

DD ISO/TS 11366:2011



BSI Standards Publication

Petroleum and related products — Guidance for in-servicing of lubricating oils for steam, gas and combined-cycle turbines

bsi.

...making excellence a habit.
AVA Documents™
Document Sharing Hub

National foreword

This Draft for Development is the UK implementation of ISO/TS 11366:2011.

This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature. It should be applied on this provisional basis, so that information and experience of its practical application can be obtained.

Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the international organization responsible for its conversion to an international standard. A review of this publication will be initiated not later than 3 years after its publication by the international organization so that a decision can be taken on its status. Notification of the start of the review period will be made in an announcement in the appropriate issue of *Update Standards*.

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into an international Standard, to extend the life of the Technical Specification or to withdraw it. Comments should be sent to the Secretary of the responsible BSI Technical Committee at British Standards House, 389 Chiswick High Road, London W4 4AL.

The UK participation in its preparation was entrusted to Technical Committee PTI/7, Lubricants and process fluids.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© BSI 2011

ISBN 978 0 580 67876 9

ICS 75.100

Compliance with a British Standard cannot confer immunity from legal obligations.

This Draft for Development was published under the authority of the Standards Policy and Strategy Committee on 30 April 2011.

Amendments issued since publication

Date	Text affected
------	---------------

**Petroleum and related products —
Guidance for in-servicing of lubricating
oils for steam, gas and combined-cycle
turbines**

*Pétrole et produits connexes — Lignes directrices pour le suivi en
service des huiles lubrifiantes pour turbines à vapeur, à gaz et à cycle
combiné*



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.



COPYRIGHT PROTECTED DOCUMENT

© ISO 2011

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	v
Introduction.....	vi
1 Scope	1
2 Normative references	1
3 Description of turbine oils	1
4 Factors affecting the service life	2
4.1 General	2
4.2 Oil system design	3
4.3 Conditions of the oil system at start-up	3
4.4 Original oil quality	3
4.5 System operating temperature	3
4.6 Contamination rates and provisions for purification	4
4.7 Oil make-up rates	4
5 Deterioration of turbine oils in service.....	4
5.1 General	4
5.2 Viscosity	4
5.3 Oxidation stability	4
5.4 Solid particles	5
5.5 Sludge.....	5
5.6 Antirust properties	5
5.7 Water separability.....	6
5.8 Foaming and air-release characteristics.....	6
5.9 Total acid number.....	7
6 Recommended tests and interpretation.....	7
6.1 Appearance and odour	7
6.2 Colour	7
6.3 Total acid number.....	7
6.4 Sludge and deposits	7
6.5 Particle counting	8
6.6 Kinematic viscosity	8
6.7 Remaining oxidation stability	8
6.8 Water content.....	9
6.9 Rust prevention characteristics.....	9
6.10 Water separability.....	9
6.11 Foaming characteristics	9
6.12 Air-release value	10
6.13 Flash point	10
7 Sampling	10
7.1 General	10
7.2 Sampling point.....	10
7.3 Sampling line	11
7.4 Containers	11
7.5 Samples marking.....	11
8 Examination of new oil.....	12
8.1 General	12
8.2 Sampling of new oil deliveries	12
8.3 Examination of new oil deliveries	13
8.4 Testing schedules	13

9 Examination of oils in service 15

9.1 Testing procedures..... 15

9.2 Frequency of the testing 18

Bibliography 20

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

In other circumstances, particularly when there is an urgent market requirement for such documents, a technical committee may decide to publish other types of normative document:

- an ISO Publicly Available Specification (ISO/PAS) represents an agreement between technical experts in an ISO working group and is accepted for publication if it is approved by more than 50 % of the members of the parent committee casting a vote;
- an ISO Technical Specification (ISO/TS) represents an agreement between the members of a technical committee and is accepted for publication if it is approved by 2/3 of the members of the committee casting a vote.

An ISO/PAS or ISO/TS is reviewed after three years in order to decide whether it will be confirmed for a further three years, revised to become an International Standard, or withdrawn. If the ISO/PAS or ISO/TS is confirmed, it is reviewed again after a further three years, at which time it must either be transformed into an International Standard or be withdrawn.

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

ISO/TS 11366 was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricants*, Subcommittee SC 4, *Classifications and specifications*.

This first edition of ISO/TS 11366 is derived from the IEC 60962. ISO/TC 28 was asked by IEC/TC 10, *Fluids for electrotechnical applications*, to adopt a technically revised version of IEC 60962, to which a consideration of gas and combined-cycle turbines has been added.

Introduction

The in-service monitoring of turbine oils is largely recognized by the power generation industry as necessary to ensure long and trouble-free operation of turbines.

There are three main types of stationary turbines used in power generation plants:

- a) steam turbines,
- b) gas turbines, and
- c) combined cycle turbines.

The combined cycle turbines are of two types:

- the first type, in which a gas turbine is associated with a steam turbine, with separated lubricating circuits;
- the second type, called single shaft combined cycle turbines, in which the steam and the gas turbines are on the same shaft and are lubricated with the same oil.

The lubrication requirements of gasturbines and steam turbines are quite similar, but there are some major differences. Gas-turbine oils are submitted to localized hot spots, and water contamination is less likely.

Gas-turbine oils have a shorter service life than steam-turbine oils. Steam-turbine oils have a much longer lifetime and experience is available with lifetimes from 10 to 20 years depending on the top-up level. The lifetime of gas-turbine oils generally does not exceed two years.

The values of the various characteristics mentioned in this Technical Specification are purely indicative. For proper interpretation of the results, account is taken of many factors, e.g. the type of equipment, the design of the lubricating oil circuit and the top-up level.

In all cases, the manufacturer's instructions are followed.

Petroleum and related products — Guidance for in-servicing of lubricating oils for steam, gas and combined-cycle turbines

1 Scope

This Technical Specification applies to mineral oils used as lubricating oils and to control fluids used to lubricate steam, gas and combined cycle turbines in service. The lubricants considered in this Technical Specification are those classified in ISO 6743-5 and specified in ISO 8068.

This Technical Specification is intended to

- help power equipment operators evaluate the conditions of the oil in their equipment and maintain the oils in serviceable conditions;
- help users understand how the oils deteriorate and carry out a meaningful programme of sampling and testing of oils in use.

This Technical Specification also gives instructions with respect to the corrective actions that are taken to maximize service life.

2 Normative references

The following referenced documents are indispensable 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.

ISO 3170:2004, *Petroleum liquids — Manual sampling*

ISO 3722:1976, *Hydraulic fluid power — Fluid sample containers — Qualifying and controlling cleaning methods*

ISO 4021:1992, *Hydraulic fluid power — Particulate contamination analysis — Extraction of fluid samples from lines of an operating system*

ISO 8068:2006, *Lubricants, industrial oils and related products (class L) — Family T (Turbines) — Specification for lubricating oils for turbines*

3 Description of turbine oils

Steam- and gas-turbines oils consist of highly refined petroleum base stocks in which additives are added to provide or to improve oxidation stability, as well as rust-protection properties, corrosion-protection properties (mainly for copper and copper containing materials). Additional foam suppressants may be added to limit the foaming tendency. However, care should be taken to avoid adding too much foam suppressant, which may have detrimental effects on air-release properties. Demulsifiers may also be used to improve the water-shedding properties, but this should not be a common practice. Turbine oils should be formulated to have naturally good water-shedding properties, without the help of demulsifiers.

To formulate turbine oils, base stocks of API groups I and II are used with success; for special applications, e.g. high-temperature gas turbines, API groups III and III+ base stocks can also be used. But in most instances, API group I and group II base stocks are largely sufficient for most applications. The refining degree of group I and group II base stocks vary from one producer to another. Hydrogen treatment is essential to get a good response to the antioxidants and to obtain good water-shedding and air-release properties.

Numerous technologies are available to provide the necessary performance in terms of oxidation stability, and rust and corrosion protection. Combinations of phenol- and amine-type antioxidants, associated with proper rust inhibitors and copper corrosion inhibitors, are commonly used.

For some applications, mainly when the turbine is coupled to gears, extreme-pressure additives are required. These extreme-pressure additives shall be chosen so as to not impair the oxidation stability.

All new oils shall comply with ISO 8068, which includes requirements with respect to the most important properties, as follows:

- oxidation stability;
- low tendency to sludge forming;
- rust-protection properties;
- copper corrosion-protection properties;
- foaming tendency;
- air-release ability;
- water-shedding characteristics.

However, all these properties cannot be expected to remain unchanged for the life of the oil.

The oil unavoidably undergoes deterioration; some deterioration can be tolerated without prejudice to the safety and efficiency of the system. Good monitoring procedures are necessary to determine when the oil characteristics have reached the condemning limits, i.e. critical values for the most important characteristics that could be deleterious to the function of the installation.

4 Factors affecting the service life

4.1 General

The following factors can affect the service life of turbine lubricating oils:

- oil system design;
- condition of the oil system at start-up;
- original oil quality;
- system operating temperature;
- contamination rates and oil purification provisions;
- oil make-up rates.