

# Marine Environmental Technology

## SINTEF responsible for aftermath monitoring during "Rocknes" incident

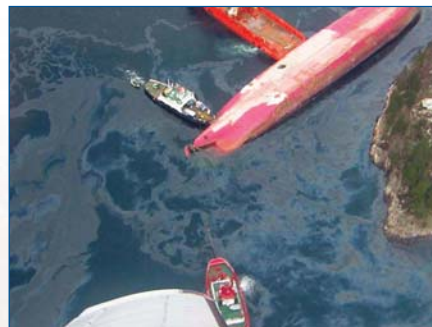
On the 19th of January 2004 the MV Rocknes hit a shallow in Vatllestraumen near Bergen. The impact of this collision eventually caused the vessel to capsize. Rocknes sank only minutes after the incident. Coastguard, police and medical services arrived on the spot shortly afterwards and a rescue operation began. Hampered by freezing water temperatures, nightfall and a slippery hull, rescue workers managed to save 9 crew members from the water and 3 from the inside of the vessel. 19 crew members died.

Rocknes was carrying totally 470 m<sup>3</sup> of IFO-380 heavy bunker fuel (HFO), 70 m<sup>3</sup> marine diesel and minor amount of lubricants. Most of the HFO was released during the first days. The high current (up to 6 knots) in Vatllestraumen made the mechanical response operations at sea very difficult, and totally 45 km of shoreline were significantly contaminated.



Scientist Janne L. M Resby from SINTEF taking samples of stranded emulsified heavy fuel oil

SINTEF's Field Monitoring Team ( see News no. 3 2001 ) was on-site on behalf of the Norwegian Coastal Administration (NCA) January 22nd in order to do



MV Rocknes capsized in the Vatllestraumen outside Bergen

the first environmental monitoring in the area close to the wreck and on contaminated shorelines.

During the next days SINTEF was heavily involved in characterizing (fingerprinting analysis and physical-chemical characterization) of stranded oil and the emulsions recovered at sea. This in order to obtain a best estimate of mass-balance (oil budget) and a documentation of the efficiency of the response operations.

On behalf of NCA, SINTEF became responsible for designing and performing the aftermath environmental monitoring on the sea surface, in the water column and on shore. The chemical and biological monitoring is following Norwegian regulation and guidelines (SFT Guideline 99:05). Selected sites (cleaned, non-recovered and non-polluted (reference) sites), will be followed regularly the coming seasons. The objective of this activity is to quantify and document the effect of the oil pollution and the efficiency and effects of the shoreline response activities.

*continued on the next page*

**Aftermath monitoring during "Rocknes" incident**  
*continued*

**The "SINTEF" Rock:**

In connection with the Rocknes incident, also SINTEF has got their "Mearns Rock" (ref: NOAA, <http://response.restoration.noaa.gov/photos/gallery.html>).

The "SINTEF rock" (close to Kongshamn in Vatløstraumen downstream to the incident position) was heavily oiled and is now used as a reference site in the evaluation of the response and restoration process. In addition, SINTEF has used this rock as a site for documentation of the natural processes according to the CEDRE protocol to quantify removal of oil from solid surface. The two different HFOs from Rocknes are used at tiles in two different exposure regimes.



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**Fourth annual OSCAR training course at UNIS on Svalbard, april 2004**

Per Johan Brandvik has enjoyed a five years leave of absence from SINTEF to serve as Associate Professor of Environmental Technology at the University Centre on Svalbard (UNIS), a state-owned limited company. Norway's four mainland universities are represented on the board. The objectives of UNIS are to provide university level education in Arctic studies, to carry out high quality research, and to contribute to the development of Svalbard as an international research platform. The archipelago's geographical location in the High Arctic makes it an ideal venue for laboratory work and also for the acquisition and analysis of specialist data.



*From left to right:  
May Kristin Ditlevsen, Liv-Guri Faksness, Marte Tveter, Gitte Hedegaard, Heli Routti, Karoline Sivertsen, Anke Krey, Mari Murtomaa, Janne Fritt-Rasmussen, Mark Reed.*

Professor Brandvik organizes a spring semester course called Fate and Modelling of Pollutants in the Arctic, wherein the SINTEF oil spill contingency and response model OSCAR plays a central role. May Kristin Ditlevsen and Mark Reed have taught this one-week course for the past four years. The course combines theoretical background with practical exercises in the computer laboratory at UNIS. The Arctic Pollution course entails a final project by each student, many of whom choose to build their projects around the OSCAR model.

For more information about UNIS: <http://www.unis.no/>

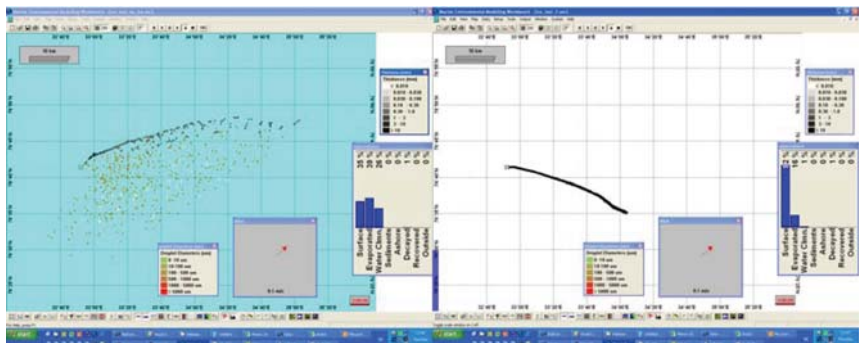
For more information about SINTEF models: <http://www.sintef.no/units/chem/environment/>

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*OSCAR scenarios comparing trajectories and weathering (mass balance histograms) in open water and with heavy drifting ice cover.*



## Interactions between oil and microbes in Arctic fjord ice – a winter field study

It is well known that biodegradation is one of the most important processes for the removal of petroleum hydrocarbons from marine environments. Also in the Arctic environments biodegradation is important, and during summer conditions degradation follows a pattern indistinguishable from that exhibited under temperate climate conditions. However, the necessary knowledge about hydrocarbon biodegradation of oil frozen in Arctic ice is lacking. The ice contains a variety of cold-adapted microorganisms, and metabolic activities have been measured at ice temperatures well below  $-10^{\circ}\text{C}$ .

During a project sponsored by the Research Council of Norway, "Weathering of marine oil spills under Arctic conditions", interactions between ice microbes and oils are investigated as a part of a winter field study. This project is a collaboration between the University Centre at Svalbard (UNIS), SINTEF Materials and Chemistry, the Norwegian Centre for Air Research (NILU) and the University of Bergen. Different crude or photo-oxidized oils were frozen into Arctic Fjord ice (Van Mijen fjord, Svea, Spitzbergen) in February 2004, and ice cores were collected in March and April (Fig. 1). The ice cores (1 m long) were thawed at the field laboratory of SINTEF in Svea. Each core was separated in sections, the upper section containing the oil. All sections have been processed for microbiological analysis at SINTEF, including various microscopic analysis, counts of actively colony-forming microbes, and characterization of microbial communities by 16S rRNA gene PCR-DGGE, and by cloning-sequencing strategies.

Preliminary results show strong indications of interactions between oils and the microbial communities in the ice. Enumerations of microbes in the ice sections by epifluorescence microscopy and by fluorescence in situ hybridization (FISH) analysis revealed that bacterial

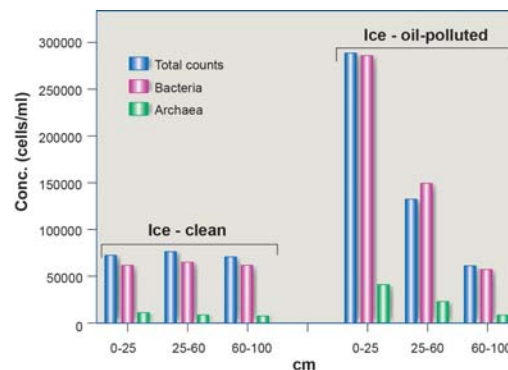


Fig. 1. The field site at Svea (left) and an ice core section containing a bunker oil (below).



concentrations were significantly higher in the top sections of the ice, containing the frozen oil, than deeper in the ice. No such patterns were measured in clean ice (Fig 2). These results were obtained in ice samples after 2 months of oil pollution, and no significant differences were measured between various oils.

Fig. 2. Total numbers of microbes, bacteria and archaea enumerated in thawed ice from non-polluted ice cores, and from ice cores polluted with a paraffinic oil for 2 months. Results are shown for the ice top sections (0-25 cm), middle sections (25-60 cm) and bottom sections (60-100 cm). Microbes were enumerated by epifluorescence microscopy with the fluorochrome DAPI (total counts), or by FISH with specific DNA probes for bacteria (EUB338) and archaea (ARCH915).



Further chemical characterization of the frozen oil at UNIS will elucidate possible biodegradation patterns in the various oils.

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SINTEF Materials and Chemistry, Marine Environmental Technology news

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<b>Call for papers</b>	The meeting is a forum for presentation of analysis tools, concepts, exchange of ideas, and technology transfer, and will be of interest to environmental managers, researchers, and consultants.
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<b>Seminar program</b>	IMEMS 2004 will focus on concepts and tools to support environmental modeling for impact assessment, resource management, and mitigation in North American coastal waters. Papers on model development and applications are being accepted world-wide, and need only be applicable to North American coastal waters.
<b>Previous meetings</b>	
<b>For information contact:</b> May K. Ditlevsen, SINTEF Applied Chemistry <a href="mailto:may.ditlevsen@sintef.no">may.ditlevsen@sintef.no</a> Phone: +47-73-591364 Fax: +47-73-591353	SINTEF initiated the first IMEMS in Trondheim, Norway in 1994. The MMS (United States Minerals Management Service) is this year's principal funder of the meeting.
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1.14 Jan 2004 JT.Heggenhougen



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