

# OIL SPILL RESPONSE SIMULATION

NTPRO 5000/PISCES II

## What is NTPRO 5000?

- 5th generation of the Navigational Simulation Platform for conventional STCW training, advanced operation specific training and R&D applications.
- Windows based network/client software package using COTS hardware infrastructure.
- Fully scalable solutions from online STCW training from the cloud up to full mission systems interconnected to other types of our and/or 3rd party simulators.
- The optimal simulation solution whether it is for generic or type specific ship's bridge operations.



STCW training



Operation specific training



Research &amp; Development

**NTPRO 5000**

## COMPLIANCE TO INTERNATIONAL STANDARDS AND REGULATIONS

- International Convention of Training, Certification and Watch keeping for Seafarers (STCW 2010 including the Manila Amendments).
- IMO model courses.
- International SOLAS Conventions.
- OPRC convention 1990.
- Close cooperation with ClassNK on training and simulator development.
- Approved with class notations: INTEGRATED SIMULATOR SYSTEM, NAUT-AW(SIM), DYNPOS-AUT(SIM), HSC, TUG, ICE, AHTS to the Class A Standard for Certification of Maritime Simulators No. DNVGL-ST-0033 April 2018.
- The Nautical Institute's and OSVDPA requirements for Dynamic Positioning Simulators.
- Regulations concerning 'special' training: fishing operations, VTS operator training, etc.



# TRAINING OBJECTIVE DEFINES THE SIMULATOR CONFIGURATION

## COMPUTER-BASED TRAINING

- Individual in-house or distance learning from the cloud
- Equipment familiarisation
- Self-examination and competence assessment
- Onboard training and assessment

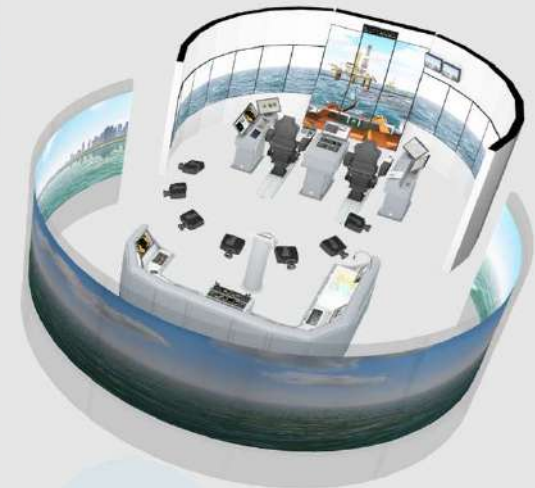
## NETWORKED CLASSES

- Interactive group exercises under instructor supervision



## FULL MISSION SIMULATOR

- Final training, assessment and certification
- Bridge Resource Management
- Pilot training
- Task rehearsals



## INTERCONNECTED SIMULATORS

- Crew resource management: **WHOLE SHIP** evolution training; Exercising communications between the bridge and engineering departments
- Operation resource management: interconnecting different types of Wärtsilä or 3rd party simulators to simulate a full operation, e.g. Oil Spill Response, Naval warfare, etc.



Cloud Based  
Simulation Solution

## INTEROPERABILITY

NTPRO 5000 is a flexible platform with powerful ethernet interfacing and intergration possibilities.

- Wärtsilä onboard equipment
- MFD
- ECDIS
- RADAR
- Wave
- BNWAS

- 3rd party simulator systems
- Military simulator systems
- Multi-manufacturer networks (EMSN)

DIS/  
HLA/  
Custom

**NTPRO  
5000**

- Wärtsilä Simulators
- TechSim ERS
- PISCES
- GMDSS Simulator 5000

NMEA/Custom

- 3rd party bridge equipment
- Integrated bridge systems
- Dynamic positioning systems
- ECDIS
- RADAR
- Autopilot
- Controls/Indicators



## PISCES II

- Resource management training for oil spill response organisations
- Oil spill investigations (backtracking)

## NTPRO

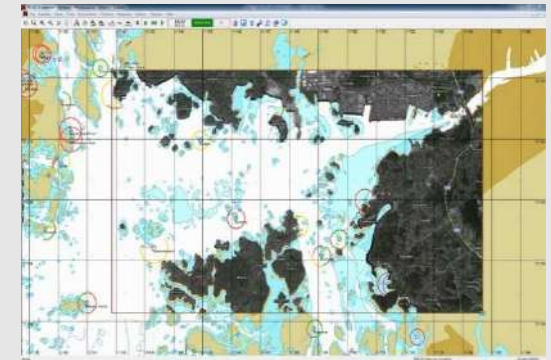
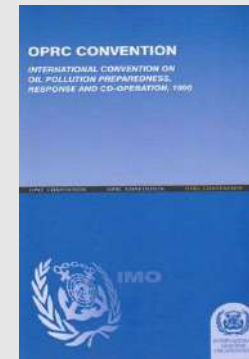
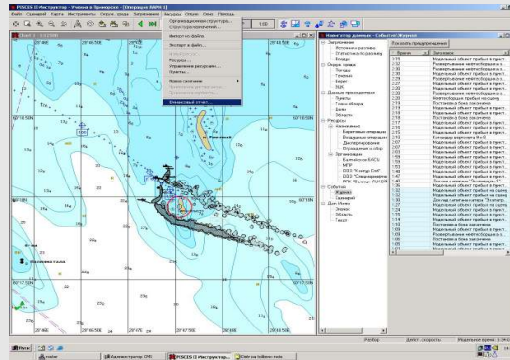
- Vessel and response equipment handling

## PISCES II – OIL SPILL RESOURCE MANAGEMENT

An incident response simulator designed for preparing and conducting resource management exercises.

Designed to evaluate the preparedness to respond effectively to oil spills, in accordance with the requirements of the **OPRC convention 1990**.

PISCES is developed specifically to support the **Preparedness for Response Exercise Program (PREP) administered by the U.S. Coast Guard** with the goal of providing an improved training environment for response managers.



## PISCES – TRAINING APPLICATIONS

- Coordination Centre's Operational Staff
  - On-scene commander (level 2)
  - Management level (level 3)
  - Insurance and Investigation Officers
  - Full operations resources management through joint exercise with navigational simulator
- Main advantage of using simulator:
    - Resource management and optimisation
    - Decrease costs through efficient communication and proper equipment handling
    - Possibility to simulate specific scenarios (e.g. bad weather conditions) which is hardly achievable for training in real environment



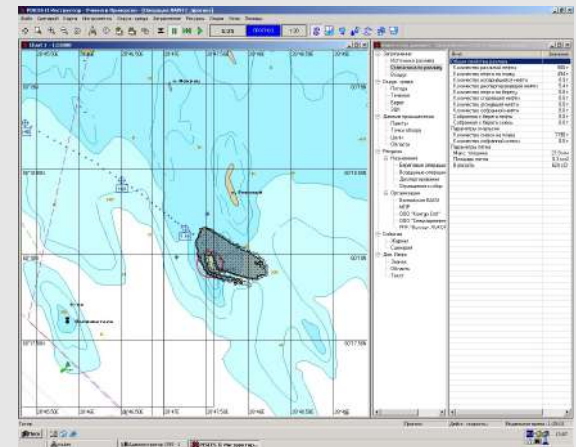
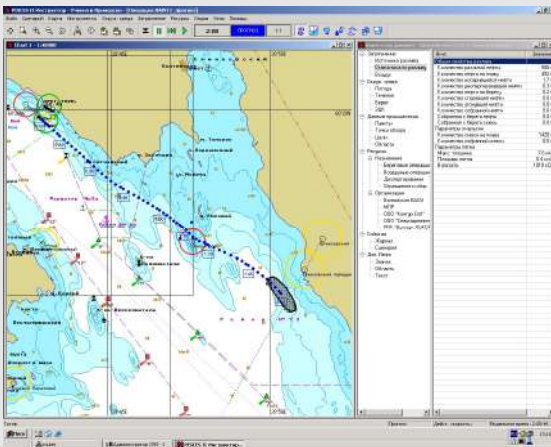




## OIL SPILL RESPONSE – PISCES – OIL SPILL MODELLING

PISCES II spill model simulates processes in an oil spill on the water surface:

- transport by currents and wind
- spreading, evaporation, dispersion, emulsification, viscosity variation, burning
- interaction with booms, skimmers, and the coastline



## OIL SPILL RESPONSE – PISCES – ENVIRONMENTAL DATA

- Weather conditions:
  - wind speed and direction
  - water and air temperature
  - wave height
  - water salinity
  
- External weather



**Data Browser - Environment \ Weather**

Name	Value
Water temperature	12 °C
Air temperature	27 °C
Wind speed	5 m/s
Wind direction	0 °
Sea state	0.5 m
Water density	1030 kg/m3
Cloudiness	5

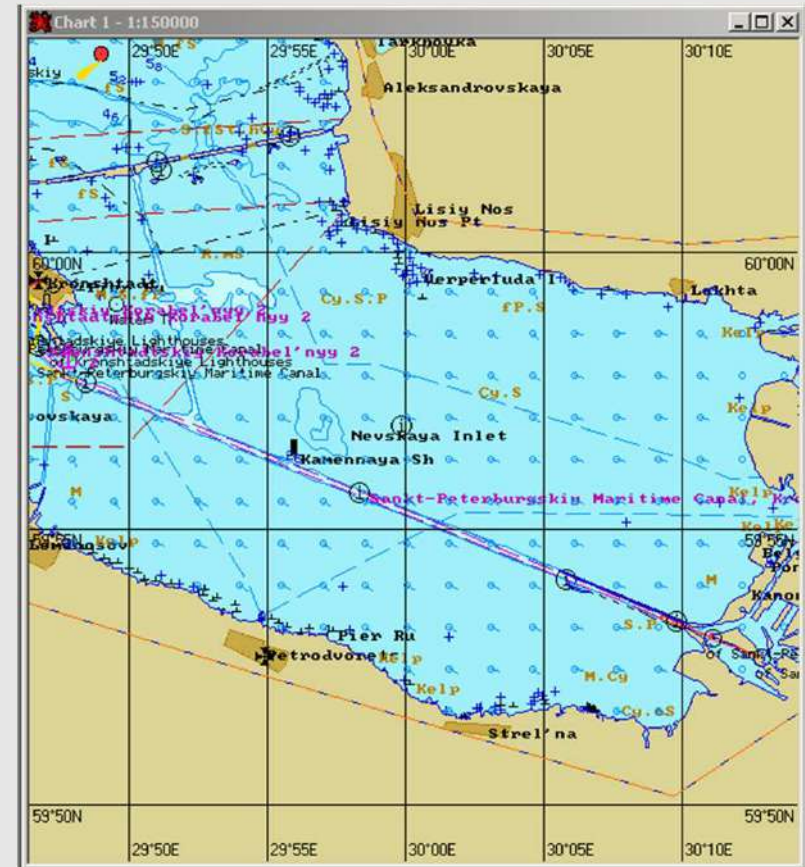
**Speed and Direction**

Time	Speed	Direction
0:00	5 m/s	0 °
1:00	3 m/s	30 °
3:30	4 m/s	60 °
4:00	4 m/s	60 °

Buttons: Insert, Delete, OK, Cancel

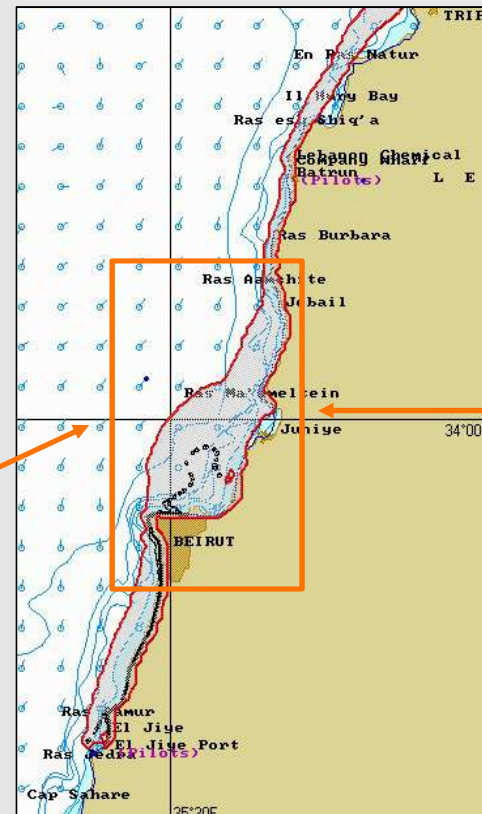
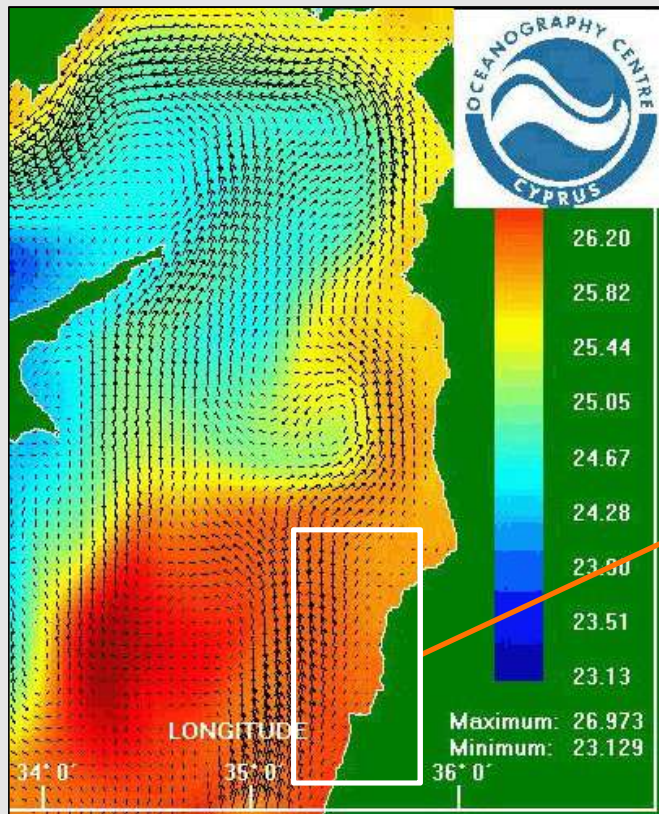
## OIL SPILL RESPONSE – PISCES – ENVIRONMENTAL DATA

- Current fields inserted by instructor
- Import of current databases in XML-formats

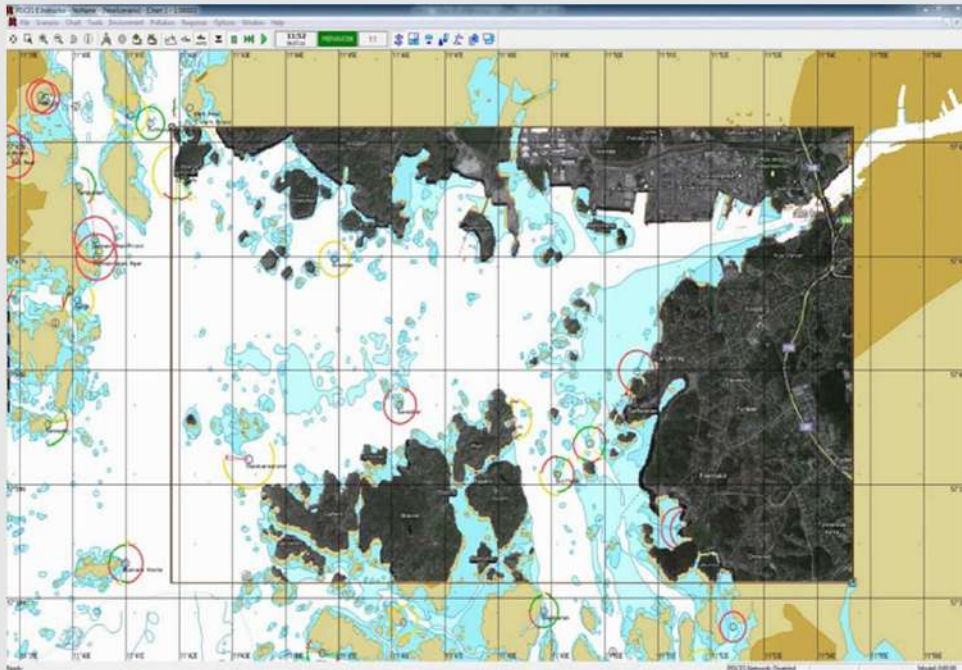


# OIL SPILL RESPONSE – PISCES – TIMED MAPS OF CURRENTS

- External HD model data
- Import to PISCES
- Satellite image



## OIL SPILL RESPONSE – PISCES – IMPORT OF GEOGRAPHICAL INFORMATION

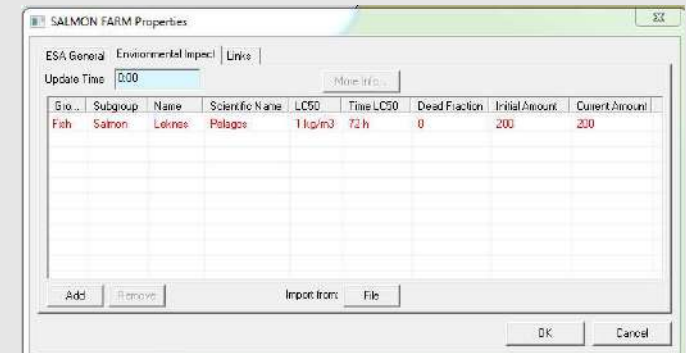
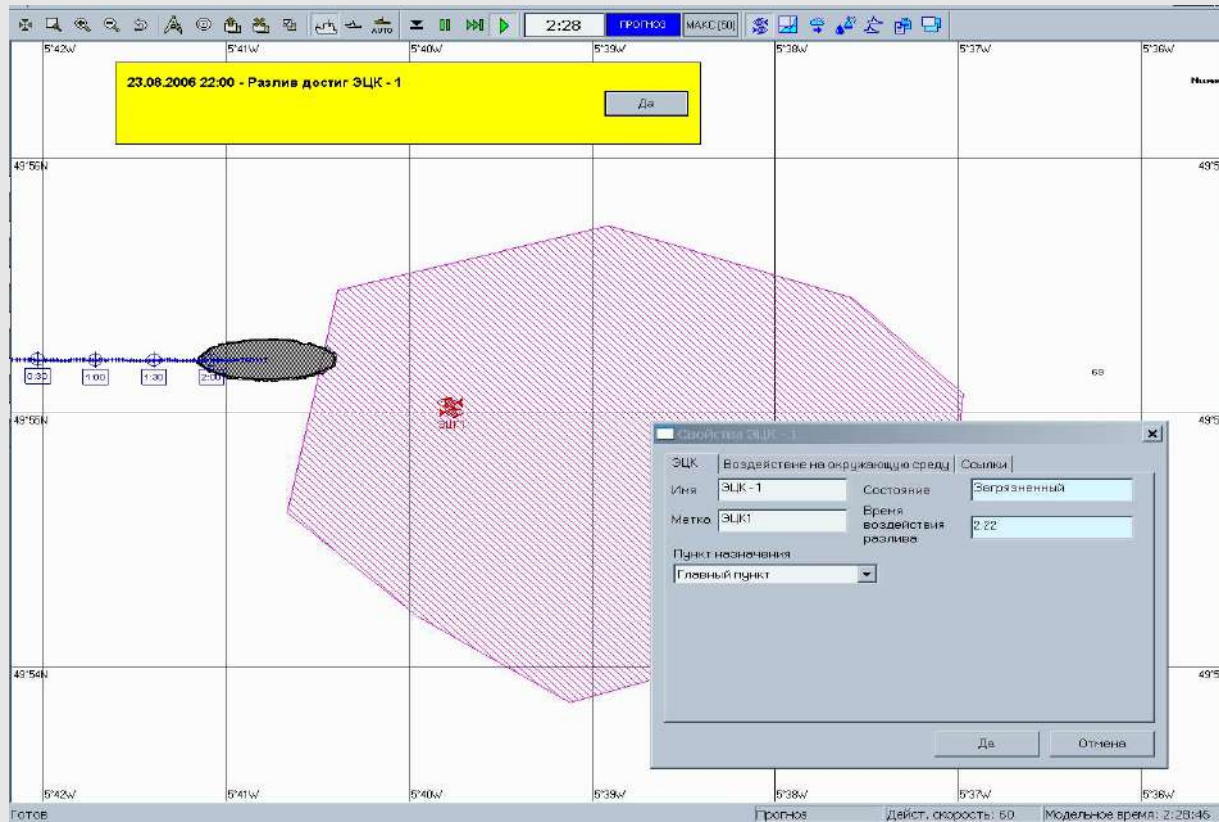


Provides trainees with additional information:

- Infrastructure
- Topographical information
- Imported raster images displayed as overlays

## OIL SPILL RESPONSE – PISCES – ENVIRONMENTAL SENSITIVE AREAS – EAS

- The user can specify a list of dweller groups and its properties within defined polygons.

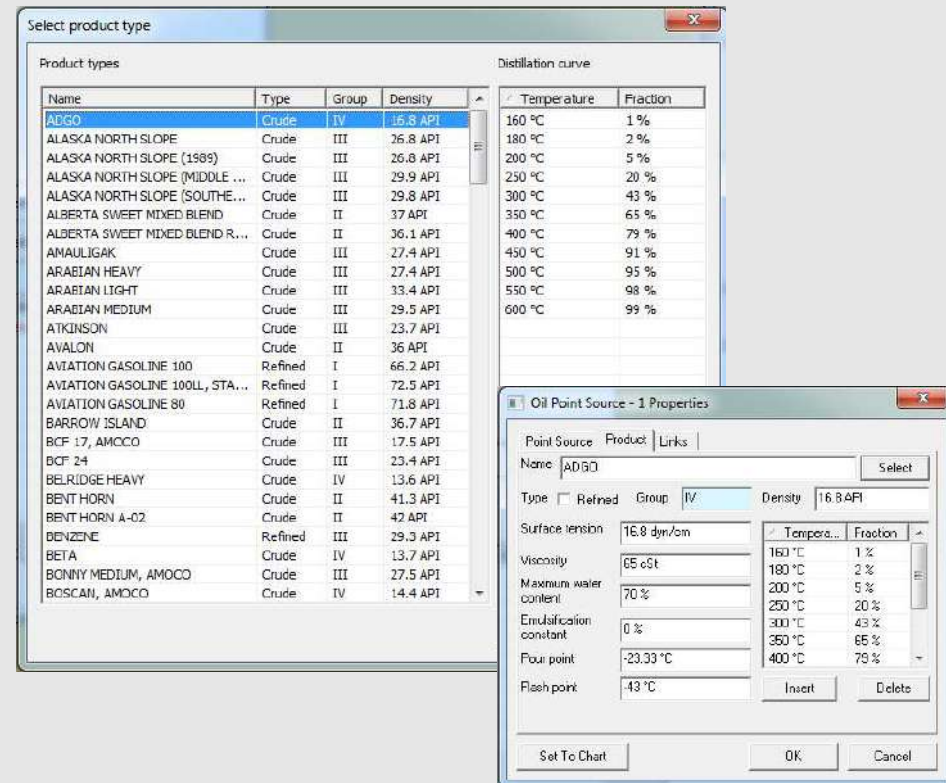


## OIL SPILL RESPONSE – PISCES – POLLUTION

- Point source – one time spill at defined position.
- Area source – one time leak at defined polygon.
- Leak source – constant leak from one object, e.g. Vessel or Blow-out.

All spills will be affected by the defined environmental conditions.

- Extensive Oil product database
- Instructor can edit/add spill products



The image shows two overlapping software windows. The top window is titled 'Select product type' and contains a table of oil products. The bottom window is titled 'Oil Point Source - 1 Properties' and shows detailed properties for the selected product 'ADGO'.

**Select product type - Product types table:**

Name	Type	Group	Density
ADGO	Crude	IV	16.8 API
ALASKA NORTH SLOPE	Crude	III	26.8 API
ALASKA NORTH SLOPE (1989)	Crude	III	26.8 API
ALASKA NORTH SLOPE (MIDDLE ...	Crude	III	29.9 API
ALASKA NORTH SLOPE (SOUTHE...	Crude	III	29.8 API
ALBERTA SWEET MIXED BLEND	Crude	II	37 API
ALBERTA SWEET MIXED BLEND R...	Crude	II	36.1 API
AMAULIGAK	Crude	III	27.4 API
ARABIAN HEAVY	Crude	III	27.4 API
ARABIAN LIGHT	Crude	III	33.4 API
ARABIAN MEDIUM	Crude	III	29.5 API
ATKINSON	Crude	III	23.7 API
AVALON	Crude	II	36 API
AVIATION GASOLINE 100	Refined	I	66.2 API
AVIATION GASOLINE 100LL, STA...	Refined	I	72.5 API
AVIATION GASOLINE 80	Refined	I	71.8 API
BARROW ISLAND	Crude	II	36.7 API
BCF 17, AMCCO	Crude	III	17.5 API
BCF 24	Crude	III	23.4 API
BELRIDGE HEAVY	Crude	IV	13.6 API
BENT HORN	Crude	II	41.3 API
BENT HORN A-02	Crude	II	42 API
BENZENE	Refined	III	29.3 API
BETA	Crude	IV	13.7 API
BONNY MEDIUM, AMOCO	Crude	III	27.5 API
BOSCAN, AMOCO	Crude	IV	14.4 API

**Select product type - Distillation curve table:**

Temperature	Fraction
160 °C	1 %
180 °C	2 %
200 °C	5 %
250 °C	20 %
300 °C	43 %
350 °C	65 %
400 °C	79 %
450 °C	91 %
500 °C	95 %
550 °C	98 %
600 °C	99 %

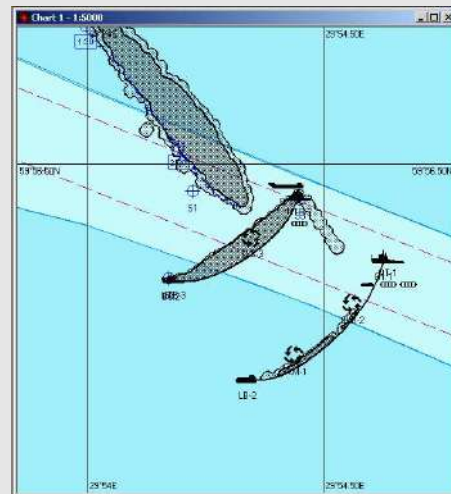
**Oil Point Source - 1 Properties table:**

Property	Value
Name	ADGO
Type	Crude
Group	IV
Density	16.8 API
Surface tension	16.8 dyn/cm
Viscosity	65 cSt
Maximum water content	70 %
Emulsification constant	0 %
Flash point	-23.33 °C
Flash point	-43 °C



## OIL SPILL RESPONSE – PISCES – RESPONSE RESOURCES

- Platforms
  - Vessels
  - Helicopters
  - Airplanes
- Personnel
- Booms, skimmers, dispersants
- Resources can be edited by instructor



Data Browser - Response resources

Name	Label	Type	Owner
Open Water Boom - 1	B1	Boom	Coast guard
Coast Guard 1	CGC-1	Vessel	Coast Guard
Oil/Water Separator - 1	OWS-1	Equipment	Fylkeskommunen
Airplane- 1	A-1	Aircraft	Kystverket
Oilfield Supply Vessel - 1	OSF-1	Vessel	Kystverket

Oilfield Supply Vessel - 1

Label: OSF-1 | Water | Oilfield Supply Vessel

State	Time	Cost
Ordered	0:00	1500 \$/h
Available	0:00	1500 \$/h
Mechanical Out of Service	0:00	250 \$/h
Personal Out of Service	0:00	700 \$/h
Assigned	0:00	2500 \$/h

Total cost: 0 \$

## OIL SPILL RESPONSE – PISCES – CALCULATION OF COST FOR USED RESOURCES

### Leknes incident- Crude Oil spill

**Location** S Leknes  
**Method** Joint operation

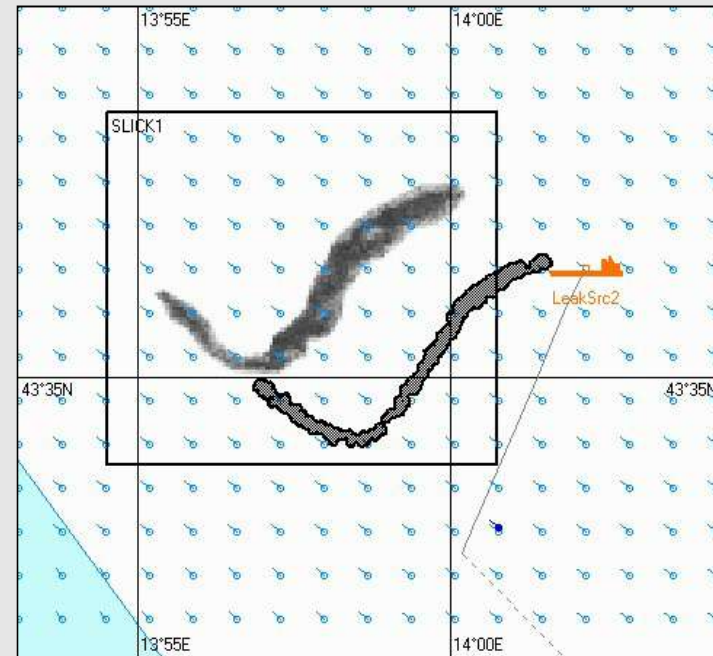
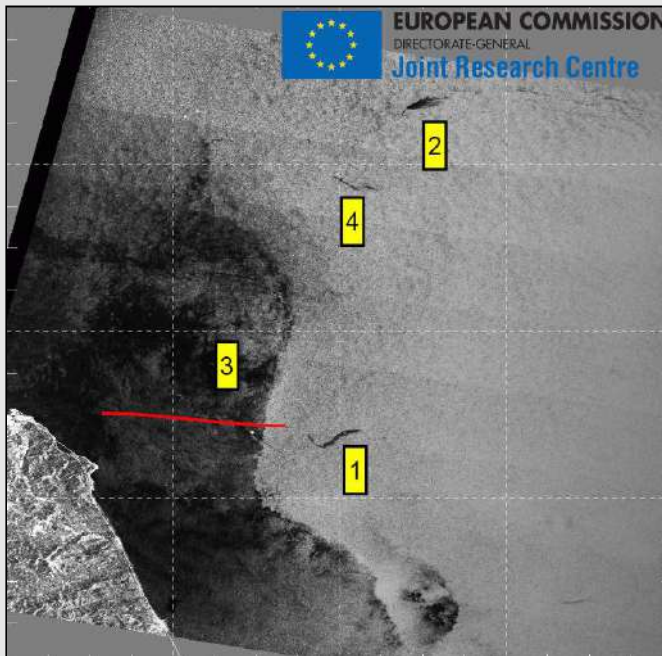
	<b>Time</b>	<b>Date</b>
<b>Start</b>	06:14	27 Oct 2010
<b>End</b>	08:26	30 Oct 2010

Owner	Resource name	Amount	Cost
Kystverket	Vidar Viking	48	\$ 22 000
Kystverket	UT-722	72	\$ 16 000
Kystverket	Ocean Buster	60	\$ 950
Kystverket	Ro-Boom 1	0	\$ -
Kystverket	Ro-Boom 2	0	\$ -
Kystverket	NOR1200L	60	\$ 1 800
Kystverket	Airplane	72	\$ 32 000
Kystvakten	KV Harstad	72	\$ 9 500
DOF ASA	Skandi Mongstad	60	\$ 35 000
<b>Total</b>			<b>\$ 117 250</b>

- Cost of each mobilised resource is determined for the statuses:
  - Ordered
  - Available
  - Assigned
  - Out of service
- Comprehensive reports

## OIL SPILL RESPONSE – PISCES – INVESTIGATION OF ILLICIT POLLUTION SOURCE

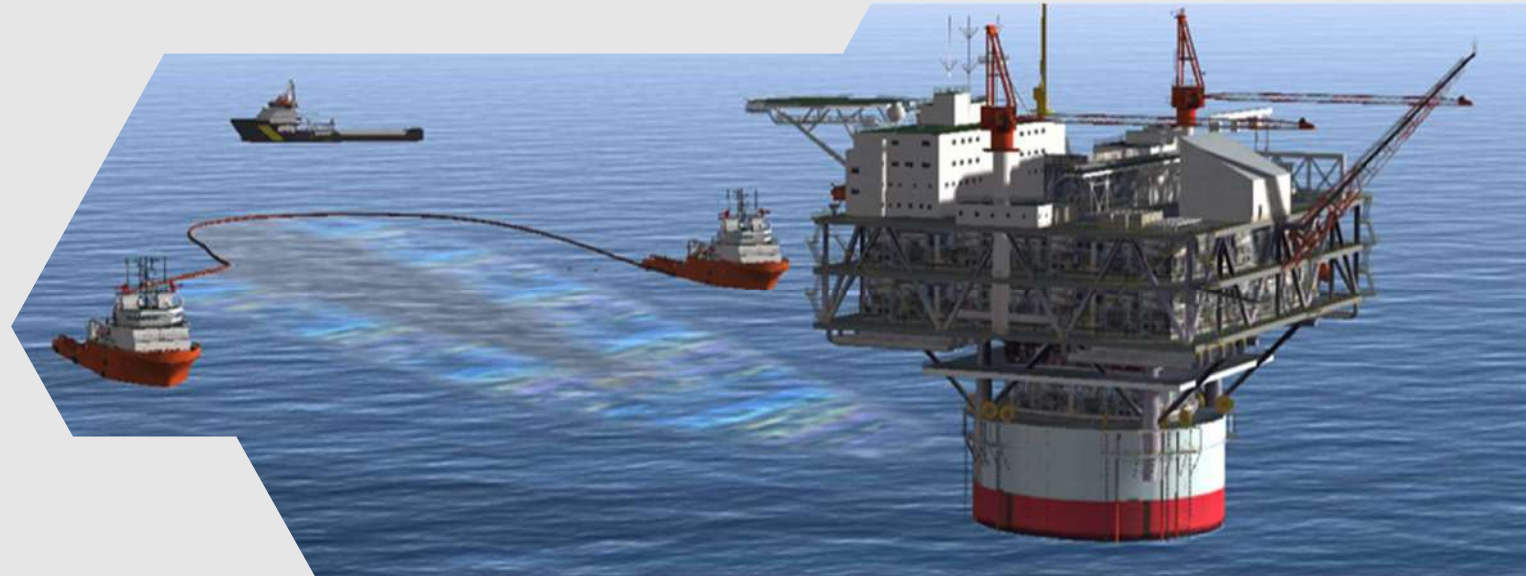
- Combination of Satellite Imagery, AIS history Data and Backtracking model allows to point out potential source of oil spill vessel.
- Successful application in the Adriatic sea (several cases).



## OIL SPILL RESPONSE – NTPRO OIL SPILL FUNCTIONALITY

Train bridge and deck crew joint actions, responding to surface oil spills. The following skills could be trained within the simulator application courses:

- Manoeuvring, fleet formation and communication
- Controlling deck winches, lines, oil booms, skimmers, busters, and oil barges
- Contaminated water/oil spill and recovery



## OIL SPILL RESPONSE – OWN AND TARGET SHIPS

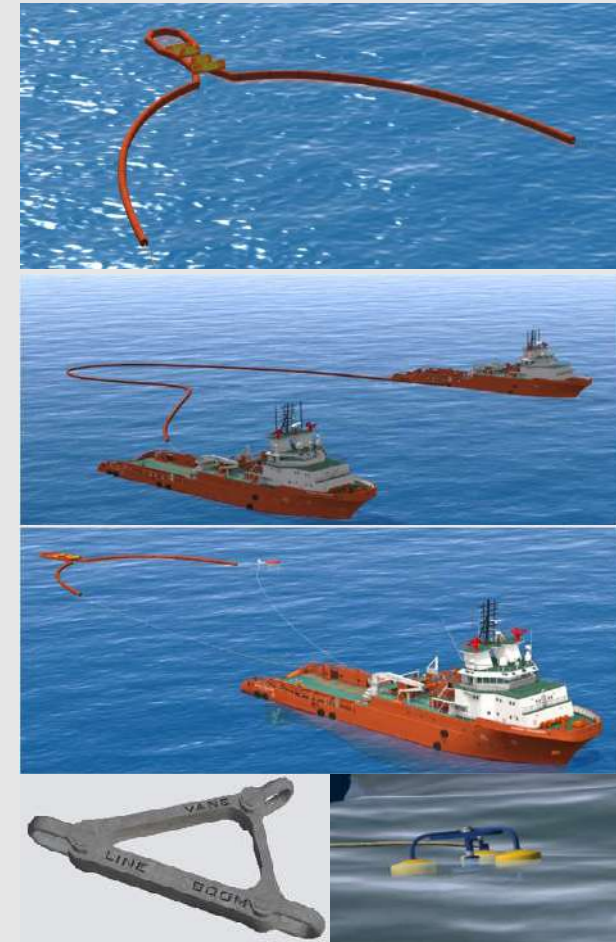


- Oil Skimmer Boat 1 (Fish boat)
  - Three winches (Port/Stbd bow and stern)
  - Three visual skins (red/blue/green)
  - Other vessels available upon request

- OSV 3 (AHTS)
  - Full winch configuration
  - Capstans

## OIL SPILL RESPONSE – OWN AND TARGET SHIPS

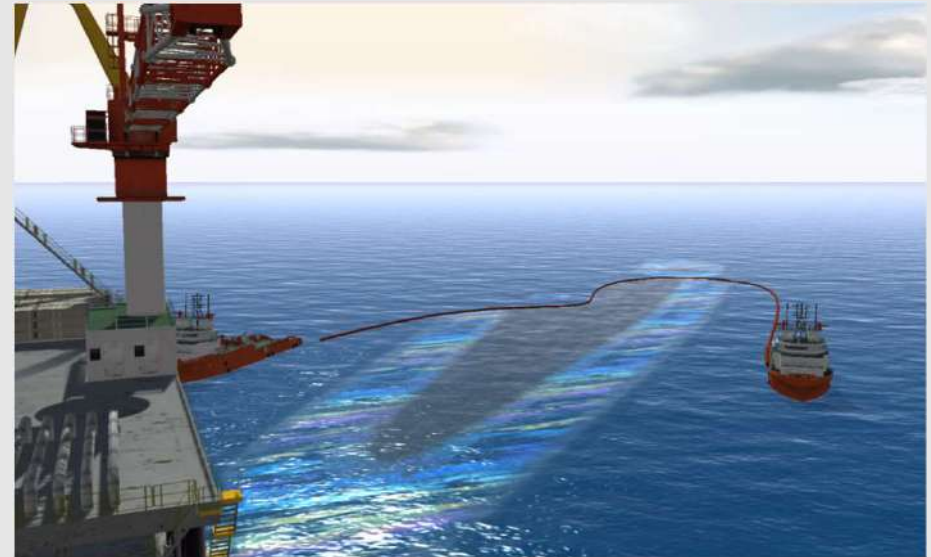
- NOFI Busters
  - Ocean, Current and Harbour Busters
- Booms
  - 600 mm, 900 m and 1200 mm
- Boom vanes with bridle for single vessel operations
- Oil skimmer
  - Capacity and clogging set by instructor
  - Indicates collected amount of spill
- Poor handling of booms and busters will lead to inefficient oil recovery.
- Modelling of response equipment is based on manufacturer data taking speed and sea state limits in account.



## OIL SPILL RESPONSE – OWN AND TARGET SHIPS

Two types of oil spill

- Oil slick
  - Physically calculated flow
  - Interacts with booms, busters, skimmers, barges, structures and vessels
- Target oils slick
  - Visual presentation for scene creation
  - Does not interact with objects
  - Different visual presentation modes



Windrow



Sheen



Streamers



Metallic



## OIL SPILL RESPONSE – OTHER OPERATIONS

### Anchored boom

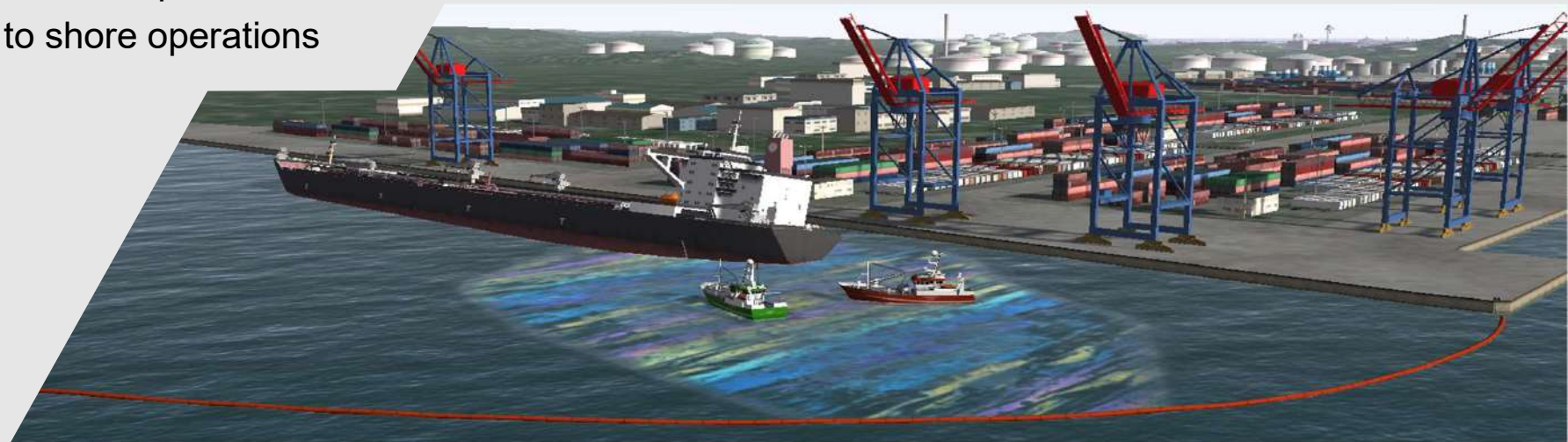
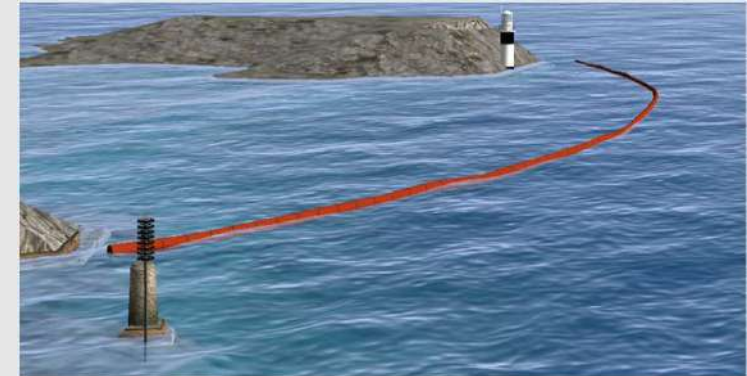
- Deploy boom at any position, e.g. along the coastline.

### Floating garbage

- Deflates boom – collected oil will transpire if towing proceeds

### Dynamic bollard object can be placed anywhere in the scene:

- Shore to shore operations
- Vessel to shore operations





THANK YOU



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