SLOVENSKI STANDARD
oSIST prEN ISO 20815:2017

01-september-2017

Petrokemična industrija ter industrija za predelavo nafte in zemeljskega plina - Optimizacija proizvodnje in upravljanje zanesljivosti (ISO/DIS 20815:2017)

Petroleum, petrochemical and natural gas industries - Production assurance and reliability management (ISO/DIS 20815:2017)

Erdöl-, petrochemische und Erdgasindustrie - Betriebsoptimierung und Zuverlässigkeitsmanagement (ISO/DIS 20815:2017)

Industries du pétrole, de la pétrochimie et du gaz naturel - Assurance de la production et management de la fiabilité (ISO/DIS 20815:2017)

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75.020	Pridobivanje in predelava nafte in zemeljskega plina	Extraction and processing of petroleum and natural gas

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Petroleum, petrochemical and natural gas industries — Production assurance and reliability management

Industries du pétrole, de la pétrochimie et du gaz naturel — Assurance de la production et management de la fiabilité

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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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is Technical Committee ISO/TC 67, *Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries*.

This second edition cancels and replaces the first edition (ISO 20815:2008), which has been technically revised.

The main changes compared to the previous edition are as follows:

— Clause 3: several new terms, definitions and abbreviations;

— Clause 4: new 4.1 and new Figure 5;

— Annexes A, B, C and E: minor changes;

— Annex D: various new text and new figures;

— Annex F: New text in clause F.3, new clause F.4, and new figure;

— Annex G and H: some changes in clauses G.2, H.1 and H.2;

— Annex I: various changes in clauses I.7 - I.10, I.18, I.20 -I.22, and new clauses I.23 - I.26.

Introduction

The petroleum and natural gas industries involve large capital investment costs as well as operational expenditures. The profitability of these industries is dependent upon the reliability, availability and maintainability of the systems and components that are used. Therefore, for optimal production availability in the oil and gas business, a standardized, integrated reliability approach is required.

The concept of production assurance, introduced in this document, enables a common understanding with respect to use of reliability technology in the various life cycle phases and covers the activities implemented to achieve and maintain a performance level that is at its optimum in terms of the overall economy and, at the same time, consistent with applicable regulatory and framework conditions.

Annexes A through I are for information only.

Petroleum, petrochemical and natural gas industries — Production assurance and reliability management

1 Scope

This document describes the concept of production assurance within the systems and operations associated with exploration drilling, exploitation, processing and transport of petroleum, petrochemical and natural gas resources. This document covers upstream (including subsea), midstream and downstream facilities, petrochemical and associated activities. It focuses on production assurance of oil and gas production, processing and associated activities and covers the analysis of reliability and maintenance of the components. This includes a variety of business categories and associated systems/equipment in the oil and gas value chain. Production assurance addresses not only hydrocarbon production, but also associated activities such as drilling, pipeline installation, subsea intervention, etc.

This document provides processes and activities, requirements and guidelines for systematic management, effective planning, execution and use of production assurance and reliability technology. This is to achieve cost-effective solutions over the life cycle of an asset development project structured around the following main elements:

— production assurance management for optimum economy of the facility through all of its life cycle phases, while also considering constraints arising from health, safety, environment, and quality;

— planning, execution and implementation of reliability technology;

— application of reliability and maintenance data;

— reliability-based technology development, design and operational improvement.

For standards on equipment reliability and maintenance performance in general, see the IEC 60300-3 series.

This document designates 12 processes, of which seven are defined as core production assurance processes and addressed in this document. The remaining five processes are denoted as interacting processes and are outside the scope of this document. The interaction of the core production assurance processes with these interacting processes, however, is within the scope of this document as the information flow to and from these latter processes is required to ensure that production assurance requirements can be fulfilled.

This document recommends that the listed processes and activities be initiated only if they can be considered to add value.

The only requirement mandated by this document is the establishment and execution of the production assurance programme (PAP). It is important to reflect the PAP document in the overall project management in the project for which it applies.

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 14224:2016, *Petroleum, petrochemical and natural gas industries — Collection and exchange of reliability and maintenance data for equipment*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

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

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

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

3.1.1
active repair time
effective time to achieve repair of an item

Note 1 to entry: The expectation of the effective time to repair is called MART (mean active repair time).

Note 2 to entry: ISO 14224:2016 distinguishes between the terms mean active repair time, mean time to repair (MTTR), mean time to restoration (MTTRes), and mean overall repairing time (MRT). See ISO 14224:2016 for further details.

Note 3 to entry: The mean active repair time (MART) is defined as "expected active repair time" in ISO/TR 12489:2013, 3.1.34. See also ISO/TR 12489:2013, Figures 5 and 6.

[SOURCE: ISO 14224:2016, 3.2, modified – Notes 1 to 3 to entry have been added.]

3.1.2
availability
ability to be in a state to perform as required

Note 1 to entry: For a binary item, the measure of the availability is the probability to be in up state (i.e. in a state belonging to the up state class), see 3.19.

Note 2 to entry: In Figure 1, the system is available at time t_1 and unavailable at time t_2.

Note 3 to entry: See ISO 14224:2016, Annex C for a more detailed description and interpretation of availability.

Note 4 to entry: Further terms are given in ISO/TR 12489:2013.

Note 5 to entry: See Figure G.1 for further information.

[SOURCE: IEC 60050-192:2015, 192-01-23, modified – Notes 1 to 5 to entry have been added.]

3.1.3
binary item
item with two classes of states

Note 1 to entry: The two classes can be 'up state' and 'down state'.

EXAMPLE 1 A usual item with an up state (3.1.54) and a down state (3.1.8) is a binary item. Components A and B in Figure 1 are binary items.

EXAMPLE 2 A system made up of two redundant binary items, A and B, has four states: S_1 (both A and B in up state), S_2 (A in up state and B in down state), S_3 (A in down state and B in up state), S_4 (both A and B in down state). If the system is able to operate as required in states S_1, S_2 and S_3 and not able in state S_4, it is a binary item with the up state class $\{S_1, S_2, S_3\}$ and the down class $\{S_4\}$. This is illustrated in Figure 1.

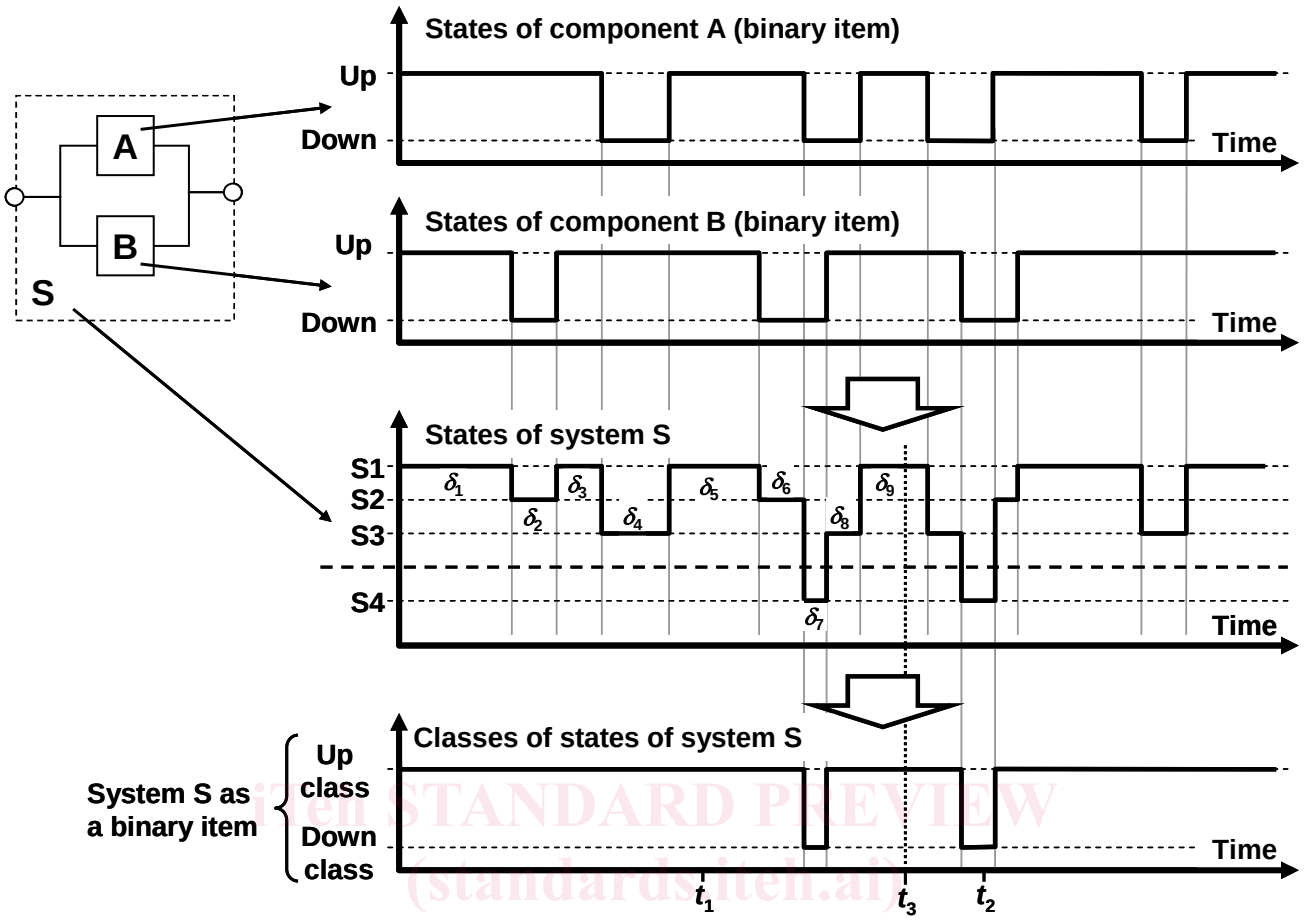

Figure 1 — Availability behaviour of an 1oo2 system

3.1.4
common cause failure
failures of multiple items, which would otherwise be considered independent of one another, resulting from a single cause

Note 1 to entry: See also notes to entry for common cause failures in ISO 14224:2016, 3.5.

[SOURCE: IEC 60050-192:2015, 192-03-18, modified – Note 1 to entry has been added.]

3.1.5
corrective maintenance
maintenance carried out after fault detection to effect restoration

Note 1 to entry: See also ISO/TR 12489:2013, Figures 5 and 6, which illustrate terms used for quantifying corrective maintenance.

[SOURCE: IEC 60050-192:2015, 192-06-06, modified – Note 1 to entry has been added]

3.1.6
deliverability
ratio of deliveries to planned deliveries over a specified period of time, when the effect of compensating elements, such as substitution from other producers and downstream buffer storage, is included

Note 1 to entry: See Figure G.1 for further information.

3.1.7
design life
planned usage time for the total system

Note 1 to entry: It is important not to confuse design life with the 'mean time to failure' (MTTF), which is comprised of several items that might be allowed to fail within the design life of the system as long as repair or replacement is feasible.

3.1.8
down state
unavailable state
internally disabled state
internal disabled state
<of an item> state of being unable to perform as required, due to internal fault, or preventive maintenance

Note 1 to entry: This concept is related to a binary item (3.1.3), which can have several down states forming the down state class of the item. All the states in the down state class are considered to be equivalent with regard to the unavailability of the considered item.

Note 2 to entry: See also notes to entry for down state in ISO 14224:2016, 3.15.

EXAMPLE In Figure 1, the down state class of the system S comprises only one state $\{S_4\}$ and the system S is in down state at time t_2.

[SOURCE: IEC 60050-192:2015, 192-02-20, - Notes 1 and 2 have been added]

3.1.9
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 ISO 14224:2016, Table 4).

[SOURCE: IEC 60050-192:2015, 192-02-21, modified – Note 1 has been added.]

3.1.10
downstream
business category most commonly used in the petroleum industry to describe post-production processes

Note 1 to entry: See ISO 14224:2016, A.1.4 for further details.

[SOURCE: ISO 14224:2016, 3.17]

3.1.11
failure
<of an item> loss of ability to perform as required

Note 1 to entry: A failure of an item is an event that results in a fault (i.e. a state) of that item (see 3.1.16). This is illustrated in Figure 3 for a binary system S comprising two redundant components A and B.

[SOURCE: IEC 60050-192:2015, 192-03-01, modified – Note 1 to entry has been added.]

3.1.12
failure cause
root cause
set of circumstances that leads to failure

Note 1 to entry: A failure cause can originate during specification, design, manufacture, installation, operation or maintenance of an item.

Note 2 to entry: See also ISO 14224:2016, B.2.3 and Table B.3, which define failure causes for all equipment classes.

[SOURCE: IEC 60050-192:2015, 192-03-11, modified – Note 2 to entry has been added.]

3.1.13
failure data
data characterizing the occurrence of a failure event

Note 1 to entry: See also ISO 14224:2016, Table 6.

[SOURCE: ISO 14224:2016, 3.25]

3.1.14
failure mode
manner in which failure occurs

Note 1 to entry: See also the tables in ISO 14224:2016, B.2.6, on the relevant failure modes, which define failure modes to be used for each equipment class.

[SOURCE: IEC 60050-192:2015, 192-03-17, modified – Note 1 to entry has been added.]

3.1.15
failure rate
conditional probability per unit of time that the item fails between t and $t + \mathrm{d}t$, provided that it has been working over $[0, t]$

Note 1 to entry: See ISO 14224:2016, C.3 for further explanation of the failure rate.

Note 2 to entry: This definition applies for the first failure of binary items (3.1.3).

Note 3 to entry: Under the assumptions that the failure rate is constant and that the item is as good as new after repairs the failure rate can be estimated as the number of failures relative to the corresponding accumulated up time divided by this accumulated up time. In this case this is the reciprocal of MTTF (3.1.30). In some cases, time can be replaced by units of use.

Note 4 to entry: The estimation of the failure rate can be based on operating time or calendar time.

[SOURCE: ISO/TR 12489:2013, modified – Notes 1 to 4 to entry have been added.]

3.1.16
fault
<of an item> inability to perform as required, due to an internal state

Note 1 to entry: A fault of an item results from a failure, either of the item itself, or from a deficiency in an earlier stage of the life cycle, such as specification, design, manufacture or maintenance. See latent fault (ISO 14224:2016, 3.44). The down states of items A, B and S in Figure 3 are examples of faults.

