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Disaster
Prevention
Center

Current Status of Oil Spill Response in Japan and a New Sensible Approach to the Issues

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I. Maritime Disaster Prevention Center

- MDPC was established in October 1976 as a private sector initiative
- In October 2003 MDPC became an independent administrative agency, and in October 2013 it became a designated maritime disaster prevention institution. In readiness for incidents involving oil and HNS tankers, or petroleum- and chemical-related operators, MDPC concludes pre-contracts offering equipment and disaster response personnel. MDPC is self-funding through receipt of commissions for disaster response training and consulting fees.
- MDPC has mobilized for more than 160 maritime disasters, including oil spill clean-up and fire-fighting activities. However, its disaster-prevention activities are not conducted for the purpose of earning revenue.


Oil spill from ship


Oil spill from facilities

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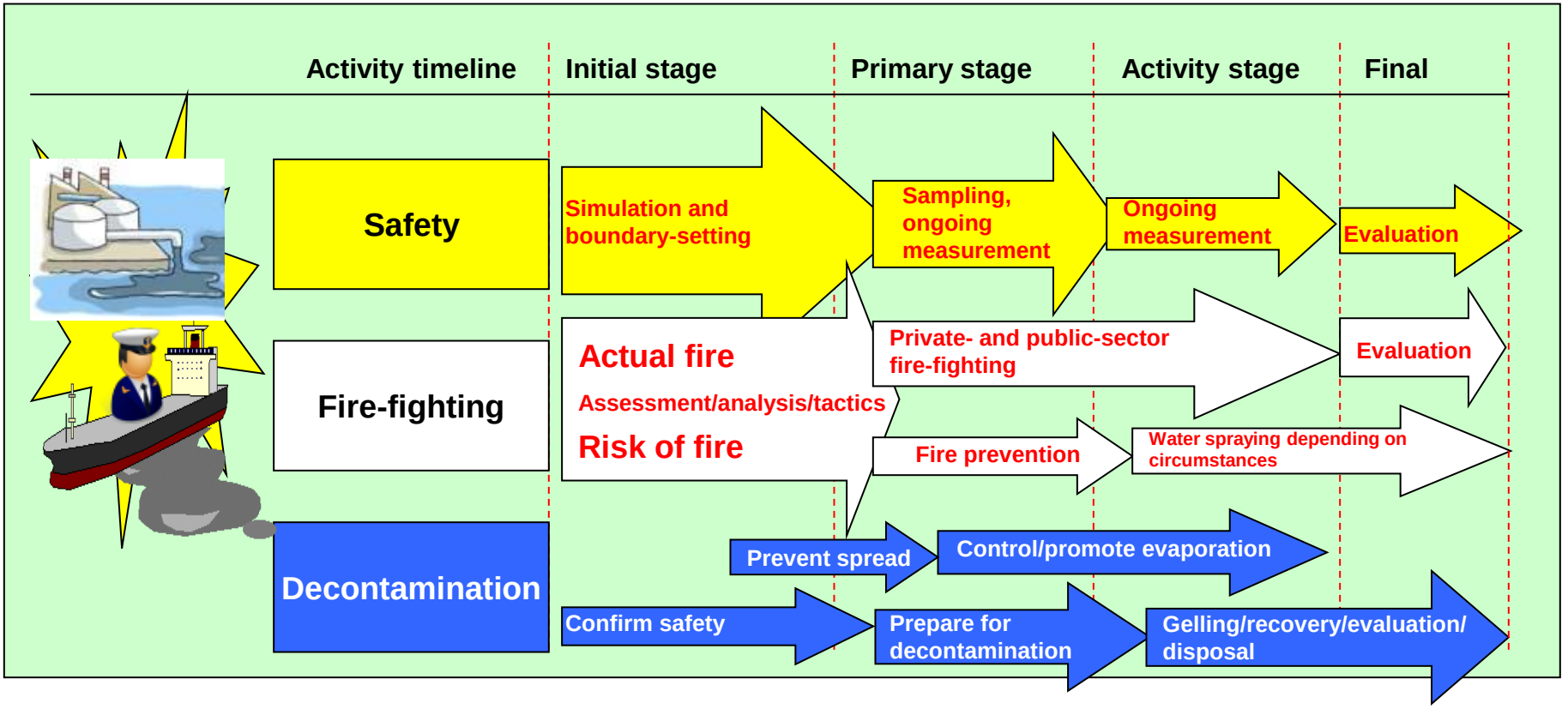
Basic Approach to Maritime Disaster Response



Note: Thickness of arrow indicates extent of risk

- MDPC's on-site responders have the skills to consider the above three factors and respond appropriately to fires and oil and HNS spills.
- Basically no difference in response to oil and HNS incidents. Crude oil is inflammable and emits toxic gas.
- MDPC has personnel and equipment to deal with these three factors.

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MDPC Bases & Depots for Maritime Disasters

Total 8 Branch Offices/3 Depots/41 Bases

Wakkanai
Muroran
Tomakomai
Hakodate
Mutsu
Hachinohe
Akita
Kuji
Niigata
Sendai
Toyama
Fukui
Kawasaki
Onahama
Kashima
Nagoya
Yokohama
North-Chiba
South-Chiba
Yokosuka
Yokkaichi
Shimizu
Irako
Wakayama Owase
Sakai
Kobe
Himeji
Mizushima
Iwakuni
Tokuyama
Ube
Shimonoseki
Kita-Kyusyu
Sasebo
Nagasaki
Kushikino
Kiire
Kagoshima
Oita
Matsuyama
Imabari
Kamigotou
Nakagusukuj

- Oil recovery system
- Oil booms, absorbent and dispersant
- HNS PPE, materials and equipment
- Oil & HNS response experts
- Disaster countermeasures depot
- Branch Office — MDPC staff stationed

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MDPC's Role in Oil Spill Response

Polluter

Insurance Office

Request to respond

Charge claims

Peace time:
Management & Planning

Stockpile Bases
---44 Bases----

MDPC

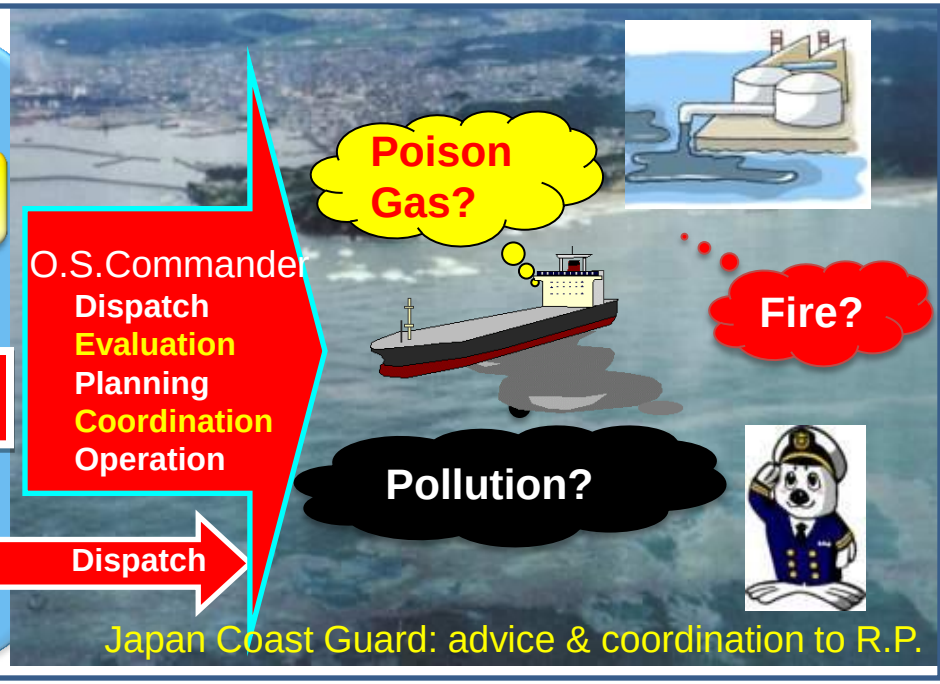
Exercises & study to develop our capability

Order to Respond

Sub- contractors
(160 in 86 main ports)

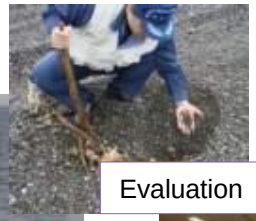
Dispatch

O.S.Commander
Dispatch
Evaluation
Planning
Coordination
Operation

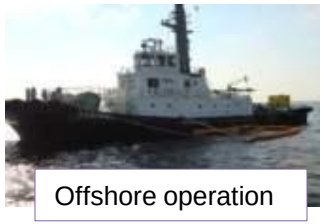


Japan Coast Guard: advice & coordination to R.P.

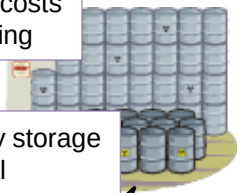
Dispatch → Evaluation → Explanation & coordination → Staging resources → Operations: offshore & shoreline → Reevaluation & revision → Oily debris disposal


Evaluation


Mobilization & staging


Offshore operation

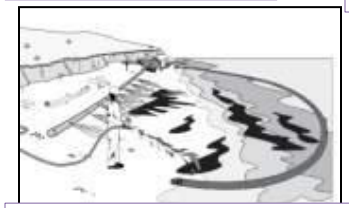
Daily report & costs
General planning

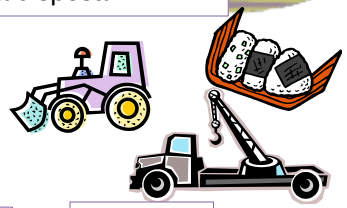

Temporary storage & disposal


Sampling


Explanation of response tactics


Protective tactics for sensitive areas


Shoreline cleanup operations


Logistics

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II. Oil Spill Response: Current Status and Issues

1. Use of Dispersants–Timing and Misconceptions

- **Dispersant is a chemical agent designated by law, and domestic law obligates oil storage facilities, oil tankers, etc. to keep dispersant on hand**
  - **Why do people hesitate to use dispersant even though it is a legally designated chemical agent?**
  - **Ill-prepared in terms of timing of use, suitability, and proper spraying?**

✧ **Mandatory emergency response measures（Act on the Prevention of Marine Pollution and Maritime Disaster, Article 39, Paragraph 1)**

Facility managers and ships' captains must immediately take emergency measures to prevent spread or continued discharge of pollutants and remove oil, etc.

(Example: Discharge of oil from onshore pipeline

Proper spraying of dispersant is an emergency measure that can be taken by a small number of people)

✧ **Mandatory clean-up measures (Act on the Prevention of Marine Pollution and Maritime Disaster, Article 39, Paragraph 2)**

Facility managers and ship owners must take measures necessary for clean-up .

(Example: Offshore spread of oil from facilities

Mechanical recovery and dispersant spraying considering consensus of local interested parties and others involved)

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II. Oil Spill Response: Current Status and Issues

- **Since dispersant is a legally designated chemical agent, MLIT sets testing standards**

→Toxicity, emulsification rate, etc.

→Low toxicity criteria: 1/10 to 1/100 of European and American standards

The real issue is environmental impact of the ultra-fine oil particles dispersed

Spraying dispersant on floating oil far out at sea involves a trade-off between minimization of the amount of oil that will strand ashore and consideration for the environment. Local community understanding (consensus) is required.

Biggest problem

The biggest problem for MDPC in more than 160 incidents has been removal of oil adhering to port facilities

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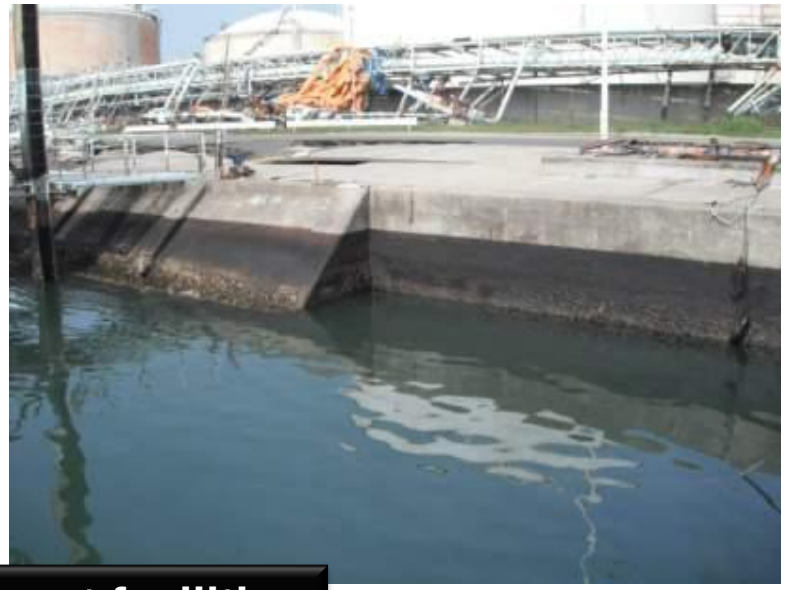
Oil Adhering to Port Facilities



Pollution of port facilities

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II. Oil Spill Response: Current Status and Issues

2. Decontamination of port facilities

Port users demand swift restoration of port functions (shipping traffic and docking facilities)

➢**Current status of decontamination**

Decontamination procedures for oil adhering to port facilities:

↓**Preparation for preventing spread of oil splashes**

↓**Let dispersant permeate for about 30 minutes after spraying**

↓**Lift with high-pressure washer using sea water**

↓**Stir dispersed oil and rely on natural clean-up**

Recover oil lifted but not fully dispersed by sorption, etc.

Repeat these procedures 2-3 times depending on the extent of pollution

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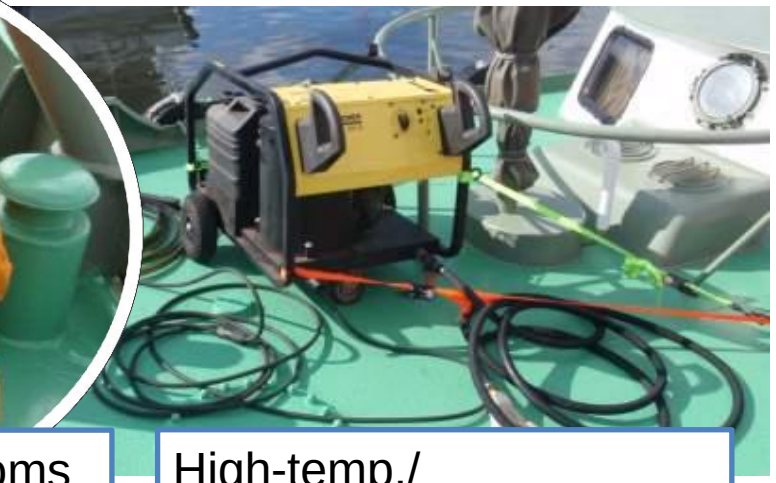
Decontamination Procedures for Oil Adhering to Port Facilities and Ships (1)

Sorbent/Dispersants

Booms/Sorbent booms



High-temp./
High-pressure washing

(1) Dispersant spraying

(2) Penetration

(3) High-pressure washing

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II. Oil Spill Response: Current Status and Issues

Issues when decontaminating oil adhering to port facilities

(1) Aversion to use of dispersants
(difficult to obtain local community consensus)

(2) High-pressure washers using sea water are prone to nozzle blockages, and are not reliable for continuous use

(3) Dispersed oil does not generally need to be recovered, but since ports are highly visible sites, there is pressure to recover floating oil

(4) If dispersant cannot be used, oil is lifted with heated and high-pressured seawater . However, since sea water contains many impurities, heater breakdowns and nozzle blockages frequently occur.

Impact

- **Hindrance to port recovery plan**
- **Docks and piers cannot be used, leading directly to claims for compensation**

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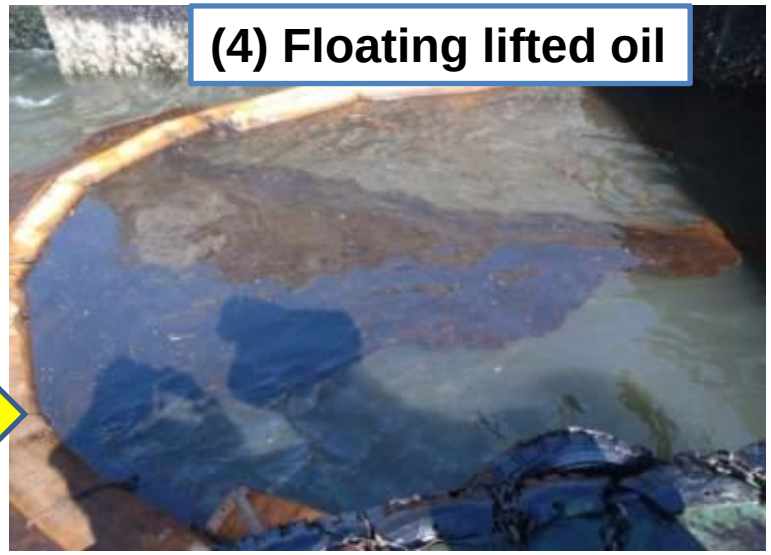
Decontamination Work for Oil Adhering to Port Facilities (2)



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Decontamination Work for Oil Adhering to Port Facilities (Canals) (3)

Decontamination in the public eye

(1) Preparation
(2) Dispersant spraying/penetration
(3) High-pressure washing

The color of dispersed oil changes to “Café au lait”

The color of non-dispersed oil is black: lifted oil floats.

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II. Oil Spill Response: Current Status and Issues

3. Ship Decontamination: Use of Dispersants and Determination of Operation Zones

- Ships contaminated as they sail through polluted waters
- Ships contaminated by docking at port facilities
- Ships contaminated during use in cleanup operations

MDPC faced problems with ship decontamination during response to oil spills following the Great East Japan Earthquake

Issues

(1) Struggle to determine operation zones for decontamination work (since this work is carried out by small vessels, it is done in shallow coastal waters)

(2) Although dispersant promotes oil lifting, the fishing industry expresses fears over eventual damage due to dispersed oil

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Decontamination Work for Oil Adhering to Port Facilities and Ships (4)

Before

After

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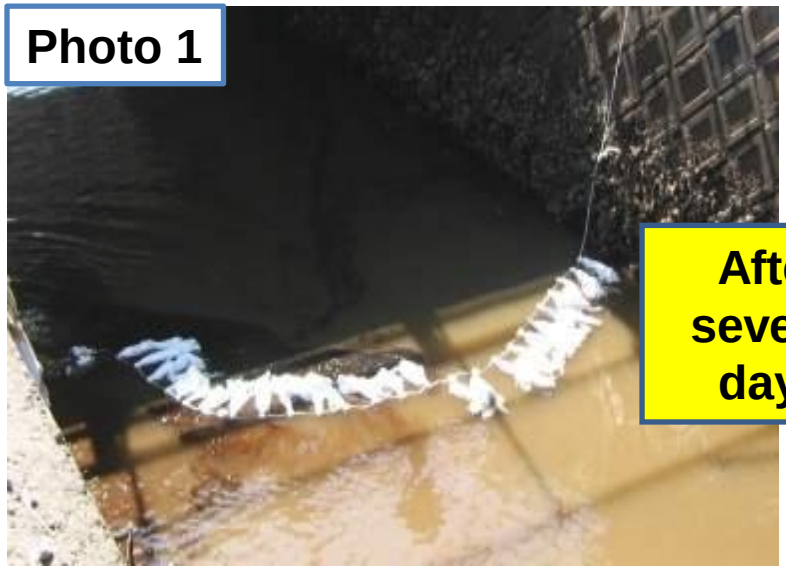
Decontamination Work for Oil Adhering to Port Facilities (5)

Photo 1



After several days

Photo 2

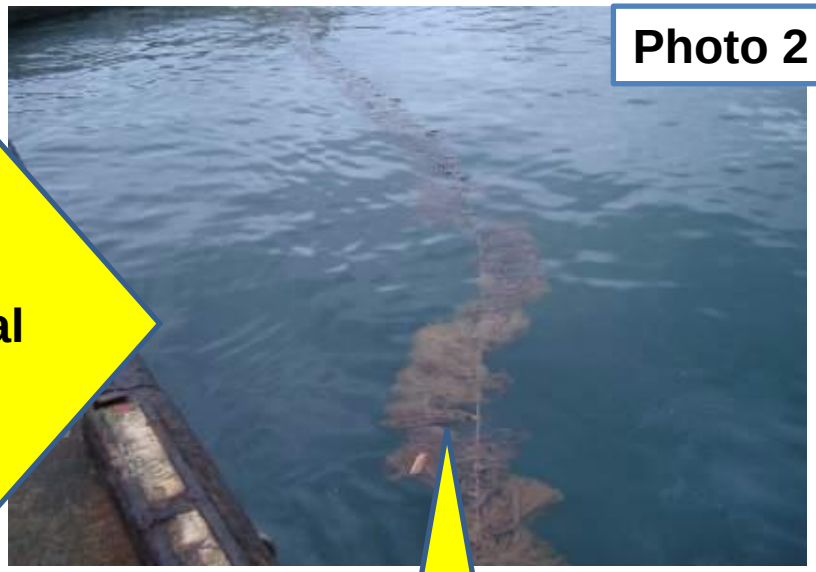


Photo 1: During initial preparation phase, the color of streamer-type adsorbent is white
Photo 2: After several days it turns brown as dispersed and lifted oil is adsorbed

Streamer-type adsorbent

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III. A New Sensible Approach to the Issues

- **R&D for adhered oil remover is a pressing issue**
  - **Easily lifts oil adhering to port facilities and ships**
  - **Floats lifted oil on the surface and recover it using a chemical agent not designated by law**
  - **Achieves readiness for port damage caused by a huge earthquake: a “magic bullet” for immediately restoring port functions**
  - **Since lifted oil is recovered physically, environmental damage is extremely low compared to use of dispersants, and it will be easier to gain understanding of local communities: an environmentally friendly solution**

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III. A New Sensible Approach to the Issues

- **Performance criteria required of adhered oil remover being researched and developed**

  When used on highly viscous oil adhering to the surface of port facilities (concrete) and ship hulls (painted steel), the remover must:

  - **Be easy to apply using commercial sprayers**
  - **Permeate easily to minimize amount sprayed**
  - **Lift oil with low-pressure seawater sprayed using small pumps (lifting capability equivalent to current hot-water method)**
  - **Float lifted oil (without emulsification or dispersion) for recovery using sorbent boom or small skimmer**
  - **Comply with national toxicity testing standards for chemical agents (oil dispersants), to eliminate local community concerns over toxicity**
  - **Have no impact on ships' paint**

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Adhered Oil Remover Development Concept

	Adhered oil remover
Target oil	High-viscosity oil that has drifted and adhered to structures after a spill
Structures	Docks, ships, breakwaters, etc.
Purpose	To reduce viscosity of adhered oil and make it easy to lift oil from structures
Method of use	After application and standing time, blast off with high pressure spray of water at normal temperature
Recovery method	Sorbent boom, small skimmer, etc.
Applicable standard	No domestic standard
Domestic products	None (currently dispersants are used as a substitute for dispersion and lifting)
Sites for use	Oil pollution sites on coast, near industrial complexes, etc.
Solubility in water	Water insoluble
Flash point	61℃and above
Aquatic toxicity	LC50 value of more than 3,000 ppm in 24 hour period for “himedaka” (Japanese killifish)

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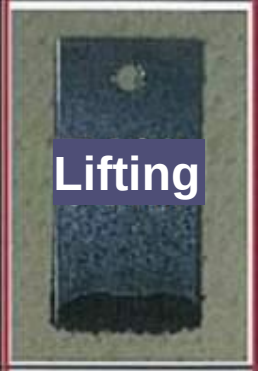
Adhered Oil Remover: Base Solvent Testing

Type	A	B	C	D	E	F
Test pieces after testing						 Lifting
Solvent after testing						 No dispersion
Flash point	51℃	98℃	83℃	81℃	62℃	154℃
Toxicity	×	○	-	○	×	○

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Adhered Oil Remover Test Results: Interim Report

In cooperation with Neos Co., Ltd., which agreed on the need for an adhered oil remover, in late 2012 MDPC began examining washing agents used in the US. The US Environmental Protection Agency approved two types of washing agents:

(1) "Lift and disperse" products

(2) "Lift and float" products

Target of MDPC/Neos R&D

Reference::

http://www.noaa.gov/factsheets/new%20version/surface_washing_agents.pdf

Criterion	Parameters
(1) Water pressure for washing	3-5 kgf/cm^2
(2) Amount of adhered oil remover applied	0.5:1-1:1 amount of adhered oil
(3) Standing time	10-30 minutes
(4) Washing time with pressure washing	1-5 minutes

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Adhered Oil Remover: Performance Comparison Test

	Remover under development	Dispersant	Highly toxic chemical agent	No chemical agent (water wash at 50℃)
Front				
Back				

Parameters used:
(1) 3 kgf/cm²
(2) Oil : test agent = 1:1
(3) 10 minutes
(4) 3 minutes

Decontamination test on high-viscosity oil applied to miniature tetrapod succeeded in lifting adhered fuel oil with water sprayed at normal temperature (15℃) and low pressure (3 kgf/cm²)


Thank you very much
for your kind attention