



IS IN-LINE INSPECTION ALONE SUFFICIENT TO MANAGE INTERNAL CORROSION OF PIPELINES?

Lewis Barton · CRFI 2018 · Israel· 8th November 2018

CORROSION MANAGEMENT

... IS ILI ENOUGH?

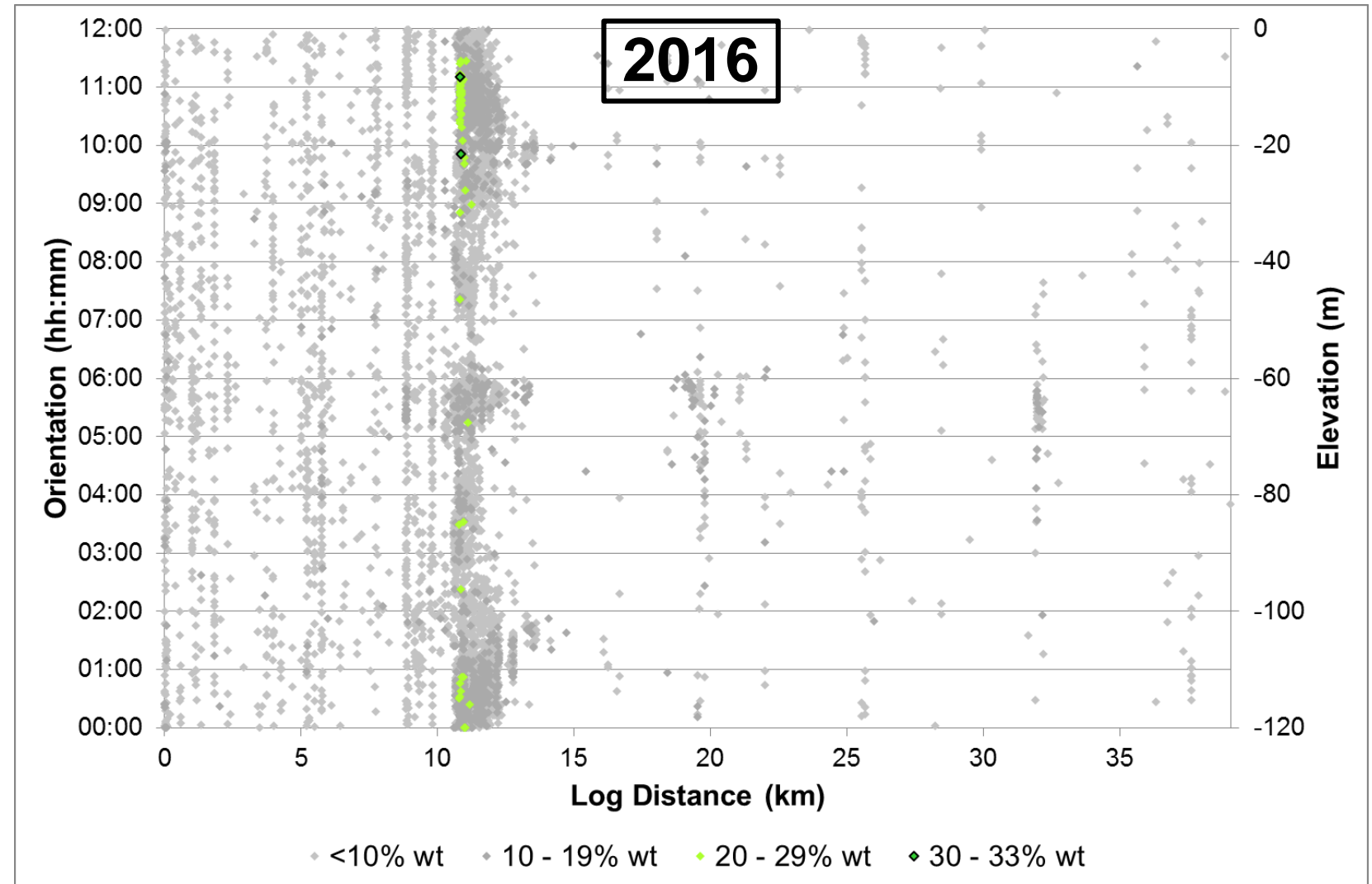


empowered by technology

NO!

However...

It is sufficient to watch corrosion happen!



CORROSION MANAGEMENT

... WHY?

- Production Efficiency
- Health Safety & Environment
- Operational Reliability
- Regulation and Legislation
- **COST**
 - CAPEX
(Capital Expenditure)
 - OPEX
(Operational Expenditure)



CORROSION MANAGEMENT

... WHY?

NACE IMPACT STUDY

- Global cost of corrosion is ~ **\$2.5 trillion USD**
- Equivalent to roughly **3.4 % of global GDP**
- Yet ... **corrosion** remains one of the most **predominant integrity threats**.
 - Specifically Internal Corrosion
- **WHY?...**

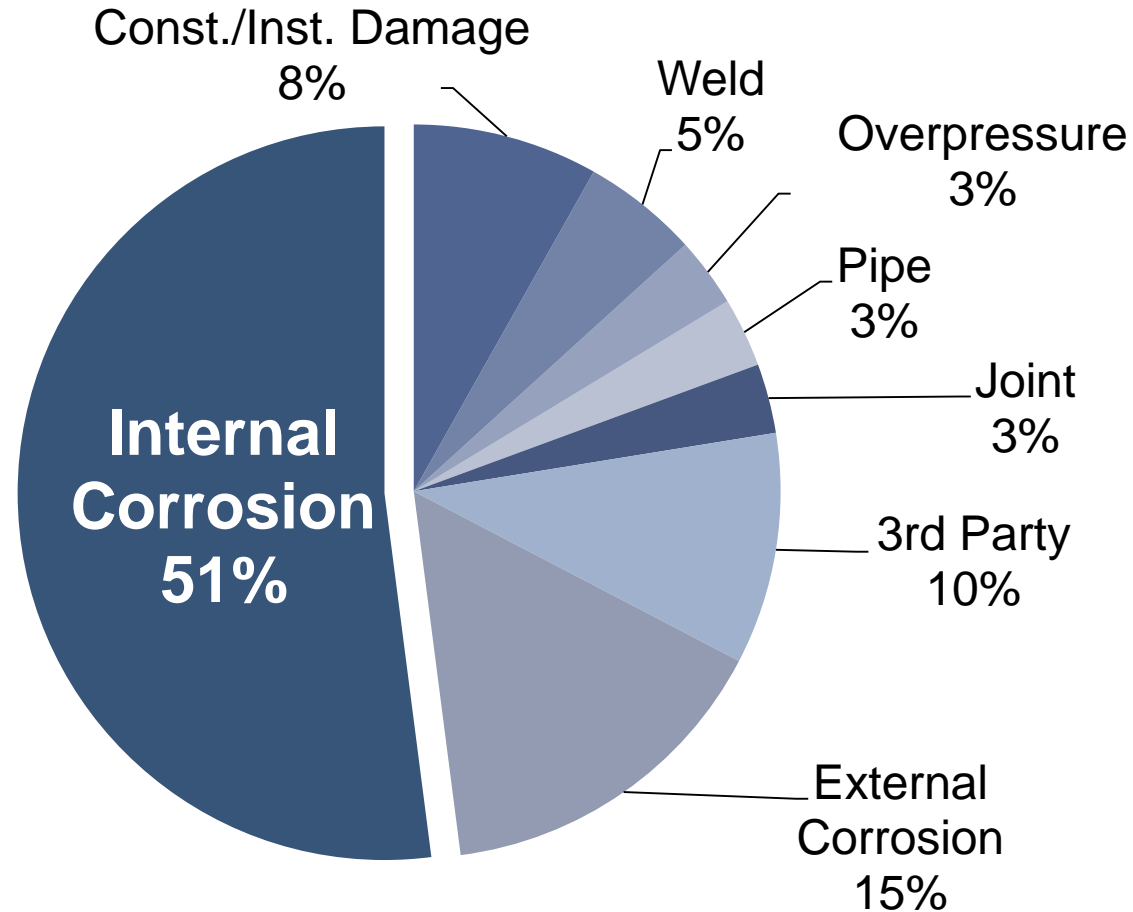
“If you can't measure it, you can't improve it”



CORROSION MANAGEMENT

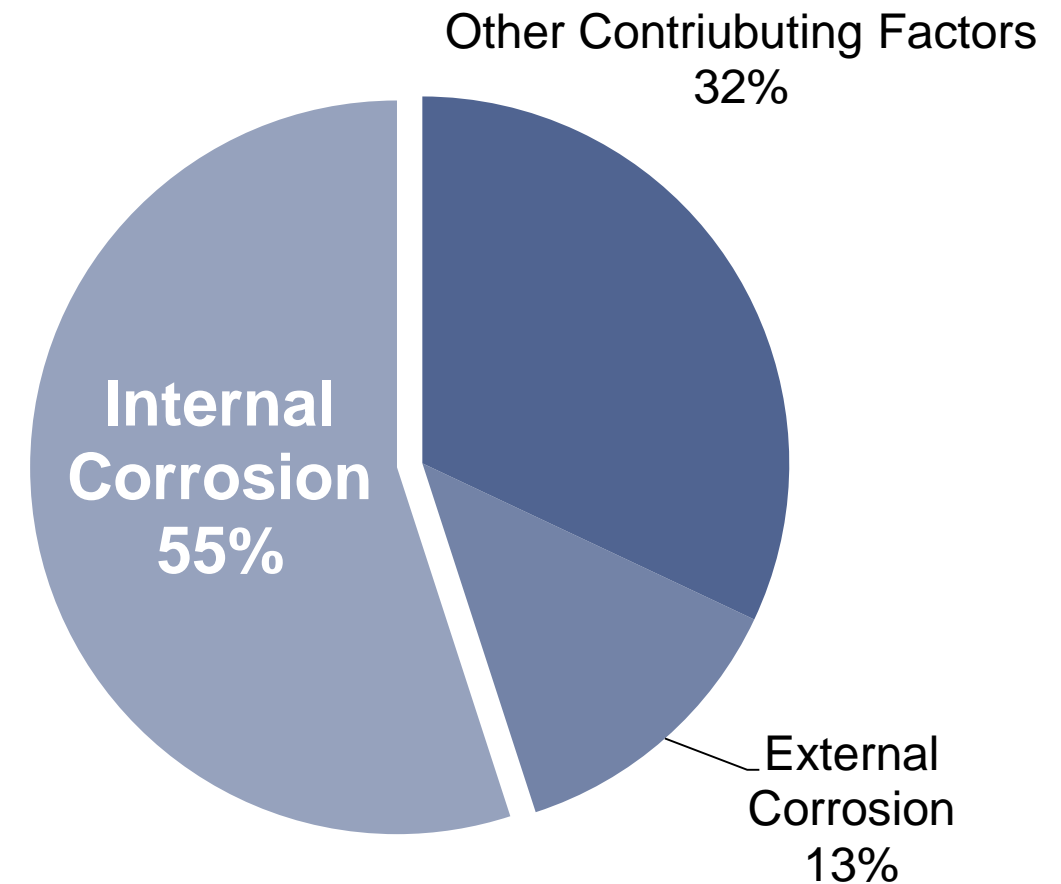
... WHY?

Worldwide Failure Mechanisms



Pipeline and Gas Journal, 2016

Country Specific Failure Mechanisms



Alberta Energy Regulator, Report 2013-B

CORROSION MANAGEMENT

... EXTERNAL

We can go and **look at it!**

- If we cant.. we have proven indirect techniques

Humans show a **greater reaction** to what they can see!

- We are naturally tuned to dislike colours associated with things we dislike (e.g. browns)
- This includes ...

CORROSION!

This means we are **more likely to fix it!**



CORROSION MANAGEMENT

...INTERNAL

We **can't** “**see**” what is happening like external corrosion

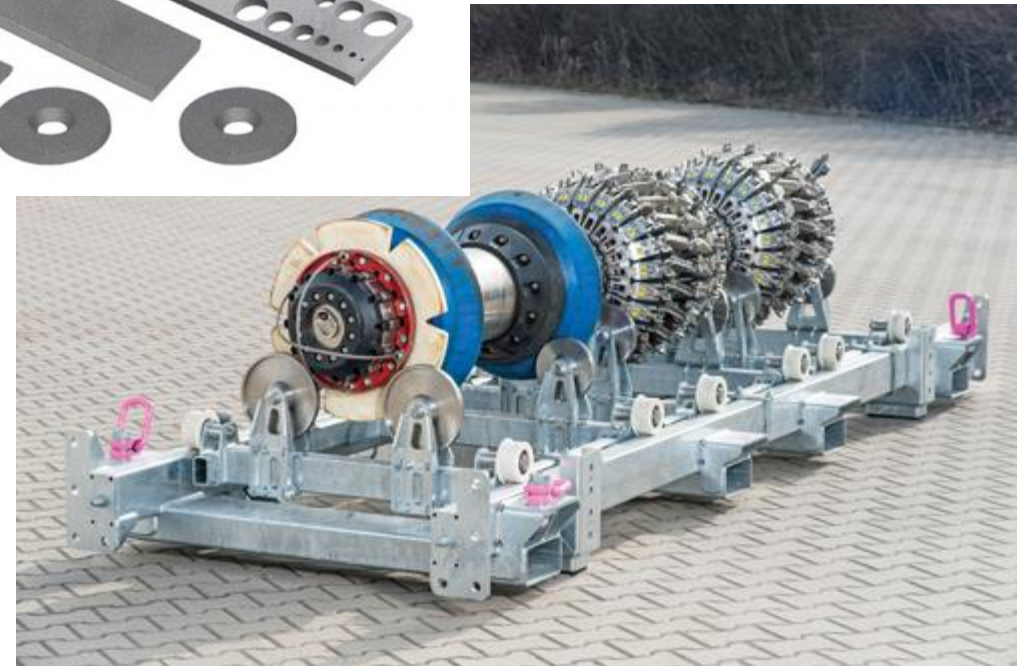
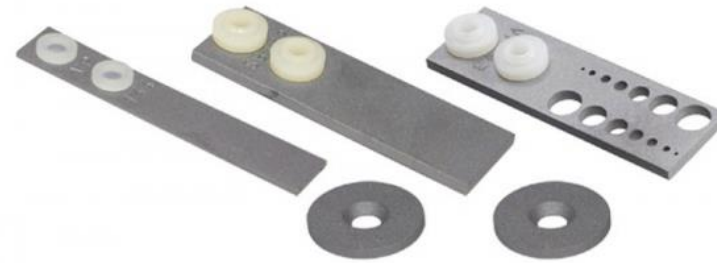
What can we do?

Reactive techniques

- In-Line Inspection
- Hydrotest
- Corrosion Coupons or probes

Proactive techniques

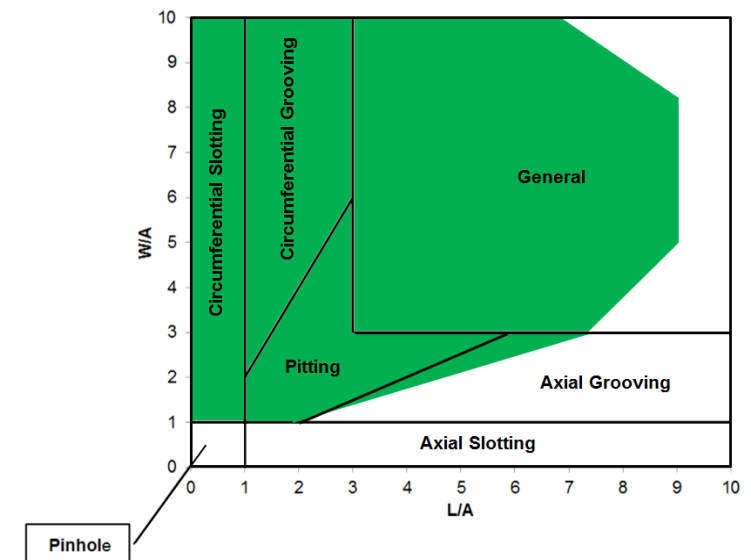
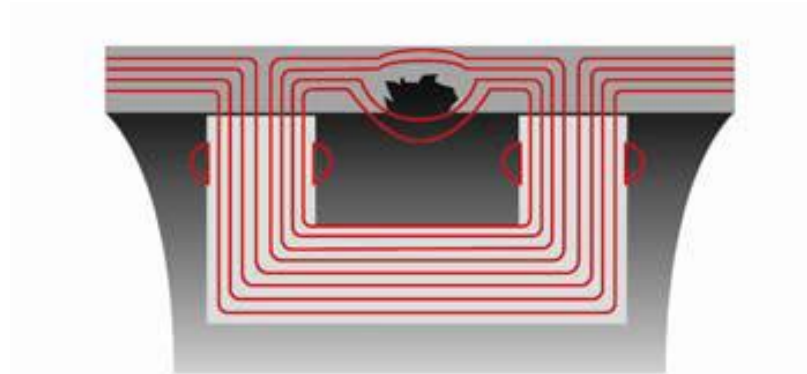
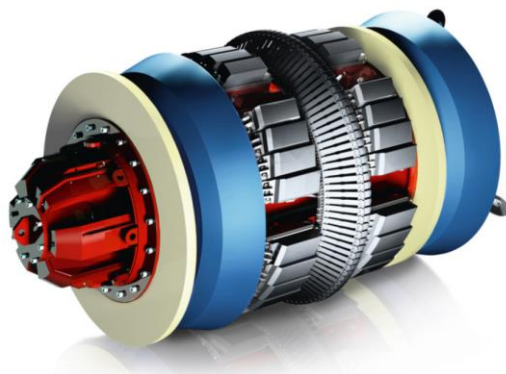
- Corrosion Risk Assessment (CRA)
- Risk Based Inspection (RBI)
- **Internal Corrosion Direct Assessment (ICDA)**



CORROSION MANAGEMENT

... IN-LINE INSPECTION?

- Regulatory pressure, has led to the **requirement for inspection**, particularly In-line Inspection (ILI),
- ILI is considered to provide one of the **most complete data sets** for pipeline integrity assessment.
- Repeat ILI identifies **corrosion growth rates** and allow for **planning** of maintenance, repair and other intervention activities
- Therefore reliance upon it has grown significantly.

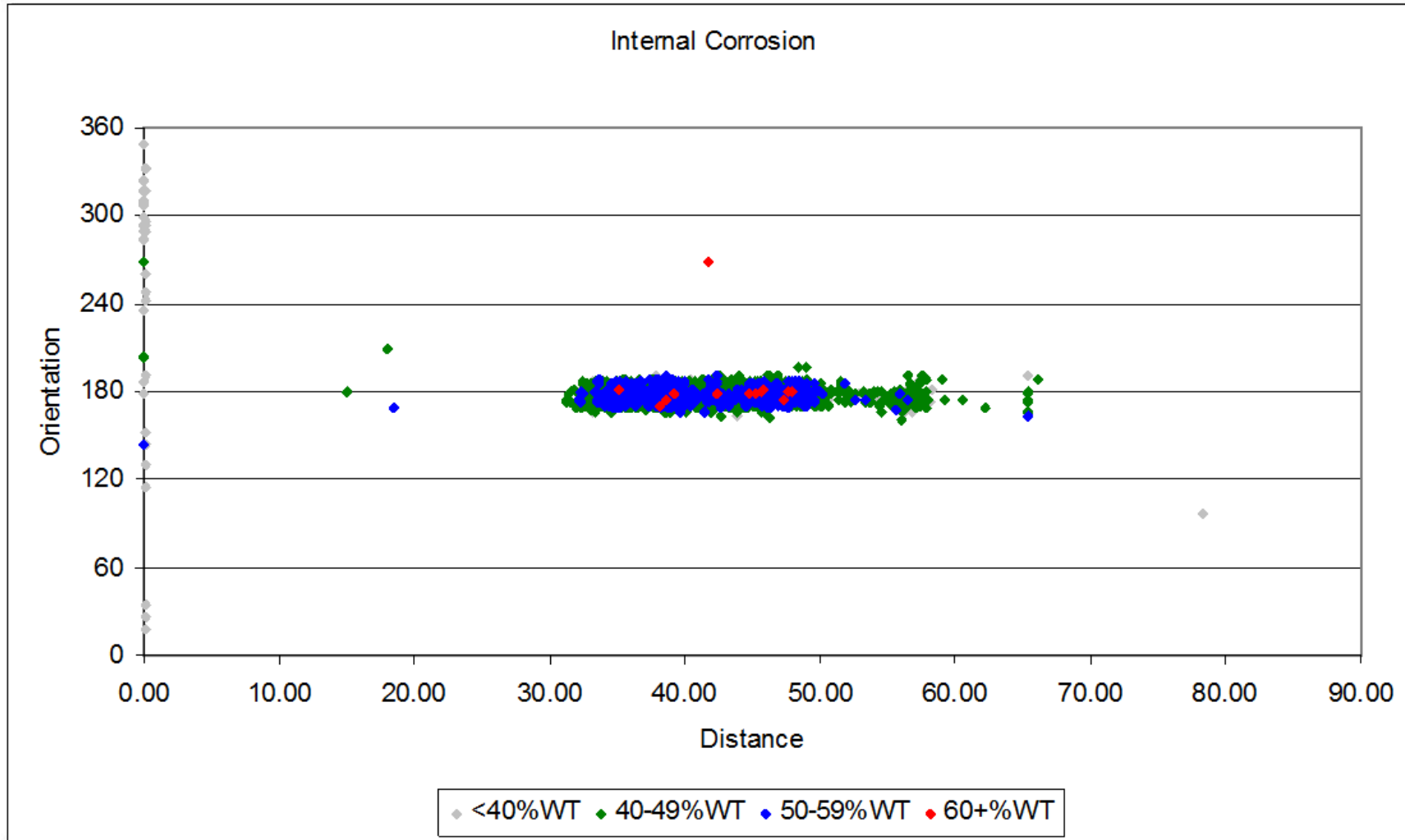


CORROSION MANAGEMENT

... ILI INSPECTION?

ROSEN

empowered by technology



- Why did this happen?
- When did this happen?
- **How can we stop it?**



CORROSION MANAGEMENT

... ILI INSPECTION?

However...

- It is ultimately a **reactive (or ‘lagging’) approach** to corrosion management,
- Integrity engineers are frequently faced with diagnosing and predicting corrosion with ILI data as the only reference source.
- Has the potential to provide a **false indication** of the prevailing and future situation if considered in isolation of other factors.
- Comparison of **repeat ILI can help with corrosion diagnosis**, but it does not scrutinise corrosion events and **only gives an average**.

THE DAMAGE IS ALREADY DONE!

CORROSION MANAGEMENT

... ICDA?

Internal corrosion Direct Assessment is ...

Targeted inspection of specific locations at a higher perceived corrosion threat

No one has considered combining ILI with ICDA ... Why?

- If a pipeline can be subjected to ILI, then there it is considered there is no reason to perform ICDA.
- If the pipeline is subject to ICDA, then it is because ILI cannot be conducted

Within the industry there is **a resistance to employ ICDA** and revert to ILI as ICDA is considered unreliable.
In many cases reliability of ICDA has been **compromised by**:

- Data quality
- None qualified personnel
- Inadequate use of modelling tools
- **Lack of experienced SME**

CORROSION MANAGEMENT

... CASE STUDY



empowered by technology

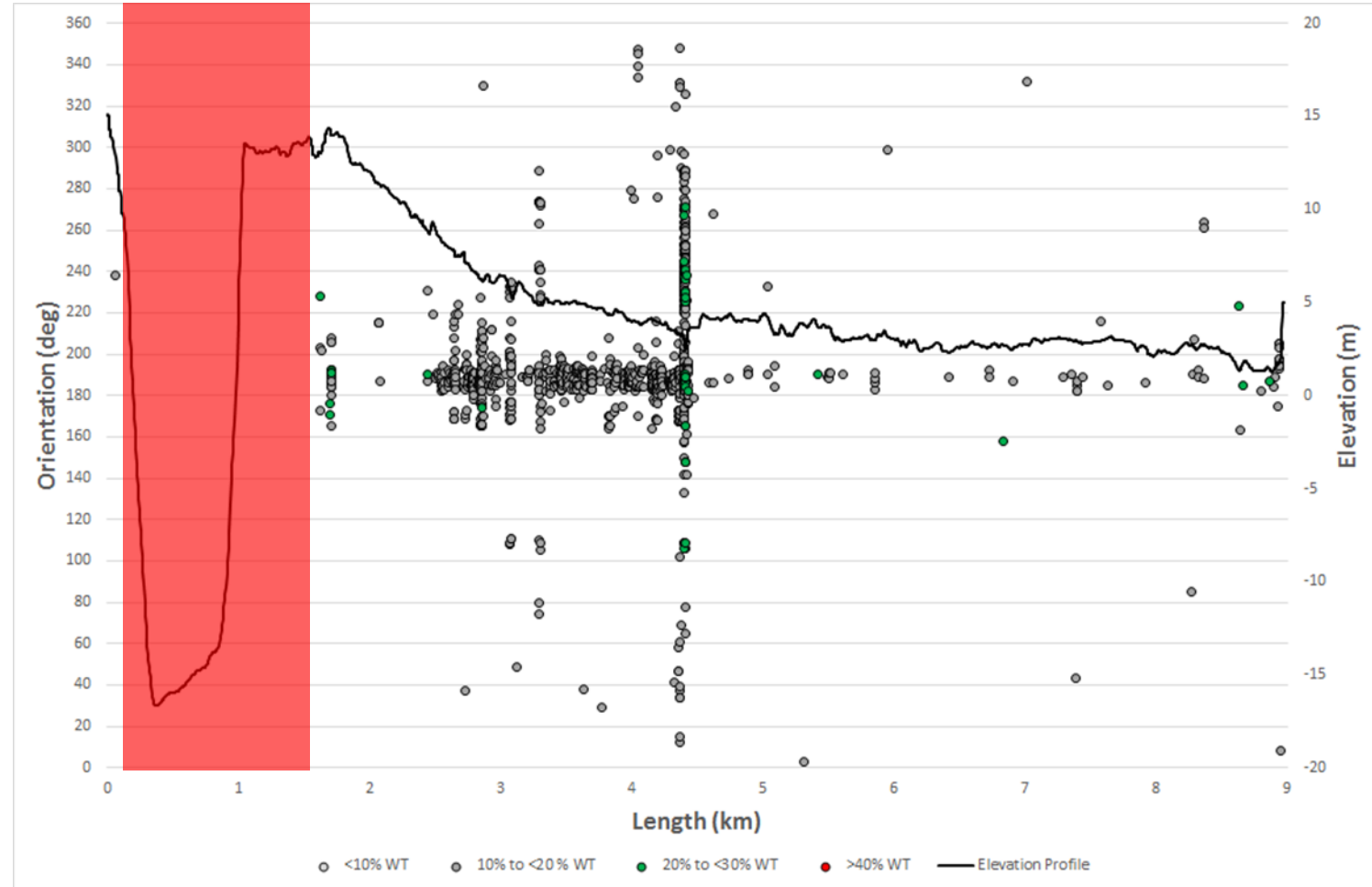
Inspection data from a “Dry Gas” pipeline...

No Data from ILI in the Red area

- Tool velocity excursions
- Poor magnetisation
- Inadequate cleaning

A re-run would have been required

However ICDA provided an alternative solution



CORROSION MANAGEMENT

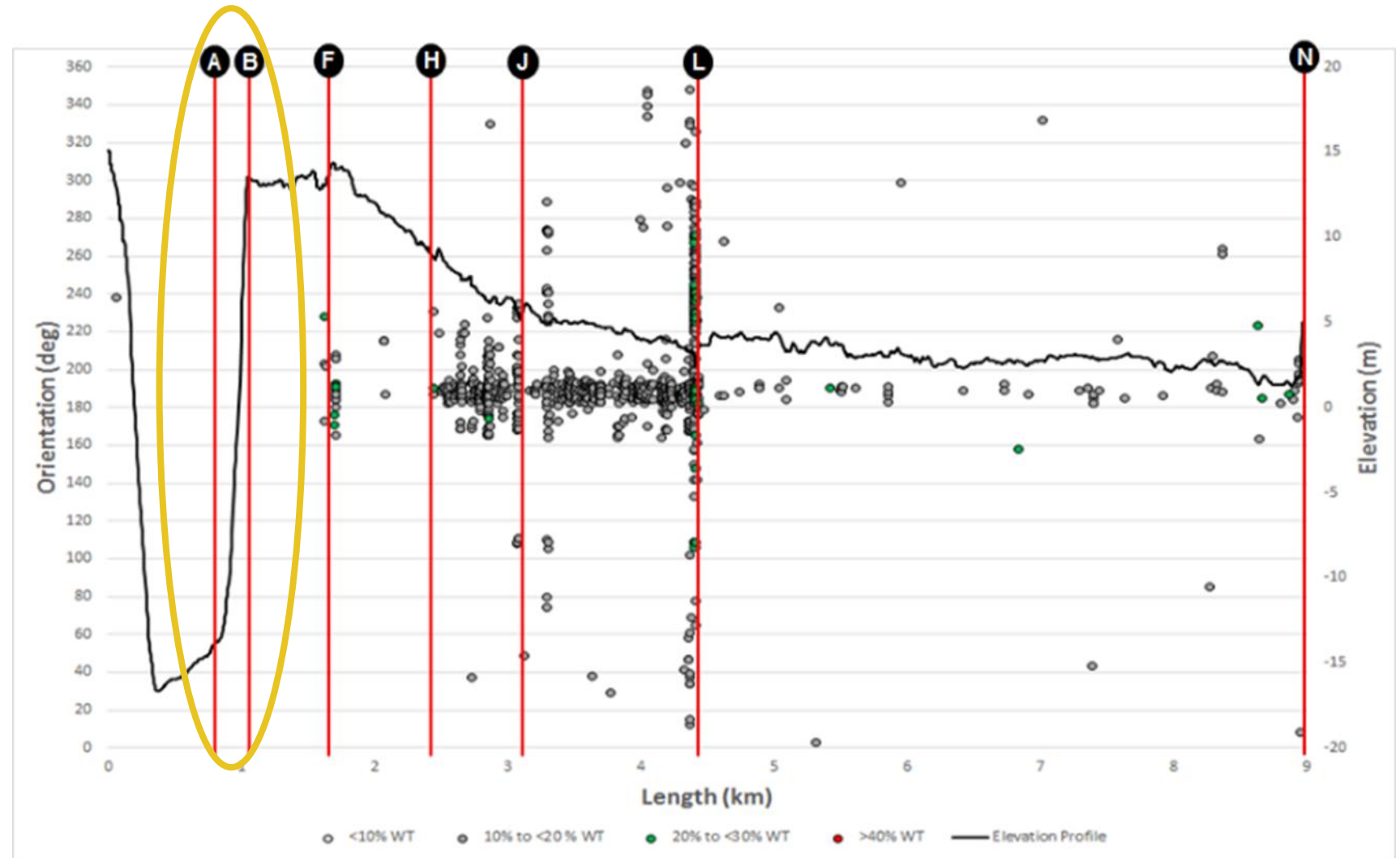
... CASE STUDY

ICDA process was benchmarked against the ILI data

ICDA error of 0.68% to the nearest deepest features

Analysis of modelling and ILI data allowed **extrapolation of corrosion growth**

- 0.18 mm/yr. measured by ILI in “similar” location
- 0.21 mm/yr. extrapolated by corrosion assessment to A and B



CORROSION MANAGEMENT

... A COMBINATION?

ICDA is an incredibly **powerful tool** when **combined with ILI**

- Move away from **reactive** approaches
- **Validation** of ILI – is it active growth or not?
- Accounts for **changes** in operation
- **Non-linear** growth
- Delivery of **mitigation** strategies
- Root Cause analysis (RCA)

Condition inference of uninspected sections using data from available inspections

Less requirement for re-runs ... less disruption ... less cost!





**THANK YOU FOR JOINING
THIS PRESENTATION.**
