



OIL SPILL Project Report – Group of Activities 3.4

## CONDUCTING OIL SPILL COMBATING TRAINING WITH STATE-OF-THE-ART MARITIME SIMULATORS

**Kadi Kasepõld, Tallinn University of Technology**

**Sergej Suzdalev, Klaipėda University**

**Igor Kuzmenko, Klaipėda University**

**Ivar Treffner, Tallinn University of Technology**

**9 September 2020**

## ABOUT THIS REPORT

This report is an output of the OIL SPILL Group of Activities 3.4 that focuses on maritime simulation training. The work group is led by **the Estonian Maritime Academy of Tallinn University of Technology**. **The Marine Research Institute of Klaipėda University** participates in the activities.

The report gives an insight into the maritime simulators and the idea behind the planned oil spill response exercises to be conducted on these simulators during the OIL SPILL project. The opportunities of the exercises and future possibility to have joint simulator exercises between several centres are also discussed.

The authors thank the colleagues from the OIL SPILL project and especially the Project Office for the support and contributions.

This report is published under the OIL SPILL project that is co-funded by the Interreg Baltic Sea Region programme. Estonian Environmental Investment Centre co-financed the Tallinn University of Technology.

(Cover photo: TalTech Emera)



## TABLE OF CONTENTS

1. Introduction to maritime simulators	3
2. Availability of maritime simulators in the Baltic Sea region	4
3. TalTech EMERA Simulator Centre	5
4. Benefits and opportunities of the simulator trainings regarding oil spill response procedures	7
5. Description, main idea and identified difficulties behind the joint simulation trainings	9
6. Small scale simulator training	10
7. Target Groups	12
8. The future of simulated oil spill trainings	12

## OIL SPILL PROJECT

The project *Enhancing oil spill response capability in the Baltic Sea region (OIL SPILL)* improves cross-border and cross-sectorial cooperation between and among relevant stakeholders in oil spill response in shallow waters and coastal areas in the Baltic Sea Region (BSR).

The overall goal is to strengthen oil spill response capability at all levels: key responsible ministries, operative competent authorities, key non-governmental organizations, relevant universities, and the petrochemical industry.

13 Partner organizations from six BSR countries form the OIL SPILL consortium. Their core activities include joint tabletop, simulator, and live field exercises, the sharing of knowledge, and the dissemination of best practices.

OIL SPILL budget is 2.0 M €, and the Project is co-funded by the EU's Interreg Baltic Sea Region programme. The Project is in operation in 2019–2021.



EXAMPLE OF NAVIGATIONAL BRIDGE AND ENGINE ROOM SIMULATOR (PHOTO: LITHUANIAN MARITIME ACADEMY)

## 1. INTRODUCTION TO MARITIME SIMULATORS

A maritime simulator or ship simulator is a system that simulates ships and maritime environments for training, research and other purposes. Today, simulator training given by maritime schools and academies is part of the basic training for maritime professionals.

The main aim of conducting simulator trainings is to teach ship manoeuvring and improve vessel handling for future seafarers, as well as enhance the competencies of masters and watch-officers to help prevent marine accidents and environmental pollution.

There are many different types of maritime simulation training software and devices to ensure safety and compliance training for maritime professionals.

Device types range from virtual engine room simulators to ship handling simulators. The most common maritime simulators include ship's navigational bridge simulators, engine room simulators, cargo handling simulators, radio communication simulators.

The navigational bridge simulators, among others, are created to feel as authentic as possible, regardless of the type, length, or weight of the vessel.



Additionally, the training drive on the navigational bridge simulator has to imitate the weather and ice conditions, currents, and bathymetric characteristics of sailing areas as closely as possible.

Communication, being an essential part of training not only deck officers but also oil spill response units on vessels and onshore, is also enabled. The navigational bridge simulators are equipped with radio communication devices that enable communication with instructor or other bridges in the simulator centre. During the proposed oil spill simulator trainings the authentic ship handling simulators and communication tools will be utilised.



EXAMPLE OF NAVIGATIONAL BRIDGE AND ENGINE ROOM SIMULATOR (PHOTO: LITHUANIAN MARITIME ACADEMY)

## 2. AVAILABILITY OF MARITIME SIMULATORS IN THE BALTIC SEA REGION

There are limited facilities in the Baltic Sea Region utilising the advanced maritime simulators with an authentic feel and look of a ship-bridge. There are several centres in the Nordic countries and the Baltics that are mainly used for the training of future deck officers as well as for training courses for active seafarers.

Maritime simulators are generally present in maritime educational institutions where future deck officers are taught. Available maritime simulators are originally not used for the oil spill response trainings, but for navigational training purposes. In recent years, the maritime simulators are also used for the research purposes and validation of R&I developments.

Within the OIL SPILL project, the only maritime focused simulator centre in Estonia, located in **Estonian Maritime Academy of Tallinn University of Technology (TalTech EMERA)**, will be utilised for the oil spill simulator training exercises.

The simulators in **TalTech EMERA Simulator Centre** are mostly used for STCW-training of future seafarers. **The International Convention on Standards, Training and Watchkeeping for Seafarers (STCW)** sets the standards of competence for seafarers internationally.



NAVIGATIONAL BRIDGE SIMULATOR IN TALTECH EMERA (PHOTO: TALTECH EMERA)

### 3. TALTECH EMERA SIMULATOR CENTRE

In **TalTech EMERA Simulator Centre**, there are four navigational bridge simulators emulating the driving of an actual ship, which are installed in special rooms, imitating real ship bridges in build and function as closely as possible. Navigational simulator **NaviTrainer Professional 5000 (NTPRO 5000)** enables simulator training and certification of watch officers, chief officers, captains, and pilots on all types of vessels.

The simulator complex enables equipment familiarisation for maritime students and refreshment trainings for active seamen, practicing general situations, based on collision avoidance regulations as well as more complex and specific scenarios like search and rescue, tug operations, ice navigation, etc.

There are several extras available for the simulators to enable these different functions and scenario practicing.

The bridges are connected to enable the conducting of joint exercises between multiple vessels in common navigational area.

Additionally, radio communication is enabled between bridges and instructors to practice correct communication and create a life-like situation.

Depending on the specifics of the exercise, the response training could consist of different parts. These parts can be used simultaneously or independently to enable joint training of various parties involved in oil spill response operations, such as bridge and deck teams and shore personnel:

- Oil spill functionality of the **NTPRO 5000** navigational simulator that enables the crews of response vessels to develop various skills like response vessel formations, manoeuvring and communication, as well as controlling oil booms, skimmers, buster and oil barges. The behavioural realism is aided by the spill's visual appearance, which depends on the amount of spilled oil and the type of oil.
- **PICES II** resource management simulator an incident response simulator designed for preparing and conducting command centre exercises and area drills. The application is developed to support exercises focusing on oil spill response.



OIL SPILL MODULE ENABLES THE VISUALISATION OF RELEVANT OIL SPILL RESPONSE EQUIPMENT (FIGURE: WÄRTSILÄ)

## 4. BENEFITS AND OPPORTUNITIES OF THE SIMULATOR TRAININGS REGARDING OIL SPILL RESPONSE PROCEDURES

Responders' preparedness to tackle real oil spill accidents is gained by the comprehensive training. The more common approach in oil spill response training includes tabletop and real (field) exercises, however maritime simulators, although being a rather novel approach, are considered to be an essential part of the preparation process.

With the help of maritime simulators, the oil spill response and related procedures can be managed in the form of a simulated role-play. The use of full-mission maritime bridge simulators enables training not only for oil spill response mission coordinators but also for the improvement of maritime skills of responders. Maritime simulator training can be considered as a complementary training method to live field-exercises as it enables the practice of non-technical-skills but not hands-on training with oil spill response equipment.

The simulator training can be used to provide the first experience in the oil spill response situation before the field-exercises, but also as refreshment for active crewmembers in the field as simulations offer a highly cost-efficient environment compared to organising field exercises.

There are several opportunities for the exercise to be implemented:

- to have a new made-up scenario of the oil spill incident,
- have it as a play-through of a real situation,
- use the simulators to practise for a live field-exercise, or
- test and practise novel procedures.

To be beneficial for the trainees, a good training scenario is of major importance. It is crucial to set the scope and clear as well as realistic objectives for the exercise. Also, the main target groups to be approached should be defined already in the exercise design phase. The development of the exercise scenario has to take into account valid environmental policies – recommendations and their legal implications, effective contingency plans, crisis management guidelines.

In recent years, Finland has shown to be the frontrunner in the field of simulated oil spill response training in the Baltic Sea Region. Experts from **the South-East Finland University of Applied Sciences** have developed a methodology and working on the development of a joint oil spill training model for the Gulf of Finland. The work is currently being carried out in the South-East Finland – Russia cross-border co-operation programme project **SIMREC – Simulators for improving Cross-Border Oil Spill Response in Extreme Conditions**.

The centrepiece of SIMREC is the development of an innovative and cost-efficient simulation environment training that capacitates response teams to maximise the efficiency of their operations. Additionally, tailored training programs will be developed. More information about the SIMREC project is available on **Kotka Maritime Research Association's [website](#)**.

EMERAs' maritime focused simulator centre offers flexibility in training and optimisation of learning time and cost. It enables EMERA to take advantage of high-tech solutions and carry out innovative cross-border training.



Compared to live exercises, simulator training is more cost-effective and risk-free. It enables easy modifications to the exercises and instant play-through of different scenarios in a controlled environment.

TalTech EMERA has previously conducted simulator exercises within the Interreg Baltic Sea Region programme project [ChemSAR: Operational Plans and Procedures for Maritime Search and Rescue in HNS Incidents](#). The main aim of the exercises was to evaluate the outcome of developed operational plan (OP) and standard operational procedures (SOPs), but also the co-operation between

rescue centres in a multi-type accident where surface units and air assets are needed. The participants and other relevant stakeholders saw the simulation exercises as a valuable source of feedback.

Additional expertise in high-level simulator exercises, besides the daily training sessions of seafaring cadets and participants of further training courses, comes from numerous search and rescue exercises conducted in TalTech EMERA. The exercises are, among others, conducted for **Estonian Police and Border Guard**, as well as **the European Border and Coast Guard Agency (FRONTEX)**.



THE WORK DONE IN CHEMSAR PROJECT IS ENHANCED IN THE RESQU2 PROJECT PLATFORM. ALSO HAZARD PROJECT THAT PRECEDED THE OIL SPILL PROJECT IS PART OF THIS CONSORTIUM. [VISIT THE RESQU2 WEBSITE.](#)

## 5. DESCRIPTION, MAIN IDEA AND IDENTIFIED DIFFICULTIES BEHIND THE JOINT SIMULATION TRAININGS

OIL SPILL project is looking for the possibility to have joint oil spill response related simulator training by enabling different simulator centres from different countries. Such an approach would enable cross-border co-operation and training without having experts in the same location.

Joint network – [the European Maritime Simulators Network \(EMSN\)](#) – was established within the European-wide **MONALISA 2.0** project and further developed in the follow-up project of **Sea Traffic Management Validation (STMV)**. The manufacturer-independent network of ship handling simulators allows joint navigational training exercises and research studies. In the STMV project, a stable version of the EMSN was mainly used to assess new navigational technologies.

By now, outgrown from these projects, the network is further developed by the consortium consisting of maritime simulator centres across Europe in the lead of **Fraunhofer Centre for Maritime Logistics** in Germany. In the last couple of years, several joint simulator exercises have been conducted, mainly in the field of navigational training for future seafarers, as well as search and rescue exercises.

Within the OIL SPILL initiative, the EMSN was regarded as a suitable potential for the conduction of joint simulator training. However, a detailed analysis of platform capacities and technical capabilities, performed by **the Estonian Maritime Academy** in co-operation with **Klaipėda University** (Lithuania), revealed the specificity of technical solutions, which makes it difficult to implement joint simulator training procedures.

The EMSN is based on the **IEEE Distributive Interactive Simulation (DIS) Protocol**, which provides time and space coherent synthetic representation of real-world environments through real-time exchange of data units. That enables the possibility of having simulator centres geographically distributed. The solution needs the centres to be on the same technological level and the use of the same standardised objects, such as navigational areas and ship models, within one exercise.

The oil spill response exercises need to be as realistic as possible to be of use for the trainees. It includes displaying the movement and spreading of the oil spillage due to weather characteristics, etc., which is not a standard object (like navigational areas, ship models). Therefore, possibilities of connecting maritime simulator centres for the purpose of conducting real-feel simulated oil spill combating training with simulators connected in the same network are quite limited.

With the rapid developments in the current digital era, these joint exercises could be a standard already in forthcoming years in the oil spill response training. In the mean time, simulator trainings taking place in one simulator centre have proven to complement theoretical knowledge, tabletop exercises and live field-exercises and could be organised to train professionals and experts either nationally or at international level.

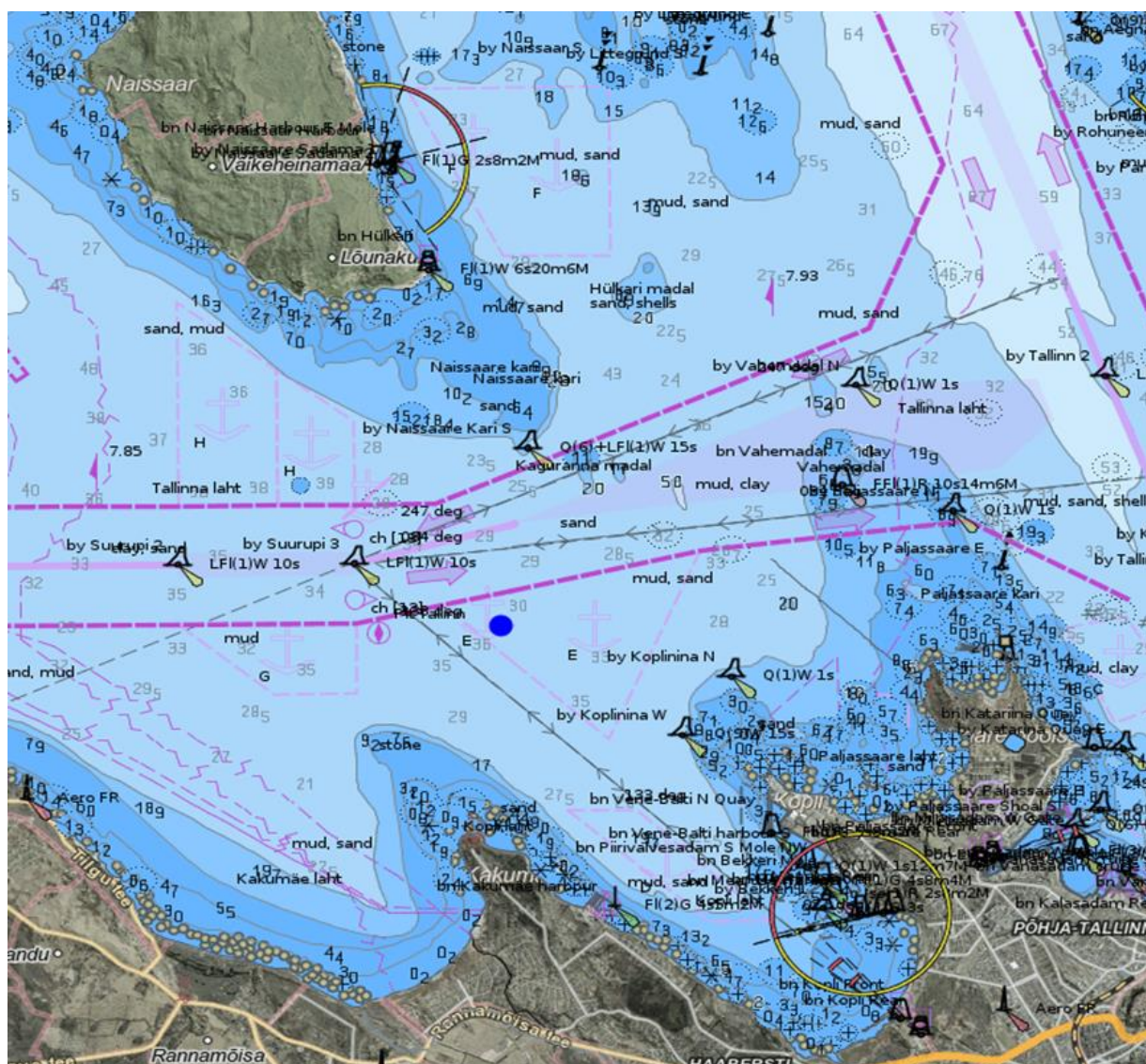
## 6. SMALL SCALE SIMULATOR TRAINING

On the 21<sup>st</sup> of May 2020, a short simulator exercise in oil spill response was organised in TalTech EMERA. The exercise was based on the scenario created for **the Balex Delta 2020** event to be held in August 2020. The scenario was shortened and modified to meet the simulator capacity.

The exercise combined elements of oil spill response and search and rescue operation.

The scenario foresaw a collision between a passenger ship and container vessel in Tallinn Bay, west of the Island of Naissaar, near the anchorage area. The container vessel suffers from damage to hull, leaking diesel fuel in the port side, 3 men overboard. The wind at the site was NW 9 m/s.

Four response vessels started from the Kopli Bay. To reach the collision site, the heavily trafficked *Suurupi* fairway had to be crossed.



THE RESPONSE EXERCISE WAS LOCATED IN THE TALLINN BAY, NEAR THE ISLAND OF NAISSAAR (FIGURE: NUTIMERI)



According to the scenario, Estonian Maritime Administration's vessels "EVA-316" and "Sektor" and Estonian Police and Border Guard vessels "Kindral Kurvits" and "Raju" responded to the situation. The participants – crewmembers in the simulator – were from **Estonian Police and Border Guard** and **Estonian Maritime Administration**. During the exercise, the container vessel and passenger ship were operated and presented by the cadets of TalTech Estonian Maritime Academy.

As it was the first time for TalTech EMERA to use the oil spill module of NTPRO5000 simulator in a response exercise conducted with crewmembers from response vessels, the feedback gained is of high-value when preparing for future training sessions. From the organisational side, it was considered important to hold a briefing session before the exercise, as well as debriefing after the session to make conclusions and discuss the issues raised during the exercise.

The main points brought out in the debriefing meeting after the exercise addressed the importance of the allocation of activities for

each of the response vessels, as well as proper vessel-to-vessel and command centre-to-vessel communication. It was stated that the starting and ending of radio communication should be more structured, and IMO standard procedures and phrases should be used more.

From the technical point of view, the visual side was brought out stating the difference between real situation and simulator exercise – spillage is easily detectable and has clear lines also in different weather characteristics, which is not so in real conditions.

The two-hour simulator exercise was considered a good experience by the participants who are experts active in the field. The necessity of this kind of training was considered high – it was stated that the "refreshment training" should be held once a year in addition to live field-exercises. As many questions and topics raised during the exercise – mainly regarding the national capacity of technical and human resources – the main benefit of these exercises would be the gathering of inter-agency competence and bringing together the expert know-how.



## 7. TARGET GROUPS

The main target groups for maritime simulation training can be divided into three levels:

- 1) on-site responders**
- 2) response coordinators**
- 3) management and coordinating authorities**

Therefore, the oil spill response training conducted as a simulated role-play can involve both, the management and operational personnel.

As all parties involved in the response operations must have sufficient training and knowledge of their roles, all organisations and units responsible for the spill response from sea and planning are considered as target groups: the rescue, environmental and maritime authorities, RCCs, crews of oil spill combating vessels, shipping companies, rescue units, SAR training, and maritime academies, NGO's and other maritime stakeholders.

Depending on the type of the simulator exercise (see, page 7), the target groups may be different.

## 8. THE FUTURE OF SIMULATED OIL SPILL TRAININGS

The simulator exercises can be considered as a standard training method in the field of oil spill response in the near future. To promote the process, the organising of these events should become regular, as are tabletop and live field exercises.

In addition, as there are several co-operation initiatives ongoing in the field of simulated oil spill response trainings and in using maritime simulators in general for different maritime safety and awareness-raising activities, the near future could bring the sector many technical advancements.

For the simulator training to be an anticipated training event, the general structure and expectations need to be set. Therefore, a survey about the needs and expectations of the target group is planned. The responses will be collected from the participants of the Simulator Training Event before the upcoming exercise. In addition, it is important to collect and analyse feedback after the event. Based on this information, a roadmap for the future oil spill response exercises will be compiled as one of the important outcomes of the OIL SPILL project.

This report is published under the OIL SPILL project that is co-funded by the Interreg Baltic Sea Region programme of the European Union.

**Visit OIL SPILL website:**

[blogit.utu.fi/oilspill](http://blogit.utu.fi/oilspill)

**Follow OIL SPILL on Twitter:**

[@oilspillproject](https://twitter.com/oilspillproject)



# OIL SPILL

## Enhancing oil spill response capability in the Baltic Sea Region

Unlike on the open sea and in international waters, combatting oil spills in shallow waters and coastal areas is often complicated. The division of tasks and responsibilities between Competent Authorities and other stakeholders, such as NGOs, is often unclear. The focus of OIL SPILL is on strengthening oil spill response capability in the Baltic Sea Region (BSR) by enhancing cooperation structures, procedures and skills between and within the relevant stakeholders.

### Fostering cooperation between competent authorities and volunteers in oil spill response

Coastal oil spill response is an arduous, long-term operation. Voluntary oil spill response capability is therefore critical in achieving optimal results and minimising environmental harm. OIL SPILL project aims to develop and promote co-operation between authorities and volunteers. Essential in optimising volunteer contribution is to establish a co-operation model for both authorities and volunteers. The OIL SPILL project aims to promote this co-operation in oil spill response.

### OIL SPILL outputs

Project's overall objective is to strengthen oil spill response capability in the BSR at the levels of key responsible ministries, operative Competent Authorities, key NGOs, relevant Universities and the petrochemical industry. OIL SPILL outputs include the following:

- Identifying administrative or other procedures to improve cross-border harmonisation;
- Clarifying key legal issues at all levels (incl. ministries, Competent Authorities and NGOs);
- Building up (inter)national training schemes;
- Organising relevant training events, incl. using simulators; and
- Organising cross-border exercises.

### Contact us at:

OIL SPILL Project  
Turku School of Economics  
FI-20014  
UNIVERSITY OF TURKU  
FINLAND

Project Leader,  
Professor Lauri Ojala  
Tel. +358 50 502 7031,  
[lauri.ojala@utu.fi](mailto:lauri.ojala@utu.fi)

Project Manager,  
Dr. Jarmo Malmsten  
Tel. +358 50 409 1493,  
[jarmo.malmsten@utu.fi](mailto:jarmo.malmsten@utu.fi)

### Project website:

[blogit.utu.fi/oilspill](http://blogit.utu.fi/oilspill)

Communication Manager,  
Minna-Liina Ojala  
Tel. +358 50 476 6664  
[minna-liina.ojala@utu.fi](mailto:minna-liina.ojala@utu.fi)