
**Ships and marine technology —
Marine environment protection —
Specifications on design and selection
of sorbents**

*Navires et technologie maritime — Protection de l'environnement
marin — Spécifications relatives à la conception et à la sélection des
sorbants*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Introduction

Sorbents are used to recover oil by absorption and/or adsorption. To enhance recovery, most sorbents are both oleophilic and hydrophobic. Additionally, there are sorbents which are either oleophilic or hydrophobic only for use with industrial spills. This document addresses applications pertaining to marine oil spills.

In general, the use of sorbents is only appropriate for the removal of thin oil layers. Sorbents can also be used to protect and/or clean environmentally sensitive areas, where the use of other cleaning equipment is restricted because of the possible damage it can produce.

This document does not refer to loose or bulk sorbents, which should not be used in open waters, because their use, especially with very thin oil layers, is inefficient, but involves the risk of uncontrolled proliferation, and thus subsequent pollution, which may be greater than the original oil pollution.

This document gives some general guidelines for manufacturers as well as users with regard to producing, purchasing, and using such types of material. It will not define any specific type and size of sorbent for a particular application, as so many variables have to be taken into consideration.

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Ships and marine technology — Marine environment protection — Specifications on design and selection of sorbents

1 Scope

This document specifies materials, types, selection criteria and designation and marking of sorbents and data to be provided by manufacturer(s) for the sorbents.

The purpose of this document is to assist manufacturers and facilitate users in selecting sorbents by technical criteria. It does not purport to address all aspects of sorbents or safety concerns associated with sorbent use, nor does it define sorbent operational procedures.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 16165, *Ships and marine technology — Marine environment protection — Terminology relating to oil spill response*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 16165 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

absorbent

material that picks up and retains a liquid distributed throughout its molecular structure

3.2

adsorbent

material that is coated by a liquid on its surface including pores and capillaries

3.3

hydrophobic

material or surfaces repelling water

3.4

oleophilic

material or surfaces attracting oil

3.5

sorption capacity

ability of a product to absorb and/or adsorb as well as contain the collected oil

Note 1 to entry: Sorption capacity is expressed as weight of oil per weight of the product.

4 Sorbent materials and forms

4.1 General

In the context of this document, the main purpose of sorbents is to recover an oil slick on the water. The sorption capacity is as important as the buoyancy; both depend on the sorbent material.

In general, no material shall be used which is proven or suspected to be potentially dangerous to the environment.

4.2 Examples of sorbent materials

4.2.1 Synthetic organic materials

Examples include polypropylene, polyethylene, nylon, polyester fibres/fabrics and polyurethane foam.

4.2.2 Natural organic materials

Examples include peat, cellulose, pulp, cotton, bark, hay, feathers, coconut husks, sugar cane waste (bagasse), cork, cellulose fibre, straw, wool, wood chips, and human hair. Straw is very useful for picking up heavier products, such as lubricating oils, fuel oils, and weathered crudes.

4.2.3 Inorganic materials

Examples include expanded perlite, glass wool, vermiculite, and volcanic ash.

4.3 Forms of sorbents

Sorbents are generally categorized by intended application and shape, as follows.

4.3.1 Sorbent booms

Sorbent booms are tubular products which contain loose sorbent material in an oil-permeable envelope. The length is far greater than the other dimensions and is in excess of one metre.

Certain models, designed for use on moderately moving water surfaces, have a "skirt," a flexible ballasted band, which improves the stability and their ability to contain a floating pollutant. These products combine the properties of containment and sorption.

4.3.2 Pads

Pads (or sheets) are thin, flexible products normally with a thickness less than or equal to 3 mm, and with length and width less than a metre.

4.3.3 Pillows

Pillows (and cushions) are flexible products in which the sorbent material is enclosed by net or fabric in a pillow sized permeable envelope. The length of this envelope is far greater than the thickness and is normally less than a metre in length.

4.3.4 Pom-poms

This form of sorbent is made up of thread-like strands joined together to form a light open structure, suitable for recovering viscous oil through adhesion.

4.3.5 Rolls

Rolls, also known as blankets, are products which can be up to several dozen metres in length. They may be perforated to enable the user to use them like pads. They can be reinforced by a rope (filament), and are thus known as sweeps.

5 Selection criteria

5.1 General

The following factors shall be considered when selecting sorbents for use on water.

5.2 Buoyancy

The sorbent shall stay afloat without oil for at least three days. Further, the sorbent which is saturated with two oil types (see 5.4.2) shall remain afloat for at least six days.

5.3 Oil retention

Oil-soaked sorbents shall retain the oil when removed from the water.

5.4 Sorption capacity

5.4.1 Viscosity

The viscosity of the oil to be collected is one main criteria of sorption capacity:

- Distilled oils of low viscosity such as gasoline, kerosene, and gas oil are most efficiently picked up by adsorbents, impregnation is rapid, e.g. a few seconds to a few minutes, but retention is less effective, thus there is a risk of release.
- Heavier oils of high viscosity, such as lubricating oils and most fuel oils, can be more efficiently picked up by adsorbents but the pollutant only adheres to the surface of the sorbent.
- Oils of higher viscosity are not efficiently recovered by sorbents because such oils cannot penetrate the full cross section of the sorbent, e.g. weathered crude oil.

5.4.2 Comparison test

Various testing standards provide different results for capacity. Thus the purchaser is recommended to compare only test results achieved under the same testing standard.

If such information is not available to determine the right product for the application, the following test may be helpful.

The sorbent is commonly tested in the field with two oil types for maximum oil sorption capacity g/g sorbent as follows:

- For low viscosity oil: 5 cSt;
- For high viscosity oil: 3 000 cSt.

5.5 Reusability

The cost of using sorbents can be decreased when the sorbent can be squeezed out and re-used. This may reduce the amount and costs for disposal but it has to be proven that the squeezed material will not cause re-oiling of the surface.

5.6 Biodegradability

A biodegradable product could be helpful for situations where recovery is difficult. The biodegradable sorbent can be left on water if the sorbent has not absorbed oil. The sorbent which has absorbed oil shall be retrieved.

5.7 Disposal

Recovered and saturated sorbents must eventually be processed and disposed unless they are reusable. The criteria for and method of disposal shall be given for the sorbent. Final disposition options include:

- Land farming;
- Burning on-site or in a mobile incinerator;
- Disposal in a properly permitted landfill or industrial (heat recovery) incinerator.

If a sorbent is composed with multiple materials, the method of disposal of each material shall be specified.

6 Data to be provided by manufacturers

The manufacturer's specification and instruction handbook shall include the following information:

- Dimensions (mm or m);
- Material of sorbent and of envelope;
- Colour of product;
- Form of sorbent (see [4.3](#));
- Buoyancy (see [5.2](#));
- Oil retention (see [5.3](#));
- Sorption capacity (see [5.4](#));
- Reusability (see [5.5](#));
- Biodegradability (see [5.6](#));
- Disposal method (see [5.7](#));
- Transport unit;
- Weight, size, and transport volume per unit (in m³);
- Basic safety instructions or warning and any appropriate chemical hazard signs, if necessary.

7 Designation and marking

7.1 General

Each sorbent unit shall be provided with an easily visible marking, preferably fixed on the inner side of the transport unit.

7.2 Marking

The marking shall include the following information:

- Manufacturer's name and address;
- Form and dimensions;
- Year of manufacture and expiry, where applicable;
- Weight of transport unit.

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