International Standard

ISO 11365

Petroleum and related products — Maintenance and use of triaryl phosphate ester turbine control fluids — Guidance and requirements

Produits pétroliers et produits connexes — Utilisation et maintenance des fluides de régulation de turbines à base de phosphates de tris(aryle) — Recommandations et exigences

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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 document 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 28, *Petroleum and related products, fuels and lubricants from natural or synthetic sources*, Subcommittee SC 4, *Classifications and specifications*.

This second edition cancels and replaces the first edition (ISO 11365:2017), which has been technically revised.

The main changes are as follows:

— clarification of the scope by explicitly listing TCD, TSD and TGD in addition to HFDR fluids;

— addition of supplementary fluid monitoring procedures.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

Many turbine manufacturers or electrical power utilities have requirements for the maintenance of triaryl phosphate ester hydraulic control fluids in service. A comparison of these requirements has made it possible to develop this document. However, the recommendations given in this document should be considered as guidance only. When interpreting results and deciding action, various factors should be taken into account, such as the conditions of use, the type of equipment and the general trend in fluid characteristics.

This document is intended to:

— assist the power equipment operator to maintain the fluid in a condition that will ensure the safe and reliable operation of the turbine while maximizing fluid life;

— provide recommended procedures for examining consignments of new fluid and monitoring the fluid in use;

— provide information on the safe handling, storage and disposal of the fluid;

— offer background information on the causes of fluid degradation.

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Petroleum and related products — Maintenance and use of triaryl phosphate ester turbine control fluids — Guidance and requirements

WARNING — The use of this document can involve hazardous materials, operations and equipment. This document does not purport to address all safety problems associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practice and determine the applicability of regulatory limitations prior to use.

1 Scope

This document provides guidance and requirements for the maintenance and the use of triaryl phosphate esters as fire-resistant fluids for turbine control, other hydraulic systems in power generation and fire-resistant turbine fluids.

This document is applicable to fluids under the HFDR category defined in ISO 6743-4 and under the TCD, TSD and TGD categories defined in ISO 6743-5.

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 2049, *Petroleum products — Determination of colour (ASTM scale)*

ISO 3104, *Petroleum products — Transparent and opaque liquids — Determination of kinematic viscosity and calculation of dynamic viscosity*

ISO 3170, *Petroleum liquids — Manual sampling*

ISO 3722, *Hydraulic fluid power — Fluid sample containers — Qualifying and controlling cleaning methods*

ISO 4021, *Hydraulic fluid power — Particulate contamination analysis — Extraction of fluid samples from lines of an operating system*

ISO 4405, *Hydraulic fluid power — Fluid contamination — Determination of particulate contamination by the gravimetric method*

ISO 4406, *Hydraulic fluid power — Fluids — Method for coding the level of contamination by solid particles*

ISO 4407, *Hydraulic fluid power — Fluid contamination — Determination of particulate contamination by the counting method using an optical microscope*

ISO 6247, *Petroleum products — Determination of foaming characteristics of lubricating oils*

ISO 6296, *Petroleum products — Determination of water — Potentiometric Karl Fischer titration method*

ISO 6619, *Petroleum products and lubricants — Neutralization number — Potentiometric titration method*

ISO 9120, *Petroleum and related products — Determination of air-release properties of steam turbine and other oils — Impinger method*

ISO 11500, *Hydraulic fluid power — Determination of the particulate contamination level of a liquid sample by automatic particle counting using the light-extinction principle*

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ISO 12937, *Petroleum products — Determination of water — Coulometric Karl Fischer titration method*

ISO 20764, *Petroleum and related products — Preparation of a test portion of high-boiling liquids for the determination of water content — Nitrogen purge method*

IEC 60247, *Insulating liquids — Measurement of relative permittivity, dielectric dissipation factor (tan δ) and d.c. resistivity*

EN 14077, *Petroleum products — Determination of organic halogen content — Oxidative microcoulometric method*

ASTM D5185, *Standard Test Method for Multielement Determination of Used and Unused Lubricating Oils and Base Oils by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)*

ASTM D6595, *Standard Test Method for Determination of Wear Metals and Contaminants in Used Lubricating Oils or Used Hydraulic Fluids by Rotating Disc Electrode Atomic Emission Spectrometry*

ASTM D7596, *Standard Test Method for Automatic Particle Counting and Particle Shape Classification of Oils using a Direct Imaging Integrated Tester*

3 Terms and definitions

No terms and definitions are listed in this document.

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

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

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

4 Description of triaryl phosphate ester fluids

Triaryl phosphates are complex mixtures of products produced from the reaction of phosphorus oxychloride with substituted phenols, for example xylenol or tertiarybutylphenol, and have been used as fire-resistant fluids in power generation applications for over 55 years. While the early fluids were neurotoxic as a result of the presence of tri-o-cresyl phosphate, at the time of publication of this document, the products in commercial use have been free from this component for several years and have very low levels of neurotoxicity. Modern phosphate esters are manufactured to meet the stringent health and safety requirements of CEN/TR 14489.[3] However, such requirements are subject to change and fluid manufacturers should be contacted for the latest information. As with all chemicals, triaryl phosphates should be handled responsibly. The health and safety recommendations given in this document (see Clause 5) are intended to minimize exposure and to provide a margin of safety for workers handling these fluids.

Particular attention should be paid to trixylyl phosphate (TXP), the phenol used being xylenol.

NOTE TXP is a substance of very high concern (SVHC) listed in Annex XIV of the Regulation For Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)[4] and its use is subject to authorization by the European Chemicals Agency (ECHA). Outside of the European Union, TXP is widely used.

Triaryl phosphate ester fluids normally have good resistance to oxidation, moderate to good air release and low foaming properties. However, they are sensitive to hydrolysis. These properties will slowly deteriorate during the life of the fluid. While some degradation can be tolerated without adverse effects on system performance, good monitoring procedures are necessary to determine when the properties have changed sufficiently to require action.

See ISO 10050 for technical specifications on triaryl phosphate esters hydraulic fluids for turbine control under the TCD category defined in ISO 6743-5. See ISO 12922 for technical specifications on non-flammable hydraulic fluids under the HFDR category defined in ISO 6743-4. See ISO 8068 for technical specifications on non-flammable turbine fluids under the TSD and TGD categories defined in ISO 6743-5.

For further information on the composition and technical performance of these fluids, the relevant technical literature available from the fluid manufacturers or suppliers should be consulted.

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