UKOPA

United Kingdom Onshore Pipeline Operators' Association

PIWG Progress Update Meeting, October 2017

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PIWG Chairman

General

- Meetings
  - Meetings have been held in January, April and September '17
  - A telecom may be held in November to review the 2018 budget submission
  - Next meeting planned for 23 January 2018, location Ambergate
- Membership
  - Currently around 27 group members / interested parties across all sectors

PIWG Aims

- Act of behalf of UKOPA Members as the expert body on pipeline integrity and defect assessment issues.
- Support, on behalf of member companies, the development and acceptance of appropriate good practice for pipeline integrity management and defect assessment.
- Provide the specialist / expert point of contact for UKOPA internal and external communications on pipeline integrity / defect assessment issues.
- Provide a formal UKOPA interface with HSE for discussions on pipeline integrity related issues.
- Provide a point of focus within UKOPA for commissioning and progressing technical work related to pipeline integrity and defect assessment with external expert bodies and technical specialist organisations including Universities.

2017 Work Plan

- GPG Line Walking – to complete and issue
- TBN Pipeline Integrity Management – to complete and issue
- GPG AC corrosion management – to scope and commission development work
- TBN – Ethylene decomposition in pipelines – to complete and issue
- Sleeve Assessment Work phase 1B – to scope and determine whether or not to proceed
- Update Dent assessment tool to allow selection of S-N curves
- GPG / TBN for Seismic risks – to determine how to wrap up the work done to-date
- Pipeline end of life – to scope areas of interest for UKOPA and develop work plan to progress
- Develop standard for epoxy shell repairs
- GPG for ILI Project Management, incorporating a state-of-the-art review for ILI Techniques
- Weld Quality Project – further work to be agreed

GPG - Line Walking

- A final draft of the GPG has been produced and presented at the May Technical Seminar
- The document has progressed through the Governance process and has been approved barring one or two typo corrections
- The finalised document will be issued to the website imminently (probably in November '17)

TBN - Pipeline Integrity Management

- The drafting of the TBN was completed in April
- The document was launched with a presentation at the May Technical Seminar
- The document has been with the Governance Group over the summer and is ready for issue to the Members' area of the website (likely November '17)
- This document is intended to act as a signposting document, highlighting sources of technical information available regarding different pipeline threats. It will also act as a gap analysis to assist in prioritisation of future work.

GPG – AC Corrosion Management (1)

- A scope of work has been prepared following detailed discussions within the group and with technical experts in the field
- An order was placed to carry out the work following approval at the May Board Meeting
- Work is ongoing, with a draft due in early January 2018 for review by the group
- It is likely that Governance etc. would see the issue of this GPG in Q2 2018

GPG – AC Corrosion Management (2)

The following information will be included

1) A list of all relevant publications including specialised UK power industry documents not reference in EN standards.
2) Information on the safety requirements as EN standards specifically exclude guidance on safety.
3) Practical guidance on how to assess pylon to pipeline separation as limited information is provided in existing pipeline and CP standards
4) Practical information on what to do for various situations e.g electrified rail line crossing, LV cable crossings and parellisms, construction of windfarms and substations close to pipelines.
5) Methods of AC interference mitigation
6) Requirements for base line data logging prior to energisation of powerlines
7) Factors to consider when conducting risk assessments work on pipelines subjected to AC interference.
8) Surge protection considerations for IJs on pipelines
9) Information on typical questionnaires to issue when new powerlines or traction systems are proposed.
10) Guidance on methods of assessing AC corrosion rate and information on typical AC corrosion rates in the field
11) Issues associated with conducting over the line surveys on pipelines with AC mitigation systems installed

TBN – Ethylene Decomposition in Pipelines

- Prior work by UKOPA has been identified for reformatting and issuing as a TBN
- This work was approved by the Board in October 2016
- A draft of the document has been delivered.
- Review is required by those companies with an interest in Ethylene logistics
- Following review, the document will be sent to the Governance Group, although, as a TBN, this process is expected to be relatively quick

Sleeve Assessment Work

- The scope of the Phase 1B study was discussed with Macaw (now Rosen)
- Further information on available data sets has been given and a firm proposal has now been made
- The costs proposed are far higher than the original estimate given (although it is recognised that at the time of the estimate the scope was undeveloped)
- The group now need to determine whether or not to take this work forward. Dialogue with Rosen will follow to understand the breakdown of costs and determine whether a truncated scope would deliver value whilst also meeting the budget

Dent Assessment

- The Dent Assessment Excel tool has been updated to allow selection of S-N curve from those available in standards (based on the TBN developed in 2016)
- The updated tool features check boxes and logic to assist the user in selection of the correct S-N curve
- The tool will be issued to Members shortly

GPG - Seismic Impact on Pipelines (1)

- This work has reached something of an impasse
- The proposed use of the National Grid methodology favours gas pipelines, so has little input for the environmental impact associated with liquids
- Further, aspects of the work were felt to be conservative, but the costs to have this view ratified are excessive (£20k+)
- Work focussed on AGIs has been suggested

- In the meantime, the group received a Committee Draft of ISO-20074 'Geological hazard risk management for onshore pipelines'
- Comments have been sent to the Standards Committee in an effort to influence how this document is related to existing assets
- The proposed standard includes methodologies for qualitative, semi-quantitative and quantitative hazard screening fr geological hazards including earthquakes
- It is anticipated that this standard will be issues as an ISO towards the end of 2018

GPG - Seismic Impact on Pipelines (2)

- An agreed way forward must be found such that the work done so far is not 'lost', however it seems sensible to capture this work in the context of either a modified version of the National Grid work (covering liquid as well as gas pipelines) or the finalised ISO standard

- For pipelines, the risk is low. A simple, qualitative screening tool should be developed to confirm this low level of risk. The work done thus far will support the selection of suitable return periods for use in the screening tool.

- For AGIs there will be areas of higher risk. It may be prudent to 'test' some examples of AGIs in a screening tool to assess the extent of any problems. This would need the tool to be developed, higher risk areas to be identified and then AGI data from these higher risk areas to be run in the tool to assess the outcome

- It is suggested that further work requiring approved expenditure should be held until the Draft ISO is issued

Pipeline End Of Life

- This was highlighted as an area of interest by members in the 2015 strategy review
- A literature review has been undertaken to review existing standards related to this topic
- Although the theoretical process for life extension is understood and well documented, several areas of practical difficulty have been identified where further advice for UKOPA members could add value
- Scoping work has taken place leading to the following proposal, which will be budgeted for 2018 delivery:

  A basic guidance document will be produced detailing how to practically enact existing standards, such as ISO-TS-12747, IGEM TD1, etc. Generic assumptions will be included for fatigue and corrosion. Worked examples will be included.
- The work to produce the document will also scope further work on how to deal with historic fatigue and corrosion where operating data is not available

Standard for Epoxy Shell repairs

- It has been suggested that a standard for epoxy shell repairs may be useful (analogous to BS EN ISO 24817 for Composite Repairs)
- A scope has been developed and proposals from three vendors have been obtained. Clarification meetings have been held with all three vendors
- Following discussion in the group a preferred vendor has been selected
- A funding request has been submitted for Board approval
- If approved, the completed procedure would be delivered in Q1 2018

GPG – ILI Project Management

- A proposal for the development of a GPG covering aspects of In-Line-Inspection was approved earlier this year
- The document covers project aspects of ILI, as well as a review of available technologies versus threat diagnosis
- The work signposts material already available through sources such as PoF
- A draft document has been produced and has been circulated to PIWG members for comment. Comments are due back in by end October
- Following this the document will be finalised and be presented to the Governance Group for approval with a view to a Q1 2018 launch

Weld Quality Project (1)

- The original scope of the weld quality project is complete
- The findings were presented at the Technical Seminar in May and resulted in some significant discussion
- The finalised report has been submitted for Board approval for publication to the UKOPA website

- The project conclusions and further discussions have identified a number of areas where further investigation is warranted:
  - Review UKOPA failure data to better understand why girth weld failures dropped off after 1992.
  - Review the P18 procedure (a gas industry procedure to support ‘poor quality’ girth welds during excavation). Can this be simplified?
  - Review CONCAWE data for UK liquid pipelines (recognising that the UK fault database only looks at MAHP). Does the CONCAWE data support the previous conclusions?
- The group will determine how best to prioritise and resource these pieces of work over the coming 12 months

Weld Quality Project (2)

- A North American operator has offered to test samples taken from a vintage 1950s and 1960s pipeline for UKOPA
- Comparison of similar vintage North American and UK pipeline girth welds will enable further corroboration of the conclusion that pre 1970’s welds are good quality
- This work has been sanctioned and is ongoing. A report is expected by year end which will give further which can be used to define further areas of study.

Weld Quality Project (3)

Fatigue of pre-1970 welds

- A piece of work has been approved to investigate the effects of fatigue on welds of pre-1970s vintage
- This has utilised some of the remaining weld samples collected
- The work is being conducted at Strathclyde University and is likely to be published with acknowledgement to UKPOA
- The work is gathering data to show that available S-N curves are acceptable for use when considering pre-1970s welds
- The work may well lead to further study at Strathclyde based on this data

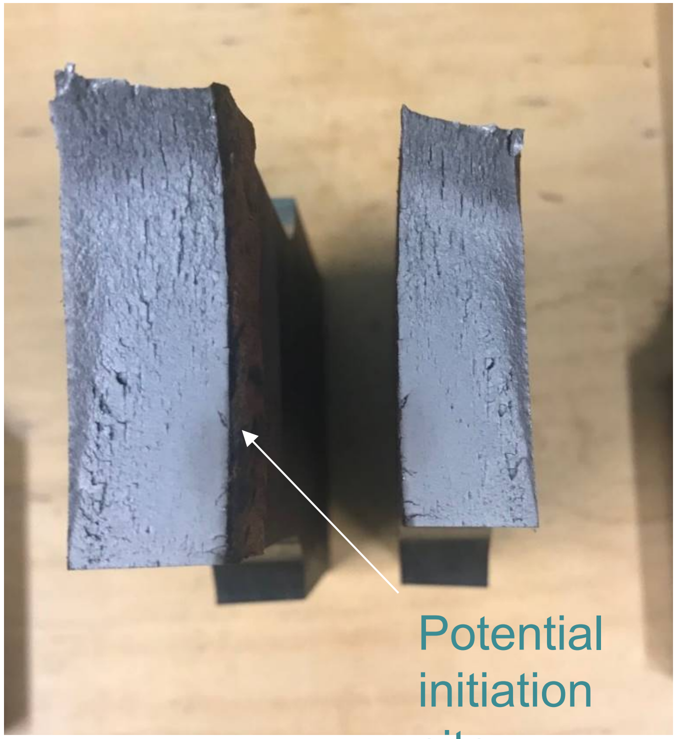
Fatigue samples machined from 36” pipe – 16mm wt

Notes:
The UTS of the 16mm pipe was measured to be ~550MPa on the 440kN Tinius Olsen instrument (Sample 1 in the photo).

Please note that this instrument is not calibrated and the measurement should be taken just as indicative.

Fatigue testing of 16mm pipe – Test 1

Test 2 – Results



Potential initiation site

Notes:
Test failed after 1,117,048 cycles

Fatigue crack initiated at weld cap from visual inspection and propagated from one corner to the other.

Picture shows the back side of the specimen with the weld root

Updated test programme 11.10.17

16mm Pipe				12.1mm Pipe		
t	16	(mm)		t	12.1	(mm)
Width	50	(mm)		Width	36.33	(mm)
A	800	(mm^2)		A	439.23	(mm^2)

Test 1	Required stress	125	(MPa)
	Stress (%SMYS)	35	%
	Load	100	(kN)
	Yield stress	358	(MPa)
	Fatigue life (mean E curve)	1.68E+06	cycles
Test 1	Experimental test	9000000	cycles

Test 5	Required fatigue life	3.00E+05	cycles
	Stress (%SMYS)	222	(MPa)
	Load	98	(kN)
	Stress (%SMYS)	62	%
Test 5	Experimental test	237060	cycles

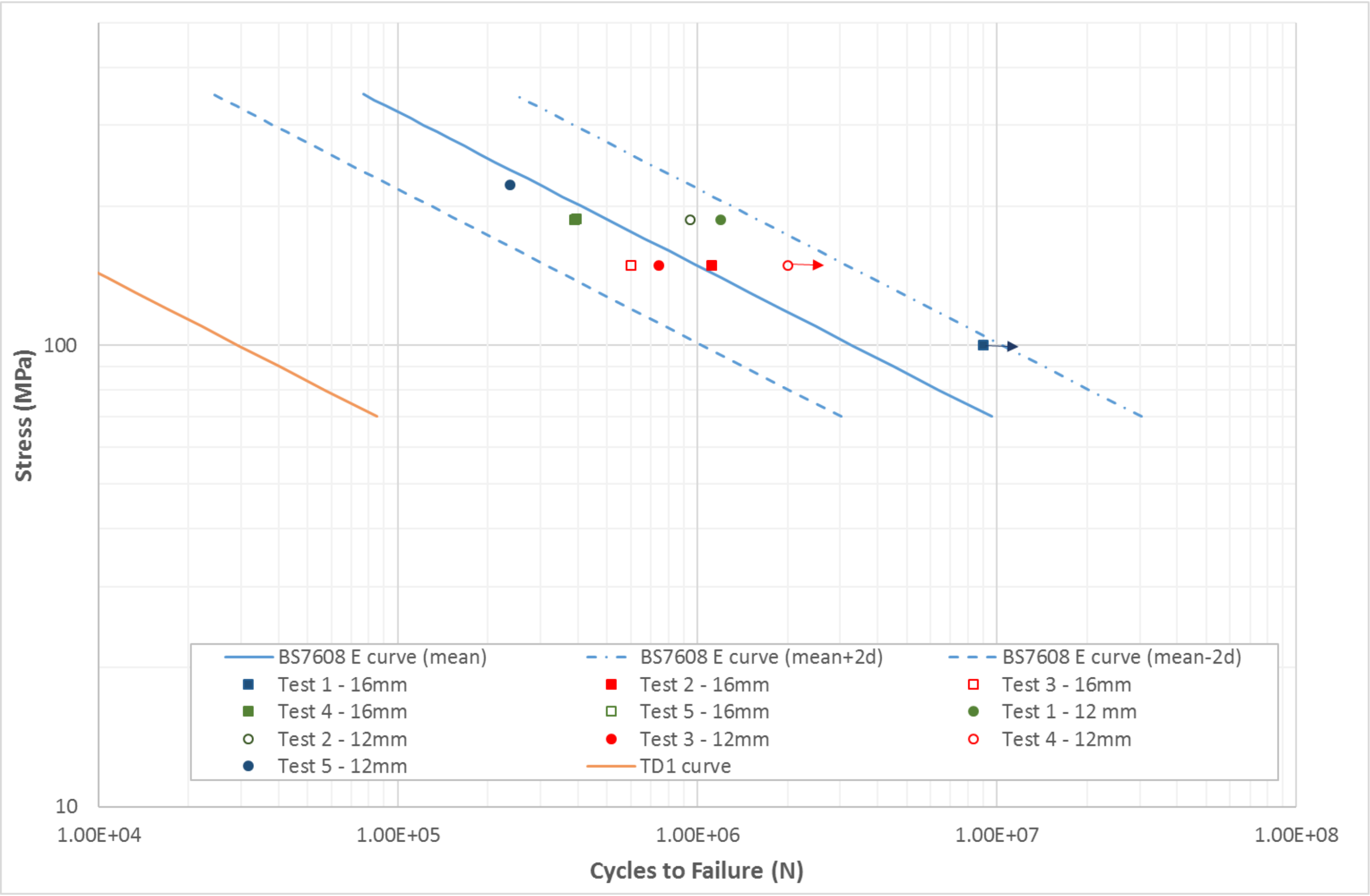
Test 2&3	**Required fatigue life**	1.00E+06	cycles
	Stress (mean E curve)	148.71	(MPa)
	Load (mean E curve)	119	(kN)
	Stress (%SMYS)	42	%
Test 2	Experimental test	1117048	cycles
Test 3	Experimental test	602660	cycles

Test 3 & 4	**Required fatigue life**	1.00E+06	cycles
	Stress (mean E curve)	148.71	(MPa)
	Load (mean E curve)	65	(kN)
	Stress (%SMYS)	240	%
Test 3	Experimental test	741380	cycles
Test 4	Experimental test	2000000	cycles

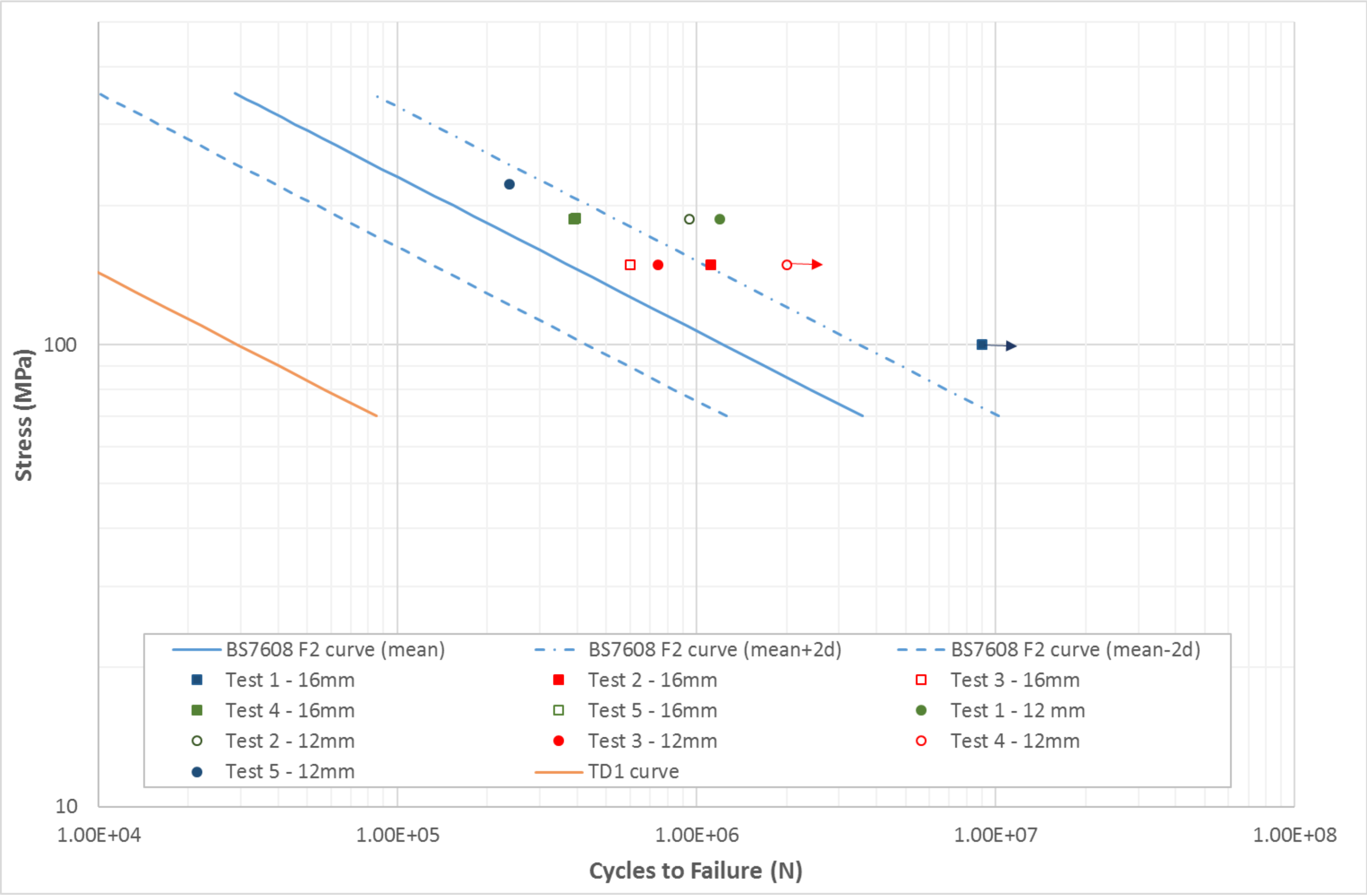
Test 4 & 5	**Required fatigue life**	5.00E+05	cycles
	Stress (mean E curve)	187.37	(MPa)
	Load (mean E curve)	150	(kN)
	Stress (%SMYS)	52	%
Test 4	Experimental test	388163	cycles
Test 5	Experimental test	397097	cycles

Test 1 & 2	**Required fatigue life**	5.00E+05	cycles
	Stress (mean E curve)	187.37	(MPa)
	Load (mean E curve)	82	(kN)
	Stress (%SMYS)	302	%
Test 1	Experimental test	1193262	cycles
Test 2	Experimental test	947012	cycles

Test results – BS7608 E curve comparison



Test results – BS7608 F2 curve comparison



Weld Quality Project (4)

Critical Defect Size in pre-1970 welds

- A piece of work has been approved to investigate the impacts of metallurgy on fatigue in welds of pre-1970s vintage and calculate the critical defect size which would propagate to weld failure
- A student has been identified to undertake this work
- The work will be conducted at Swansea University with oversight for UKOPA by Tim Rudd of Valero
- The report will be due by late 2018

2018 Work Plan

- The group have started to formulate a work plan for 2018
- This is based on:
  - existing ideas
  - Items from the 2015 UKOPA Strategy Review
  - Developments of existing work programmes
- The programme for 2018 could contain the following;
  - Comments on the Committee Draft of ISO 19345 – ‘Pipeline Integrity Management Specification for On-shore Pipelines’
  - Development of a Damage Assessment Guide
  - Historic girth weld failure investigation work
  - Further research work at Strathclyde University
  - Seismic screening guide for pipelines and AGIs
  - Development of advice for screening dented pipelines for fatigue
  - Life extension – develop basic guide and scope areas for further work
  - GPG for DC interference

Questions?