

# MARITIME SAFETY AND ENVIRONMENTAL CONCERN ARE IN HIGH PRIORITY IN VTT'S RESEARCH FOLDER

The Baltic Sea has some of the busiest shipping routes in the world. Around 2,000 sizeable ships are normally at sea at any time in the Baltic, including large oil tankers, ships carrying dangerous and potentially polluting cargoes. Especially the development of oil transportation in the Baltic Sea has been breathtaking. The oil transportation along the Gulf of Finland's water exceeded last year 140 million tons, and is expected to be close to 200 million tons after a couple of years. Thus, it is not a coincidence that the improvement of maritime safety in the Baltic Sea has been selected as a baseline focus area for VTT's maritime R&D portfolio.

## Maritime safety issues are an essential part of the R&D portfolio

The overall goal of the VTT's risk-based R&D projects is to contribute to the reducing of risk for ship collisions and groundings, and thereby decreasing the risk for people and environment in the Baltic Sea area. This can be performed by analysing the ship traffic in the Baltic Sea, ship bridges and VTS (Vessel Traffic Service) centres, with special emphasis on human factors.

Currently VTT is using the harmonised Formal Safety Assessment (FSA) framework in the Sea of Åland area and in the Bornholm Gat area. The risk reducing effect of different safety improving measures like implementation of Routeing Systems (e.g. Traffic Separation Schemes), Ship Monitoring and Information Systems (e.g. Ship Reporting Systems) and escort & emergency towing as well as additional risk control options for the ice season will be analysed. Models for quantifying the mentioned risk reducing initiatives will be developed. Here an extensive cooperation is carried out with the SSPA Sweden AB, MSI Design, Chalmers Shipping and Marine Technology from Sweden and Technical University of Denmark (DTU) and Gatehouse from Denmark. Here, as well as in all the safety related projects, the essential prerequisite of successful projects is the full support of the maritime authorities and shipping industry.

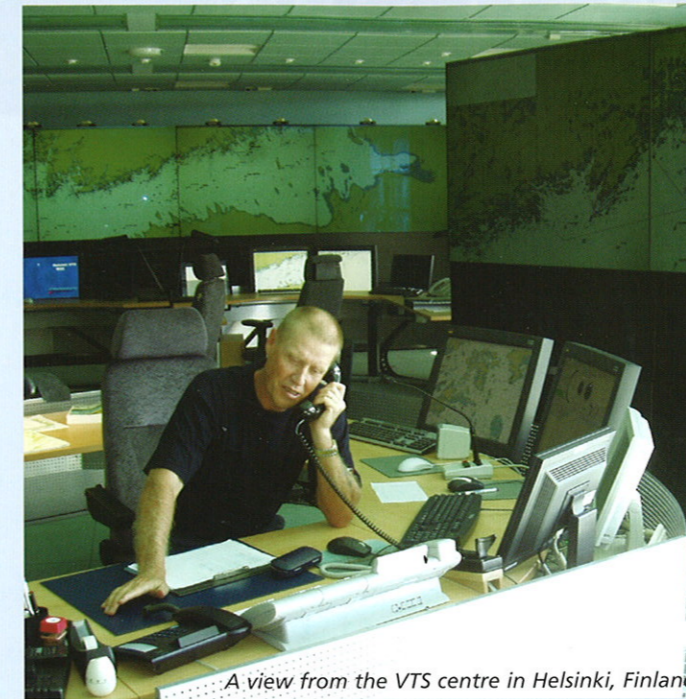
## Oil and chemical transportations in focus

Due to the fact that the marine oil transportation is constantly increasing in the Baltic Sea area VTT has been active in this area already for years. First scenarios on the development trends and published reports were already made more than 10 years ago.

In 2004, VTT published a study on Oil transportation and terminal development in the Gulf of Finland. The report covers statistics on oil transport in the area and discusses future terminal development. During the project, question about chemical transportations came up several times. This question led finally to the actions and the report on Transportation of chemicals by tankers in the Baltic Sea area was published in the beginning of 2006. Both reports can be found and loaded from VTT's web site (<http://www.vtt.fi/>).

## VTS and AIS services in focus

One of the modern ways of enhancing maritime safety and the protection of the environment is the use of effective maritime monitoring and information systems. In brief, the systems collect and distribute relevant information to vessel traffic and may intervene into potentially hazardous situations e.g. collision or grounding. VTT has strongly contributed to the development of these systems already for more than a decade. When developing systems related to safety-critical domains such as vessel traffic services (VTS), ship reporting systems (SRS) and vessel traffic management and information systems (VTMIS), VTT emphasises the need for combining operational, technical and human-technology interaction (HTI) skills and expertise. A variety of approaches and methods related to human factors, cognitive ergonomics and risk analysis is needed.



A view from the VTS centre in Helsinki, Finland.

An excellent example of an interdisciplinary development work has been the research related to Finnish VTS and SRS and the studies on the development of trilateral Finnish-Russian-Estonian mandatory ship reporting system in the Gulf of Finland (GOFREP). In addition to the development of vessel traffic monitoring and information systems, VTT also promotes studies on the quality and content of the information available from automatic identification system (AIS). The aim is to foresee the future demands for maritime safety systems and to ensure that these systems can live up to the expectations.

## Do the cruise liners influence on the Baltic Sea eutrophication?

Recently VTT finished a study concerning the nutrient load from ship originated waste waters at the Baltic Sea area. The study was commissioned by the Finnish Ministry of the Environment, the Ministry of Transport and Communications and the Finnish Maritime Administration. The study includes also information about the maritime traffic, waste water management and legislation.

According to the results the ship borne nitrogen load represents approximately 0.05% of the total nitrogen load and phosphorus load represents approximately 0.5% of the total phosphorus load both into the Baltic Sea and into the

Gulf of Finland. The nutrient load from ships' exhaust gases contributes to 6% of the total atmospheric deposition of nitrogen. The main nutrient load into the Baltic Sea derives from waterborne inputs and atmospheric deposition. The estimated nutrient load from ship generated sewage was calculated assuming that, there is no waste water treatment onboard and all waste waters are discharged into the sea. Thus, on the basis of calculations and references, the nutrient load originated from ships is rather small but not negligible due to the sensitivity of the Baltic Sea marine environment. The nutrient load is concentrated along shipping routes, and immediately available for uptake by e.g. blue green algae, adding to the severe eutrophication of the Baltic Sea. The publication can be downloaded from VTT's web site (<http://www.vtt.fi/>).

## Ballast water - threat to the environment?

The introduction of invasive marine species into new environments through ships' ballast water, attached to ships' hulls and via other vectors has been identified as one of the four greatest threats to the world's oceans. During the years 2001-2004 VTT participated to the EU-project entitled MARTOB, which focused on onboard treatment of ballast water. Several potential treatment options were studied, among those ultraviolet light, ultrasound and ozone. Now the focus has been directed to the automatization and innovations to develop robust and automatic measuring systems to evaluate the treatment capacity. Here the combination of novel transducer technologies, wireless data transfer and data management systems are used in the R&D projects.

## To the reader

In order to understand better the vulnerable and sensitive Baltic Sea environment, please do not hesitate to visit HELCOM's webpage (<http://www.helcom.fi/>) or the Baltic Sea Portal maintained by the Finnish Institute of Marine Research (<http://www.fimr.fi/en/itamerikanta.html>).

Contact us at VTT if you need an innovation partner or integrator to find new solutions for safe and sustainable solutions.

## Business Solutions, transport, traffic and logistics:

Mr. Jorma Rytönen, Vice President, [jorma.rytonen@vtt.fi](mailto:jorma.rytonen@vtt.fi).

## Maritime Operations and Environment R&D Team:

Mr. Tapio Nyman, Team Leader, Senior Research Scientist, [tapio.nyman@vtt.fi](mailto:tapio.nyman@vtt.fi).

Mr. Kai Happonen, Research Scientist, [kai.happonen@vtt.fi](mailto:kai.happonen@vtt.fi).

Ms. Saara Hänninen, Research Scientist, [saara.hanninen@vtt.fi](mailto:saara.hanninen@vtt.fi).

Mr. Markus Porthin, Research Scientist, [markus.porthin@vtt.fi](mailto:markus.porthin@vtt.fi).

Mr. Jukka Sassi, Research Engineer, [jukka.sassi@vtt.fi](mailto:jukka.sassi@vtt.fi).

Ms. Sanna Sonninen, Research Scientist, [sanna.sonninen@vtt.fi](mailto:sanna.sonninen@vtt.fi).

Oil Tanker in the harbour of St. Petersburg, Russia.



The Maritime Operations and Environment Team at Lake Ladoga, Russia.

