

PETRONAS TECHNICAL STANDARDS

TECHNICAL SPECIFICATION

SPECIFICATIONS AND REQUIREMENTS FOR PIPELINE IN-LINE INSPECTION

(AMENDMENTS / SUPPLEMENTS TO API 1163 – 2005)

PTS 30.40.60.31

JANUARY 2011



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PTS Title:	Specifications and Requirements for Pipeline In-Line Inspection (Amendments / Supplements to API 1163 – 2005)

This new PTS 30.40.60.31 - Specifications and Requirements for Pipeline In-Line Inspection (Amendments / Supplements to API 1163 – 2005) (January 2011, Revision 0) has been developed to provide the minimum requirements and recommended practice in performing pipeline in-line inspection. It is intended to act as standard document reference for pipeline fraternity throughout PETRONAS Group.

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PREFACE

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Document Title : Specifications and Requirements for Pipeline In-Line Inspection
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PART I INTRODUCTION

1.1 SCOPE

This PTS specifies requirements and gives recommendations for specifications and requirements for pipeline in-line inspection for both onshore and offshore pipeline system.

Part II of this PTS provides amendments and supplements to clauses of API 1163. The Section numbering in Part II follows that of API 1163. Where clauses of API 1163 are not amended or supplemented by this PTS they shall apply as written.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by PETRONAS, the distribution of this PTS is confined to companies forming part of the PETRONAS or managed by a Group company, and to Contractors and Manufacturers/Suppliers nominated by them.

This PTS is intended for use in oil refineries, gas plants, chemical plants, oil and gas production facilities, supply/marketing installations, and pipelines system installations within PETRONAS Group.

If national and/or local regulations exist in which some of the requirements may be more stringent than in this PTS, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable as regards safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Company of any deviation from the requirements of this PTS which is considered to be necessary in order to comply with national and/or local regulations. The Company may then negotiate with the Authorities concerned with the object of obtaining agreement to follow this PTS as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Authorities** are governing bodies that regulate the operation and maintenance of gas and liquid hydrocarbon pipeline systems.

The **Company** is the party which owns part or all of the pipeline systems. The Company will generally specify the technical requirements. The Company may also include an agent or consultant authorised to act for, and on behalf of the Company. Also referred as "pipeline operator"

The **Contractor** is the party which engaged by the Company to carry out integrity management and/or inspection and/or maintenance and/or operation activities for the pipeline systems. The Company may undertake all or part of the duties of the Contractor. Also referred as "service provider"

The **Consultant** is the party which provides technical consultancy services and expertise to perform duties specified by the Company.

The **Manufacturer** is the party which manufactures and/or supplies equipment to perform duties specified by the Company.

The **Vendor** is the party which supplies equipment and/or services to perform the duties specified by the Company.

The word **shall** indicate a requirement.

The word **should** indicate a recommendation.

1.4 CROSS-REFERENCES

Where cross-references to other parts of this PTS are made, the referenced section number is shown in brackets. Other documents referenced in this PTS are listed in (Part III).

PART II AMENDMENTS/SUPPLEMENTS TO API 1163 - 2005

1 Introduction

1.2 GUIDING PRINCIPLES

Page 1, 1st paragraph, 2nd statement

Amend the statement as follows,

“Combined, these three standards provide requirements and processes for the qualification of inline inspection systems, including the in-line inspection tools, their software, and the personnel *whose jobs requires specific knowledge of the technical principals of IP technologies, operations, regulatory requirements and industry standards as applicable to pipeline system* to operate the systems and analyze the results.”

3 References

Page 2, last statement

Amend the statement as follows,

“European Pipeline Operators Forum *Specifications and Requirements for Intelligent Pig Inspection of Pipelines*

Version [2009](#)”

4 Terms & Definitions

Page 2

Delete 4.3 and 4.35, rearrange numbering for 4.3 – 4.6 and after 4.20. Add the statements for 4.6, 4.24, 4.28, 4.48, 4.51, 4.62, 4.64, 4.68, 4.70, 4.74, 4.94, 4.95, 4.96, 4.115, 4.118, 4.127, 4.138, 4.139 and 4.140 as follows,

4.3 anomaly (See Figure 1): An unexamined deviation from the norm in pipe material, coatings, or welds. See also **imperfection, defect, and feature**.

4.4 anomaly & pipeline data analysis: The process through which anomaly & pipeline data are integrated and analyzed to further classify & characterize anomalies.

4.5 appurtenance: A component that is attached to the pipeline; e.g., valve, tee, casing, instrument connection.

4.6 Arc strike: *Localised points of surface melting caused by an electrical arc (also referred to hot spot).*

4.20 cold work: Permanent strain in a metal accompanied by strain hardening.

4.21 component: Any physical part of the pipeline, other than line pipe, including but not limited to valves, welds, tees, flanges, fittings, taps, branch connections, outlets, supports and anchors.

4.22 confidence interval: A range of values around the statistical mean.

4.23 confidence level: A statistical term used to describe the mathematical certainty with which a statement is made.

4.24 corrosion cluster: *Two or more adjacent metal loss anomalies on the wall of a pipe or on a weld that may interact to weaken the pipeline more than either would individually.*

4.25 corrosion: The deterioration of a material, usually a metal, that results from a reaction with its environment.

4.26 crack: A fracture type discontinuity characterized by a sharp tip and high ratio of length to width to opening displacement.

4.27 data analysis: The evaluation process through which inspection indications are classified and characterized.

4.28 debris: *Extraneous material in a pipeline which may interfere with the ILI tool.*

4.29 defect: A physically examined anomaly with dimensions or characteristics that exceed acceptable limits. See also **imperfection**.

4.30 deformation: A change in shape, such as a bend, buckle, dent, ovality, ripple, wrinkle, or any other change which affects the roundness of the pipe's cross-section or straightness of the pipe.

4.31 deformation tool: An instrumented in-line inspection tool designed to measure deformations in the pipe. See **geometry tool**.

4.32 dent: A local change in piping surface contour caused by an external force such as mechanical impact or rock impact.

4.33 detect: To sense or obtain a measurable indication from a feature.

4.34 detection threshold: A characteristic dimension or dimensions of an anomaly that must be exceeded to achieve a stated probability of detection. See also **measurement threshold** and **reporting threshold**.

4.35 DSAW: Double submerged arc welding. A welding process used in the manufacture of pipe.

- 4.36 electromagnetic acoustic transducer (EMAT):** A type of transducer that generates ultrasound in steel pipe without a liquid couplant using magnets and coils for inspection of the pipe.
- 4.37 ERW:** Electric resistance welding. A welding process used in the manufacturing of pipe.
- 4.38 essential variables:** The common set of characteristics or analysis steps for a family (series) of in-line inspection tools that may be covered within one performance specification.
- 4.39 evaluation:** A review, following the characterization and examination of an anomaly, to determine whether the anomaly meets specified acceptance criteria.
- 4.40 examination:** A direct physical inspection of an anomaly by a person, which may include the use of nondestructive examination techniques.
- 4.41 feature:** Any physical object detected by an in-line inspection system. Features may be anomalies, components, nearby metallic objects, welds, appurtenances or some other item.
- 4.42 flash welding:** A form of electric resistance welding used in the manufacturing of pipe.
- 4.43 gas:** Natural gas, flammable gas, or gas which is toxic or corrosive.
- 4.44 gauging pig:** A utility pig mounted with a flexible metal plate, or plates to gauge the internal diameter of the pipeline. Pipe bore restrictions less than the plate diameter or short radius bends will permanently deflect the plate material.
- 4.45 geometry tool:** An instrumented in-line inspection tool that measures deformations in the pipe. See **deformation tool**.
- 4.46 girth weld:** A complete circumferential butt weld joining pipe or components.
- 4.47 gouge:** Elongated grooves or cavities usually caused by mechanical removal of metal. See also **cold work**.
- 4.48 grinding:** *Reduction in wall thickness by removal of material by hand filing or power disk grinding.*
- 4.49 hard spot:** A localized increase in hardness through the thickness of a pipe, produced during hot rolling of a steel plate as a result of localized quenching.
- 4.50 hazardous liquid:** Petroleum, petroleum products, CO₂, or anhydrous ammonia.
- 4.51 heat affected zone:** *The area around the weld where the metallurgy of the metal is altered by the rise in temperature caused by the welding process, but this is distinct from the weld itself. The width of the heat affected zone is typically limited to a few mm only, depending on the welding process and parameters.*
- 4.52 ILI:** See **in-line inspection**.
- 4.53 imperfection:** An anomaly with characteristics that do not exceed acceptable limits. See also **defect**.
- 4.54 indication:** A signal from an in-line inspection system. An indication may be further classified or characterized as an anomaly, imperfection, or component. (See Figure 1).
- 4.55 inertial tool:** A type of in-line inspection tool used to map the centerline of a pipeline using sensors that respond to inertial changes. See also **mapping tool**.
- 4.56 in-line inspection (ILI):** An inspection of a pipeline from the interior of the pipe using an in-line inspection tool. Also called intelligent or smart pigging.
- 4.57 in-line inspection report:** A report provided to the operator that contains a comprehensive analysis of the data from an in-line inspection.

4.58 in-line inspection system: An inspection tool and the associated hardware, software, procedures, and personnel required for performing and interpreting the results of an inline inspection.

4.59 in-line inspection technology: A class of inspection methodologies (i.e., EMAT, MFL, ultrasonic, caliper, etc.) used in the performance of an in-line inspection.

4.60 in-line inspection tool: An instrumented device or vehicle that uses a nondestructive testing technique to inspect the pipeline from the inside or that uses sensors and other equipment to size one or more characteristics of the pipeline. Also known as intelligent or smart pig.

4.61 inspection: The use of a nondestructive testing technique.

4.62 intelligent pig: See *"in-line inspection tool"*.

4.63 interaction rules: A spacing criterion among anomalies that establishes when closely spaced anomalies should be treated as a single, larger anomaly.

4.64 joint: *Single section of pipe that is welded to others to make up a pipeline.*

4.65 lamination: An internal metal separation creating layers generally parallel to the surface.

4.66 lap weld: A welding process used in the manufacture of line pipe.

4.67 launcher: A device used to insert an in-line inspection tool into a pressurized pipeline, may be referred to as a pig trap or scraper trap.

4.68 longitudinal weld: *Tubular product having one longitudinal seam produced by any welding process.*

4.69 magnetic flux leakage (MFL): A type of in-line inspection technology in which a magnetic field is induced in the pipe wall between two poles of a magnet. Anomalies affect the distribution of the magnetic flux in the wall. The magnetic flux leakage pattern is used to detect and characterize anomalies.

4.70 magnetic marker: See *Above Ground Marker*.

4.71 magnetic particle inspection (MPI): A nondestructive examination technique for locating surface flaws in steel using fine magnetic particles and magnetic fields.

4.72 management of change (MOC): A process that systematically recognizes changes of a technical, physical, procedural or organizational nature and communicates them to the appropriate parties.

4.73 mapping tool: An in-line inspection tool that uses inertial sensing or other technology to collect data that can be analyzed to produce an elevation and plan view of the pipeline route.

4.74 measured wall thickness: *Measured wall thickness that is representative for a whole pipe joint/component. For ultrasonic tools the value shall be based on direct wall thickness measurement, for magnetic tools on the inferred magnetic flux signals.*

4.75 measurement threshold: A dimension or dimensions above which an anomaly measurement can be made. See also **detection threshold** and **reporting threshold**.

4.76 mechanical damage: A generic term used to describe combinations of dents, gouges, and/or cold work caused by the application of external forces. Mechanical damage can also include coating damage, movement of metal, and high residual stresses.

4.77 metal loss: Any pipe anomaly in which metal has been removed. Metal loss is usually due to corrosion or gouging.

4.78 MFL: See **magnetic flux leakage**.

4.79 MIC: See **microbiologically influenced corrosion**.