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ILI Crack Tool Performance Evaluation (NDE-4E)

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PRCI NDE-4E
Crack Tool Performance

- Project Objectives
  - To collect, validate and store existing industry data on the measurement, characterization, assessment and repair of crack and crack-like features measured by ILI and field excavation techniques
  - To evaluate the performance, capability of different ILI technologies in detecting, identifying and sizing cracks and crack-like features
  - To characterize the inspection process through an investigation of the root cause of crack-related incidents where the pipeline was assessed using ILI crack detection technology before the failure occurred

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Summary

- 51,000 crack features from 80 ILI tool runs collected from 8 companies
- ILI performance was assessed as a function of remaining strength
  - Pipe strength combines length and depth and is relevant to integrity management
  - ILI and field measurements correlate better for pipe strength than for length or depth individually
- Rate of detection increases with increasing feature size
- Field measurement precision and accuracy are critical to ILI performance evaluation
  - Feature profiles were used when possible
  - Depths measured by grinding and remaining wall thickness were used when possible

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Data Summary

Company ID	Features	Crack-Likes	Crack-Fields	Near Weld	> 25mm X 1mm	Profile Data
A	35,547	3,231	5,411	4,176	2212	0
B	10,983	459	10,039	652	2672	386
C	683	59	7	0	23	0
D	133	85	9	18	49	19
E	467	117	8	346	19	0
F	69	25	1	0	6	0
G	1,058	210	712	0	104	0
H	1,806	936	401	177	389	0
TOTAL	50,746	5,122	16,588	5,369	4,684	405

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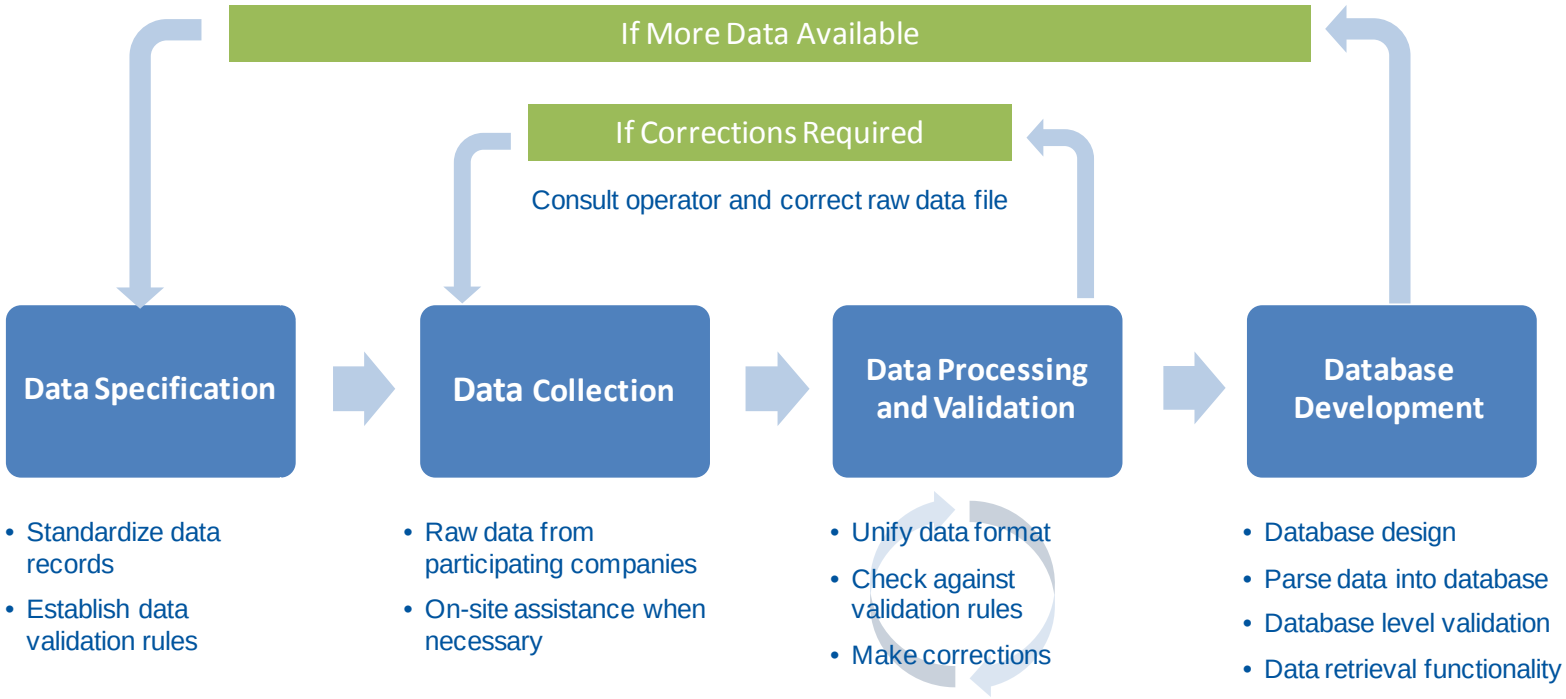
Data Management Process



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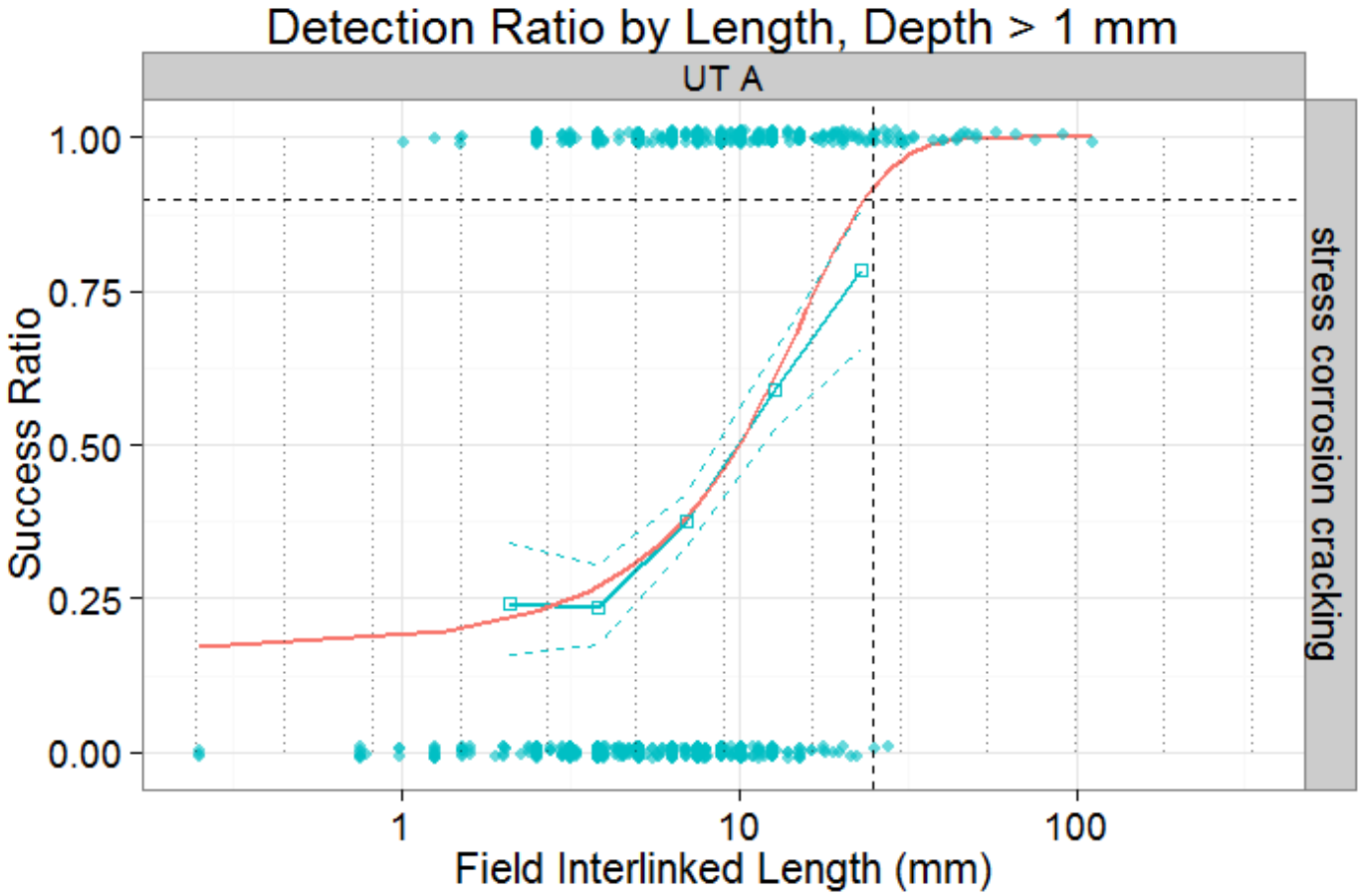
Rate of Detection



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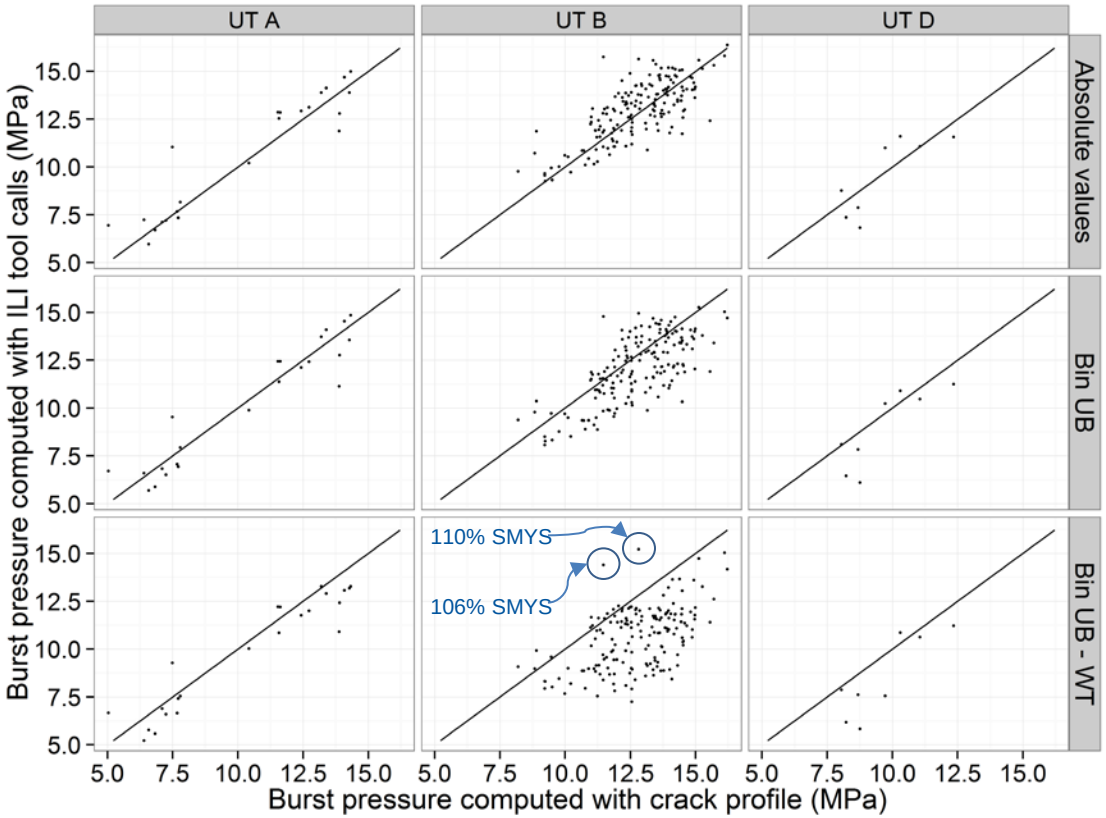
Burst Pressure Plots



Calculated using absolute ILI depth values

Calculated using depth category upper bound

Calculated using depth category upper bound and WT measured by ILI tool

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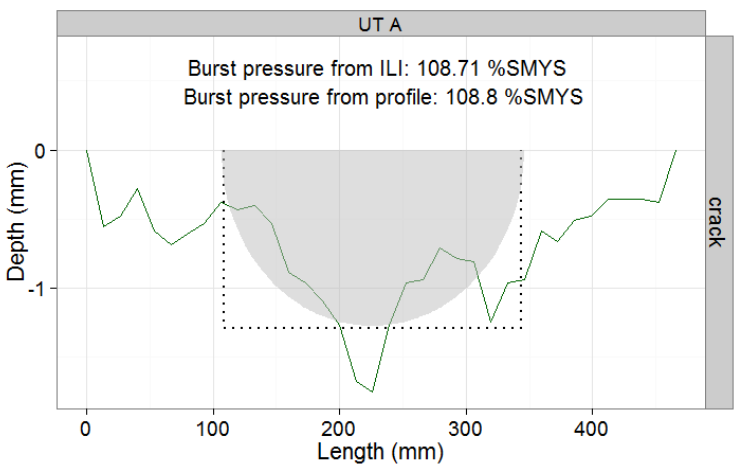
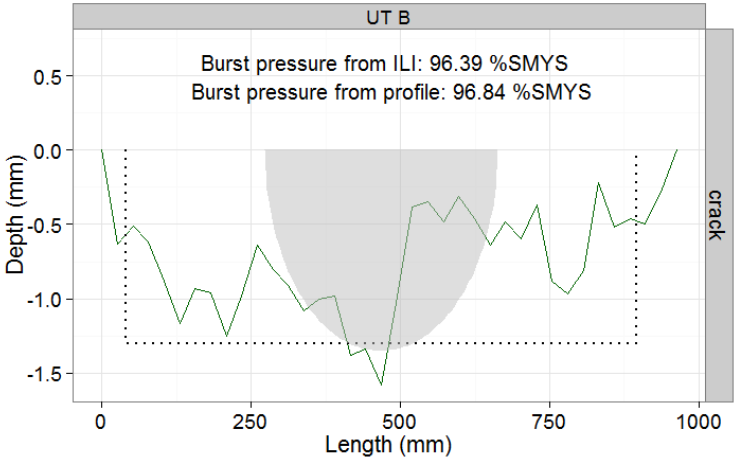
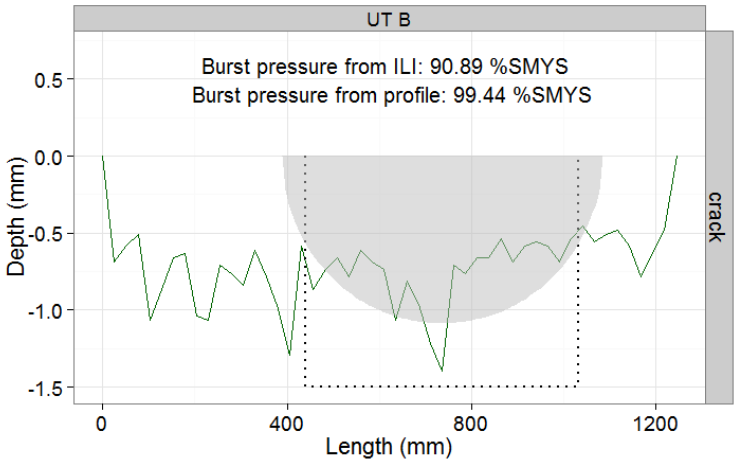
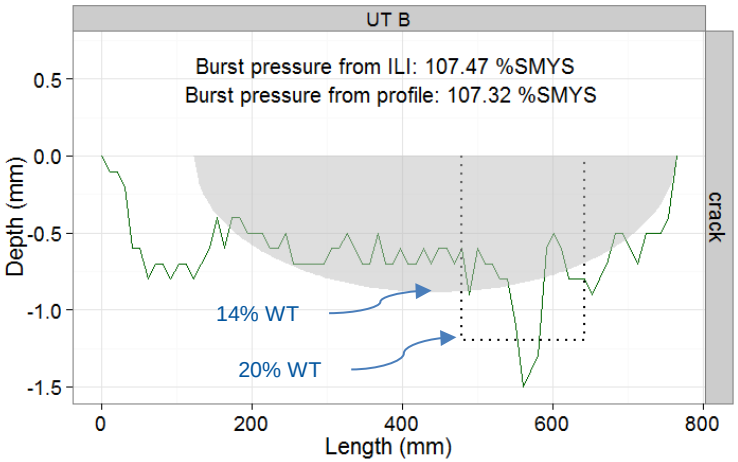
Example Profiles









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Conclusions

- A database was selected for long-term industry-wide data storage on ILI and field measurements.
- Data validation is a critical element in the analysis process to ensure data is consistent, accurate and complete.
- The correlation between ILI and field measurements are improved when:
  - assessing burst pressures rather than length or depth individually
  - more detailed field data is used (profiles vs maximum depth and length)
  - there is higher confidence in the field measurements (grind + UT)
- ILI crack sizing can conservatively estimate burst pressure when conservative assumptions are used.
- Rate of detection increases with increasing feature size
- Tool performance varies by tool and is affected by run-specific conditions and should be studied after every ILI tool run.

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Questions

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