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Prepoznavanje razlitij olj - Nafta in sorodni naftni proizvodi - 1. del: Vzorčenje

Oil spill identification - Petroleum and petroleum related products - Part 1: Sampling

Identifizierung von Ölverschmutzungen - Rohöl und Mineralölerzeugnisse - Teil 1: Probenahme

Identification des pollutions pétrolières - Pétrole et produits pétroliers - Partie 1 : Échantillonnage

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Oil spill identification - Petroleum and petroleum related products - Part 1: Sampling

Identification des pollutions pétrolières - Pétrole et produits pétroliers - Partie 1 : Échantillonnage

Identifizierung von Ölverschmutzungen - Rohöl und Mineralölerzeugnisse - Teil 1: Probenahme

This European Standard was approved by CEN on 25 December 2022.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents	Page
European foreword	4
Introduction	5
1 Scope.....	6
2 Normative references.....	6
3 Terms, definitions and abbreviations	6
3.1 Terms and definitions	6
3.2 Abbreviations.....	8
4 Principle	8
5 Sampling in general	8
5.1 General.....	8
5.2 Sampling schedule.....	9
5.3 Types of sample.....	9
5.4 Sample volume.....	10
5.5 Number of samples to be taken	10
6 Precautions against contamination of samples during collection	11
6.1 General.....	11
6.2 Potential sources of contamination	11
6.3 Controls	11
7 Sampling equipment and sample containers and closures	11
7.1 Introduction.....	11
7.2 General instructions and strategies	12
7.3 Sample containers, closures and packages	12
7.4 Sample devices.....	13
7.4.1 General.....	13
7.4.2 For sampling oil layers and oil sheens from water surfaces.....	13
7.4.3 For sampling ship's cargo tanks, bunker tanks and bilges, barges, road tankers, shore tanks and pipelines	13
7.4.4 For sampling waterborne oil layers greater than 1 mm thickness	14
7.4.5 For sampling waterborne very viscous oil layers	14
7.4.6 Helicopter sampling devices.....	15
7.4.7 Less suitable sampling devices	17
8 Sampling procedures.....	18
8.1 Sampling from water surfaces	18
8.1.1 Sampling oil layers less than 1 mm and sheens.....	18
8.1.2 Sampling of viscous oil layers greater than 1 mm thickness	19
8.1.3 Helicopter sampling.....	20
8.2 Sampling beaches, rocky shores, river banks and harbour structures.....	20
8.3 Sampling tar balls	21
8.4 Samples from oiled animals.....	21
8.5 Samples from ships, barges or river-craft	21
8.5.1 General.....	21
8.5.2 Sampling cargo, bunker tanks and slop tanks.....	22
8.5.3 Sampling from ships, barges or river craft pipelines	23

8.5.4	Samples from ballast tanks, bilges and void spaces.....	23
8.6	Sampling from land tanks and pipelines.....	23
8.7	Sampling from road and rail tank wagons	23
9	Sample documentation and logistics.....	23
9.1	Sample information and documentation	23
9.2	Sealing of samples	24
9.3	Custody of samples.....	25
9.4	Sample holding time	25
10	Transport and storage of samples.....	26
Annex A	(informative) Recommended contents of sampling kits.....	27
A.1	Oil-spill sampling.....	27
A.2	Ships, road and rail tank wagons	27
Annex B	(informative) Examples of forms.....	29
B.1	Sample record form	29
B.2	Sample transport and receipt form.....	30
Bibliography	31

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[SIST EN 15522-1:2023](https://standards.iteh.ai/catalog/standards/sist/22cc69b3-78c6-45a9-9378-67039c8eaebc/sist-en-15522-1-2023)

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EN 15522-1:2023 (E)**European foreword**

This document (EN 15522-1:2023) has been prepared by Technical Committee CEN/TC 19 “Gaseous and liquid fuels, lubricants and related products of petroleum, synthetic and biological origin”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2023, and conflicting national standards shall be withdrawn at the latest by September 2023.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TR 15522-1:2006.

In comparison with the previous edition CEN/TR 15522-1:2006, the following technical modifications have been made:

- added another design for a helicopter sampling device as well as some less recommended devices;
- removed ship designs, because this is only relevant for skilled sample takers that should know where to sample on a ship.

EN 15522 is composed of two parts that describe the following:

- Part 1 on sampling, describing good sampling practice, detailing sampling equipment, sampling techniques and the handling of oil samples prior to their arrival at the forensic laboratory;
- Part 2 giving the analytical method, which covers the general concepts and laboratory procedures of oil spill identification, analytical techniques, data processing, data treatment, interpretation/evaluation and reporting of results.

A list of all parts in the EN 15522 series can be found on the CEN website.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

This document is composed of two parts that describe the following:

- Part 1 on sampling, describing good sampling practice, detailing sampling equipment, sampling techniques and the handling of oil samples prior to their arrival at the forensic laboratory;
- Part 2 giving the analytical method, which covers the general concepts and laboratory procedures of oil spill identification, analytical techniques, data processing, data treatment and interpretation/evaluation and reporting of results.

This document specifies a forensic method for characterizing and identifying the source of oils spills in the environment resulting from accidents or intentional discharges. The method may be used in support of the legal process for prosecuting offenders. This method is based on the experience gained with its former publications over the years (see [1]).

Where an oil pollution incident has occurred, samples should be collected from both the spill and, wherever possible, the potential source of the pollutant, e.g. ship, shore side storage tank, pipeline or vehicle, in order to assist in the identification or confirmation of the source of the spill.

The aim of this document is to give guidance on the current best practice for taking such samples.

Part 1 of EN 15522 is meant to provide general guidelines for legal oil sampling¹. It does not contain details relating to all types of spill situation, however, by following these guidelines it should be possible to collect and provide legally valid samples that can be used in the process of identifying or confirming the source of the spill.

The issues addressed only cover the mechanics of sample collection. The command and control that may be put in place during incident response, the authorities who may request sample collection and the individuals who have the authority to collect samples, will vary from country to country and as a consequence these issues are not addressed.

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¹ Legal sampling (according to Interpol Pollution Crime Forensic Investigation Manual [2]): sampling that has been conducted in such a way that the results of its analysis can be used in a court of law. Procedures are followed to prove the chain-of-custody of the samples and to prove that they have not been tampered with.

EN 15522-1:2023 (E)**1 Scope**

This document provides guidance on taking and handling samples related to oil spill identification in legal proceedings. Guidance is given on obtaining samples from both the spill and its potential source.

Preservation of evidence is an essential part of legal procedures and this document presents appropriate oil sampling procedures.

WARNING — The use of this document can involve hazardous materials, operations and equipment.

This document does not purport to address all of the safety problems associated with its use. It is the responsibility of users of this document to take appropriate measures to ensure the safety and health of personnel prior to the application of the standard, and to determine the applicability of any other restrictions for this purpose.

IMPORTANT — Most countries have teams with specialists trained in sampling on board of ships. Do not take unnecessary risks, seek assistance from such teams where available.

NOTE For the sake of clarity, the word 'oil' is used throughout this document. It can equally refer to crude oil, a petroleum product or mixtures of such.

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.

EN 15522-2:2023, *Oil spill identification — Petroleum and petroleum products — Part 2: Analytical method and interpretation of results*

EN ISO 3170, *Petroleum liquids — Manual sampling (ISO 3170)* 2023

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3 Terms, definitions and abbreviations

For the purposes of this document, the following terms and definitions apply.

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

— IEC Electropedia: available at <https://www.electropedia.org/>

— ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 Terms and definitions**3.1.1****chain of custody**

practice of ensuring security of the sample so that no one has an opportunity to tamper with or otherwise alter the sample or the results

Note 1 to entry: It includes chronological documentation that records the sequence of sample handling including sampling, sealing, storage, transfer, analysis and disposal to ensure that only documented sample handlers have direct access to the samples.

3.1.2**sample heterogeneity**

non-representative or non-homogenous character of samples caused for example by variable degrees of mixing within a tank or oil slick

3.1.3

contamination

changes in oil composition which take place during/after the spillage in either sample by addition of non-petroleum compounds from biogenic (e.g. fat from feathers) or anthropogenic sources (e.g. compounds from plastics)

Note 1 to entry: Mixing and contamination are used to differentiate between the addition of petroleum products (mixing) and non-petroleum products (contamination).

3.1.4

weathering

changes in oil composition which can occur after the spillage due to environmental processes, including evaporation, dissolution, emulsification, oxidation, biological decomposition, wax redistribution

Note 1 to entry: *In situ* burning will result in additional changes to oil composition.

3.1.5

bilge water

mixture including water and oil collected in the bilge of a ship as a result of leakage, drainage, etc.

3.1.6

slop

mixture of water and oil residues from cargo tanks in oil tankers that may contain oil/water emulsions, wax, sediments and other tank residues

3.1.7

sludge

deposits, generally from the purification of fuel and lubrication oils, consisting of mixtures including oil, wax, sand and water

3.1.8

tank washings

tank washing water containing cargo tank residues including oil, wax, sediment and other foreign matter

EXAMPLE Tank cleaning chemicals.

3.1.9

background samples

samples representing the background that can be expected in source or spill samples

Note 1 to entry: E.g. sample from the surface water close to but not contaminated by the spill, sample from the deck just next to a contaminated part of the deck of which a sample has been taken.

Note 2 to entry: Background samples from water should, where possible, be taken in the same manner as the spill samples (e.g. via ETFE net).

Note 3 to entry: Background (according to Interpol Pollution Crime Forensic Investigation Manual [2]: Background (Control) sample: a sample of soil, water, air or other medium that is not believed to be impacted by the deleterious environmental discharge and is believed to represent a "clean sample".

3.1.10

petroleum

crude oil (pure or mixed) and all its products resulting from its distillation or processing in units of mixtures and refining

EN 15522-1:2023 (E)

EXAMPLES Fuels, gas oils, kerosene, gasoline, residues, solvents, etc.

3.2 Abbreviations

For the purposes of this document, the following abbreviations apply.

PE	Polyethylene
ETFE	Ethylene-tetrafluorethylene ²
PTFE	Polytetrafluorethylene
PA 6.6	Polyamide 6.6

4 Principle

Samples form an important aspect of any investigation and care should be taken to ensure that they are as representative of both the spill and the potential source as possible.

When investigating a spill, samples are usually taken from:

- the water surface (sea, river, canal or lake);
- shoreline or banks (sand, shingle, rocks and oiled animals and vegetation);
- marine or river ship's cargo tanks, fuel tanks, waste oil tanks, slop tanks, ballast tanks, bilges, or other (oiled) areas (e.g. deck, hull);
- land tanks and pipelines;
- road and rail vehicles.

For each type of spill, specific instructions and materials are required or advised.

All spills and potential sources are to be sampled. Sampling takes place as soon as possible and before any cleaning operation commences.

Samples are handled as legal evidence and are kept in a chain of custody until identification and possible legal procedure has been completed.

5 Sampling in general**5.1 General**

Whenever possible sampling should occur immediately after the spill and prior to any cleaning operations. If this is not possible avoid areas where chemical treatments have been used.

It is important to take samples from both the spill and the source even when it appears certain where the spill originated.

Sampling procedures, which are connected to liability investigations, shall be performed in a manner that preserves the samples' value as evidence.

² ETFE is most well-known by the DuPont brand name Tefzel® and is an example of a suitable commercially available product. An example is a Tefzel® net manufactured by SEFAR – Internet: www.sefar.com (Sefar Fluortex Product ref. 09-150/36 or 9-250/39). This information is given for the convenience of users of this document and does not constitute an endorsement by CEN of this product.

Sampling procedures and other suggestions in connection with sampling are briefly described in this clause. The information given is designed to assist the sample collector in obtaining samples, which may be used for identifying oil spills.

If samples are to be used in connection with legal proceedings, this document should be read in conjunction with any documents issued by the regulatory authorities in the country or countries where the spill has occurred.

These suggestions do not contain details relating to all types of spill situations, but should merely be regarded as general guidelines. However, by following these guidelines it should be possible to collect and provide legally valid samples that can help to determine the source responsible for the spill.

It is recommended that photographs are taken of the site being sampled to support the investigation.

5.2 Sampling schedule

It is essential that all possible sources of a spill are sampled in order to determine its origin. It is also important that the samples are collected as soon as possible after the spill.

IMPORTANT — Unbiased spill samples shall always be taken before any cleaning operation takes place.

If a source sample is not obtained shortly after the spillage, it may be impossible to obtain a relevant sample at a later date. This can render the analyses of the spill samples useless with respect to the determination of the source responsible for the spill.

If any part of the spill differs in any respect from other parts, extra samples shall be taken to check if more than one spill has occurred in the area.

If the spill response operation continues for more than one day, samples should be taken every day to make it possible to determine the degree of weathering of the oil, as well as possible contamination by other oils.

Nevertheless, this frequency can be adapted according to the situation and to the response time and clean-up of the site, but at least one sampling per week for long periods is recommended, or at least to make sure to have enough samples for legal processing.

If an oil sample is suspected to be contaminated with material already in the water, on the deck or on the hull etc., also take samples including the 'contaminant'. E.g. waters in harbours and estuaries may contain traces of various petroleum products and when spills in such waters are sampled it is therefore important to provide the laboratory with background samples³ of the water.

5.3 Types of sample

The following types of oil or oily mixture can occur at spill sites and shall then be sampled:

- oil, oily water, heavily emulsified oil, tar balls or lumps on the water surface;
- mixtures of oil and sorbents or other materials which are soaked with oil;
- mixtures of oil and foreign materials on beaches;
- surfaces, rocks, quays, plants, sand, sediments and soil contaminated with oil;
- oiled animals on the water surface or on beaches.

³ Background (according to Interpol Pollution Crime Forensic Investigation Manual [2]: Background (Control) sample: a sample of soil, water, air or other medium that is not believed to be impacted by the deleterious environmental discharge and is believed to represent a "clean sample".

EN 15522-1:2023 (E)

The following types of oil or oily mixture can occur at suspected sources and shall then be sampled:

- pure oil in ships, offshore constructions or land facilities;
- oily water in bilges and slop tanks on board ships;
- oily sludge in sludge tanks on board ships.

When relevant, the following types of additional samples should be sampled:

- background samples from the engine, deck, hull, water, beach, etc. when possible.

Oil wiped with an ETFE net (see 3.2) from a deck may contain contaminants from the deck. Therefore, an additional sample should be taken by wiping a “clean” part of the deck next to the spill location with a clean ETFE net.

NOTE 1 Where ETFE is written this can apply equally to PTFE.

- counter samples.

Laws can be different in European countries, but in general the potential offender has the right of defence and can ask for a second set of samples to be analysed in a laboratory of choice (see 9.3).

NOTE 2 Witnessing can be agreed, as an alternative for counter samples. Witnessing is common between commercial laboratories on request of insurance companies. There are, for example, many commercial laboratories specialized in the analysis of physical properties of petroleum or petroleum products, but not in oil spill identification. An analyst of such a laboratory can be asked to witness the unsealing, sample preparation, sample analysis and sample evaluation of an oil case. When results been obtained according to the appropriate protocols, the witness can indicate this, including remarks, on the final oil case report.

5.4 Sample volume

In general, samples should be taken from the thickest oil accumulations. Whenever possible each sample should contain between 10 ml and 100 ml of oil. Should that be impossible, even extremely small amounts of oil can be considered for laboratory analysis.

IMPORTANT — While analyses can be undertaken on very small samples they may be overly affected by weathering and hence less representative. Taking sufficient sample material is therefore strongly recommended.

It may be difficult to acquire visible traces of oil in the sample when collecting from very thin oil films on the water surface. The use of ETFE nets is strongly recommended for sampling such oil films because the oil sticks to the net and can therefore be collected from a larger area.

If ETFE nets are not available water samples shall be collected. Even when only small amounts of oil are visible in a sample, or there is oil odour, sufficient material may be present for the laboratory to analyse.

5.5 Number of samples to be taken

The collection of several samples from the spill area is strongly recommended. A minimum of two samples should be collected, even in small spills. The distance between the sampling positions should aid documenting the total range and distribution of the spill.

Be aware that the composition of the oil may have varied during the spillage, or that more than one source caused the spill.

It may be sufficient to take only one source sample from any single sampling point on-board a ship or offshore/land-based installation. If required for administrative reasons (e.g. counter samples), more than one sample may be taken from each sampling point.