SLOVENSKI STANDARD
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Petrokemična industrija ter industrija za predelavo nafte in zemeljskega plina - Zbiranje in izmenjava podatkov o zanesljivosti in vzdrževanju opreme (ISO/DIS 14224:2015)

Petroleum, petrochemical and natural gas industries - Collection and exchange of reliability and maintenance data for equipment (ISO/DIS 14224:2015)

Erdöl-, petrochemische und Erdgasindustrie - Sammlung und Austausch von Zuverlässigkeits- und Wartungsdaten für Ausrüstungen (ISO/DIS 14224:2015)

Industries du pétrole, de la pétrochimie et du gaz naturel - Recueil et échange de données de fiabilité et de maintenance des équipements (ISO/DIS 14224:2015)

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Petroleum, petrochemical and natural gas industries — Collection and exchange of reliability and maintenance data for equipment

Industries du pétrole, de la pétrochimie et du gaz naturel — Recueil et échange de données de fiabilité et de maintenance des équipements

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This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

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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. www.iso.org/directives

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

ISO 14224 was prepared by Technical Committee ISO/TC 67, Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries.

This third edition cancels and replaces the second edition (ISO 14224:2006), which has been technically revised. The main changes are:

— Clause 3; several new definitions.

— Annex A; e.g. new equipment classes.

— Annex B; e.g. associated new and aligned failure modes.

— Annex C; some new sections, e.g. C.3.4.

— Annex E; e.g. new KPIs.

— Annex F; e.g. alignment with ISO/TR 12489.

Introduction

This International Standard has been prepared based on ISO 14224:2006, experience gained through its use, and know-how and best practices shared through the international development process.

In the petroleum, natural gas and petrochemical industries, great attention is being paid to safety, availability, reliability and maintainability of equipment. The industry annual cost of equipment unavailability is very large, although many plant owners have improved the availability of their operating facilities by such attention. A stronger emphasis has recently been put on cost-effective design and maintenance for new plants and existing installations among more industrial parties. In this respect, data on failures, failure mechanisms and maintenance related to these industrial facilities and its operations have become of increased importance. It is necessary that this information is used by, and communicated between, the various parties and its disciplines, within the same company or between companies. Various analysis methodologies are used to estimate the risk of hazards to people and environment, or to analyse plant or system performance. For such analyses to be effective and decisive, equipment reliability and maintenance (RM) data are vital.

These analyses require a clear understanding of the equipment technical characteristics, its operating and environmental conditions, its potential failures and its maintenance activities. It can be necessary to have data covering several years of operation before sufficient data have been accumulated to give confident analysis results and relevant decision support. It is necessary, therefore, to view data collection as a long-term activity, planned and executed with appropriate goals in mind. At the same time, clarity as to the causes of failures is key to prioritizing and implementing corrective actions that result in sustainable improvements in availability, leading to improved profitability and safety.

Data collection is an investment. Data standardization, when combined with enhanced data-management systems that allow electronic collection and transfer of data, can result in improved quality of data for reliability and maintenance. A cost-effective way to optimize data requirements is through industry co-operation. To make it possible to collect, exchange and analyse data based on common viewpoints, a standard is required. Standardization of data-collection practices facilitates the exchange of information between relevant parties e.g. plants, owners, manufacturers and contractors throughout the world.

Petroleum, petrochemical and natural gas industries — Collection and exchange of reliability and maintenance data for equipment

1 Scope

This International Standard provides a comprehensive basis for the collection of reliability and maintenance (RM) data in a standard format for equipment in all facilities and operations within the petroleum, natural gas and petrochemical industries during the operational life cycle of equipment. It describes data-collection principles and associated terms and definitions that constitute a “reliability language” that can be useful for communicating operational experience. The failure modes defined in the normative part of this International Standard can be used as a “reliability thesaurus” for various quantitative as well as qualitative applications. This International Standard also describes data quality control and assurance practices to provide guidance for the user.

Standardization of data-collection practices facilitates the exchange of information between parties, e.g. plants, owners, manufacturers and contractors. This International Standard establishes requirements that any in-house or commercially available RM data system is required to meet when designed for RM data exchange. Examples, guidelines and principles for the exchange and merging of such RM data are addressed. This standard also provides framework and guideline for establishing performance objectives and requirements for equipment reliability and availability performance.

Annex A contains a summary of equipment that is covered by this International Standard.

- This International Standard recommends a minimum amount of data that is required to be collected and it focuses on two main issues:

  — data requirements for the categories of data to be collected for use in various analysis methodologies;

  — standardized data format to facilitate the exchange of reliability and maintenance data between plants, owners, manufacturers and contractors.

- The following main categories of data are to be collected:

  — equipment data, e.g. equipment taxonomy, equipment attributes;

  — failure data, e.g. failure cause, failure consequence;

  — maintenance data, e.g. maintenance action, resources used, maintenance consequence, down time.

NOTE Clause 9 gives further details on data content and data format.

- The main areas where such data are used are the following:

  — reliability, e.g. failure events and failure mechanisms;

  — availability/efficiency, e.g. equipment availability, system availability, plant production availability;

  — maintenance, e.g. corrective and preventive maintenance, maintenance plan, maintenance supportability;

- safety and environment, e.g. equipment failures with adverse consequences for safety and/or environment.

- This International Standard does not apply to the following:
  - data on (direct) cost issues;
  - data from laboratory testing and manufacturing (e.g. accelerated lifetime testing), see also 5.2;
  - complete equipment data sheets (only data seen relevant for assessing the reliability performance are included);
  - additional on-service data that an operator, on an individual basis, can consider useful for operation and maintenance;
  - methods for analysing and applying RM data (however, principles for how to calculate some basic reliability and maintenance parameters are included in the annexes).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-192:2015, *International electrotechnical vocabulary — Part 192: Dependability*

IEC 60050-444:2002, *International electrotechnical vocabulary — Part 444: Elementary relays*

IEC 61508:2010, *Functional safety of electrical/electronic/programmable electronic safety-related systems*

IEC 62508:2010, *Guidance on human aspects of dependability*

ISO 20815:2009, *Petroleum, petrochemical and natural gas industries — Production assurance and reliability management*

ISO/TR 12489:2013, *Petroleum, petrochemical and natural gas industries — Reliability modelling and calculation of safety systems*

EN 13306:2010, *Maintenance — Maintenance terminology*

3 Terms and definitions

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

NOTE 1 Some derived RM parameters, which can be calculated from collected RM data covered by this International Standard, are contained in Annex C. References to Annex C are given as deemed appropriate.

NOTE 2 Notes to entry may be different from those given in the definition source document. For those definitions, where new notes to the entry are added in this International Standard, it is indicated next to the source information. There are provided no information regarding omitted source notes to the entry.

3.1
active maintenance time
duration of a maintenance action, excluding logistic delay

Note 1 to entry: Technical delays are included in the active maintenance time.

Note 2 to entry: For a more detailed description and interpretation of maintenance times, see Figure 4 and Annex C. See also ISO/TR 12489, Figure 5.

Note 3 to entry: A maintenance action can be carried out while the item is performing a required function.

[SOURCE: IEC 60050-192:2015, 192-07-04, notes 2-3 to entry have been added]

3.2
availability
ability to be in a state to perform as required

Note 1 to entry: For a more detailed description and interpretation of availability, see Annex C.

Note 2 to entry: Further terms given in ISO/TR 12489.

[SOURCE: IEC 60050-192:2015, 192-01-23, notes 1 and 2 to entry have been added]

3.3
boundary
interface between an item and its surroundings

3.4
common cause failures
failures of multiple items, which would otherwise be considered independent of one another, resulting from a single cause

Note 1 to entry: Common cause failures can also be common mode failures.

Note 2 to entry: The potential for common cause failures reduces the effectiveness of system redundancy.

Note 3 to entry: It is generally accepted that the failures occurs simultaneously or within a short time of each other

Note 4 to entry: Components that fail due to a shared cause normally fail in the same functional mode. The term common mode is therefore sometimes used. It is, however, not considered to be a precise term for communicating the characteristics that describe a common cause failure.

Note 5 to entry: See also ISO/TR 12489, 3.2.14 and 5.4.2.

Note 6 to entry: See also C.1.6

[SOURCE: IEC 60050-192:2015, 192-03-18, notes 3-6 to entry have been added]

3.5
common mode failures
failures of different items characterized by the same failure mode

Note 1 to entry: Common mode failures may have different causes.

Note 2 to entry: Common mode failures can also be common cause failures (IEC 60050 192-03-18).

Note 3 to entry: The potential for common mode failures reduces the effectiveness of system redundancy.

[SOURCE: IEC 60050-192:2015, 192-03-19, notes 1-3 to entry have been added]

3.6
condition-based maintenance
CBM
preventive maintenance based on the assessment of physical condition

Note 1 to entry: The condition assessment may be by operator observation, conducted according to a schedule, or by condition monitoring of system parameters.

[SOURCE: IEC 60050-192:2015, 192-06-07]

3.7
corrective maintenance
maintenance carried out after fault detection to effect restoration

Note 1 to entry: Corrective maintenance of software invariably involves some modification

Note 2 to entry: See also Figures 5 and 6 in ISO/TR 12489, which also illustrates terms used for quantifying corrective maintenance.

[SOURCE: IEC 60050-192:2015, 192-06-06, notes 2 to entry has been added]

3.8
critical failure
failure of an equipment unit that causes an immediate cessation of the ability to perform a required function

Note 1 to entry: Includes failures requiring immediate action towards cessation of performing the function, even though actual operation can continue for a short period of time. A critical failure results in an unscheduled repair.

Note 2 to entry: See also definition of critical dangerous failure and critical safe failure in ISO/TR 12489, 3.2.4 and 3.2.7, respectively.

3.9
cycle
operation and subsequent release/reset

[SOURCE: IEC 60050-444:2002, 444-02-11]

3.10
degraded failure
failure that does not cease the fundamental function(s), but compromises one or several functions

Note 1 to entry: The failure can be gradual, partial or both. The function can be compromised by any combination of reduced, increased or erratic outputs. An immediate repair can normally be delayed but, in time, such failures can develop into a critical failure if corrective actions are not taken.

3.11
demand
activation of the function (includes functional, operational and test activation)

Note 1 to entry: For a more detailed description, see C.1.3.

Note 2 to entry: Annex F.3 gives a list of safety critical equipment which are subject to periodic testing.

Note 3 to entry: See also relevant definitions in ISO/TR 12489. Mean time to demand (MTTD) is defined in 3.1.38. Failure due to demand is defined in 3.2.13. Demand mode of operation safety system is defined in 3.3.1.

3.12
design life
planned usage time for the total system

Note 1 to entry: Design life should not be confused with the ‘mean time to failure’ (MTTF), which is comprised of several items that may be allowed to fail within the design life of the system as long as repair or replacement is feasible.

[SOURCE: ISO 20815]

3.13
detection method
method or activity by which a failure is discovered

Note 1 to entry: A categorization of detection methods (e.g. periodic testing or continuous condition monitoring) is shown in Table B.4 (see B.2.4)

3.14
down state, <of an item>
unavailable state
internally disabled state
internal disabled state
state of being unable to perform as required, due to internal fault, or preventive maintenance

Note 1 to entry: Down state relates to unavailability of the item.

Note 2 to entry: The adjectives “down” or “unavailable” designate an item in a down state.

Note 3 to entry: See also Table 4 and Figure 4.

Note 4 to entry: See also ISO/TR 12489, Figure 5 and 6.

[SOURCE: IEC 60050-192:2015, 192-02-20, notes 3-4 to entry have been added]

3.15
down time
time interval during which an item is in a down state

Note 1 to entry: The down time includes all the delays between the item failure and the restoration of its service. Down time can be either planned or unplanned (see Table 4).

Note 2 to entry: Mean downtime is in IEC 60050-192, 192-08-10, defined as the ‘expectation of the down time’.

[SOURCE: IEC 60050-192:2015, 192-02-21, notes 1-2 to entry have been added]

3.16
downstream
business category most commonly used in the petroleum industry to describe post-production processes

EXAMPLE Refining, transportation and marketing of petroleum products

Note 1 to entry: For further details, see also A.1.4.

3.17
equipment class
class of similar type of equipment units (e.g. all pumps)

Note 1 to entry: Annex A contains equipment specific data for the equipment covered in this International Standard.

3.18
equipment data
technical, operational and environmental parameters characterizing the design and use of an equipment unit

3.19
equipment type
a particular feature of the design which is significantly different from the other design(s) within the same equipment class

3.20
equipment unit
specific equipment within an equipment class as defined by its boundary

Note 1 to entry: Equipment unit is given at level 6 of the equipment subdivision shown in Figure 3.

3.21
error
discrepancy between a computed, observed or measured value or condition and the true, specified or theoretically correct value or condition