GERIATRIC PIPELINES
ONE FOOT IN THE GRAVE

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Introduction

Pipelines are like ourselves – they wear and age, and have some of the same symptoms in that:

- They have a finite life – design versus achievable. Keep in good order and it will outlive the design (just as we need exercise and fitness)
- They need additional treatment as they get older – Biocide, corrosion inhibition, wax reducing agents (just as we need pills)
- Valves and control systems may not function to the standard required (just as our joints may need replacement)
- Closer operational control and monitoring is required to ensure no leaks or faults (just as we need more regular checks as we grow older)
- There is no substitute for actual inspection – intelligent pigging, subsea ROV camera etc (just as the doctor will diagnose us)
- How good is the documentation – it is essential that documentation for the pipeline is kept up-to-date including as built drawings, amendments etc (just as our medical history can assist the doctor)
- Changes in legislation affect:
  - How you manage the pipelines – PSRs, MAPDs Operator etc
  - Legislative authorities and who you communicate to – HSE Pipelines Inspectorate, DTI

  (just as pension changes may effect us)

The Pipeline Integrity Management Scheme must cater for all of these concerns.

External Issues:

External damage can occur due to damage caused by:

- Fishing interaction, anchors, dropped objects, external interference with the CP system etc
- Cathodic protection systems failing, ie:
  - Anode failure
  - Impressed current, eg Thistle switched off due to diving work
- Coating failures due to faulty application or damage in situ
- Attachments – tees and stubs, dead legs which can corrode
- Riser splash zone – inadequate protection from corrosion and erosion

Internal Issues

Internal issues occur mainly due to corrosion and can arise due to a combination of the following:

- Current fluids not matching the original design intent with CO_2, water and H_2S levels being higher than perhaps first envisaged
- Changing operational conditions with:
  - Water cuts increasing
  - Deposits, sludge and wax build-up in lines
  - Flow rates decreasing
  - SRBs developing

To help reduce deposits and water lying in the pipeline, operational pigging may have to be increased along with the use of more aggressive pigs.

These cleaning pigs are generally designed to push any loose material/ water through the pipeline and to apply a mechanical force between the pig and the pipe wall surface to remove debris that can be easily removed. These pigs are typically composed of wiping sealing surfaces (discs or cups) with brushes or magnets mounted on them.

Corrosion models may predict indicative corrosion rates but it cannot predict localised corrosion (eg pitting, preferential weld corrosion, bacteriological induced corrosion etc) and are not a substitute for inspection.

The only way to ensure integrity is by Inspection.

Topsides Equipment and Valves

Maintenance needs to be continually reviewed and remedial works carried out as repairs are identified. This could include corrosion under insulation and remedial painting for corrosion. What was ok as a frequency during the early life may now need shorter periods.

Emergency shutdown valve trending of leak rate and closure times may indicate when changeout will be required.

Valves for isolation purposes (ie pigging and operational use) which are passing may require changeout and a shutdown.

Pig launchers/door closure mechanisms wear out and may need changing. What was alright 20 years ago may not be so now.

Changes in operating practice can have an input (eg isolation standards now require double block and bleed, but old facilities still have single valve isolation). This may mean taking a shutdown for operations or maintenance requirements.

General

Extension of planned field life is not always known until the later years of operation. This can lead to assumptions made during the initial design being not applicable for these later life operations, ie corrosion allowance, material selection, fatigue and coating degradation.

The importance of ongoing monitoring of conditions is essential to ensure that we don't get into the situation where the metal loss within a pipeline is unknown.

Control and closer monitoring of product, chemicals, excursions etc needs to be emphasised.

More regular operational pigging may be required due to changing conditions and low flow, ie wax, water drop out etc.

If old lines can't be intelligent pigged what do you do? The use of predictive data and monitoring (either end of the line) will always result in a semi-quantitative assessment of a line and can best be used as a ranking for the timing of intelligent pigging. It is not a substitute for IP or any other methods to actually measure metal loss within a line. Riser crawler pig may be an alternative.

Spans and upheaval buckling need continual assessment and can be costly to fix, eg rock dumping

Control systems can become obsolete and the original engineering manufacturer (OEM) may not be able to fix or maintain.

Spares is another area which can give problems due to obsolete items, ie flexibles, valves etc.

Records and documentation needs to be maintained for field life and is essential for extension of field life and for decommissioning. Hold onto your inspection data?

A Pipeline Integrity Management Scheme, based on a continuous life cycle assessment of the pipeline condition, can mitigate these concerns and minimise costs.

Decommissioning – Plan for decommissioning now – don't wait till it happens.

Actual Cases

Don

Problem:

Subsea stubs with pressure transducers, which were used during startup but then isolated – leak occurred at the transducer.

Findings:

Valves not fully closed.

Transducer not designed for subsea use and drawings not kept up-to-date.

Forties

Problem:

Monel and neoprene coatings failure.

Findings:

Inspection frequency and records not kept.

Poor material selection.

Magnus

Problem:

Pig receiver external corrosion and door closure problems.

Findings:

Inspection and poor maintenance.

Loss of operational pigging and subsequent heavy corrosion.

SNS

Problem:

Dry to wet gas operation internal corrosion.

Finding:

Changes not fully understood.

Magnus

Problem:

Pig trap isolation problems – shutdown and pigging stopped.

Finding:

Operation set up not fully appreciated.

Wytch Farm

Problem:

Preferential weld corrosion.

Finding:

Not IP before.

NWH

Problem:

Operational pigging not appreciated the importance in the early years of operation

Finding:

Lead to integrity questions in later life, which may not always be resolved in later life.