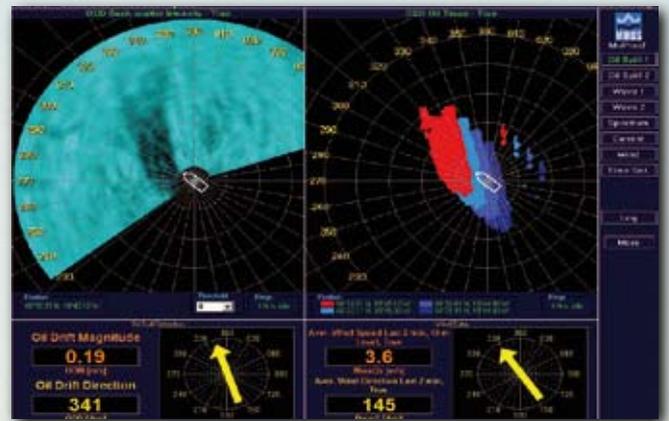


Miros OSD - Oil Spill Detection System

The tool making your oil recovery operations more effective and reliable
- day and night



- measuring the ocean surface

Oil Spill Detection and Recovery

Minimizing damage and cost from oil spills requires systems and procedures to be present when the incident occurs. The Miros OSD System offers key functionality for oil detection and recovery.

Miros offers a radar based OSD solution which is thoroughly tested in oil-on-water exercises. It has successfully supported response operations in real oil spill incidents. Miros OSD has a rapidly growing base of installations around the world.

The system has fully automated detection, giving oil spill position, position history and estimate of future drift. Miros OSD can operate in nearly all visibility conditions on a 24 hour basis.



Courtesy Exxon Valdez Foundation

Miros OSD Highlights

Key features

- For recovery operations, accurate data within 2 - 4 km radius
- Surveillance detection range is substantially longer and depends on installation height and radar equipment
- Storing of all acquired data during operation, screen dumps and data export to electronic chart system
- The ship's standard unmodified navigation X-band radar can be used

Support for search, detection and tracking of oil spills

- Automated detection
- Day and night operation, in fog and poor visibility
- Wave, wind and surface current data to support recovery

Optimized tactical presentation display

- Real-time data supporting OSD operation
- Size of oil spill and position history
- Oil drift prediction with direction and speed

Proven product

- Tested in yearly oil-on-water exercises since 2004
- Used in real clean-up operations
- Adopted by international oil recovery operators



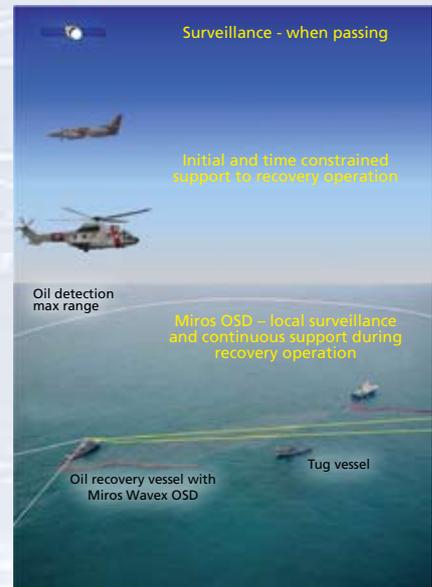
Operational Context

For Oil Spill Recovery operations, the Miros OSD system is used as a stand alone system or as part of a remote sensor network consisting of satellite, aircraft and ship borne systems. However, satellite and air borne sensors provide periodic coverage only. The Miros OSD System provides continuous local surveillance and ensures progress in an oil recovery operation in time periods when no aerial data are available.

During operations, the tactical display assists the crew onboard in

- Searching for oil spills
- Detecting and locating oil spills
- Following and tracking located oil spills

Miros OSD can be used for continuous Oil Spill Surveillance, as a stand alone system or as complement to satellite systems for monitoring of high risk areas such as off-shore installations, oil terminals and ports.

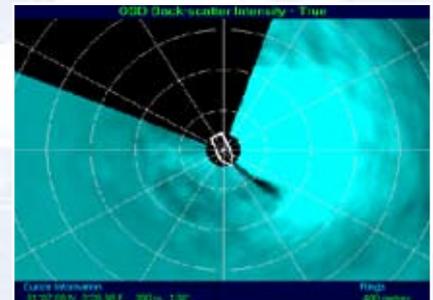


Measurement Principles

For an X-band radar, low grazing angle backscattering from the sea surface is caused by the electromagnetic waves' interaction with the wind generated sea surface capillary waves, a mechanism known as Bragg scattering.

Creation of such capillary waves is dependent on the surface tension of the sea water. If oil is present, the surface tension is reduced and the capillary waves are not created. Hence, the backscattered electromagnetic energy from sea surface areas covered with oil is strongly reduced. In fact a very thin film of oil is enough to prevent the capillary waves from being created.

The thickness of an oil slick can not be measured using microwave radar. However, knowledge of how the oil drifts under given wind and surface current conditions, ensures that the mechanical oil recovery equipment or chemical dispersant spraying equipment can be kept within areas of combatable oil thickness at any given time.



Search for an oil spill



Detect and locate the oil spill



Tracking of the oil spill

Miros OSD – A Proven Product

The Miros OSD System has been developed in cooperation with NOFO (Norwegian Clean Seas Association For Operating Companies). It has been thoroughly tested during yearly oil-on-water field exercises conducted by NOFO in the North Sea. During these field tests many types of oil, such as crude oils, fuel oils and emulsions have been released and detected by the OSD system.

2000 Deep Spill trial - first data collection from release of 60 m³ oil

2004 NOFO oil-on-water trial - online operating system.

2005 NOFO oil-on-water trial - online operating system, automatic detection

2006 NOFO oil-on-water trial - Miros OSD on three vessels, night navigation.

2007 NOFO oil-on-water trial - Miros OSD on three vessels.

2008 NOFO oil-on-water trial - Miros OSD on one vessel.

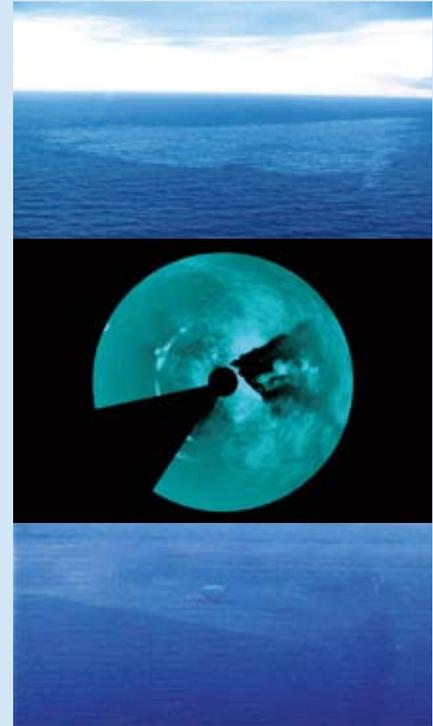
2006 Oil spill in the North Sea - The oil spill occurred during an offloading operation, and a NOFO vessel with the Miros OSD System was directed to the area to commence the recovery operation. Early in the operation, dispersant was applied from the ship with helicopter guidance. The Miros OSD System enabled the NOFO vessel's crew to continue the recovery operation during the dark hours when aerial guidance was unavailable. The data collected by the Miros OSD System were essential when evaluating the operation.

Experience from operational use is continuously fed back into Miros OSD product improvement to offer best possible functionality in an emergency situation.

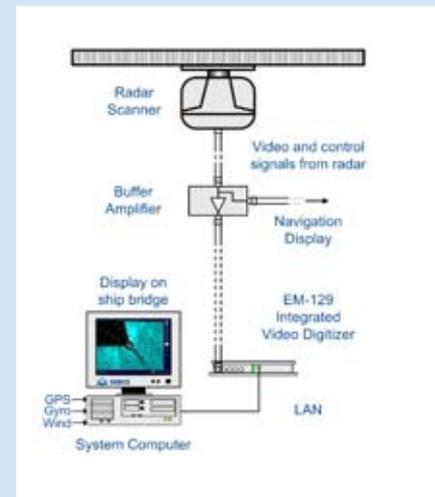
Product Installation

A typical Miros OSD system hardware configuration comprises the following components:

- Type approved Maritime System Computer
- Flat-screen monitor with night vision dimming functionality
- Integrated Video Digitizer unit
- Gyro, GPS and Wind sensor interfaces
- Marine X-band radar, either the ship's navigation radar or a dedicated OSD radar



Helicopter view (upper), video still photo (lower) and a clear OSD back scatter intensity image in the middle.



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