

**Guidelines for the inventory control, management,
decontamination and/or disposal of electrical equipment
and insulating liquids containing PCBs**

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CENELEC

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Foreword

This Technical Report has been prepared by CENELEC BTTF 116-1 "Fluids for electrotechnical applications".

It was circulated for voting in accordance with the Internal Regulations, Part 2, Subclause 11.4.3.3 (simple majority).

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Introduction

Insulating liquids with PCBs bases (Askarels) or contaminated by PCBs that may still be present in electrical equipment in the generation, transmission, distribution and use of electric energy.

Polychlorinated biphenyls (PCBs) are a mixture of 209 possible congeners (as defined by EN 61619). Such compounds of a synthetic origin, have been produced and used in various commercial mixtures at an international level since 1930 (see Annex A). The chemical stability and relative non-flammable nature of PCBs was the main reason for their use by the electrotechnical industry.

The same functional features of these substances created environmental problems: PCBs are, in fact, classified as hazardous and persistent organic pollutants (POPs) in the environment, bio-accumulable along the food chain.

It is recognised that oil-filled electrical equipment may have been contaminated by PCBs either during manufacture or maintenance operations using oils which have been contaminated with PCBs.

Insulating liquids and equipment containing insulating liquids are classified, respectively, "PCBs" and "Equipment containing PCBs" when the total concentration of polychlorinated biphenyls (209 possible congeners) and correlated compounds PCTs (polychlorinated terphenyls-8 557 possible congeners) and PCBTs (polychlorinated benzyltoluenes-thousands of possible congeners) present in the insulating liquids exceeds the limits prescribed by current legislation for the single environmental matrices and/or applications (equipment and insulating liquids in operation, waste, used oils, fuel oils, etc.).

During their operational life cycle, such equipment and insulating liquids degrade, and may degrade faster if not properly managed and maintained, inducing failures that could cause incidents having a significant environmental impact, that can be correlated to the specific site conditions. In accordance with Directive 96/59/EC, during their service life, equipment containing PCBs should, under certain conditions, be subject to measures capable of preventing and/or mitigating degradation processes and the spillage of PCBs, to ensure the protection of workers, public health and the environment, as well as complying with the prescriptions of the Stockholm Convention on Persistent Organic Pollutants (POPs) entered into force on 17 May 2004.

Since the 1980's, PCBs have been subject to prohibitions and limitations for the marketing and use: the recent Council Directives and Commission Decisions introduced new obligations for the inventory, control, management, decontamination and/or disposal of electrical equipment and insulating liquid containing PCBs.

1 Scope

The scope of this Technical report is to provide guidance for the activities of inventory, control, management, decontamination and/or disposal of equipment and containers with insulating liquid containing PCBs, in compliance with the Council Directives (96/59/EC), using Best Available Techniques - BAT - (96/61/EC), Commission Decision (2001/68/EC), Stockholm Convention on Persistent Organic Pollutants (POPs) and/or with appropriate national or local legislation.

This Technical report is addressed, in particular, toward the Life Cycle Management (LCM) of insulating liquids and it has been developed in accordance with the following objectives:

- a) reduction of risks for workers, public health and the environment, arising from human error, malfunction, or failures of the equipment that could cause fires or spillage of hazardous and Persistent Organic Pollutants (POPs)s;
- b) implementation of the "Best Available Techniques" (BAT),"Best Environmental Practices"(BEP)and methodologies available for safety, whilst taking into account the surroundings and the criteria of self-sufficiency and functional recovery;
- c) technical feasibility of the activities within the prescribed time schedules, taking into account current legislation and economic feasibility.

NOTE 1 For those CENELEC countries in which the European Directives do not apply, this Technical report has an informative purpose only. Different limits from those given in the present Technical report are required in some countries.

NOTE 2 For those countries outside of European Community the Stockholm Convention on Persistent Organic Pollutants (POPs) should be applied.

NOTE 3 When reading this Technical report, reference should also be made to Annex C of EN 50195 and Annex B of EN 50225, because in some EU countries (i.e. France, Italy, Poland, Spain, etc.) there are other mandatory requirements.

2 Normative references

The following referenced documents may be used for the application 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 12766-1	Petroleum products and used oils - Determination of PCBs and related products - Part 1: Separation and determination of selected PCB congeners by gas chromatography (GC) using an electron capture detector (ECD)
EN 12766-2:2001	Petroleum products and used oils - Determination of PCBs and related products - Part 2: Calculation of polychlorinated biphenyl (PCB) content
EN 12766-3	Petroleum products and used oils - Determination of PCBs and related products - Part 3: Determination and quantification of polychlorinated terphenyls (PCT) and polychlorinated benzyl toluenes (PCBT) content by gas chromatography (GC) using an electron capture detector (ECD)
EN 50195	Code of practice for the safe use of fully enclosed askarel-filled electrical equipment
EN 50225	Code of practice for the safe use of fully enclosed oil-filled electrical equipment which may be contaminated with PCBs
EN 60567	Oil-filled electrical equipment - Sampling of gases and of oil for analysis of free and dissolved gases - Guidance (IEC 60567)
EN 60599	Mineral oil-impregnated electrical equipment in service - Guide to the interpretation of dissolved and free gases analysis (IEC 60599)
EN 61198	Mineral insulating oils - Methods for the determination of 2-furfural and related compounds (IEC 61198)

EN 61619	Insulating liquids - Contamination by polychlorinated biphenyls (PCBs) - Method of determination by capillary column gas chromatography (IEC 61619)
EN 62535	Insulating liquids - Test method for detection of potentially corrosive sulphur in used and unused insulating oil (IEC 62535)
EN 60296	Fluids for electrotechnical applications - Unused mineral insulating oils for transformers and switchgear (IEC 60296)
EN 60422:2006	Mineral insulating oils in electrical equipment - Supervision and maintenance guidance (IEC 60422:2005)
EN 60836	Specifications for unused silicone insulating liquids for electrotechnical purposes (IEC 60836)
EN 61099	Specification for unused synthetic organic esters for electrical purposes (IEC 61099)
EN 61203	Synthetic organic esters for electrical purposes - Guide for maintenance of transformer esters in equipment
EN ISO 9001	Quality management systems - Requirements (ISO 9001)
IEC 60475	Methods of sampling liquid dielectrics
IEC 60588 series	Askarels for transformers and capacitors
IEC 60944	Guide for the maintenance of silicone transformer liquids
ASTM D 971	Standard test method for interfacial tension of oil against water by the ring method
ASTM D 7151	Standard test method for determination of elements in insulating oils by inductively coupled plasma and atom emission spectrometry (ICP-AES)

3 Terms and Definitions

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

3.1

askarel

synthetic, fireproof insulating liquid which, when decomposed by electrical arc, will evolve predominantly non combustible gaseous mixtures

NOTE Askarels usually consist of polychlorinated biphenyls with or without the addition of polychlorinated benzenes.

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3.2

Best Available Techniques (BAT) and Best Environmental Practices (BEP)

Best Available Techniques (BAT) means the most effective and advanced stage in the development of activities and their operation methods which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole:

- “*techniques*” shall include both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned;
- “*available techniques*” shall mean those techniques developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the member state in question, as long as they are reasonably accessible to the operator;