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Oil and gas industries including lower carbon energy — Pipeline transportation systems — Requirements and guidance for pipeline life extension assessment

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Contents

Page

Foreword

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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).

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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 67, *Oil and gas industries including lower carbon energy*, Subcommittee SC 2, *Pipeline transportation systems*.

This first edition cancels and replaces ISO/TS 12747:2011, which has been technically revised.

The main changes are as follows:

- assessment requirements for lifetime extension considering a change of pipeline fluid, beyond that which can occur naturally as fluid sources or compositions change, have been incorporated;
- additional references to codes and standards detailing assessment approaches suitable for the assessment of threats identified as part of a lifetime extension assessment have been added, and the existing references updated as appropriate;
- guidance on the following has been provided:
  - assessment approaches for common pipeline features that may limit remnant life;
  - additional considerations for maintaining the integrity of risers within caissons and j-tubes;
  - appropriate inspection, testing, monitoring and sampling techniques that can be used to mitigate risks during any period of extended operation;
  - factors affecting the future operability of the system that should be addressed as part of lifetime extension in addition to the structural integrity of the pipeline system;
  - lifetime extension considerations for unbonded flexible pipe.

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.

Introduction

The purpose of this document is to detail a suitable approach to pipeline life extension assessment that can be applied by operators (or parties acting on their behalf) across the industry. It is concerned with the proof of structural integrity of the pipeline system for the justification of extended operation. Integrity management is not covered in detail. However, the interface between a pipeline integrity management system (PIMS) and the life extension process is considered because:

— a PIMS, where present, forms an integral part of the integrity assessment of the pipeline system;

— a PIMS of some form is required for operation in extended life.

Factors affecting the future operability of the system but not the structural integrity, such as deterioration of topsides equipment or the loss of a control umbilical, are flagged as requiring assessment but are not addressed in full in this document.

NOTE Further guidance on the lifetime extension of subsea systems, including umbilicals and topsides equipment, is provided in NORSOK U-009.

Whilst this document is aimed primarily at the pipeline operators, it can also be of interest to other stakeholders such as:

— regulators approving the life extension application;

— members of the public affected by the life extension application, such as other users of maritime waters, landowners and developers.

Considering this, an overview of the life extension process and the key principles involved is given in Clause 5. The remainder of the document is intended to detail requirements of the process and to provide guidance to those performing the life extension assessments. All guidance presented is intended for use in conjunction with sound engineering practice and judgment.

This document is not intended for use as a design standard.

Oil and gas industries including lower carbon energy — Pipeline transportation systems — Requirements and guidance for pipeline life extension assessment

1 Scope

This document presents assessment requirements and associated guidance for extending the service life of a pipeline system, as defined in ISO 13623, beyond its specified design life. It applies to both onshore and offshore rigid metallic pipelines and risers [including steel catenary risers (SCRs)].

This document is not directly applicable to the following:

— flexible pipelines;

— pipelines constructed from other materials, such as glass reinforced plastics or polymers;

— umbilicals (control or chemical conveyance service, or both);

— topsides equipment and piping (outside of pipeline system limits defined in accordance with local regulatory requirements);

— pipeline protection and support structures and components.

However, the assessment process defined herein can be applied in the lifetime extension assessment of the above at the discretion of the user.

This document addresses life extension, which is a change to the original design premise. It is also applicable to other changes to the design premise, such as maximum allowable operating pressure (MAOP) re-ratings or a change to the conveyed fluids, at the discretion of the user.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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/

3.1
acceptance criteria
specified indicators or measures employed in assessing the ability of a component or system to perform its intended function

3.2
ancillary component
component attached to the pipe or piping within the *pipeline system* (3.18) with additional functions to the conveyance of fluid, such as to monitor pipeline parameters or control pipeline conditions or flow

Note 1 to entry: This includes valves, pressure indicators, temperature gauges, corrosion probes, steel catenary riser (SCR) flex joints, etc.

3.3
anomaly
discrepancy or deviation of an element of the *pipeline system* (3.18) from the established rules and limits

3.4
anomaly limits
criteria set as part of the design and *pipeline integrity management system (PIMS)* (3.16) processes to enable determination of *anomalies* (3.3)

3.5
design life
period for which the design basis is planned to remain valid

[SOURCE: ISO 13623:2017, 3.1.2]

3.6
failure
event in which a component or system does not perform according to its operational requirements.

3.7
flow assurance
ensuring successful and economical flow of fluid through the *pipeline system* (3.18)

3.8
HIPPS
high integrity pressure protection system
mechanical overpressure protection system that rapidly isolates the *pipeline* (3.17) if there is a *risk* (3.21) of exceeding the *maximum allowable operating pressure (MAOP)* (3.11)

3.9
life extension
additional period beyond the original *service life* (3.23) for which the *pipeline system* (3.18) can be operated safely

Note 1 to entry: Life extension is considered as a modification to the design premise.

3.10
location class
geographic area classified according to criteria based on population density and human activity

[SOURCE: ISO 13623:2017, 3.1.10]

3.11
maximum allowable operating pressure
MAOP
maximum pressure at which the *pipeline system* (3.18), or parts thereof, is allowed to be operated

[SOURCE: ISO 13623:2017, 3.1.12, modified — "maximum internal pressure" has been replaced by "maximum pressure"; "in compliance with this document" has been removed; note 1 to entry has been removed.]

3.12
offshore pipeline
pipeline (3.17) laid in maritime waters and estuaries seaward of the ordinary high-water mark

[SOURCE: ISO 13623:2017, 3.1.13]

3.13
onshore pipeline
pipeline (3.17) laid on or in land, including lines laid under inland water courses, up to the ordinary high-water mark when connected to an *offshore pipeline* (3.12)

[SOURCE: ISO 13623:2017, 3.1.14 modified — the term has been changed from "on-land pipeline" to "onshore pipeline"; "up to the ordinary high-water mark when connected to an offshore pipeline" has been added.]

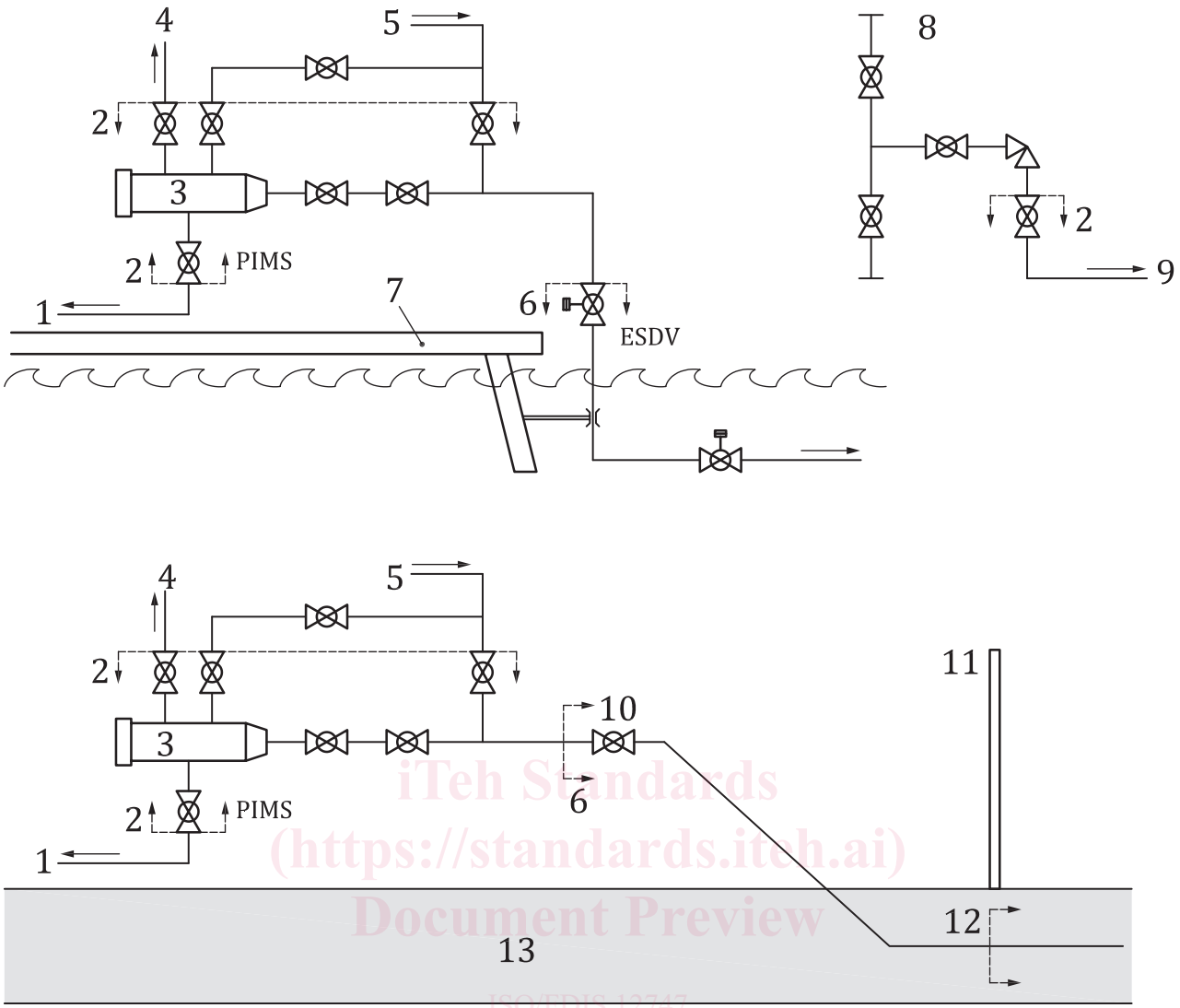
3.14
operation
activities involved with running and maintaining the *pipeline system* (3.18) in accordance with the design premise

3.15
operator
party ultimately responsible for the *operation* (3.14) and integrity of the *pipeline system* (3.18)

3.16
PIMS
pipeline integrity management system
management system designed to ensure the safe and efficient *operation* (3.14) of a *pipeline system* (3.18) in accordance with the design intent, by control of the physical condition of a *pipeline* (3.17), the operating conditions within the system and any changes made to the system

3.17
pipeline
facilities through which fluids are conveyed, including pipe, pig traps (where present), components and appurtenances, up to and including the isolating valves

Note 1 to entry: The definition of pipeline limits can vary by design standard, geographical region, and *operator* (3.15) designation under the *pipeline integrity management system (PIMS)* (3.16). Examples of selected facilities are provided in Figure 1.



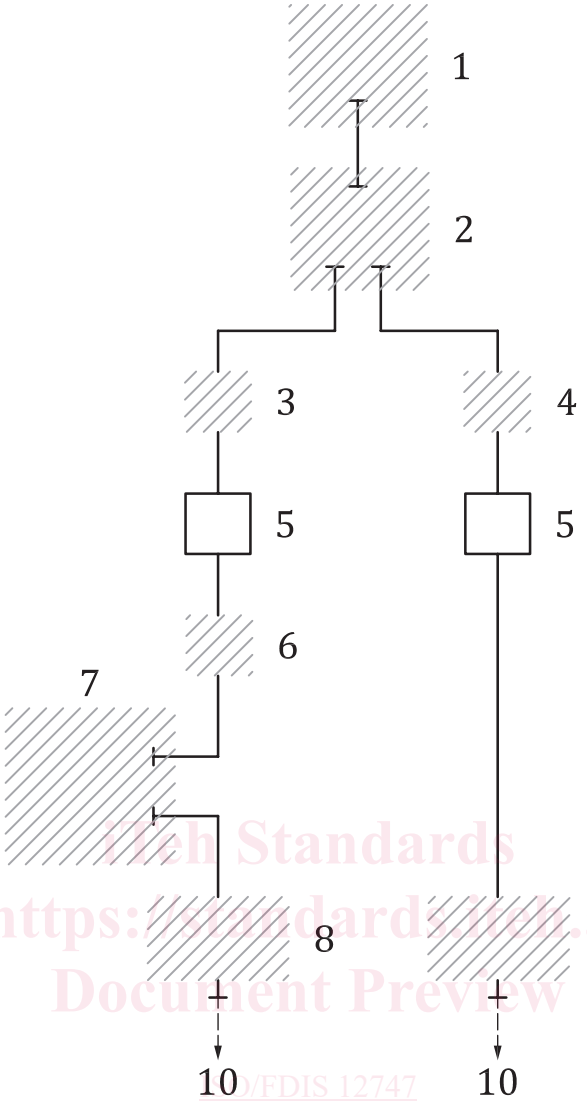
Key

1	drain	5	process	9	pipeline	13	onshore facility
2	pipeline limit	6	pipeline limit if there is no pig trap	10	isolation valve		
3	pig trap	7	offshore installation	11	fenceline		
4	vent	8	subsea xmas tree	12	pipeline limit if entering facility		

Figure 1 — Definition of pipeline limits at selected facilities

3.18
pipeline system
pipelines (3.17), stations, supervisory control and data acquisition system (SCADA), safety systems, corrosion protection systems, and any other equipment, facility or building used in the transportation of fluids

Note 1 to entry: The extent of the pipeline system covered by this document is defined in Figure 2.



Key

1	wellsite
2	gathering station, treatment plant or process plant
3	pump station
4	compressor station
5	valve station
6	tankage
7	refinery
8	depot
9	pressure-reduction station
10	DISTRIBUTION
———	pipeline systems covered by this document
——⊣	connection with other facilities
_ _ _ _	pipeline not covered by this document
	station/plant area or offshore installation not covered by this document

Figure 2 — Extent of pipeline systems covered

[SOURCE: ISO 13623:2017, 3.1.16, modified — Note 1 to entry has been added.]

3.19
remnant life
assessed period [irrespective of the defined *design life* (3.5)] for which a *pipeline system* (3.18) can be operated safely, based on time-dependent degradation mechanisms such as corrosion and fatigue

3.20
required life
desired operational life of the *pipeline* (3.17), accounting for continued *operation* (3.14) beyond the original pipeline *design life* (3.5)

3.21
risk
qualitative or quantitative likelihood of an event occurring, considered in conjunction with the consequence of the event

3.22
risk management
policies, procedures and practices involved in the identification, assessment, control and mitigation of *risks* (3.21)

3.23
service life
period of time during which the *pipeline* (3.17) is assessed to fulfil all specified performance requirements

3.24
threat
activity or condition that can adversely affect *pipeline system* (3.18) integrity

3.25
topsides
structures and equipment placed on a supporting structure (fixed or floating) to provide some or all of a platform's functions

[SOURCE: ISO 19900:2019, 3.54, modified — Notes to entry have been removed.]

4 Abbreviated terms

CCUS	Carbon capture, utilization and storage
CP	Cathodic protection
ECA	Engineering critical assessment
ESDV	Emergency shut-down valve
HIC	Hydrogen-induced cracking
ILI	In-line inspection
MBES	Multi-beam echo sounder
MFL	Magnetic flux leakage
NDE	Non-destructive examination
QRA	Quantitative risk assessment
ROV	Remotely operated vehicle