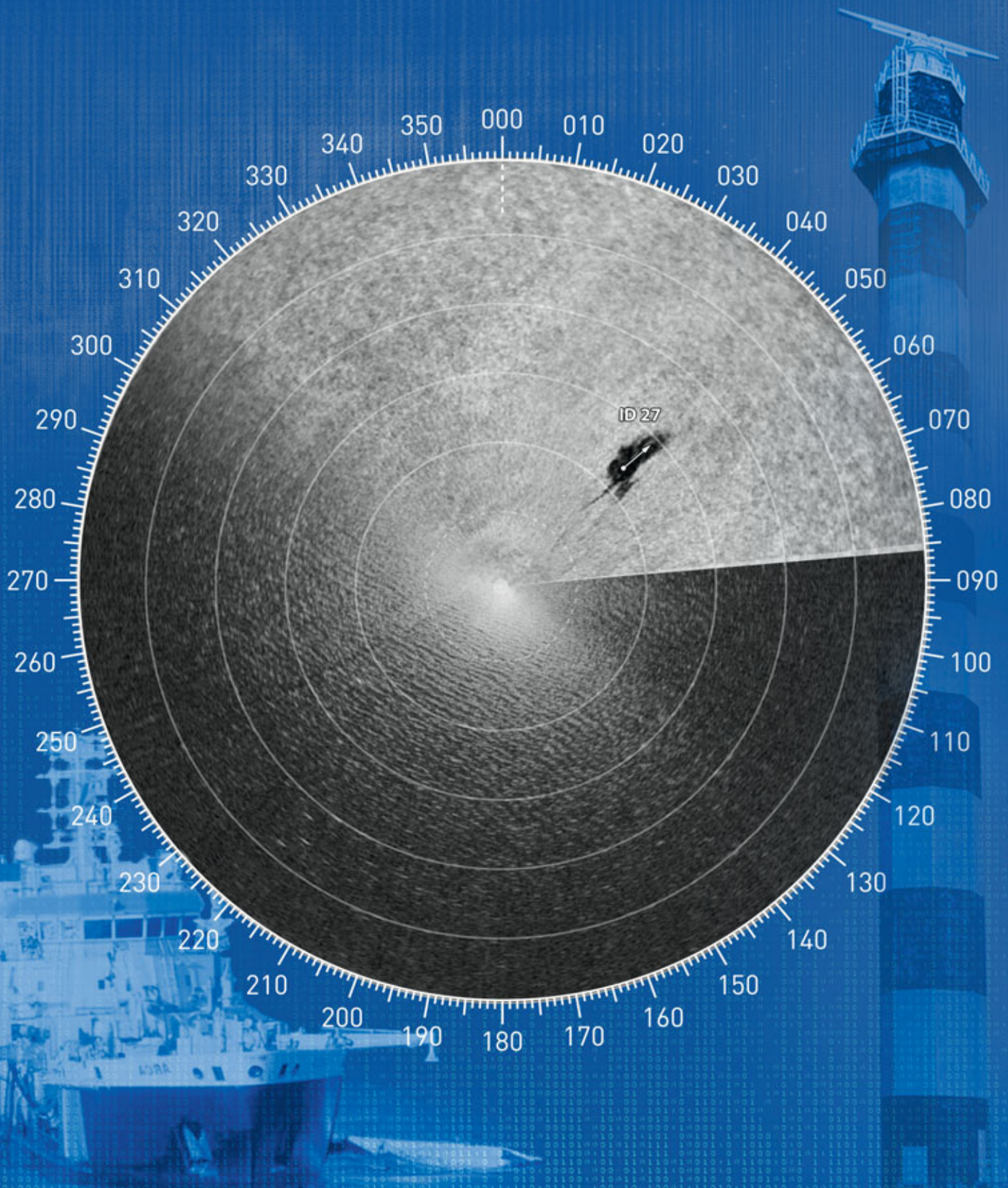


Using a high resolution marine X-band radar, the SeaDarQ software can automatically detect and monitor oil spills on the ocean surface. Using a combination of fast update rates, great horizontal resolution and low detection limits, the Nortek oil spill detection system is both technologically at the forefront and an established tool.

## SeaDarQ

Oil Spill Detection with Radar



ENVIRONMENTAL RADAR MONITORING SOLUTIONS



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[www.seadarq.com](http://www.seadarq.com)  
True innovation makes a difference

# SeaDarQ

OIL SPILL DETECTION AND MONITORING

- Fully automated and simple user interface
- Delivering real time information of the slick movement
- Automatic detection with spill outline, area determination, trajectory tracking
- Exceptional sensitivity for challenging environments
- Smart image processing techniques sensitive to small signal differences allows detection of small size spills at long ranges
- Low false alarm rate
- Recognition from NOFO and EMSA. One of the main suppliers to European Marine Safety Agency fleet of OSRVs



## Real time oil spill monitoring

The ability of the SeaDarQ system to measure oil spills when there is only a small surface roughness represents one of the significant and unique advantages SeaDarQ holds over competitive products. The SeaDarQ software operates on the principle that oil on water reduces the sea surface roughness, and attenuates wind-generated waves. This reduces the backscatter intensity from the radar signals, which in turn appears as dark structures in the radar images. The software records a number of consecutive images and integrates these over time to produce continuous real time images of oil spills. When waves are present, the SeaDarQ oil spill detection system works optimally and can clearly identify areas of reduced backscatter. The presence of waves also offers the possibility to estimate the current field, which simplifies the planning of the clean-up operation and can save time and resources at critical stages of the oil recovery campaign.

## Data export for integrated systems

Data delivered by the system can be integrated in a VTMS, transmitted to an aircraft or projected on a webserver. Formats and data products designed to meet networks bandwidth and infrastructure characteristics.

## Sensitivity

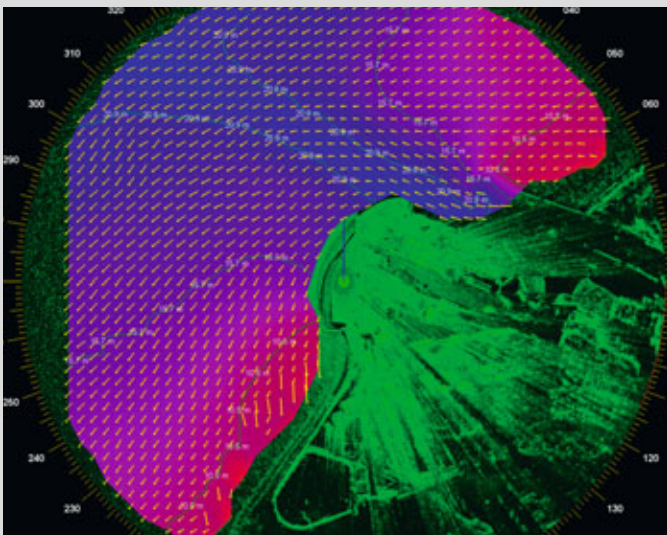
To maximize the sensitivity of the system and increase the spatial resolution, a short pulse radar with fast turning, vertically polarized antenna should be used. Early detection and fast recovery are key elements and tests have shown the system to be capable of detection quantities as small as 5 liters. Unlike satellite and airborne radars, SeaDarQ can continuously measure oil spill.

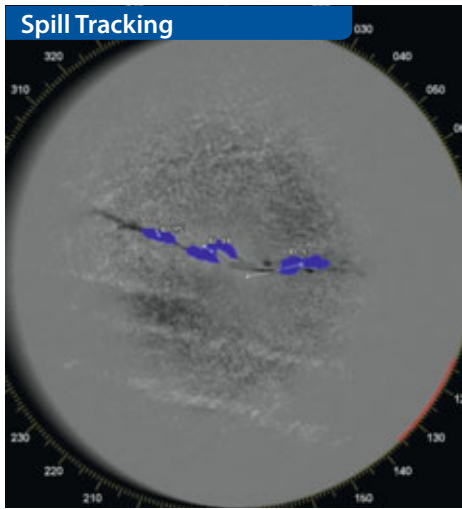
## Automatic Detection and Tracking

The reduced backscatter in the radar image is merely the beginning of the detection process. The automated process of detecting and outlining involves advanced smart image processing. Radar images pass through advance image processing algorithms where candidate spills are compared to models based on numerous oil spills. A match to the model characteristics automatically flags the candidate and the tracking begins. For vessel operators this means freeing up time to other tasks, for monitored locations it means a system only needs to wait for notification of an oil spill. Tracks are complete with location, spill outline, area, and the speed and direction of the drift trajectory.

## Measurement of currents, waves, depth, bottom topography and small objects detection

The backscattered radar signal is modulated by ocean waves and the SeaDarQ software can provide direct measurements of the wave length and wave direction in a high resolution grid within a 2-6 km diameter circle. If the wave period is longer than 3-4 seconds – normally the case in the open ocean – the wave period can be estimated from a sequence of radar images that are processed real time. The relationship between wave direction, wave period and wave length depends on the depth and the ocean current in the surface layer. Through sophisticated inversion methods, expanded version of the SeaDarQ software operating in "hydrography mode" can estimate the bottom bathymetry and currents with astonishing resolution and accuracy in a finely tuned grid. The SeaDarQ software also has the capability to detect small objects that generate persistent surface signals through the use of special filtering methods developed to detect small boats or weakly scattering surface objects.





Multiple geostationary polygons identify the slick, highlighting the contaminated surface area.

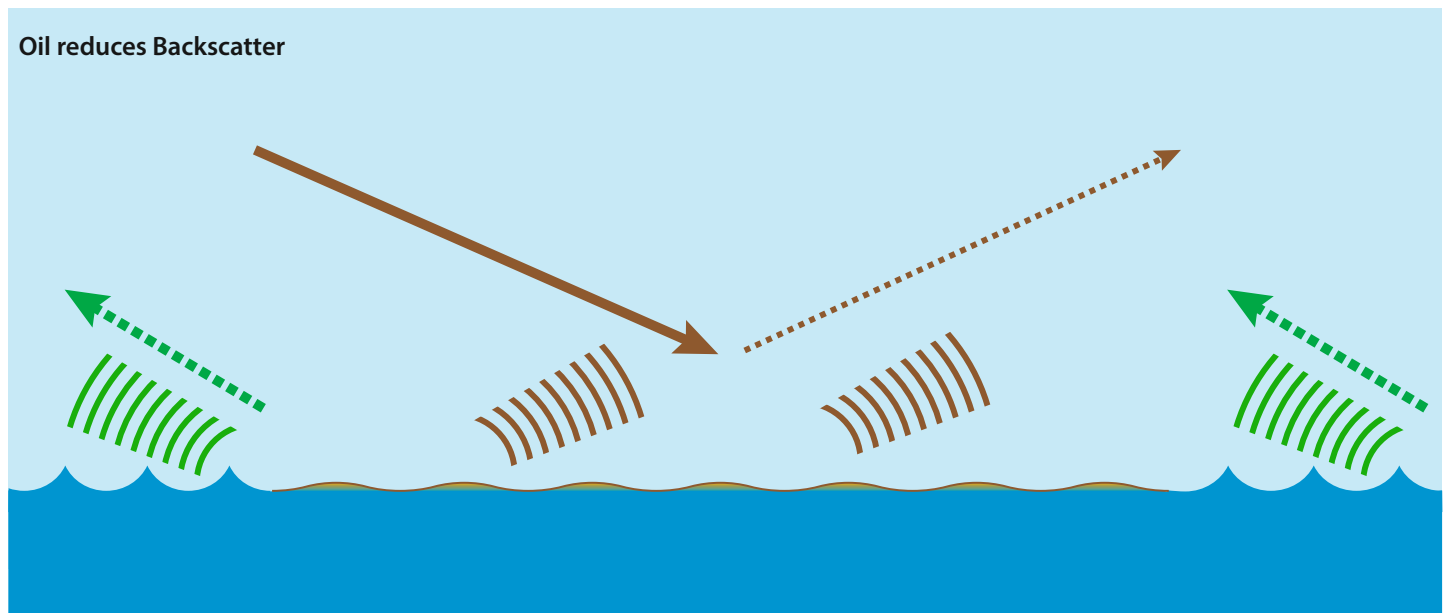
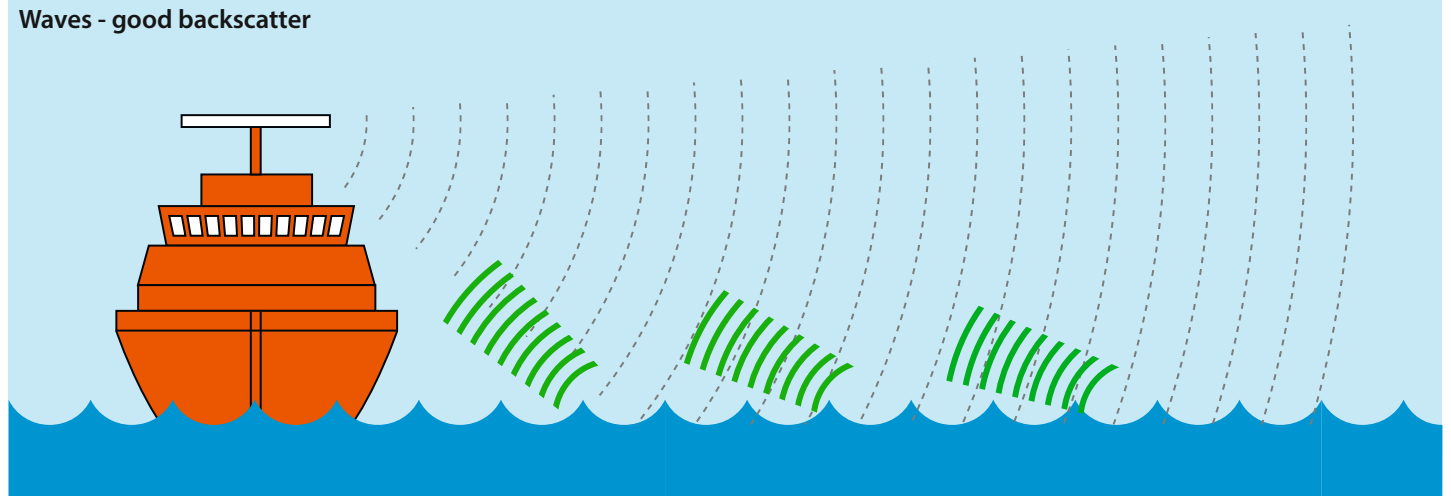


Nortek oil spill detection system installed onboard OSRV "Arca" as part of an Oil Spill Response Network.



Fixed radars mounted on land can both monitor oil on surface and gather hydrographic information. A tall mounting tower is required to obtain maximum operational range.

### How does SeaDarQ work?



# Technical Specifications

Function / Parameter	
Image Presentation:	Logarithmic display of amplitude, Zooming, panning, scrolling overlay of geocode information Software STC – Sensitive Time Control – adjustable gain control
Image sampling grid:	Cartesian
Detection range:	0.1-3.5 km (greater range for higher antenna)
Resolution:	Better than 3.75 m (short pulse mode)
Operational wind speed:	> 2 m/s
Vessel Movement Compensation:	Real time
Static Object Enhancement:	Up to detection resolution in real-time
Operator Controls	
Keyboard and Mouse:	Function buttons/ docking windows/ pop-up menus
Current Mode	
Current Speed:	Range: $\pm 2$ m/s; Accuracy: $\pm 0.1$ m/s; Resolution: 0.1 m/s
Current Direction:	Accuracy: 5°-10° Measurements apply to upper 3 m water layer
Water depth:	Depth range: up to 30 m; Accuracy: $\pm 0.5$ m

Interface	
Video Input:	0-1 Volt Analog, 75 Ohm*
Trigger Input:	TTL*
Azimuth Input:	TTL/RS422 pulses, up to 4096 pulses/revolution*
North Reset Input:	TTL/RS422 pulses, up to 4096 pulses/revolution*
Data communications:	RS232/RS422*

\*Signal levels can be customized.

Recommended navigation radar system specifications	
Frequency:	X-Band
Antenna length:	8 feet or longer
Minimum antenna height:	15 meters
Polarisation:	Vertical
Field of view: Range:	>2500 m
Azimuth:	360°
Pulse width:	50 ns/250 ns/1 $\mu$ s
Peak Power:	25 kW and more
PRF:	1800 Hz/1300 Hz/ 650 Hz
Rotation speed:	48 RPM
Receiver:	No clutter suppression
GPS/DGPS:	NMEA RS232/RS422 OUTPUT
Heading:	NMEA RS232/RS422 OUTPUT

The following highlights the complete system into three groups of elements:

- Externally sourced radar and system components
- Nortek SeaDarQ hardware and software,
- Optional products.

