
- Proposals for reduction of air pollution from ships.

The SEAM Project uses the structure of Formal Safety and Environmental Assessment (FSEA) for ships, which is a structured method for performing risk analysis, assessing current regulation and policy and suggesting alternative rules and policy.

The methodology, which is being used in the project is primarily one of problem definition, risk assessment, risk control, cost/benefit modelling, and lastly recommendations for decision making.

MARTOB focuses on the following main objectives:

- To investigate methodologies and technologies for preventing the introduction of non-indigenous species through ships' ballast water.
- To develop design tools and treatment equipment to be used in the further development of ballast water treatment techniques.
- To assess the effectiveness, safety, and environmental and economic aspects of current and newly developed methods.
- To develop cost-effective (capital and operating), safe, environmentally friendly on board ballast water treatment methods, which have a minimum impact on ship operations.
- To produce guidelines for crew training and criteria for selecting appropriate ballast water management method.
- To assess the financial, technical and operational effects of 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.
- To help to facilitate the introduction of an important sulphur emission abatement measure without unintentional distortion of competition in the shipping market.



PARTNERS

SEAM involves **11 partners** from eight European Countries.

It is coordinated by METTLE (Maritime Engineering and Technology for Transport, Logistics and Education) in France.

The other partners are:

- AMRIE, The Alliance of Maritime Regional Interests in Europe (BE)
- BMT, British Maritime Technology (UK)
- EMIL S.A. (IE)
- Grimaldi (IT)
- ISL, Institute für Seeverkehrswirtschaft und Logistik (DE)
- Port of Rotterdam (NL)
- Southampton Institute (UK)
- SWH Bremen (DE)
- SAT, Salerno auto terminal (IT)
- SAL A/S (DK)

MARTOB involves **25 partners** from eight European countries.

It is coordinated by the School of Marine Science and Technology, University of Newcastle upon Tyne, in UK.

The other partners are:
Abo Akademi University, Alfa Laval AB, Association of Bulk Carriers (London), Berson Milieutechniek B.V., Bureau Veritas, Environment, Energy and Process Innovation (TNO), Environmental Protection Engineering S.A., Fisheries Research Services, French Research Institute for the Exploitation of the Sea, Fueltech AS, Institute for Applied Environmental Economics (TME), International Association of Independent Tanker Owners, International Chamber of Shipping, MAN B&W, (MARINTEK) Norwegian Marine Technology Research Institute, Norwegian Shipowners Association, Shell Marine Products,SINTEF Applied Chemistry, Souter Shipping Ltd., SSPA Sweden AB, hree Quays Marine Services, Van den Heuvel Watertechnologie, VTT Industrial Systems and Wallenius Wilhelmsen Lines.

MAIN ACTIONS

SEAM focuses its main actions in three measures:

Environmental Risk Assessment of Maritime Transport Activity in the German Bight and the Gulf of Naples

Three fundamental modelling systems have been implemented and used for the prediction of the environmental risks caused by the release of anti-fouling, ballast waters and ships atmospheric emission around coastal waters.

The study has been carried out in two pilot European regions: the German Bight in the North of Europe and the Gulf of Naples within the Mediterranean Sea. Ships traffic networks around both pilot regions have been geographically identified together with the various standard shipping routes details that are adopted by all types of maritime vessels. The release rates of anti-fouling and atmospheric emissions have also been quantified in each route and across the whole networks

The environmental risk evaluation from ship traffic activity around European coastal zones is dynamically modelled with time. It is possible to identify the affected coastal zones and correlate it with specific marine species of concern in each coastal zone at various time periods of year. A slightly different risk ratio was used for the atmospheric case study.

Mitigation measures: SEAM has identified operational and technological mitigation measures for all three of the addressed hazards.

- Antifouling coatings: technological solutions could be to use other metals (such as copper and zinc); or the physical properties of low surface energy coatings; or fouling deterrents; or coating systems. Operationally, there is little that can be done except to use hulls cleaning stations to remove the fouling.

The main activities of **MARTOB** are related to Ballast Water Treatment.

Test Protocols and Standards

One of the many objectives of the project is to assess the biological effectiveness of selected ballast water treatment technologies.

The treatment technologies included in the project are:

- High temperature thermal treatment
- Ultraviolet
- Ultrasound
- Ozone
- Oxicide
- De-oxygenation
- Hurdle technologies, which will be combinations of the above techniques.

In order to assess efficiencies of the treatment methods the trials have to be carried out under the same conditions for each treatment technology. To provide such consistent platform of "testing and assessment" and also logistical reasons it was decided to gather all the prototype treatment technologies to one location (Newcastle University) in June 2002.

The overall aim of the lab scale trials was to measure and compare the efficacy of the selected technologies at removing or killing organisms i.e. the **biological effectiveness** of the treatment.

A major part of the project has been the development of a set of **standard procedures** for assessing the biological effectiveness of the treatment technologies. Such sets of standards do not currently exist although a variety of options have been suggested. Many of the proposed standards have suggested using **standard ballast water** with a mix of known densities of species representative of those likely to be found in ballast water.

MAIN ACTIONS

• Ballast water discharge: Technological solutions are only onboard treatment (with chemical, physical or heat treatment; or filtration and cyclonic separation). Onshore treatment has not been seriously considered. Operationally, SEAM recognises two methods of mitigation: Open Ocean Exchange (exchange of the ballast water held in tanks, by deballasting and then reballasting with new open ocean water or by flow through methods) and ballast water management systems including decision support systems (e.g., the Australian AQIS system was introduced in 2001)

• Air emissions from ships: Technically, a reduction in sulphur emissions can be achieved either at source (by reducing the level of sulphur in the bunker fuel) or by flue scrubbing. Reduction in NOx emissions can be achieved by the use of different propulsion systems or the good maintenance of fitted engines or by various systems fitted to the engine, e.g. catalytic converters, water injection/emulsion. Operationally, various schemes have been proposed: speed reduction, market-based incentives and emission trading schemes. In port, "cold ironing" of ships reduces the emissions from ships by a switch to the use of shore-side power.

Next steps.
The next phase of SEAM will undertake a cost-benefit analysis of a selected number of mitigation methods for the three environmental problems. This analysis will attempt not only to consider shipping economics but also endeavour to incorporate environmental economic factors. Also important to the choice of mitigation method is the acceptability of that methodology to all stakeholders e.g. ship owners, environmentalists, regulators etc.

Team of biologists in the MARTOB project collated information regarding proposed standards from various sources and taking these into account as much as possible chose the following organisms to compose a representative biological group called as **MARTOB Soup**:

Zooplankton:
- Benthic Larvae (Nereis virens - Nectochaete larvae)
- Calanoid copepod (Acartia sp)
- Harpacticoid copepod (Tisbe sp)

Phytoplankton:
- Diatom (Thalassiosira sp)
- Dinoflagellate (Alexandrium sp)

Results of the lab scale tests are now available and these have provided valuable guidelines for the development and improvement of full scale treatment systems.

Full scale/ Large Scale tests, onboard trials

High temperature thermal treatment system, Deoxygenation and Benrad system (Hurdle technologies) have now been decided to go onboard a Pure Car and Truck carrier travelling in Mediterranean waters. Other technologies will be tested at Offshore facilities using real seawater supply.

Objective Assessment

Assessment of management technologies have not been limited to their biological effectiveness only, other criteria such as their compatibility with a particular ship and her route, overall cost, safety, crew, life cycle assessment, corrosion effects and many other factors have been considered here as **ranking criteria** with their individual **weighting** in the final assessment.
MARTOB has also developed a comprehensive IT based technology to determine attractiveness of a particular Ballast Water management system for an individual ship travelling at a particular route.

CLUSTERING ACTIONS

The common ground and need of both projects is environmentally acceptable shipping.
During the negotiations of both projects, the European Commission asked that a cluster between them to be established.

The **objectives** of this cluster are:
- to add value to both projects and for the European Commission;
- for each project, to benefit from mutual results;
- to develop technical and dissemination interactions between the two projects.

Although both projects include similar tasks and titles but as far as technical and scientific approach is concerned, they greatly complement each other.

The following **clustering actions** have been decided:

1 – Achieved

- Creation of this joint *SEAM-MARTOB Newsletter*.
- *Joint workshop* to establish a "Risk Acceptance Criteria" held on 6 February 2003 in Brussels, in order to fully take into consideration the SEAM WP4 results.
- The SEAM coordinator, in conjunction with MARTOB project, has presented a dissemination paper to the ENSUS Conference at the University of Newcastle in December 2002.
- An Advisory Group has been formed by nominating 4 experts per project, who represent different sectors and geographical areas in the European maritime community. Their role will be:
  - to monitor the research activities of the clustered projects;
  - to enhance results of dissemination and exploitation.

2 – Ongoing

- On several work packages, the two consortia will exchange ideas and information.
- A *joint position paper on EU (Transport and Environment) and IMO policies* will be issued.
- A joint statement, presenting results from both projects and making recommendations to EU will be published in January 2004.
- A Final *joint dissemination conference will take place in Spring 2004*.

3 – The expected policy impacts of the cluster

The policy impacts of the cluster should be, as mentioned at the end of the common workshop, the following:
- To present the policy related results on Ballast Water treatment management and standards at IMO MEPC 49.
- To provide EU with guidelines on SOx and NOx emissions. The Cluster will propose the most acceptable solution to minimise these emissions. In particular, the sulphur content of fuel oil will be studied, and the results will be exploited by the IMO and the EC.
- To deliver the most acceptable solution to the Commission concerning the replacement of the TBT (tri-butyl-tin), proposing a solution to the IMO ASF-Convention (Convention on the Control of Harmful Anti-fouling Systems on Ships)