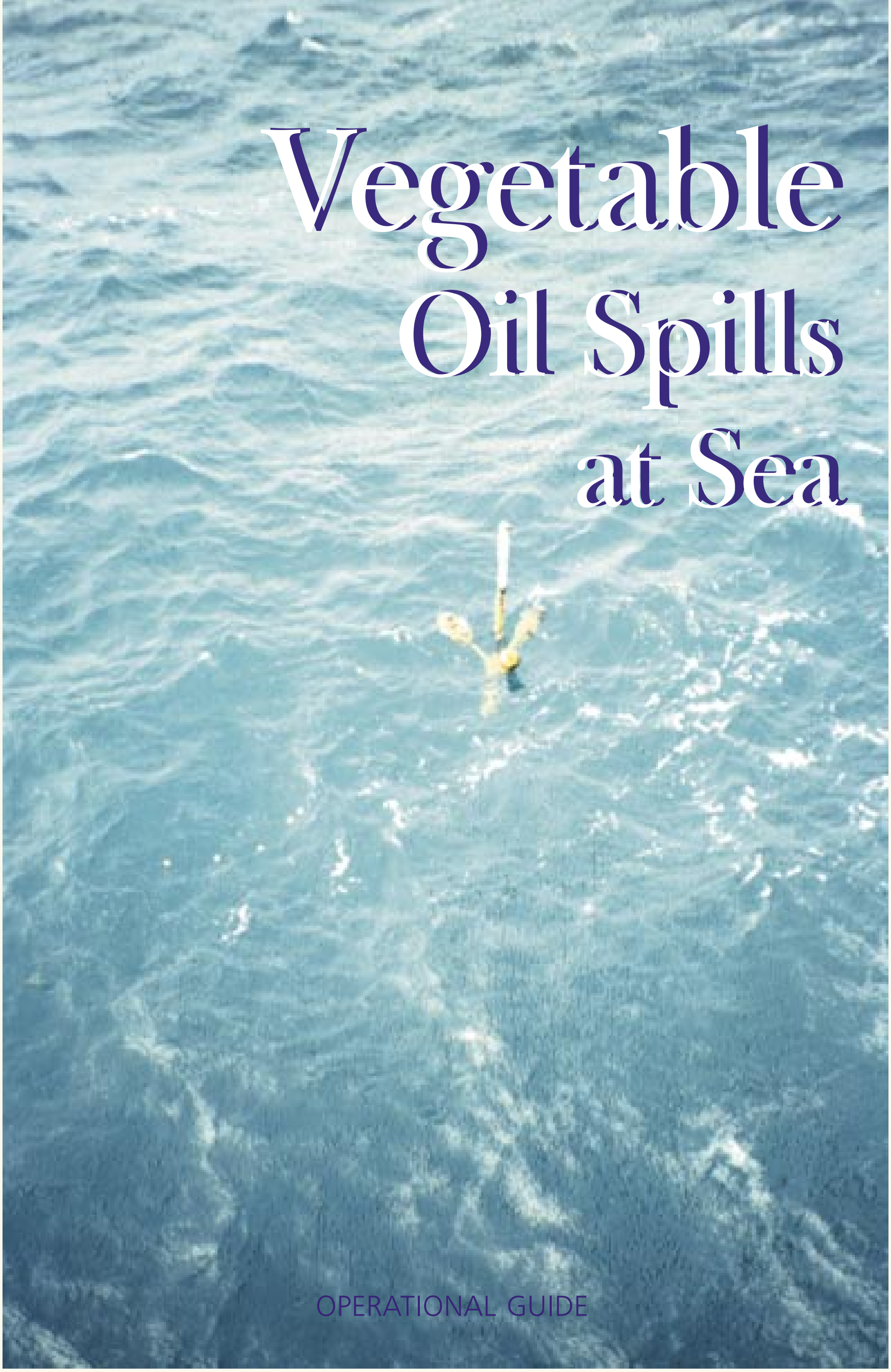
Vegetable Oil Spills at Sea



OPERATIONAL GUIDE

Cedre

Cover photo: NORDA drifting buoy on a vegetable oil slick *(Cedre)*.

Vegetable Oil Spills at Sea

OPERATIONAL GUIDE

This guide was prepared by the team of the Centre of Documentation, Research and Experimentation on Accidental Water Pollution (*Cedre*) as part of its technical programme, with financial support from the French Navy and Total.

The information contained in this guide is based on *Cedre*'s research and experience. *Cedre* may not be held liable for consequences arising from the use of the data in this publication.

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Purpose of this guide

Vegetable oils are an ever-increasing part of bulk traffic, as can be seen from the data for the Channel:

- 1999: 2,650,000 tonnes for 23 voyages
- 2000: 4,423,000 tonnes for 342 voyages from 1 January to 1 June
- 2001: 8,730,000

These oils are only slightly toxic: they are classed as Marpol D ("Substances which are practically nontoxic to aquatic life… or produce a moderate reduction of amenities because of persistency, smell or poisonous or irritant characteristics …"). However, when spilled in significant volumes, and particularly in the spring and summer, they can have adverse effects on the environment or economic activities (tourism, mariculture) and interfere with amenities.

These potential consequences may lead the authorities to track slicks originating at sea, forecast future drift and possibly carry out response operations. They may also lead to pollutant collection operations on the coast and/or environmental and economic impact studies.

The objective of this guide is to offer useful scientific and technical facts to those involved in order to:

- assess the risk
- make decisions regarding the timeliness of a response
- select any action to be taken
- inform the public of the situation and prospects.

Contents

A
B
C
D
E
F
G

Introduction

This guide constitutes a summary of work carried out by *Cedre* from 1998 to 2000, with experiments at sea (PALMOR I, II and III operations), in a testing channel and in the laboratory.

These experiments were carried out under the direction of CEPPOL, the French navy's committee for practical studies in pollution response with the active participation of Polmar aircraft from French Customs, to which we owe the aerial photographs and the signatures of the drifting slicks, thanks to the onboard sensing elements.

This guide offers a methodical and dynamic approach in five phases:

■ Alarm, notification, first measures:

These three factors are closely interrelated and may have a decisive impact on the progress of operations. The announcement of the loss or discovery of vegetable oil at sea generates procedures for alarm, notification and safety or security measures of a reflex nature.

■ Assessment of the situation:

In addition to information on the behaviour of the product, data on the sea and weather conditions, sensitivity of the environment and available means of response must also be researched.

■ Decision-making:

The estimated potential impact will allow for assessment of the level of threat and determination of the timeliness of the response.

■ Response:

This phase of the operation consists of implementing response decisions: searching, marking, recovery and disposal.

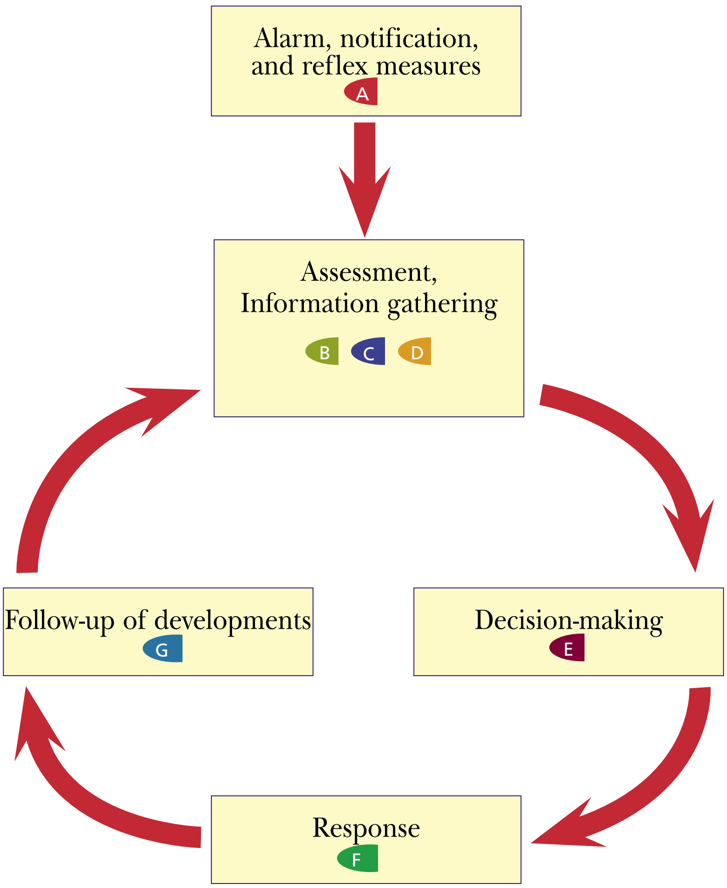
■ Follow-up of progress:

Faced with a situation likely to change rapidly, particularly under the influence of meteo-oceanic factors, continuous follow-up of the development of all the elements is necessary to reassess the situation and restart the decision-making process.

To support the various phases of this general methodical approach, the information contained in this guide has been assembled in chapters which cover the following topics:

A – Alarm, notification, first measures
B – Identification of vegetable oils
C – Assessment of behaviour
D – Risk profiles
E – Decision-making
F – Response
G – Follow-up

Operational organisation



Alarm, notification, first measures A

Identification of vegetable oils B

Assessment of behaviour C

Risk profiles D

Decision-making E

Response F

Follow-up G

A

Alarm, notification, first measures

Solidified vegetable oil slick (RAPSODI II experiment)

Loss reported by vessel responsible

A1

In accordance with current international provisions, any accident involving a vessel carrying vegetable oil, and any critical situation arising onboard such a vessel, must immediately be brought to the attention of the maritime authorities.

Questions to be put to the vessel:

What?

- What is the product in question?
  - soya bean oil
  - palm oil
  - palm nut oil
  - rape-seed oil
  - sunflower oil
  - castor oil
  - olive oil
  - other

How much?

- Volume spilled
- Volume in affected tanks

When?

- Time of incident

Where?

- Location of accident or spill
- Vessel's route at the time of the incident or during the spill period
- Conditions in the area (swell, wind)

How?

- Circumstances of the incident (collision, grounding, fire, explosion), location of the breach, etc.
- Is the vessel in difficulty (manoeuvring or not, with or without power onboard, drifting) ?

Context?

- Type of vessel involved
- Single-hull, double-hull tanker
- Heated cargo (indicate temperature)
- Volume of tanks and distribution
- Bunkers: exact type and volume
- Measures taken by the crew (leak stopped or not)

Validate information by repeating approaches.

Pollution from unknown source

A2

Questions to be put to the vessel or detection aircraft:

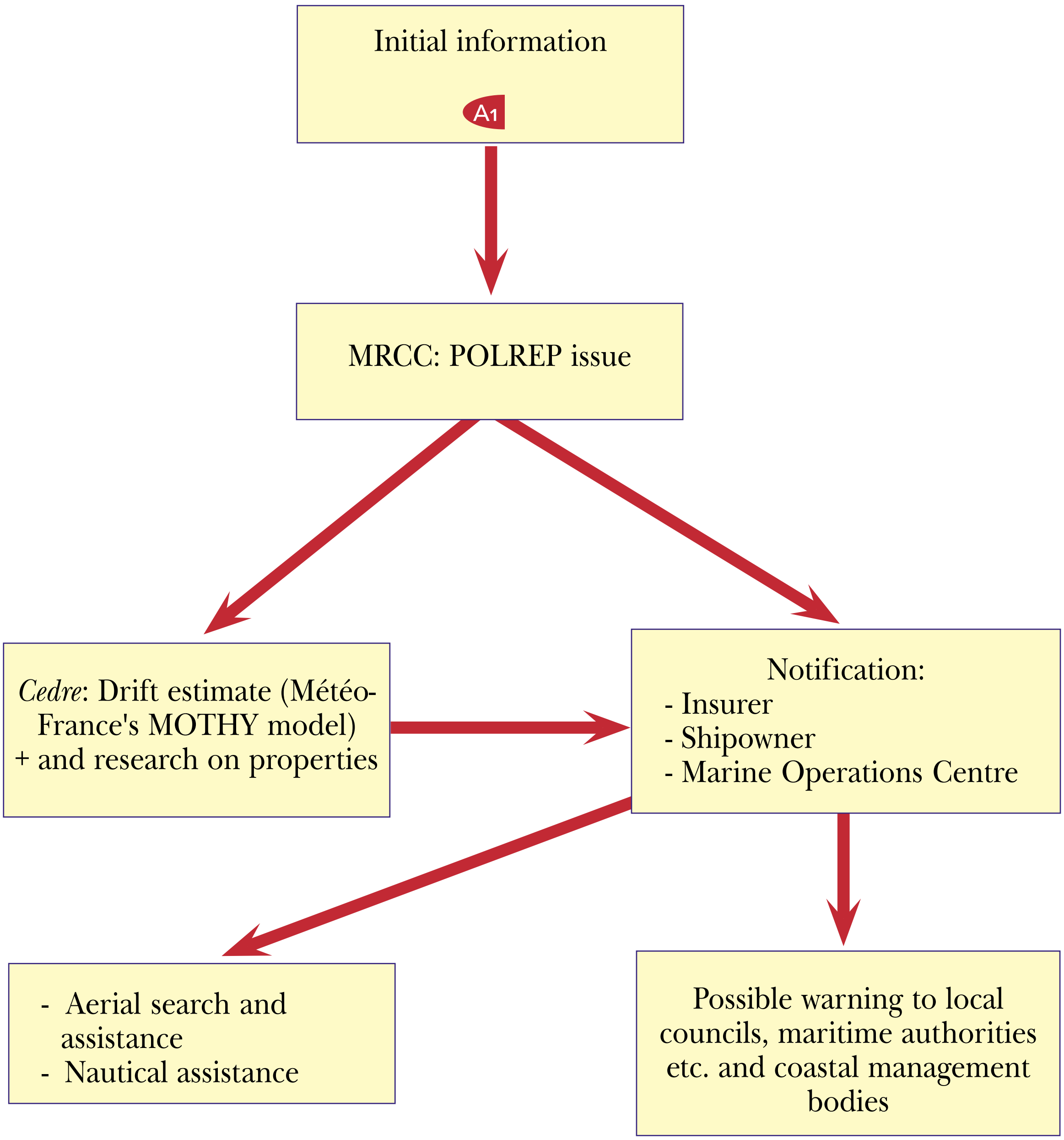
First approach:

- Position
- Time of discovery
- General appearance of pollution
- Shape, size
- Colour
- Apparent state
- Persistence
- Drift
- Weather conditions in area → B

Second approach:

- Sampling
- Analyses → C3

Notification, first measures



Identification of vegetable oils

B

Vegetable oil spills at sea are detected like oil slicks.

Bibliographical data
Vegetable oils

B1

OIL TYPE	RAPE-SEED	PALM	PALM NUT	CASTOR
Synonyms	Rape oil, Rape seed oil, Canola oil	Palm oil, Palm butter	Palm nut oil Palm kernel oil	Castor oil, Cosmetol, Gold bond, Phorbyol, Neoloid, Ricinus oil
Marpol category	D	D	D	D
Case n°	8002-13-9	8002-75-3	8023-79-8	8001-79-4 (8021-37-2)
Appearance (state at 20°C)	Yellow liquid	Orange-red solid, light to dark	Light yellow liquid, hazelnut odour	Colourless/pale yellow liquid, slight odour
Density relative to sea water (at 20°C)	0.91	0.895 to 0.95	0.899 to 0.913	0.96
Melting point (°C)	-18 to -8	+26 to +30 (or even 45)	+23 to +30	-18 to -10
Boiling point (°C)				313
Flash point (°C)		+314		+298
Solubility in sea water (mg/l)	insoluble	insoluble	insoluble	insoluble
Viscosity (cSt at 20°C)	72 to 82	25 to 31 (at 50°C)	17 to 20 (at 50°C)	600 to 1,200 (at 840°C)
Auto-ignition temperature (°C)				

B1

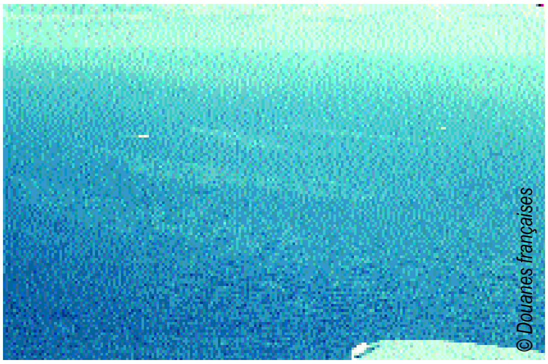
Bibliographical data
Vegetable oils

OIL TYPE	OLIVE	SOYA BEAN	SUNFLOWER
Synonyms	Olive oil, Sweet oil	Soya bean oil, Soybean oil	Sunflower oil
MARPOL category	D	D	D
Case n°	8001-25-0	8001-22-7	8001-21-6
Appearance (state at 20°C)	Yellow-green liquid	Yellowish liquid	Yellowish liquid
Density relative to sea water (at 20°C)	0.910 - 0.919	0.92	0.92
Melting point (°C)	0	-15	-15
Boiling point (°C)			
Flash point (°C)	225	317	
Solubility in sea water (mg/l)	insoluble	insoluble	insoluble
Viscosity (cSt at 20°C)	75 to 80	60 to 80	70
Auto-ignition temperature (°C)	343		

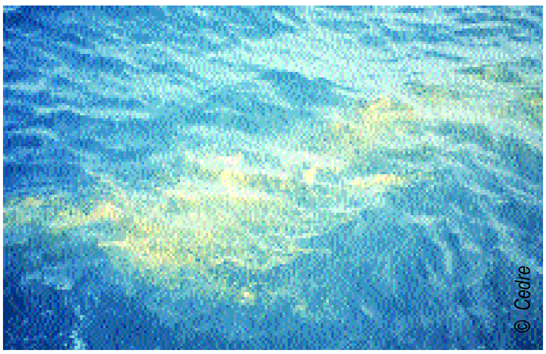
Aerial detection
Visual observation

The limitations of visual observation depend on the colour of the oil. However, in low-angled light, the eye distinguishes films which correspond to thicknesses of around one micron.

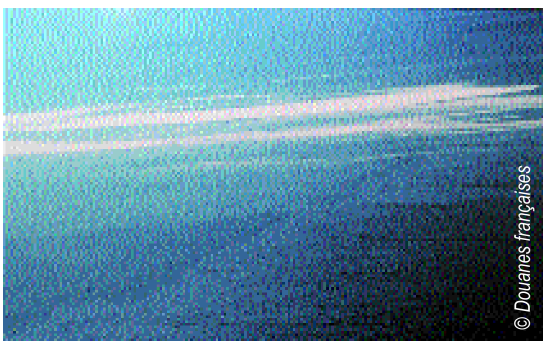
In the case of palm oil, the camera detects aggregates above all.



Slicks of castor oil, soya bean oil, 50/50 fuel oil and palm oil in background – aerial view.
PALMOR I experiment (October 1998)



Slick of palm oil seen from the deck of a vessel (PALMOR I)



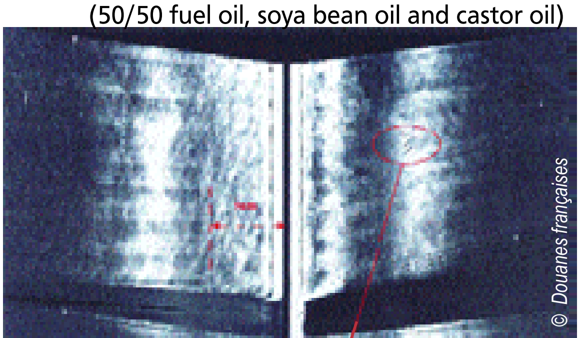
Palm nut oil – aerial view (Allegra incident, 900 t, 1997)

B2

Aerial detection
SLAR detection (Side-Looking Airborne Radar)

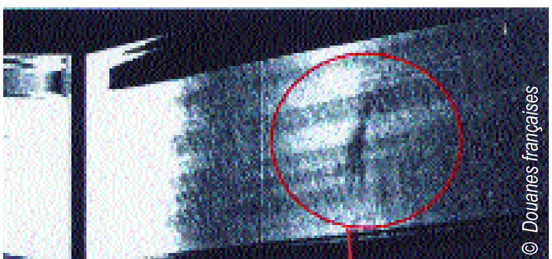
Acquired during the PALMOR I experiment, these images show that spilled products are detected very easily at close to 1,000 feet, over a range of 20 m.

Volumes spilled = 4 m³ of palm oil and 2 m³ for each of the other products (50/50 fuel oil, soya bean oil and castor oil)



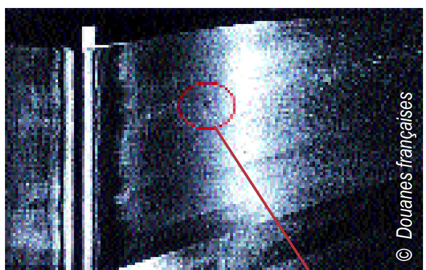
Date: 19/10/98
UTC time: 14:11 hrs
Latitude: 49°17'N
Longitude: 003°55'W
Heading: 082
Altitude: 3,834 feet
Speed: 181 knots
Range: 20 nautical miles
Sea: 23

Slight detection of 4 slicks
From top to bottom:
- palm oil
- 50/50 fuel oil
- soya bean oil
- castor oil



Date: 20/10/98
UTC time: 08:09 hrs
Latitude: 48°59'N
Longitude: 003°50'W
Heading: 323
Altitude: 2,400 feet
Speed: 178 knots

Drift of 4 slicks
19/10/98



Date: 20/10/98
UTC time: 09:08 hrs
Latitude: 49°16'N
Longitude: 004°08'W
Heading: 064
Altitude: 3,394 feet
Speed: 195 knots

Detection of a castor oil slick between the two vessels taking part in the exercise

Aerial detection
Palm oil

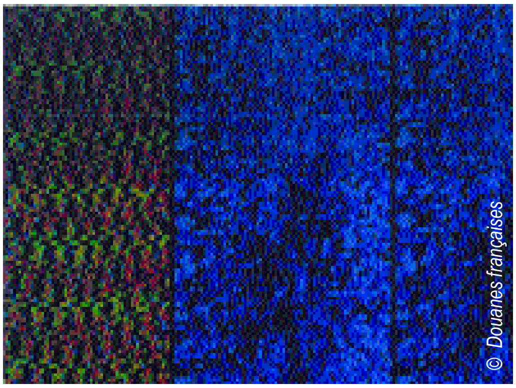
Infrared imagery detects palm oil clearly. The visible camera and the microwave radiometer, although less effective, provide additional information for thick areas and help evaluate surface areas (see page 20).

B2

PALMOR I experiment: volume spilled = 4 m³

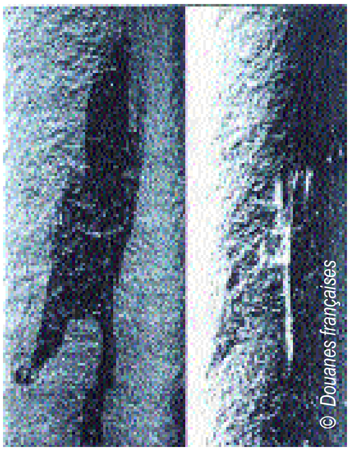
Date: 19/10/98
UTC time: 13:24 hrs
Latitude: 49°07’8N
Longitude: 004°00’7W
Heading: 308°
Altitude: 1,000 feet
Wind: 253/11 knots
Sea: 23

Microwave radiometer



None of the system colorimeters can highlight the minimal thickness of the slick. However, the outline is practically identifiable in the shaded area. This recording demonstrates the high sensitivity of the onboard radiometer.

Infrared Visible



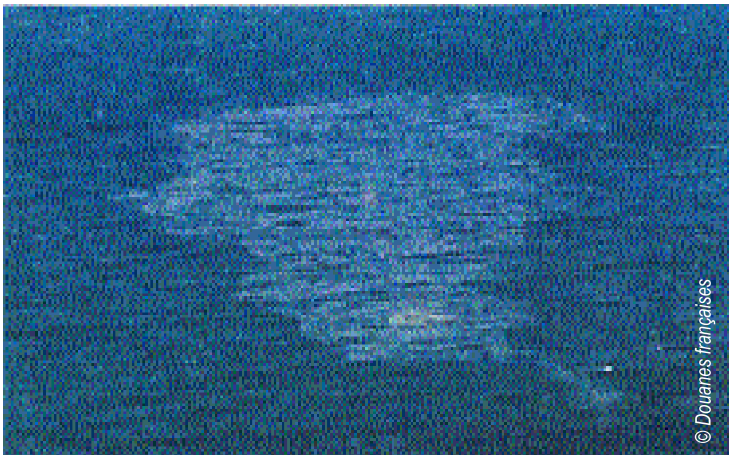
Uniform slick, with regular outline (thin film). The visible camera barely detects the perimeter but highlights the oil emulsion (white area).
Surface area: 143,000 m².

Aerial detection
Castor oil

Infrared imagery detects castor oil clearly. The visible camera and the microwave radiometer, although less effective, provide additional information on thick areas and help evaluate surface areas (see page 21).

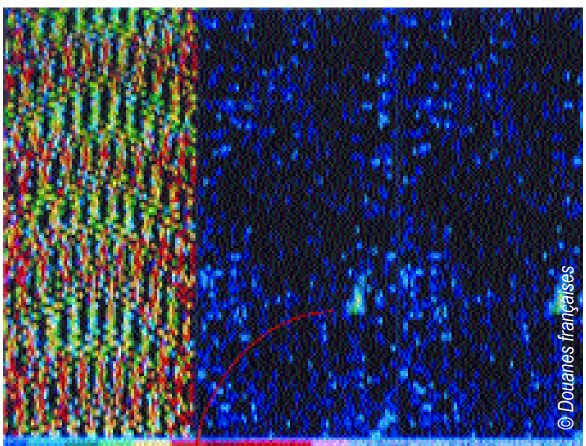
B2

PALMOR I experiment: volume spilled = 2 m³



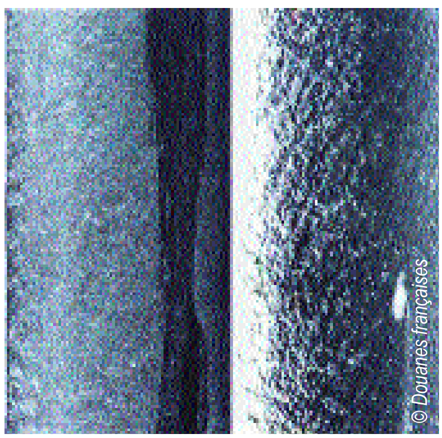
Date: 19/10/98
UTC time: 13:13 hrs
Latitude: 49°07’8N
Longitude: 004°00’7W
Heading: 308°
Altitude: 1,000 feet
Wind: 265/14
Sea: 23

Microwave radiometer



Significant detection of the thickest part of the castor oil slick: thickness = 30 µm.

Infrared Visible



Good infrared detection.
Surface area: 1,800,000 m²

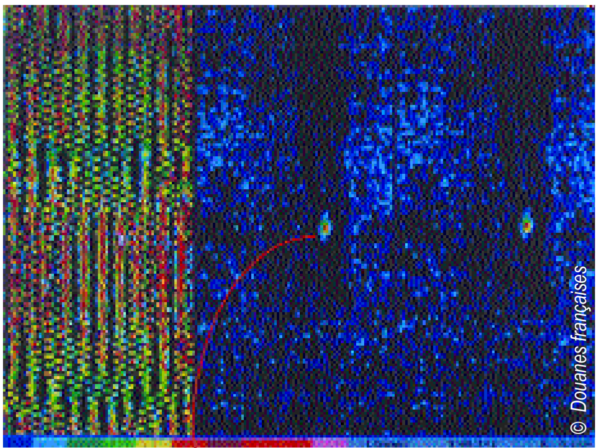
Aerial detection
Soya bean oil

Infrared imagery detects soya bean oil clearly. The visible camera and the microwave radiometer, although less effective, provide additional information on thick areas and help evaluate surface areas (see page 21).

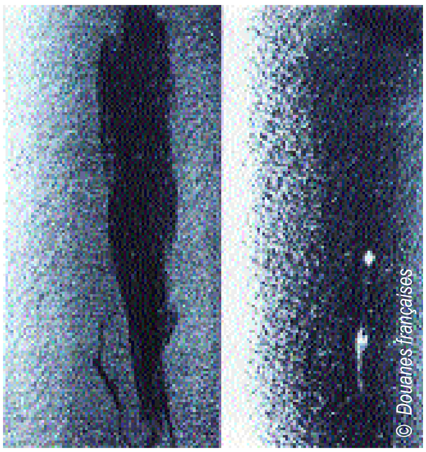
PALMOR I experiment: volume spilled = 2 m³

Date: 19/10/98
UTC time: 13:17 hrs
Latitude: 49°07'8N
Longitude: 004°00'7W
Heading: 308°
Altitude: 1,000 feet
Wind: 268/14*
Sea: 23

Microwave radiometer



Infrared Visible



Significant detection of the thickest part of the soya bean oil slick: thickness = 45 µm.

Good infrared detection.
Surface area: 170,000 m².

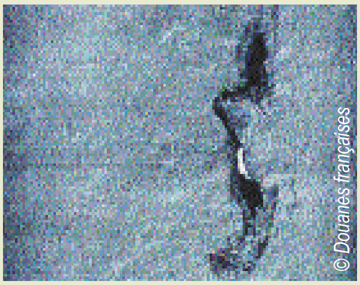
Aerial detection

Microwave radiometry - Calculation of surface area

The thickest parts of the castor oil and soya bean oil slicks (over 30 µm) are easily detected. The same cannot be said for solidified palm oil. The thickest parts can however be detected in shaded areas, although an estimation of the volume is unable to be obtained.

B2

50/50 FUEL OIL (reference)
Volume spilled = 2 m³



Length: 400 m
Width: 60 m
Total surface area: 23,000 m²

Thickness between 1 and 10 µm

Surface of red area corresponding to microwave data: 1,500 m²
Thickness: 30 µm
Volume: 0.05 m³

PALM OIL
Volume spilled = 4 m³

Length: 788 m
Width: 182 m
Total surface area: 143,000 m²

Thickness between 1 and 10 µm

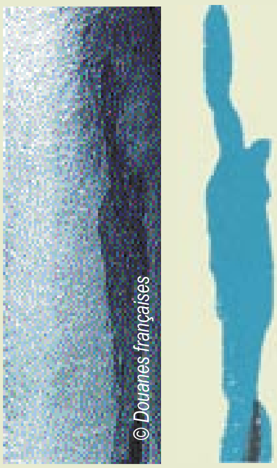
Volume: estimate impossible

Aerial detection

Microwave radiometry - Calculation of surface area

B2

CASTOR OIL
Volume spilled = 2 m³

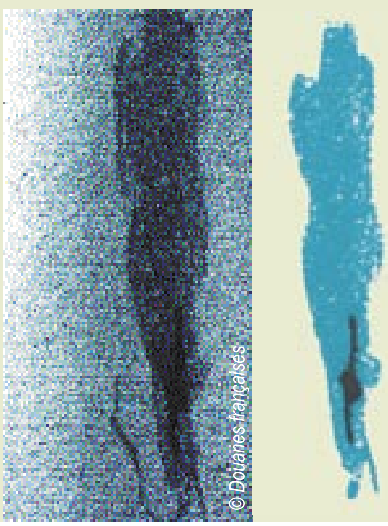


Length:	1,371 m
Width:	131 m
Total surface area:	180,000 m²

Thickness between 1 and 10 µm

Surface of black area corresponding to microwave data:	8,000 m²
Thickness:	30 µm
Volume:	0.24 m³

SOYA BEAN OIL
Volume spilled = 2 m³



Length:	1,224 m
Width:	138 m
Total surface area:	170,000 m²

Thickness between 1 and 10 µm

Surface of black area corresponding to microwave data:	10,500 m²
Thickness:	45 µm
Volume:	0.48 m³

Assessment of the behaviour of vegetable oil spills at sea

Surface drift

Vegetable oils are stable, non-volatile products which will float while spreading and develop slowly over time under the effect of the sun (ultraviolet) and waves (mechanical action). Palm oil, a solid at ambient temperature, will solidify on contact with seawater and produce aggregates the diameter of which may reach several tens of centimetres, accompanied by a solid film of whitish to orange-yellow colour.

Vegetable oils spilled at sea will therefore:

1. drift on the surface under the effect of the current and winds, and possibly become stranded
2. be broken down under the effect of the sun
3. be assimilated by fauna (birds, fish, etc.) and undergo microbial attack
4. in some cases, polymerise and persist for several years in the environment.

In this guide, we only deal with point 1 as the other phenomena are either very slow or rare.

The drift of oils on the surface (solid or liquid) obeys the same laws as those governing the drift of floating hydrocarbons.

Wind effect

- 3% of the average wind speed
- in the direction in which the wind is blowing

Current effect

- 100% of the speed of the current
- towards where the current is heading

A simple vector construction gives a good picture of the speed modulus and direction of the immediate drift.

Cedre can implement the MOTHY drift forecast model through Météo France's Marine Forecast Centre in Toulouse.

The reliability of slick drift simulations deteriorates over time. Beyond 3 days, the meteo-oceanic forecasts are not sufficiently reliable to allow for operational use of the simulations. It is essential to readjust the model through aerial observation of the slicks (once a day at least, twice by preference). It is advisable to map slicks or to take note of:

- the position (longitude, latitude)
- the number of slicks
- their appearance
- their size
- their direction.

Refer to the guidelines published by *Cedre* entitled, "Aerial Observation of Oil Pollution at Sea".

Since the resolution of the MOTHY model is 1 nautical mile, the slicks will be positioned (latitude, longitude) individually if the distance that separates them is greater than this value.

Marking using drifting buoys

The PALMOR I and PALMOR II experiments showed that some buoys, e.g NORDA* and PTR (SERPIESM)** buoys, drift in a similar way to liquid or solid floating oils.

The drift of the IESM buoys may be followed remotely with a position detected 20 to 40 times per day according to whether the Argos signal is linked to a GPS position or not.

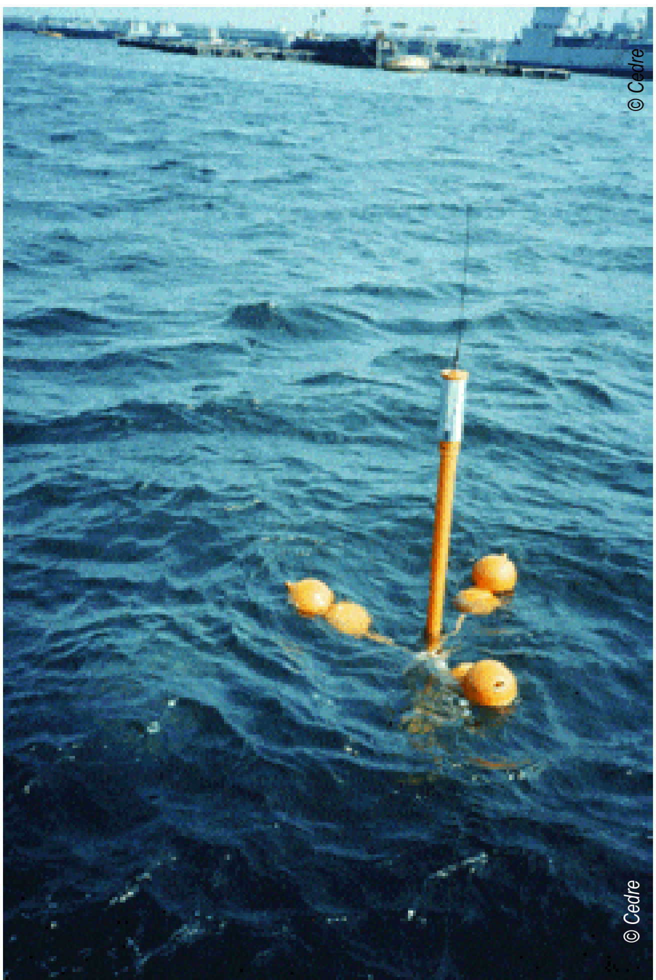
These buoys can be dropped from low-flying aircraft (e.g. jettisoning tube from Breguet Atlantics or S.A.R. hatches of French Customs patrol aircraft).

The remote surveillance of their drift requires specialised software (ELSA) available at *Cedre* or at the Argos satellites management centre (C.L.S. in Toulouse).

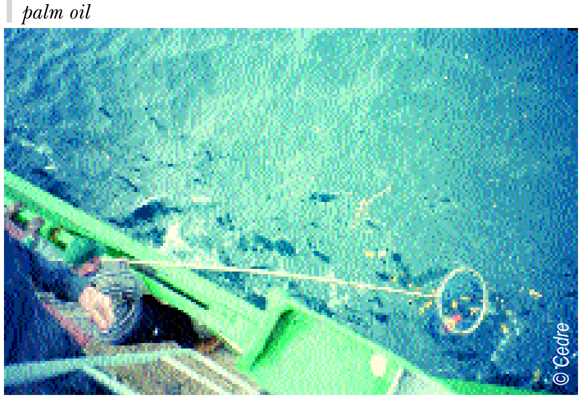
C2

* Available from the French Navy's stockpile
** Available from the SHOM's stockpile

NORDA marking buoy (French Navy) equipped with an ARGOS transmitter



Recovery of a PTR marking buoy (SERPIESM) in palm oil



Sampling

Sampling must be systematic in order to identify the product in the event of an unexpected discovery and to support legal action, if necessary.

Sampling for legal purposes (so-called judicial sampling) is carried out in the presence of an authorised official who draws up a report. It necessarily involves 3 sealed samples, each in a glass flask filled with water + oil or absorbent paper soaked in oil, sealed hermetically (aluminium paper between the stopper and the inside of the flask), kept cold (4/5°C) and sheltered from the light. One of these flasks is intended for the person requesting the sample, another for the opposing party and the third for any counter-valuation that may be required by the judge. Analysis must be carried out by an approved laboratory.

Sampling for purely operational purposes (so-called administrative sampling) can be provided by any operator appointed by the spill response authority. Two samples at least will be taken, to allow for counter-analysis. The technical precautions are the same as for judicial sampling. The analysis can be entrusted to any competent laboratory.

Spreading

The PALMOR I experiment showed that vegetable oils spread to form a very fine film between 1 and 10 µm thick at 15°C.

	Castor ($2\ m^3$)	Soya bean ($2\ m^3$)	Palm ($4\ m^3$)	50/50 Fuel ($2\ m^3$)
Total surface area covered (1 - 10 µm)	18 ha (1 400 x 130 m)	17 ha (1 200 x 140 m)	14 ha (800 x 180 m)	2,4 ha (400 x 60 m)
Area of thickness greater than 30 µm (0.03 mm)	0.8 ha	1 ha	Unquantified solid aggregates	0.14 ha

PALMOR I: spreading of vegetable oils

C4

One hour after the spill, a small part of this surface area (around 5%) has a thickness greater than 30 microns (µm). Only these parts are likely to be collected and recovered by nautical means.

Risk profiles

Risks for participants

- No significant risk except that connected with slippery surfaces.

Risks for the environment

- Immediate effect: oiling of the coastline and birds as with petroleum products but without their toxicity (due, amongst other things, to the aromatics) unless large quantities of oil are ingested, except for benthic fauna which could become asphyxiated.
- Persistence: no accumulation. Apart from polymerisation, slow but fairly complete biodegradation which reduces the oxygen dissolved in water more significantly than for hydrocarbons (depending on the agitation and temperature of the environment).
- Effect on amenities: possible, owing to a nauseating smell linked to the bacterial degradation process (tourism, mariculture, sensitive areas).

MARPOL category: D (defined in Appendix 1 of Annex II of MARPOL 7378 Convention, 2002 Edition) as: "Substances which are practically nontoxic to aquatic life ... or produce a moderate reduction of amenities because of persistency, smell or poisonous or irritant characteristics".

Accumulation of vegetable oil (palm nut oil) in a creek.
Allegra *incident, Guernsey coast, 1997*

Decision-making

Factors to be taken into account when making response-related decisions:

- Time limit for response: is it possible to recover the product?
- The volume spilled: is a response at sea justified (recovery)?
- Surface drift: is the slick drifting towards a sensitive area (for a given period)?
- Are resources threatened by the arrival of the product on the shore (tourism, mariculture, spawning grounds)?
- Have the shore authorities (councils, prefectures, defence areas) and the coastal protection bodies expressed their wishes?

Aerial surveillance and marking are essential to making the decision to initiate a response.

Response

Whatever the type of vegetable oil in question, the main response strategy is recovery, preceded by containment on the water within a boom.

Vessels (RSV and tug) pulling a surface trawl net

Techniques and tools

Dispersion using dispersant products gives poor to mediocre results. This response technique is therefore not recommended.

Recovery of vegetable oils is the only effective technique likely to prevent (or reduce) the impact on the environment and interference with amenities.

The use of open sea booms is essential in order to contain the vegetable oil, according to techniques proven during real oil spill incidents (towing in a "U" or "J" configuration), techniques described in the following pages.

Oils in a liquid or solid state will be easily recovered using a weir skimmer up to a sea state of 3. The following pages refer to manoeuvring. Solid products (i.e. palm nut oil) may also be recovered using a net or a trawl net.

Weir skimmer and palm oil

Containment of soya bean oil (2 m³), 300m of boom towed in a U configuration (PALMOR II experiment)

Containment and recovery of pollutant at source

Objective

To contain the oil close to the source of a spill (breach in the hull of a stricken vessel, for example) to limit the spread and dispersion of pollutant in the environment.

Necessary resources

- Antipollution equipment:
  - medium or heavy curtain boom
  - skimmers + pumping units
- Naval support:
  - 1 barge with pusher tug or 1 small coastal tanker
  - 1 tug
- Ancillaries:
  - ropes and chains
  - anchors and buoys or mooring buoys and trunk buoys
  - flexible hoses and connections
  - magnets for attaching booms to the hull of the vessel

How to proceed

- Contain completely by encircling the stricken vessel with a floating containment boom
  ➔ if there is sufficient quantity of lengths of boom available.
- Contain partially around the source of the spill (by using wind and current to best advantage)
  ➔ if the lengths of boom available are insufficient.

Deployment

- Prepare and assemble lengths of boom necessary for containment operations.
- Put the boom on the water from a boat or pontoon and tow it, in a line, by tug.
- Partially or completely encircle the stricken vessel.
- Simultaneously connect the boom to its mooring points on the water.
- Position skimmer(s).

Recommendations

- Prevent current inversion by using a double anchorage (if using anchors).
- Comply with the rules for positioning booms facing the current.
- Use wind and current (rather than submitting to them) when positioning.
- Regulate traffic by stopping access to the area of operations by other vessels.

Containment of slicks at sea and simultaneous recovery of pollutant

Objective

To collect drifting slicks by means of a boom connected to a device allowing for recovery of the pollutant.

Necessary resources

- Antipollution equipment:
  - medium or heavy curtain boom
  - skimmer + pumping unit
- Naval support:
  - 1 or 2 vessels to tow the boom (pusher tug, tug or supply boat)
  - 1 vessel or barge to store recovered products (if tugs do not have their own storage)
- Aerial support (tracking):
  - 1 helicopter or light aircraft
- Ancillaries:
  - radio link
  - ropes

How to proceed

- Sweep the polluted area by trawling the slick using:
  - a U configuration: the boom is towed by two vessels, recovery provided by a third
  - a J configuration: the boom is towed by two vessels, one of which provides recovery and storage
  - a single-vessel device: the boom and recovery device are deployed coupled to a single vessel, using a jib boom or a paravane

Deployment

- Put the boom on the water, at sea, close to the slick.
- Pay out the boom gradually, the vessel moving at slow speed.
- Connect the free end of the boom to the second vessel or set up the jib boom or paravane (if single vessel).
- Assemble the flexible hoses of the pumping unit, then put the skimmer on the water.
- Tow the slick at reduced speed: 0.5 to 0.8 knots (surface speed).

Recommendations

- Guide the vessel by aerial means.
- Optimise the use of storage resources by only operating the skimmer when sufficient oil has accumulated.
- Discharge settling water in the boom.
- Monitor the level in the storage tanks and continuously assess the oil content of the recovered product
  ➔ adjust the flow rate of the pump and skimmer if necessary.
- Monitor the wake behind the boom
  ➔ in the event of an escape: slow down the speed of the convoy.
- Avoid straying into shallow or narrow areas.
- Avoid any extreme acceleration or change in direction.
- To increase the breadth of sweep: place a funnelling containment device in front of the convoy.

F3

Containment/recovery of vegetable oil residues – POL SEINE 2 experiment

Trawling of solid vegetable oil

Objective

To collect slicks in a solid state (aggregates).

Necessary resources

- 1 surface trawl net
- Trawl net cod end (provide spares)
- Aerial support (tracking)
  - 1 helicopter or light aircraft
- Ancillaries:
  - radio link
  - mooring gear (rope)
  - polyethylene box
  - sorbent rolls
  - Bidim® (Polyester Geotextile)
- Naval support:
  - 2 vessels (810 m/ 200 horsepower minimum)
  - barge provided with tank for storing recovered part (trawl net cod end)

How to proceed

- Fishing vessels are particularly well suited and used to working in formation. The trawl net is towed by two vessels. The two wings of the trawl net act as concentrating elements which allow the aggregates to congregate at the bottom of the pocket. The back of the trawl net is held outside the water by two metal tubes, the hoists. The towlines or draglines are taken up on two wooden joists (L = 1 m), located at the end of the wings. Each trawl net cod end can contain several cubic metres of product.

Deployment

- Anchor the wing which serves the second vessel onto the leading vessel. Lash the other wing to the external dragline.
- Put the trawl net on the water starting with the pocket. On reaching the foot ropes (leading edges), seize the trawl net and attach the two hoists. Continue to pay out onto the water.
- The second vessel moves closer, in parallel with the leading vessel, and attaches itself to the anchored wing using its dragline, which is lashed onto the internal wing.
- The second vessel sends its bow line forward and the second vessel's wing is released from the leading vessel.
- For every 10 m of dragline paid out, move the bow line 56 m away
- Change of bottom: the trawlers approach each other. The second vessel takes back the bow line. The leading vessel turns its dragline until the wing touches the transom plate (two circles onboard). The leading vessel brings the haul onboard. The pocket is seized by the grommet and the tension is released to decouple the two circles. Once the pocket is free, put a new one on and pay out the trawl net.
- Fix a rope equipped with a buoy on the bottom for recovery. Return the pocket by freeing the grommet and close up the other end of the envelope.

Recommendations

- Surface trawl nets are suitable for floating solid products, and aggregates of solidified vegetable oil.
- The operating speed can be up to 4 knots for a sea state of less than 4.
- Provide for a recovery device (crane) and storage of the trawl net cod ends. The full cod ends are hoisted by the grommet or towed to a port provided with a hold.

Recovery of pollutant onshore and disposal

Objective

To clean the coastline affected by pollution and dispose of waste collected during this operation.

Response for solid vegetable oil

Necessary resources

- Specialised screening equipment (sand screener, mini-sand screener)
- Plastic sacks and dustbins

How to proceed

In the event of a massive arrival of agglomerates at sites with difficult access (rocky creek or shingle beach), manual collection is necessary in order to reduce degradation and the resulting production of nauseating odours. If the areas affected are beaches, collection may be carried out using sand screeners.

Response for liquid vegetable oil

Necessary resources

- Pollution response equipment
  - Boom
  - Skimmer + pumping unit
  - Low-pressure cold water jets
- Ancillaries:
  - Sorbent rolls + sorbent boom
  - Bidim ®

How to proceed

- At high tide, surround the slick using boom, then pump via the skimmer.
- At low tide, the area may be cleaned using low-pressure cold water jets in order to reduce the emulsification process. After decantation of the effluents, the oil must be pumped.

Recommendations

In both cases, it is necessary to provide an intermediate storage site for collected waste (both liquids and solids).

Collection must be selective.

The use of low-pressure water jets requires the setting up of a cleaning station identical to those used for petroleum pollution.

Waste disposal

Large solid waste collected that is not soiled or barely soiled should be disposed of according to conventional procedures for removal of household waste. With regard to the oil and very soiled material, refer to the guide published by Cedre, "Oil Spill Waste Management".

Follow-up

In order to be able to reassess the situation at any time, a surveillance procedure for the development of the spilled product is necessary. To do this, the following techniques are used:

- Detection of vegetable oils → B2
- Assessment of behaviour of vegetable oils spilled at sea → C

Acronyms and abbreviations

°C: Degree Celsius
CAS: Chemical Abstract Summary
CEPPOL: Commission d'Etudes Pratiques de Lutte Antipollution
C.L.S.: Collecte Localisation Satellite (Satellite Location Collection Point)
cSt: Centistoke
GPS: Global Positioning System
µm: micron
MRCC: Marine Rescue Coordination Centre
RSV: Regional Support Vessel
SAR: Search and Rescue
SHOM: Service Hydrographique et Océanographique de la Marine (French Naval Hydrographical and Oceanographic Department)
SLAR: Side-Looking Airborne Radar
UTC: Universal Time Conversion

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