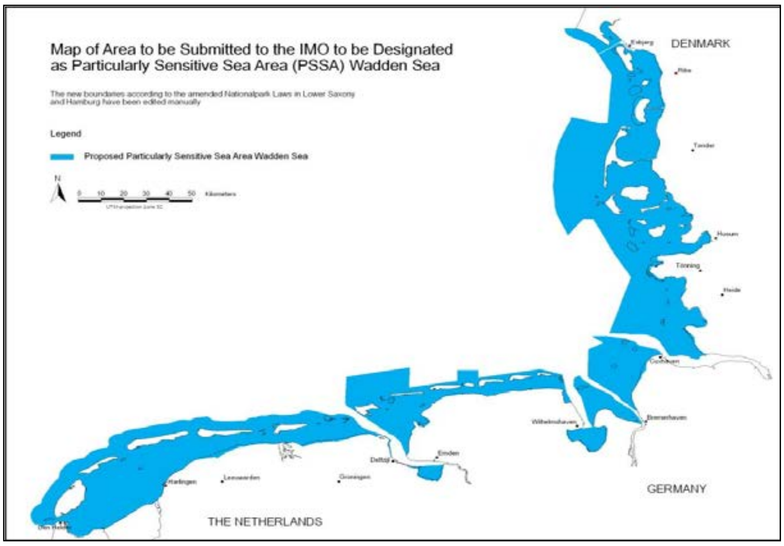
Oil spill response simulator revisited.
(By Stephen Cross and Pim Werner).

Environmental aspects.

In the case of a major accident such as a collision or grounding involving a tanker, there will most probably be the need for an extensive operation involving local, national and international resouces and equipment.
In order to be effective in these cases realistic contingency plans will have to exist for each size of accident. The response operations can be set into motion smoothly and available resources from the relevant organisations utilised in a well coordinated and organised manner.

Environmental policies, their legal implications, insurance, effective crisis management and public relations strategies after a serious incident, are all elements which can be taken into practice in a realistic training scenario.
Good crisis management will provide confidence to those involved in the ability to cope with such incidents and underline an organizations credibility.

Because of the vulnerability of the Dutch Coast and the Wadden Sea Area as well as the intensive shipping traffic and oil and gas exploration activities in the adjacent Nortrh Sea, all care is taken to be as well prepared as possible, if a serious spill occurs. Preparedness training by means of the spill response simulator can be an essential part of that preparation.



Wadden Sea extent

Additionally others have also recognized the uniqueness of the Waddenzee area as it on the lists of Netherlands Natura 2000, the Unesco World Heritrage and IMO's Particularly Sensitive Sea Area's (PSSA). All of which obviously justifies the efforts taken at MIWB, located on the Wadden Sea border, to be prepared should something unfortunate happen!

Training aspects.

In the scope of maritime training it seems interesting to try and identify niche markets for providing courses . BRM, ERM and DP training are examples which are beside the common education and training programmes.
A very specialist application is that of the trailing suction hopper dredger which has been developed and used in MIWB for some years now. Extension of the dredger simulator with surface sweeping and pumping facilities suddenly turns the dredging ship simulator into and oil spill response vessel as employed in reallife in The Netherlands.

A number of elements can be distinguished to take place in the course of an oil spill response. The managing of the spill response and the logistics of such an operation can be practiced in the form of simulated role play. Secondly the actual actions of responding to a spill and implementing the various types of equipment to clean up the spill can be trained. Furthermore researching of the most effective action to be taken according to the prevailing meteorological and oceanographic circumstances can be done in order to be fully prepared in the case of a real disaster.

In a simulated manner the on-scene response teams will be able to provide information about the pollution site and the extent of the spill.
Then notification of the regional response teams and the further organisation can follow using a series of real communication equipment as telephone, fax, marifoon, mobile phone, etc.
The Operational Control staff at the headquarters will then assess the spill situation based on the various information received. In this assessment the availability of response resources is included in relation to the mobilization time.

Furthermore the impact on sensitive areas such as recreational zones, fish farms, bird feeding and nesting areas will be taken into consideration. Based on this the Operational Control determines which resources to be mobilized (ships, booms, skimmers, manpower) in order to minimize the damage caused and expedite the cleanup operations.

To make the training situation as realistic as possible the simulator staff can also roleplay journalists, local representatives, environmental organisations, authorities, private persons affected and other parties that have to be dealt with in case of a real oil spill disaster.

The instructors in control of the exercise can introduce failures, malfunctions of the equipment, engine failures of the vessels, injuries to operational personnel and changes in environmental and weather conditions which will force the trainees to change their tactics and strategies.

All possible variations and combinations of prevailing conditions can be created and examined without having to wait for these circumstances to occur or the effect of such to be guessed of.
It seems that the use of a simulator system for the kinds of training activities described is preferable to real practice, for a number of reasons:
- oil spills are unpredictable and irregular,
- real practice is expensive, complicated and often unrealistic,
- real exercising can be dangerous.

Various techniques, methods and procedures which will be required during a maritime environmental threat, could be included in the training scenario, such as:
- lightering a vessel in difficulty or distress
- confinement and recovery at sea or in a coastal area of spilt oil
- prevention of oil washing ashore
- storage and treatment.of polluted waste.

Real dredging vessel with sweeping facilities.

Simulator aspects.

In general it can be said that the Oil Spill Response Simulator is based on the same platform as the bridge simulators with a number of stations, visual systems and communication facilities.

As most of the operations will be lead from the ships bridge this will obviously be a main component. If the bridge is first extended with the dedging operations facilities and instead of dredging pipes sweeping arems are employed on the vessel.

An essential part of thetrainer is the so-called oil spill module.This module simulates situations based on information provided by the instructor, such as spill site and conditions and information such as tides, currents etc. The model calculates drift, spreading and weathering of oil, both from continuing spills and drifting oil slicks and the amount of debris collected.

As with a ship bridge simulator the heart of the trainer is the Instructor System from where all simulator functions are controlled. From the instructor system the instructors create the exercises, introduce problems and act as ships crews controlling the speed and course of target vessels or introduce other Own Ships from where other trainees are in volved in the scenario.
The various resources available such as booms, skimmers and barges are deployed by the trainees in their capacity of either ship staff or on-scene commanders. A helicopter aerial view is available for the decision makers so that they can overlook the situation by flying overhead at relevant course and speed.

On the visual scenes the sea areas are shown as well as the booms, ships and equipment in use by the operational units and the area and extent of the oil spill.

Between the individual trainees and the trainees and instructors an intensive communication pattern will develop for which a telephone system is available where malfunctions can be introduced, cordless phones can be used, telefaxes can be connected and an intercom system for use between instructor stations of the simulator staff is included.

The oil drift model takes care of computations of the drift and the resultant shape and size of the oil spill offshore. The model will calculate drift, spread, washing ashore of oil, evaporative losses, both natural and chemical dispersion, oil weathering due to evaporation and emulsification, the configuration of towed and preventive booms and efficiency of mechanical containment and recovery.

Stranding of oil takes place when a particle crosses the contour of the coastline. Information on the location of the stranding, tidal currents, surface currents, wind and waves is transferred to the damage model . In the case of sea ice the ice boundary will be treated as an impenetrable barrier such as the coastline.

The weathering of oil, including changes in viscosity due to evaporation losses and emulsion formation is also calculated. The rate of evaporation and emulsification is determined by the type of oil, sea temperature, sea state and time spent on the sea.

Currents are taken into account and calculated as a sum of the general circulation pattern, tidal currents and wind or wave induced surface currents. The seasonal effects and prevailing meteorological conditions are added in order to optimize the accuracy of the computations.

Recovery and removal of oil because of combatting action is computed, based on information from the instructor about the use of active resources such as booms and skimers. The efficiency of the recovery operation is determined by the capacity of the equipment, the amount of oil available and the prevailing sea state. The configurations and possible failures of booms towed by vessels or anchored as protecting boom are computed on the basis of information about the length of the booms, towing speed, surface currents and working characteristics of the boom types utilized.

Tugboat directing oil to sweeping arm

Simulated vessel with sweeping arm and containment boom

Aknowledgement.

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