

Refs:

Absorbent Polymers for Hydrocarbons, Oils, and Solvents

Quick, easy & non-toxic cleanup of accidental oil spills

Immobilization of PCB-containing oil in underground cables

Removal of emulsified/dissolved oils from industrial effluents

Removal of food oils & grease from waste and wastewater



☎ +33(0)456-81-3736

✉ info@prometek.fr

<http://www.prometek.fr>

Macro-polymers to remove organic pollutants from your liquid and solid waste and wastewater

Contamination by organic pollutants continues to threaten our environment. Refs series products use an innovative technology to internally bind these pollutants in polymer matrices and turn them into a viscoelastic and hydrophobic mass.

Refs contain **no harmful chemicals**, are **operator friendly** (light and remain dry and powdery after absorption) allowing an easy collection of pollutants such as **oils, hydrocarbons, organic solvents and PCB-containing oils**, and **will not desorb** the captured pollutant. In addition, **the absorptive reaction time is short**, and the used Refs can be completely incinerated and used as a fuel material if the quantity allows.

This technology can be used to:

- clean up accidental oil spills in water bodies and on paved surfaces
- remove the pure liquid phase of pollutants
- wash contaminated soils
- remove emulsified/dissolved oils and hydrocarbons from industrial effluents and liquid waste
- remove the animal and vegetable oils, grease, and lipid emulsions from food processing industries' liquid and solid waste

Refs series products

- **Refs-A Universal Absorbent:** It absorbs oils, hydrocarbons (including coal tar, asphalt, and heavy crude oils), and organic solvents up to 10 times its volume.
- **Refs-AG Fluidized Absorbent:** It is a liquid-suspended version of Refs-A. It can be pumped out to treat a remote oil spill in water bodies and be collected easily as it floats after absorption. It is suitable to remove heavy hydrocarbons spilled in complicated structures such as rocky coastlines.
- **Refs-MW Petroleum Product Absorbent:** It absorbs petroleum products. Due to its powdery nature, it can be fluidized and pumped through narrow and complicated structures such as an underground electrical cable to absorb and immobilize the pollutants inside (PCB-containing oil, etc).
- **Refs-ST Absorbent for paved surfaces:** It is a mixture of Refs-A with absorptive minerals, so it treats the same target pollutants. It can be used on paved surfaces to collect spilled oil and solvent.
- **Refs-E Demulsifier-Absorbent:** It demulsifies and absorbs the emulsified oils from industrial processing and washing effluents, thus reducing the waste quantity to be treated. It can treat dissolved oils in a few ppm range up to highly emulsified effluent of a hundred of g/L. Only a small amount (~0.01 - 2 % w/v) is needed to treat such liquid waste and effluents. The absorbed product can be filtered out for disposal.
- **Refs-ENC Non-Chloride Demulsifier-Absorbent:** It is a non-chloride version of Refs-E, which allows reusing of the treated water.
- **Refs-T Food Oil and Grease Absorbent:** It absorbs the oils (including heavily viscous oils) and grease, and treats lipid emulsions in wastewater from food and meat processing industries.
- **OR:** In order to solve various problems with treating different types of oils, we can customize a product according to our clients' needs.

Refs-A/AG

Solidification of organic pollutants by absorption

Target Pollutants

Oils, Hydrocarbons, Heavy petroleum products, Coal Tar, Asphalt, Organic Solvents, PCBs-containing oil

Application fields

Cleanup of spilled pollutants on hard surfaces (Refs-A) and in water bodies (Refs-AG)

Cleanup of spilled oils in a complicated structure such as a rocky coastline and a sandy beach

Removal of free oil phase from industrial liquid waste and effluents

Mix with existing absorbents to enhance their absorptive capacities.

Washing of excavated contaminated soils and sediments

Characteristics

1. It does not contain any harmful chemicals.
2. It quickly absorbs the target pollutant (can be a mixture of pollutants).
3. It remains dry and powdery after absorption, enabling an easy, quick and clean collection of the absorbed product.
4. It absorbs only the pollutants and does not absorb water.
5. It will not desorb.
6. Refs-AG (Refs-A with a non-toxic fluidizing agent) can be fluidized in water*.
7. It floats on the water after absorption.
8. Absorbed Refs-AG can be collected by filtration and the filtered product remains dry and powdery due to its hydrophobicity
9. Absorbed Refs-AG remains stable and can be left in water until collection
10. Used Refs-A/AG can be completely incinerated for waste disposal..

*Natural water sources can be used to prepare Refs-AG (sea and fresh water). Refs-AG can fluidize up to 40% (w/v) of Refs-A depending on the need.

How to use

1. According to the table below, estimate the quantity of Refs-A required to treat the spill.
2. Distribute directly and evenly on the entire extent of a spilled pollutant.
3. Leave Refs-A to react and agitate the mixture to increase the contact (see the table for reference).
4. Collect the mixture by sweeping (on paved surfaces) or by pumping and filtration (in water).
5. If the mixture is oily, add more Refs-A so the collection process will be cleaner and easier.
6. The used product can be incinerated.

Detailed explications on how to use Refs-A/AG in case of

1) oil removal in the water bodies and

2) washing of contaminated soil and sediments

are provided in different brochures in ppt format and available at www.prometek.fr

Storage & Care

1. Store the product indoors.
2. Avoid humidity, direct exposure to the sun, and high temperatures.
3. The reactivity of Refs-A depends on the temperature and the viscosity of target oils and solvents.
4. The used product can be incinerated. (Depending on the absorbed liquid, it may produce a harmful gas. In such a case, treat the smoke properly).

Data & Specification

	Quantity to add (w/v %)	Reaction time *** (min)
Transformer/Insulating oils	10 ~ 25	5 ~ 10
Turbine oils	15 ~ 25	10 ~ 20
Engine oils	15 ~ 25	10 ~ 20
Rolling oils	15 ~ 25	10 ~ 20
Bunker fuel	15 ~ 20	5 ~ 10
Diesel fuel	15 ~ 20	5 ~ 10
Kerosine	15 ~ 20	5 ~ 10
Toluene	15 ~ 25	5 ~ 15
Hexane	15 ~ 20	5 ~ 10
Solvent naphtha	15 ~ 25	5 ~ 15

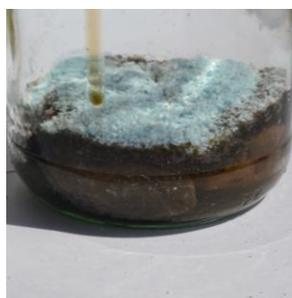
Appearance	Blue granulate
Bulk specific gravity	0.25 – 0.35
Flash point	>200 °C
pH at 1% suspension	7
Packaging	Paper sack of 12 kg

*** Reaction takes place instantaneously. The indicated time is the upper limit of reaction time to obtain a homogeneous absorption under mechanical mixing. In natural settings, waves will help mix the product and oil. In the absence of waves, water can be pumped to artificially create waves on the surface.

Demonstration



Stones covered with oil



Addition of Refs-A



After 1 minute, water was added to let float the mixture



Zoom on the cleaned stones

Refs-MW

Immobilization of PCB-containing oils from underground cables

Target Pollutants

Petroleum products, Coal tar, asphalt and PCBs-containing oils

Application fields

Solidification of pollutants by absorption.

Immobilization of PCB-containing oils from underground electric cables.*

Mix with existing absorbents to enhance their absorptive capacities.

*By adding a non-toxic special agent to retard the absorption reaction, Refs-MW can be gradually pumped through an electric cable to immobilize and solidify a PCB-containing oil which will prevent an accidental exposure to the pollutant during various operations. The immobilization can be achieved for a cable length of 50 to 250 m.

Characteristics

1. Same as Refs-A. (apart from target pollutants)
2. It can be fluidized in water.
3. It floats on the water after absorption.

How to use

Same as Refs-A.

Storage & Care

Same as Refs-A.

Data & Specification

	Quantity to add (w/v %)	Reaction time *** (min)
Gasoline	15 ~ 25	5 ~ 10
Diesel fuel	15 ~ 25	5 ~ 20
Kerosine	15 ~ 25	5 ~ 20
Bunker fuel A	15 ~ 25	10 ~ 20
Bunker fuel B	15 ~ 20	15 ~ 25
Crude oil	15 ~ 20	10 ~ 20

Appearance	White powder
Bulk specific gravity	0.25
Flash point	>200 °C
pH at 1% suspension	7
Packaging	Paper sack of 12 kg

Refs-ST

Efficient and instantaneous removal of spilled oil from roads

Target Pollutants

Oils, Hydrocarbons, Organic Solvents

Application fields

Road, airport, and any paved surface maintenance

Characteristics

1. Refs-ST does not contain any harmful chemicals.
2. It absorbs water and target pollutants from road and paved surfaces.
3. It will not leave an oil film on the surface.*
4. It remains dry and powdery after the treatment to allow an easy collection of the absorbed materials.
5. Used Refs-ST can be completely incinerated for waste disposal.

*If the treatment with Refs-ST takes place immediately after the spill and within the absorptive capacity of the surface to be treated.

How to use

1. Shake and mix Refs-ST before use.
2. Depending on the type of pollutant and its viscosity, the quantity to add will change (refer to the table below).
3. Distribute Refs-ST evenly on the surface to be treated.
4. Using a broom, mix Refs-ST with the pollutant to increase the contact and let it react for about 1 minute.

Storage & Care

1. Avoid humidity, direct exposure to the sun and high temperatures.
2. Refs-ST tends to separate, so mix well before use.
3. The used product can be incinerated. (Depending on the absorbed liquid, it may produce a harmful gas. In such a case, treat the smoke properly.)

Data & Specification

Absorbing capacity (L/kg of Refs-ST)	
Fuel oil A	5 ~ 6
Diesel oil	5 ~ 6
Gasoline	5 ~ 6
Engine oils	4 ~ 5

Appearance	Gray/white granulate
Apparent specific gravity	0.15 ~ 0.25
pH at 1% suspension	7
Packaging	10 kg paper sack

Refs-E/ENC

Removal of emulsified and dissolved oils from effluents

Application fields

Removal of emulsified and/or dissolved oils in industrial liquid waste and effluents (cutting fluids, air compressed condensate, the wash-water of fuel tanks and other reservoirs).

Characteristics

1. Refs-E/ENC does not contain any harmful chemicals.
2. It simultaneously demulsifies emulsified oils and absorbs this demulsified oils.
3. It can remove high concentrations (~100 g oil/L or more) of emulsified oils to < 0 ppm
4. It can also remove low concentrations (a few ppm) of dissolved oils to < 0 ppm.
5. Only a small amount (~0.01 - 2% w/v) is necessary for the treatment.
6. Formed sludge can be pumped and filtered out after the treatment, allowing an on-site treatment of effluents..
7. Once filtered, formed sludge remains dry and powdery due to its hydrophobicity.
8. It is suitable to use prior to passing the effluent to a filter-press, which allows a liquid-solid separation and oil removal simultaneously.
9. Refs-ENC does not contain chlorides, so the treated water can be reused after adjusting the water pH.
10. Used Refs-E/ENC can be completely incinerated for waste disposal.

How to use

1. Transfer the effluent into a mixing tank. (or a submersible mixer can be used directly)
 - ➔ If there is an oil phase in the effluent, add Refs-A first to remove this free oil phase.
2. Neutralize the wastewater to pH 6 – 8.
 - ➔ This increases the absorptive capacity and decreases the quantity of Refs E/ENC to be added.)
3. Depending on the oil concentration of the effluent to be treated, add 0.01 – 2 % (w/v) of Refs E/ENC.
 - ➔ For recommendation, try 1 % (w/v) first and adjust the quantity of Refs E/ENC for optimization.
(ex. In a Fukushima site, the effluent (28.40 g/L of emulsified hydrocarbons) was efficiently removed to 0.00 g/L with 1% of Refs-E. An effluent with total oil concentration of 25 ppm was treated with 0.02% of Refs-E)
4. Thoroughly mix the mixture for 5 – 15 minutes.
5. Absorbed product will form loose flocculation sludge.
 - ➔ Although not necessary, if it is wished to quickly visualize the formation of flocculation sludge, add 0.1 % polymer coagulant (anionic coagulant) and mix slowly for 30 seconds. This allows an easier collection of the formed sludge, although too much floc will slow down the subsequent filtration process.
6. Filter the formed sludge using a filter cloth or pass the treated effluent directly to a filter-press.
 - ➔ Refs-ENC will decrease the effluent pH, so neutralize the treated water before discharge.

Storage & Care

1. Refs-E/ENC slightly absorbs humidity, so keep the product dry.
2. Avoid exposure to the sun and high temperatures.
3. Use the opened product within 6 months.
4. Treated water must be tested before releasing (Refs-E/ENC remove emulsified and/or dissolved oils but not the emulsifier or the surfactant used which sometimes cause the elevated COD).
5. When the formed sludge is incinerated, it may produce a harmful gas depending on the composition of the effluent. In such a case, treat the smoke properly.

Specifications

	Refs-E	Refs- E N C
Appearance	Light Gray powder	Gray/black powder
Apparent specific gravity	0.5 ~ 0.7	0.6 ~ 0.8
pH of 1% w/v suspension	6	4
Packaging	15 kg paper sack (3 x 5kg packages)	15 kg paper sack (3 x 5kg packages)

Demonstrations



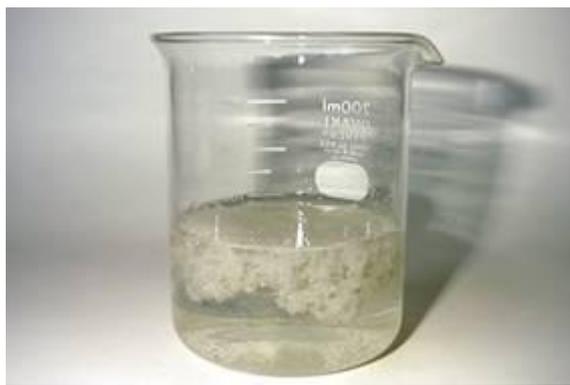
Machine-washing effluent



After treatment with Refs-ENC



Air-compressed condensate



After treatment with Refs-E

Refs T

Removal of food oil & grease from waste and wastewater

Application fields

Removal of animal and vegetable oils and grease in liquid and solid waste from food and meat processing industries.

Removal of emulsified lipids in food and meat processing industries' effluents

Removal of floating oil and grease in a grease trap

Characteristics

1. Refs-T does not contain any harmful chemicals.
2. It can absorb and solidify a mixture of oils (animal, vegetal and mineral) from liquid and/or solid waste.
3. It absorbs only the oil and not the water.
4. It demulsifies and absorbs lipid emulsions in wastewater.
5. It floats after the treatment, so the collection of absorbed oil waste is quick and easy.
6. The maximum oil temperature for using Refs-T is about 60°C.
7. Used Refs-T can be completely incinerated for waste disposal.

How to use (floating oil and grease)

1. Shake/Mix Refs-T well before use.
2. If the oily waste to be treated does not contain water, add approximately 5% (v/v) of water to the waste.*
3. According to the table below, add 10 – 25 % (w/v) of Refs-T and mix thoroughly with the oil mixture to increase the contact.
4. Leave the mixture for 5 minutes.
5. Remove the solidified oil waste and discard properly or incinerate the waste.

*Refs-T works better with oils floating on water.

How to use (lipid emulsions)

1. Shake/Mix Refs-T well before use.
2. Transfer the wastewater into a mixing tank (or a submergible mixer can be used directly).
3. Add 2 ~ 3% (w/v) of Refs-T in the wastewater to be treated.
4. Thoroughly mix the mixture for 5 – 15 minutes.
5. Filter the formed sludge.

Storage & Care

1. Avoid exposure to the sun and high temperatures and keep the product dry.
2. Shake and mix Refs-T before use.
3. Do not use with very hot oils (>60°C).

Data & Specification

	Quantity to add (w/v%)
Frying oils	10 ~ 15
Canola oil	8 ~ 12
Sesame oil	10 ~ 15
Olive oil	15 ~ 20
Fuel oil B	8 ~ 12

Appearance	Gray/white powder
Apparent specific gravity	0.25 ~ 0.35
pH at 1% suspension	9 ~ 10
Packaging	15 kg paper sack

Demonstration



Floating vegetable oil



After treatment with Refs-T



Collection of solidified waste



+33(0)456-81-3736

info@prometek.fr

<http://www.prometek.fr>

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