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Condition monitoring and diagnostics of machine systems — Tribology-based monitoring and diagnostics —

Part 1: General requirements and guidelines

Surveillance et diagnostic de l'état des systèmes de machines — Surveillance et diagnostic basés sur la tribologie —

Partie 1: Exigences et lignes directrices générales

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Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Symbols (and abbreviated terms) **2**
5 Lubricant and wear particle analysis **2**
5.1 Asset management 2
5.2 Strategies 2
5.2.1 Before failure onset (as a proactive strategy tool) 2
5.2.2 During failure development (as a predictive strategy tool) 2
5.2.3 Following machine failure (as a reactive strategy tool) 2
5.2.4 Other benefits 2
5.3 Information to be gained through lubricant and wear debris 3
5.3.1 Lubricant properties 3
5.3.2 Lubricant contamination 3
5.3.3 Machine wear 3
6 Measurement parameters **3**
6.1 Lubricant and wear debris parameters 3
6.2 Lubricant test suites 3
6.3 Sampling frequency 4
7 Sampling **4**
7.1 Objectives 4
7.2 Pressurized sample points 5
7.3 Static sample points 6
7.4 On-line and in-line sampling 7
7.5 Magnetic plug sampling 7
7.6 Grease sampling 8
8 Fluid sampling equipment **8**
8.1 General 8
8.2 Sample containers 8
8.3 Sample tubing 8
8.4 Manually operated hand held sample pumps 8
8.5 Other equipment 9
8.6 Sample transport 9
9 Sample analysis **9**
9.1 General 9
9.2 On-site analysis 9
9.3 Off-site analysis 10
9.4 Sample documentation 10
10 Alarm criteria **10**
11 Diagnosis and prognosis **11**
12 Results reporting **12**
13 Personnel qualifications **12**
13.1 Field analysts 12
13.2 Laboratory analysts 12
Annex A (informative) **Common lubricant and wear debris parameters** **13**
Annex B (informative) **Typical lubricant test suites and frequencies** **22**

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Annex C (informative) **Sampling procedure examples** **25**
Annex D (informative) **Commercial laboratory selection guidelines** **29**
Annex E (informative) **Sample documentation requirements** **31**
Annex F (informative) **Alarm criteria guidelines** **33**
Annex G (informative) **Diagnosis and prognosis guidelines** **38**
Bibliography **48**

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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 documents 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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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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 108, *Mechanical vibration, shock and condition monitoring*, Subcommittee SC 5, *Condition monitoring and diagnostics of machine systems*.

A list of all parts in the ISO 14830 series can be found on the ISO website.

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

Tribology and lubricant-based monitoring is a broad field comprising the activities of monitoring, reporting and responding to information obtained from the analysis of lubricating oils, hydraulic fluids and greases. Common terms used to describe this practice are "oil analysis", "lubricant" and "wear debris". Because it also encompasses the analysis of used hydraulic fluids and greases, this document generically refers to the entire practice as "lubricant analysis".

Lubricants are used in a wide range of machine types, including stationary industrial equipment and mobile equipment used in transportation, construction and mining. Examples of machine types include gearboxes, pumps, hydraulic systems, turbines, compressors, engines and transmissions. Many different condition types can be analysed and reported in the practice of lubricant and wear debris, including:

a) quality and condition of new oil deliveries;

b) state of lubricants during storage and dispensing;

c) distressed, degraded or non-compliant in-service lubricant properties;

d) lubricant contamination;

e) wear particle composition and physical characteristics;

f) abnormal failure root causes or stressing conditions.

The methods of gathering and analysing fluid properties and conditions vary widely and evolve directly from which conditions listed above will be reported. Often instruments and procedures are employed in a laboratory to analyse lubricant samples. Similar instruments can be used remotely in the field or plant. In certain cases, instruments or sensors can be used in real time, including on-line particle analysis, dedicated to a specific machine and fluid.

This document for lubricant condition monitoring, also known as tribodiagnostics, forms a vital component of asset management and as such will form one of the platform condition monitoring knowledge base documents required for the application of ISO 55000, ISO 55001 and ISO 55002 (asset management International Standards) to machines which establishes the management system requirements for performance monitoring.

Using lubricant and wear debris to monitor condition and diagnose faults in machinery is a key activity in predictive maintenance programmes for most industries. In certain cases, instruments or sensors can be used in real time, including on-line debris analysis, dedicated to a specific machine and fluid types. Other non-intrusive technologies including thermography, vibration analysis, acoustic emission and motor current analysis are used as complementary condition analysis tools. Those in the manufacturing industry who have diligently and consistently applied these techniques have experienced a return on investment far exceeding their expectations. However, the effectiveness of these programmes depends on the capabilities of individuals who perform the measurements and analyse the data.

This document contains general requirements and guidelines for activities relating to monitoring of physical and chemical properties of lubricants, lubricant contamination and wear particle suspended in lubricants. The monitoring objective is to assess tribological health and condition of machine system surfaces, as well as condition of the lubricant itself, to provide information on the operating condition of the machine for protection and predictive maintenance.

The accuracy and repeatability of lubricant analysis results are dependent upon both sample acquisition techniques and analyst’s competence. The competence requirements for both are detailed in ISO 18436-4 and ISO 18436-5.

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Condition monitoring and diagnostics of machine systems — Tribology-based monitoring and diagnostics —

Part 1: General requirements and guidelines

1 Scope

This document specifies requirements and guidelines for the analysis of lubricating oils, hydraulic fluids, synthetic fluids and greases.

Tests for electrical insulating oils and heat transfer oil are outside the scope of this document.

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 13372, *Condition monitoring and diagnostics of machines — Vocabulary*

ISO 13379 (all parts), *Condition monitoring and diagnostics of machines — Data interpretation and diagnostics techniques*

ISO 13381-1, *Condition monitoring and diagnostics of machines — Prognostics — Part 1: General guidelines*

ISO 17359, *Condition monitoring and diagnostics of machines — General guidelines*

3 Terms and definitions

For the purposes of this document, the terms and definitions given ISO 13372 and the following apply:

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

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

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

3.1
analytical ferrography
magnetic precipitation and subsequent analysis of wear particles from a fluid sample

3.2
contamination control
set of planning, organizing, managing and implementing activities for the purpose of achieving and maintaining a specific contamination level

3.4
tribology
science and technology of interacting surfaces in relative motion, and of related subjects and practices including lubrication, friction and wear

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