

# New POF specifications in relation to recent developments in in-line inspection technologies

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Peter van de Camp

Shell representative in POF and current Chairman of POF



# Contents of this presentation

- Background to POF
- Short overview of POF specs
- Recent developments
  - Defects other than metal loss and dents
  - Other ILI technologies besides MFL
  - Pinhole detection
  - Reporting
- Conclusions / Way Forward



# Background to POF

- The Pipeline Operators Forum is a non-profit association enabling pipeline integrity engineers to share and build best practice, thereby raising the standard of pipeline integrity management.
- Mission Statement:
  - To create and maintain a forum to share pipeline integrity experience and best practices with the express purpose of improving quality of pipeline integrity management at every level, hence protecting people and environment.
- POF goals:
  - Promote pipeline integrity management globally.
  - Work with industry to improve quality of pipeline integrity management and the services provided.
  - Upgrade and develop ILI (In-Line-Inspection) specifications, best practices and other relevant documentation.
  - Share experiences and best-practices of integrity management issues with members (e.g. via meetings and forum discussions).
  - Maintain an environment with access to developed documentation, specifications (see POF website [www.pipelineoperators.org](http://www.pipelineoperators.org) with public area and members area).



## POF Member companies

- BP
- Chevron
- ConocoPhillips
- Dong
- Enagas
- Engie
- ExxonMobil
- FGSZ
- Fluxys
- Gail (India)
- Gas Connect Austria
- Gassco
- Gasum
- GRTgaz
- Indian Oil Corporation
- Inpex
- Nederlandse Gasunie
- NWO
- Open Grid Europe
- Petrobras
- Qatar Petroleum
- Shell
- SPMR
- Statoil
- TAL
- Total



# POF Guidance Documents and Activities

- Published standards/documents available to general public:
  - Specifications and Requirements for In-line Inspection of Pipelines (2016)
  - Guidance on achieving ILI first run success (2012)
  - Guidance on field verification procedures for in-line inspection (2012)
  - Integrity Management of CRA pipelines (2015)
  - Forms/questionnaires/checklists on:
    - ILI Pipeline Questionnaire
    - ILI check list
    - ILI data feedback form
- Current Active working groups (to develop new standards) on:
  - In-line inspection company compliance check template.
  - Update of “ILI first run success” document (2012).
  - Multiple run comparison reporting (including specification of raw data format).
  - Overview/Experiences with non-intrusive pipeline inspection techniques.



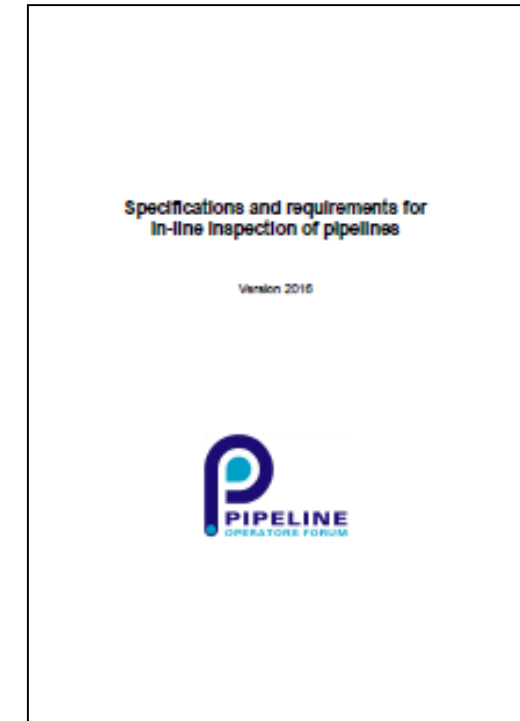


# “POF Specifications”

- POF specifications updated in 2016.

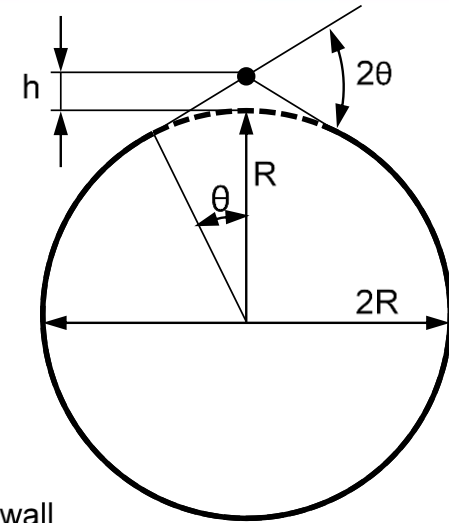
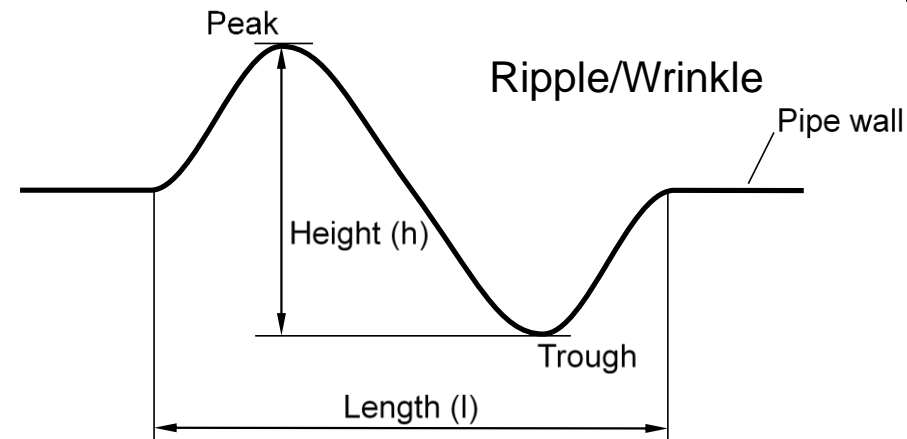
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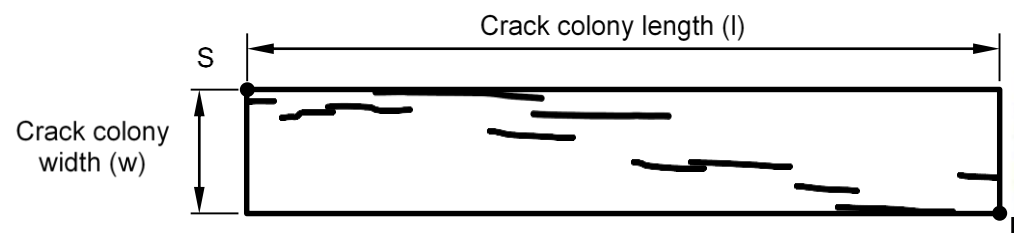


## 2. Definitions and Abbreviations

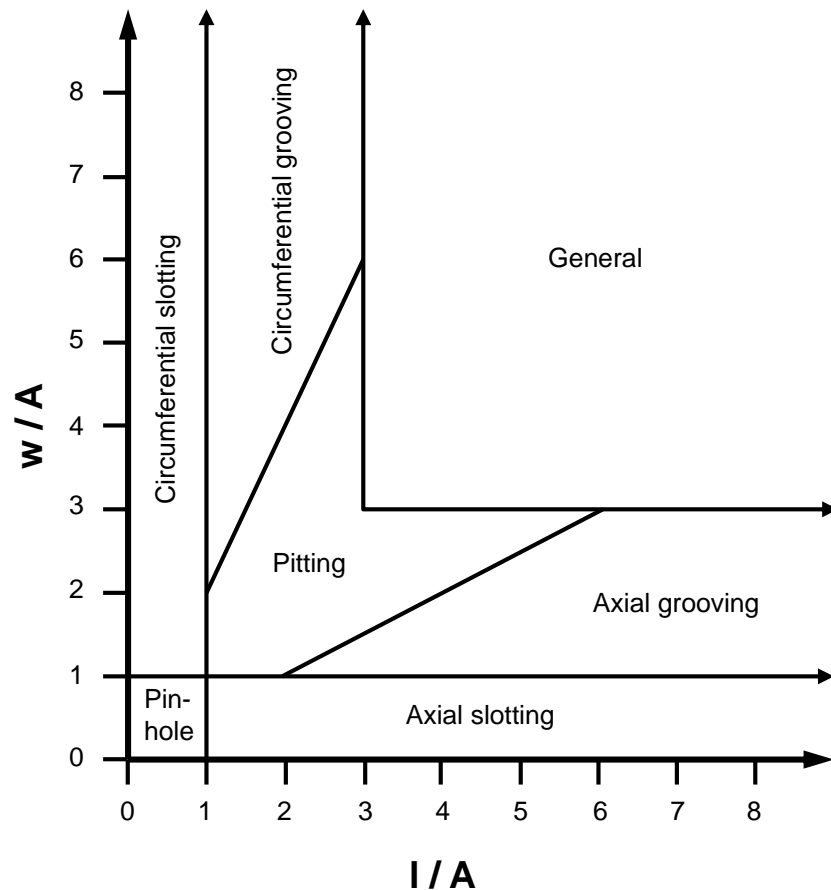
- Regulator and Company requirements for proper Pipeline Integrity Management have intensified over time. Proper management of all credible threats to a pipeline is a key element in this.
- In the past POF specs concentrated on metal loss and dents.
- Now more guidance to other type of defects is provided, see examples.
- Definitions have been aligned with other industry documents.



Peaking /  
Roof topping



## 2. POF diagram



- $l$ =length,  $w$ =width
- $t$ =wall thickness  
If  $t < 10$  mm then  $A = 10$  mm  
If  $t \geq 10$  mm then  $A = t$
- POF diagram stayed as is.
- Anomaly classification retained for reporting.
- Only applicable to MFL for tool specifications (detection and sizing capabilities).





# 4. Tool Specifications

- Some important changes:
  - Clear distinction between tool data sheet and technique performance specification
  - MFL performance
  - Combination of technologies: separate and combined specification required.
  - Clarification on basis of performance
  - Access to supporting performance information
  - Introduction of POD  $a_{90/95}$  concept (compared to  $a_{90/50}$ )
  - More attention to performance for pinholes. See also next slide; latest extra high resolution tools actually have capability to detect these defects.

*Table A5-2: MFL detection and sizing accuracy for metal loss anomalies*

	General metal-loss	Pitting	Axial grooving	Circumf. grooving	Pinhole	Axial slotting	Circumf. Slotting
Depth at POD=90%					N/A see below		
Depth sizing accuracy at 90% certainty							
Width sizing accuracy at 90% certainty							
Length sizing accuracy at 90% certainty							
Minimum pinhole diameter at POD=90% if depth=50%							n.a.
Minimum pinhole diameter at POD=90% if depth=20%							n.a.

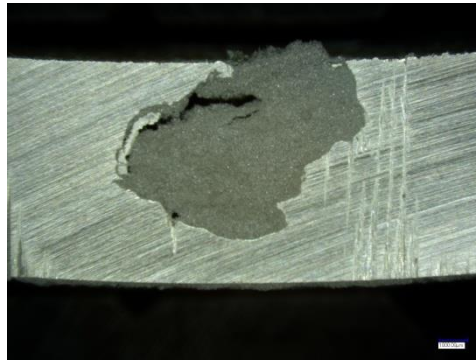
*Table A5-3: Metal loss detection and sizing accuracy for technologies other than MFL.*

Detection but no sizing at POD=90%	Minimum diameter	
	Minimum depth	
Detection and sizing at POD=90%	Minimum diameter	
	Minimum depth	
Depth sizing accuracy at 90% certainty		
Length sizing accuracy at 90% certainty		
Width accuracy at 90% certainty		
Accuracy of wall thickness measurement at 90% certainty		

## 4. Measurement (Spatial) Resolution

- Axial resolution typically determined by tool speed and sampling frequency
- Circumferential resolution by sensor spacing (typically number of sensors divided by circumference)
- With UT (not a point measurement) also beam diameter plays a role
- Sampling theory: at least twice as much as smallest required resolvable feature (Nyquist-Shannon).

Typical ILI industry values for metal loss tools		
	“regular” tools	“extra high res” tools
MFL axial	3	1
MFL circ.	8	1.6
UT axial	3	0.75
UT circ.	8	4
UT probe $\varnothing$	10	5
	mm	mm



example pinhole pictures  
wall thickness = 7.8 mm



## 7. Reporting

- Various type of reports listed and described.
- Two mandatory reports:
  - Field operations report
  - Final report (with requirements for pipe tally format and default reporting thresholds)
- Optional reports:
  - Preliminary report
  - Processed raw data report (see next slide)
  - Multiple run comparison report (see next slide)
  - Experience report
  - Additional reporting as requested/specified by Client



## 7. Data format and multiple run comparison reports

- These reports are gaining importance because of more lines that have experienced multiple runs, availability of processed raw data and viewers, and the requirement to monitor anomaly growth in more details. Here is how it is described in the POF specs:
- (Processed) Raw data report
  - On request of the Client the raw data or processed raw data from an ILI run or a specific pipeline section shall be provided. The format of the data depends on the type of tool applied and is to be agreed between Client and Contractor and shall be defined in the inspection contract. (See also presentation by SPMR)
- Multiple run comparison report
  - If requested by the Client, anomaly data from two or more successive ILI runs carried out on the same pipeline, shall be compared individually and clustered. Aim is to detect discrepancies between reported anomalies of successive runs like new or missed features, corrosion growth, etc.
  - The run comparison report shall contain a table with matching and non-matching features per joint and include the results of these matching in terms of location, sizing and evolution.
  - If the same Contractor is chosen for two successive inspection runs, the Client may request:
    - A signal to signal comparison analysis between the two inspections
    - A 2nd report based on the raw data of the previous inspection, but processed with the new algorithm.



# Conclusions / Way Forward

- It is good practice to clearly define upfront pipeline inspection and reporting requirement.
- POF specifications can help with this. It gives options and default requirements but it is recommended to tailor this to your requirements.
- POF specifications have been updated recently to reflect changing requirements from operators and new development in the ILI industry.
- Visit POF website for latest info ([www.pipelineoperators.org](http://www.pipelineoperators.org))
- If you would like to make comments on the specification documents you can use the [Specification Comments Form](#) available from the POF website.





Thank you for your attention

Questions?

