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# 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 a la sélection des sorbants*



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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

 

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# Foreword

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This document was prepared by Technical Committee ISO/TC 8, *Ships and marine technology*, Subcommitee SC 2, *Marine environment protection*.



 

# 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.

# 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 absorbents, 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.