



PHMSA R&D Forum
Cleveland, OH
November 2016

SOME CURRENT PERSPECTIVES

Bryce Brown
Group Strategy Management
The ROSEN Group

ROSEN
empowered by technology

CONTENT

- Motivation
- Metal Loss
- Crack/Crack-Like
- Materials
- Data Analysis/Reporting
- Field Verification
- Collaboration

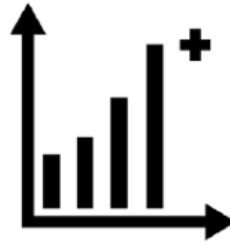
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THE MOTIVATION



Safety & Compliance



**Asset
Performance & Efficiency**



Asset Lifetime

Safe, Reliable, Economic operation

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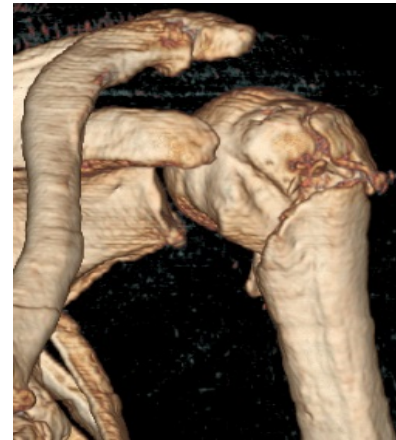
METAL LOSS

Similar constraints have prevailed in medical imaging ...

X-Ray



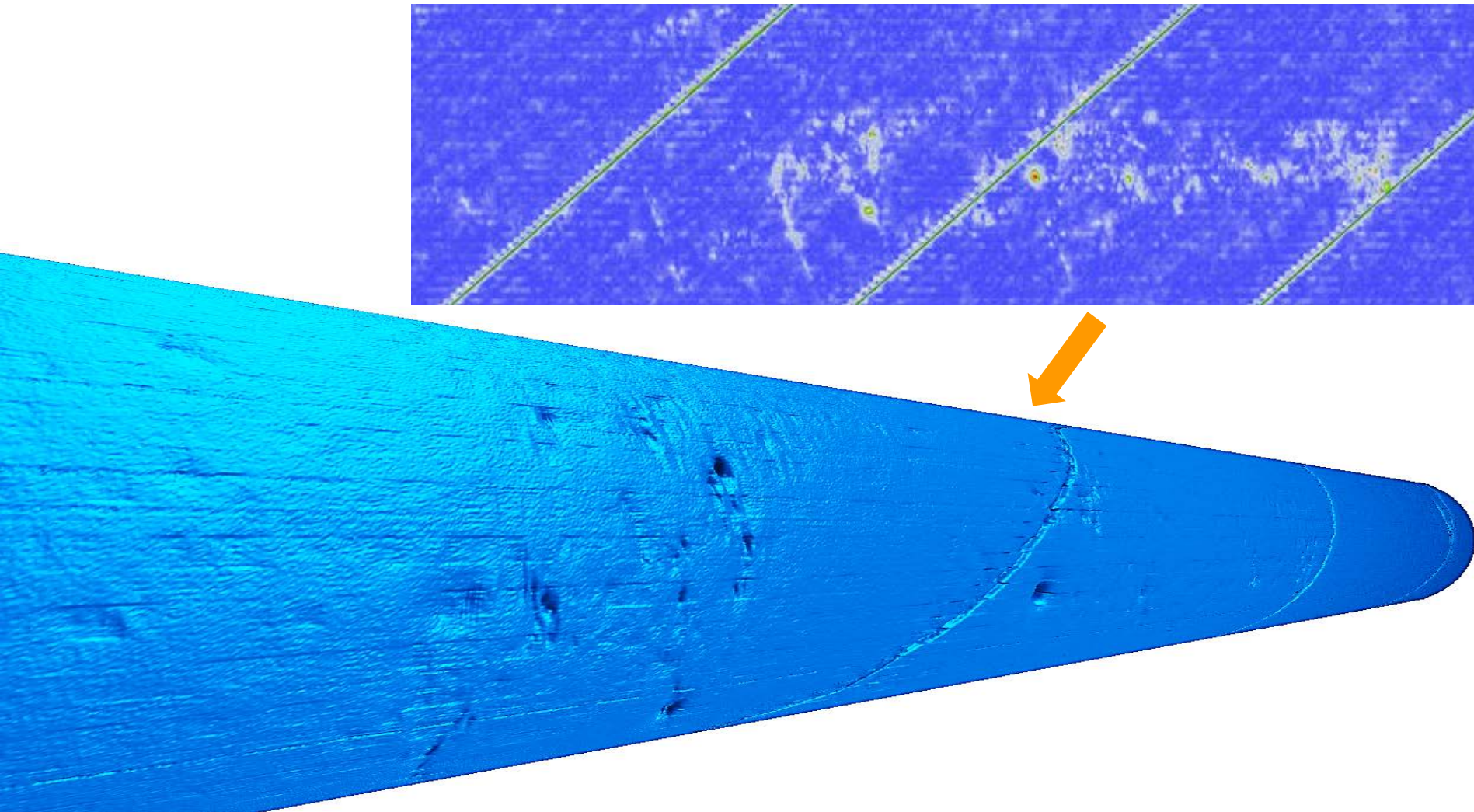
3D CT



... until these were resolved by a step change in technology.

METAL LOSS

... and with MFL



MFL STEP CHANGE

ILI provides data points and line plots ...

... with increased resolution, now delivers realistic Pipeline Imaging

- Increased resolution
- Triaxial
- Improved sensor suspension,
(optimized girth weld passage)



Pipeline Imaging close to that of Laserscan:

1.6mm (0.06") circum. spacing x 1mm (0.04") axial sampling rate

MFL
Step Chg.
1.6mm

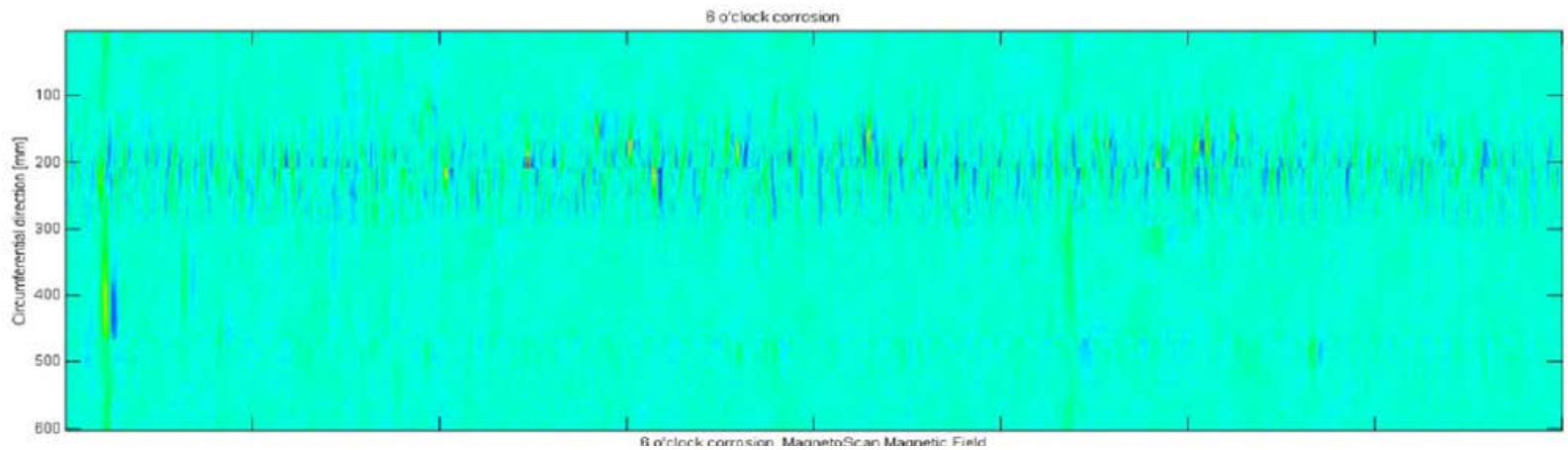
MFL
High Res.
4-6mm

UTWM
Pitting
4mm

Laserscan
report
1mm

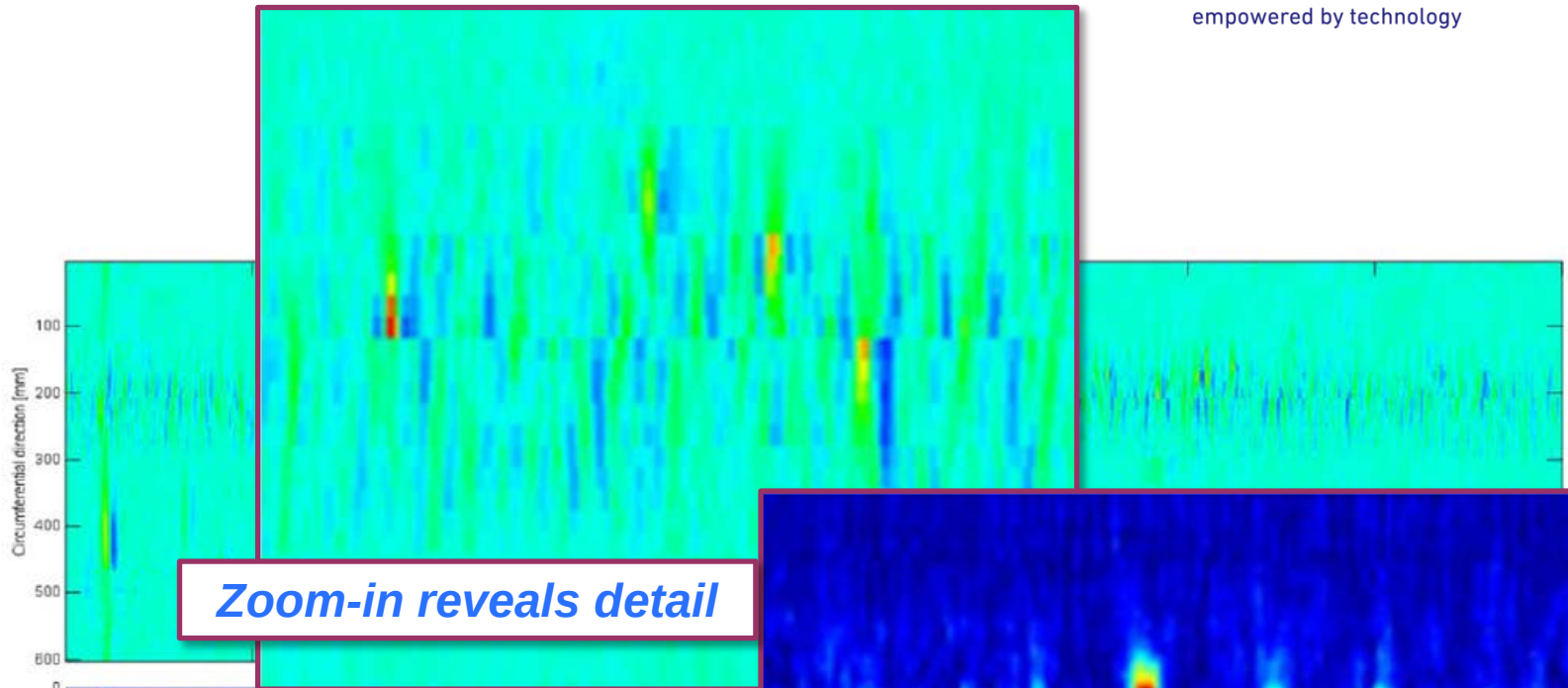
SOLUTION – INCREASED RESOLUTION

Current
MFL



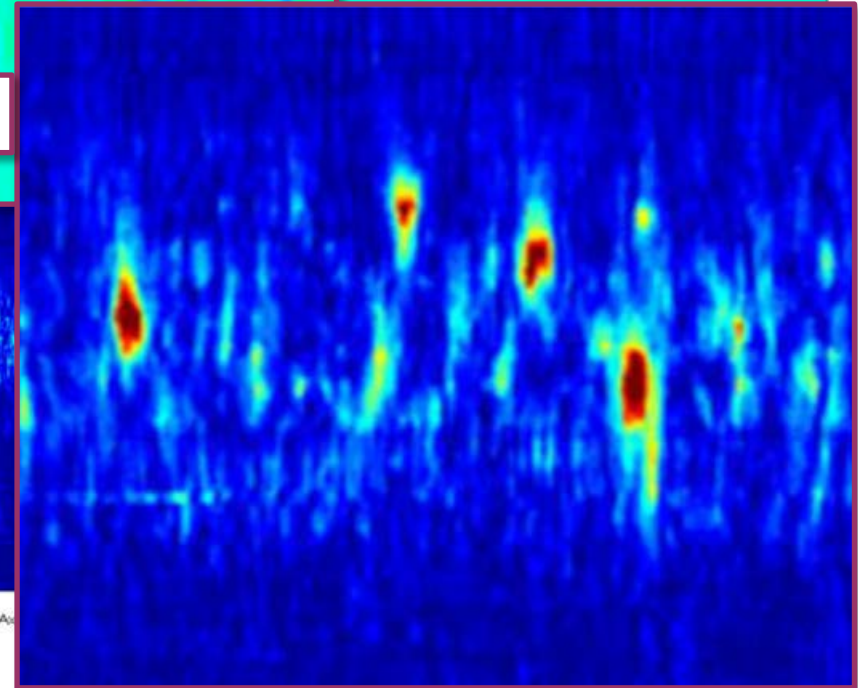
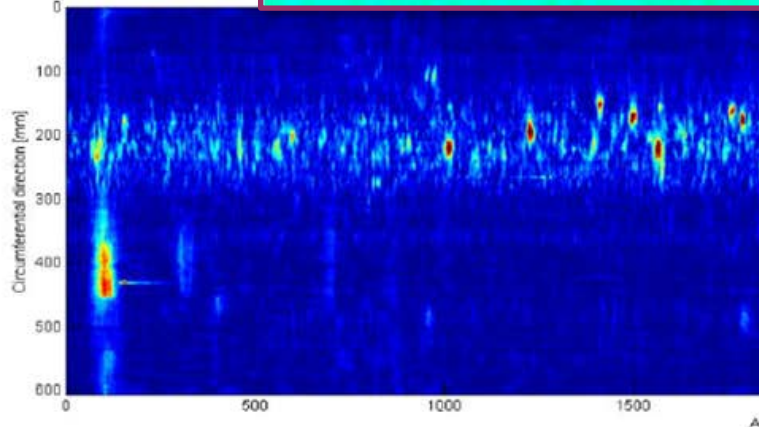
SOLUTION – INCREASED RESOLUTION

Current
MFL



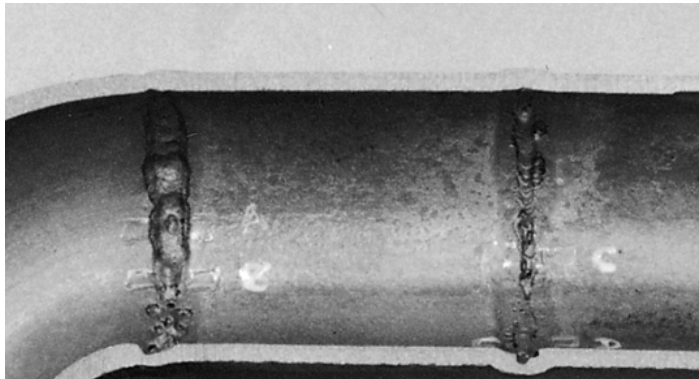
Zoom-in reveals detail

Step
Change



Necessary improvements to High Resolution MFL to inspect for, analyze and characterize certain anomaly/defect types:

- Pinhole anomalies/defects
- Complex corrosion anomalies/defects
- Girth Weld anomalies/defects

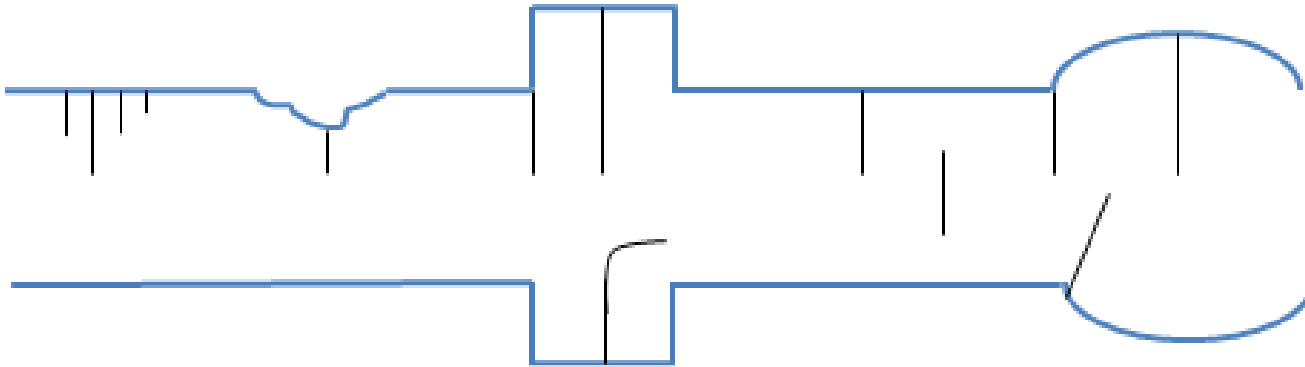


- Further enabled pressure based assessment and other integrity analyses
- Enhancing the ability to reduce the number of digs

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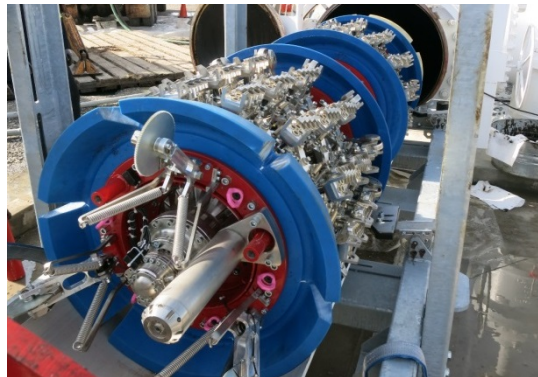
CRACK/CRACK-LIKE



EMAT



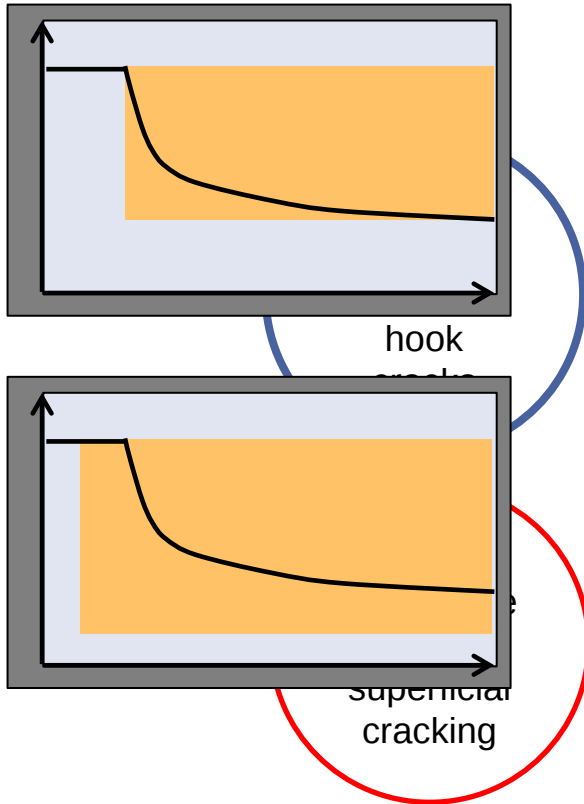
UTCD



MFL-C



CRACK/CRACK-LIKE IDENTIFICATION PROCESS



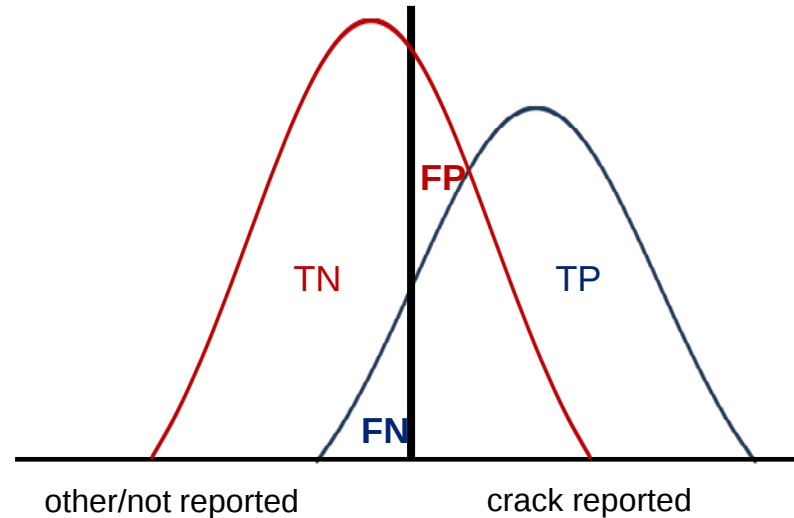
Inspection Report

other/not reported

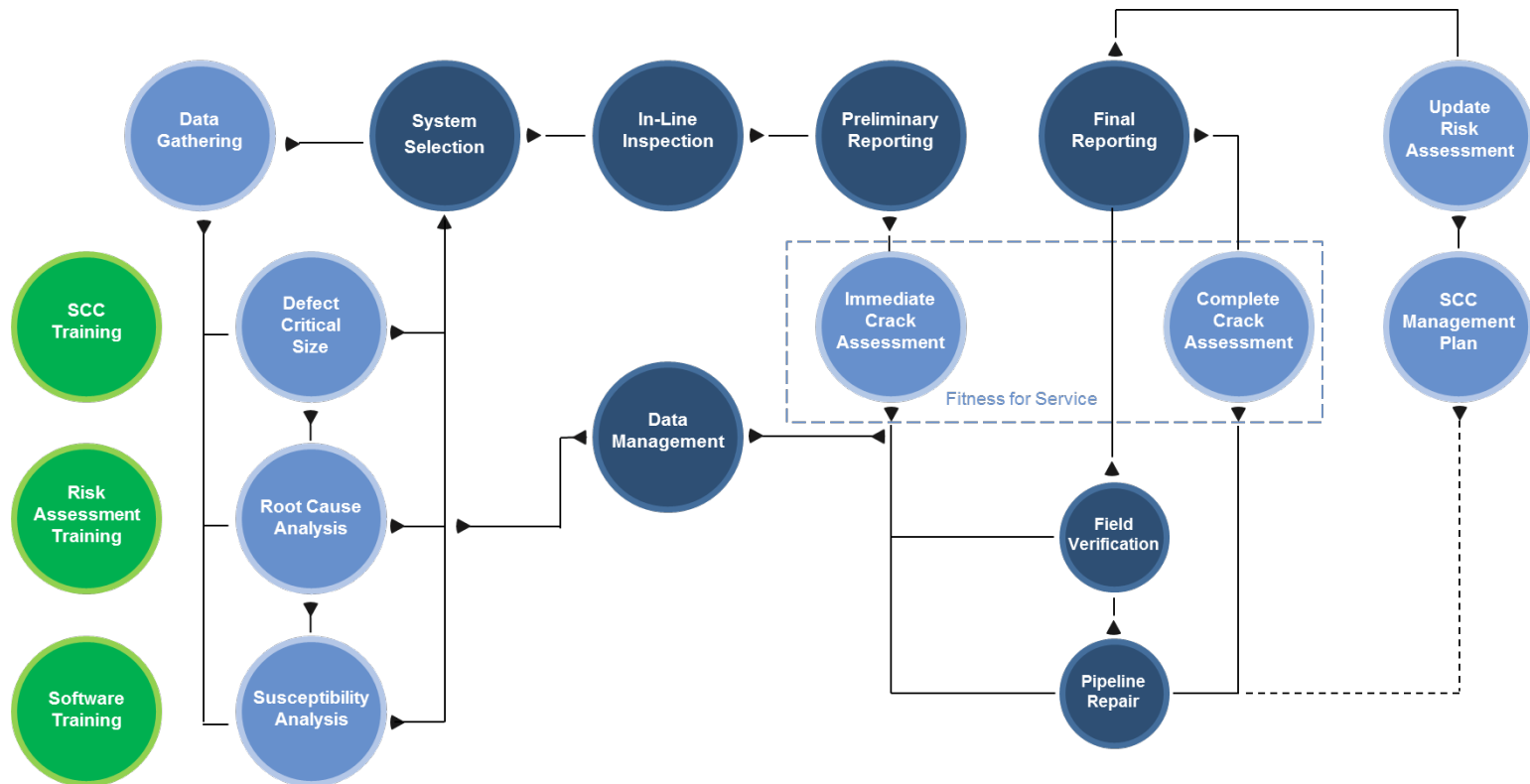
crack reported

CRACK/CRACK-LIKE IDENTIFICATION PROCESS

- conservative analysis
- pipeline specific reporting threshold
- assurance of crack types
- 360° field verification
- combined technologies



FRAMEWORK FOR CRACK ASSESSMENT

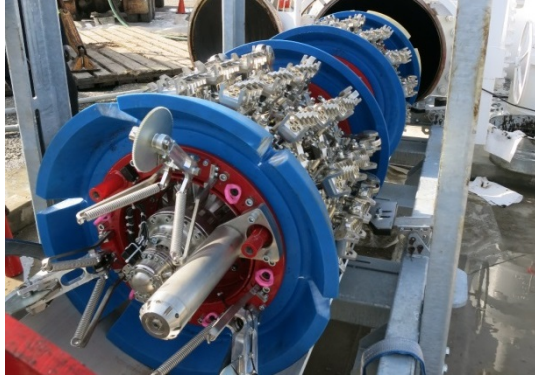


CRACK/CRACK-LIKE

EMAT



UTCD



MFL-C



Tendency in the industry is run a combination of a crack detection technology and magnetic flux leakage metal loss technology for a significant improvement of POI.

From Classification based sizing ...

... to Depth based sizing ...

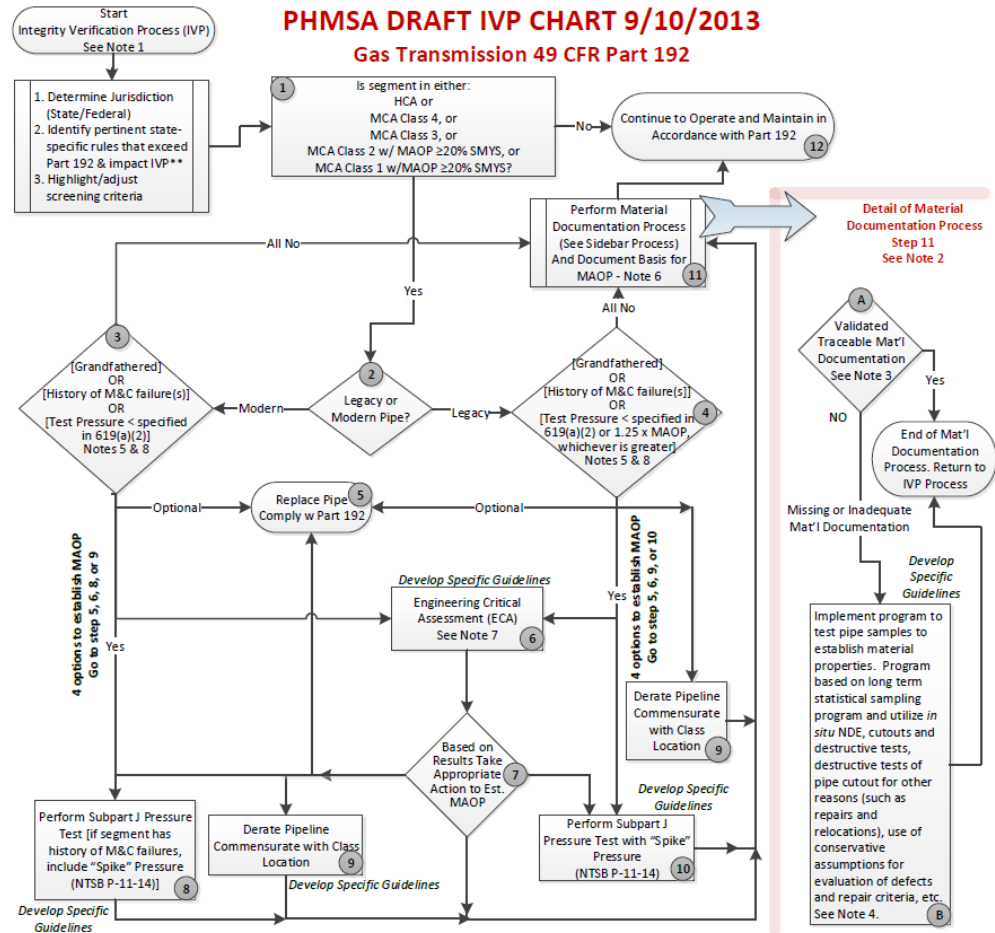
... what's next?

[e.g. “river-bottom” profile?]

CONTENT

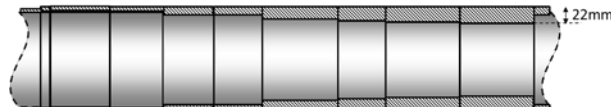
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Focus is on “Step 11” and validating/establishing Material Documentation.

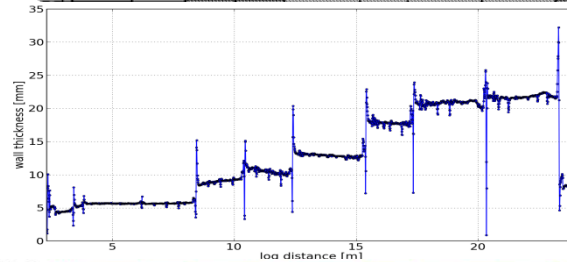


MATERIALS – FROM ILI, PIPE GRADE DETERMINATION

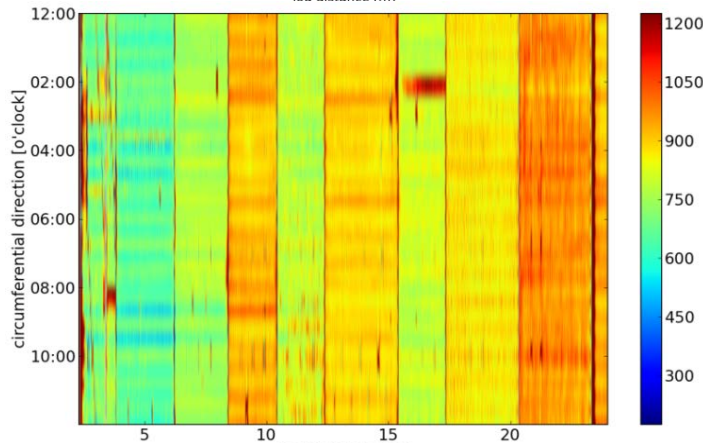
Schematic view



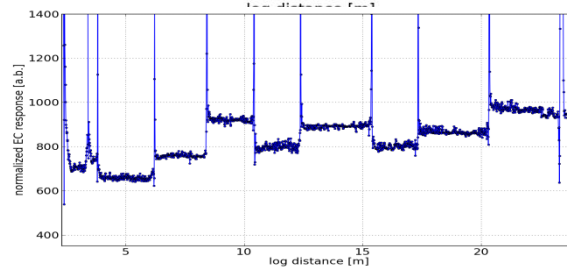
WT measurement
from MFL



Pipe Grade ILI
Color Scan



Median in
circumferential
direction of
Pipe Grade ILI



performance pull tests

Pipe Grade ILI response
clearly independent from
WT

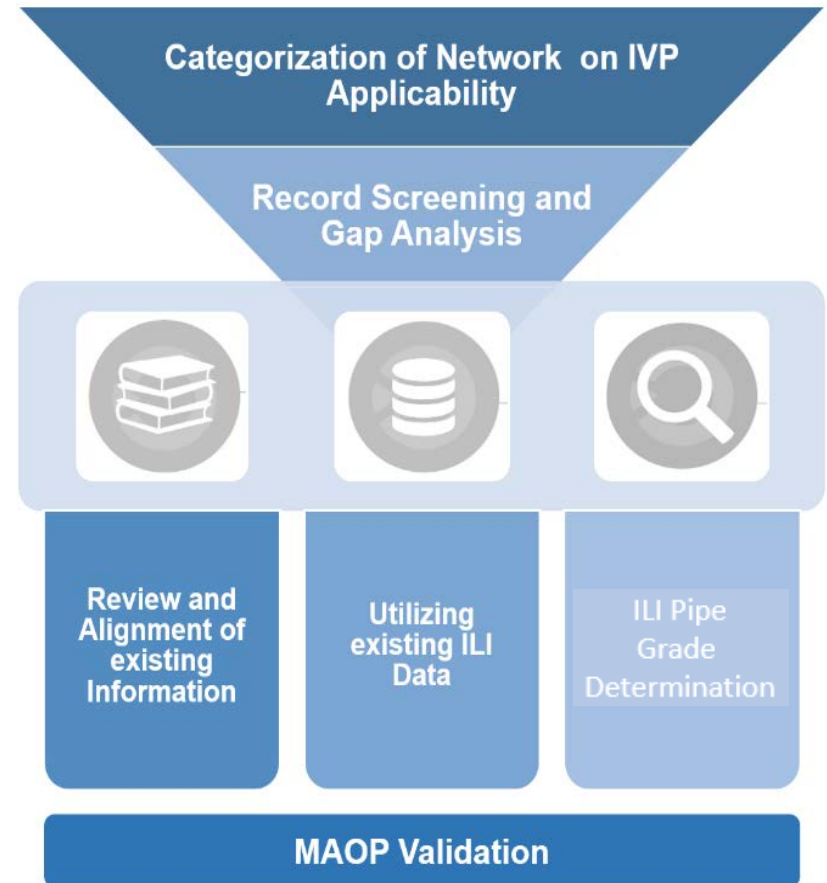
MATERIALS - INTEGRATED APPROACH

Gap Analysis:

- Categorization of Pipeline Network for Pipelines applicable to IVP process.
- Screening of Pipelines for records available and verified for MAOP validation process.

Closing the Gap:

- Data Collection, Integration and Alignment of available records.
- Extended data analysis routines and processes on conventional ILI technologies to potentially retrieve more out of historical ILI's.
- Pipe Grade ILI, determination of those lines missing the yield strength.



(Reliable) Verifiable, Traceable, Complete

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Focused utilization of Neural Network/Machine Learning

- Significant step changes for the common ILI data processing/analysis.
- Coming very close to elimination of human factors/errors.
- Applying Neural Networking to process huge amounts of data in seconds.
- Applying pattern recognition algorithms to identify and cluster anomalies and installations while automatically eliminating false calls.
- Integrated machine learning ensures continuous improvement process with each performed data analysis.
- **Delivery of Comprehensive Results within a few days** (currently for MFL).
- Mind-set change.
- Standardized Reports?

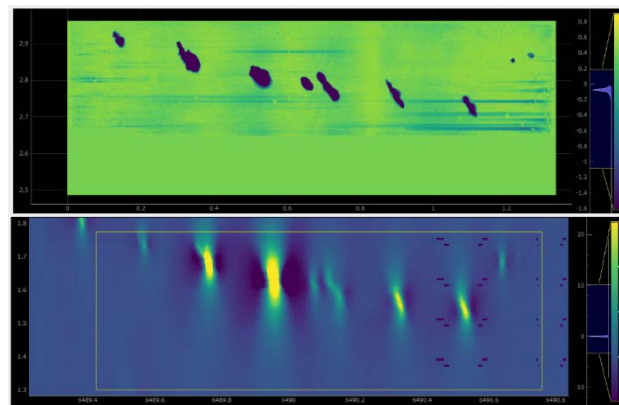
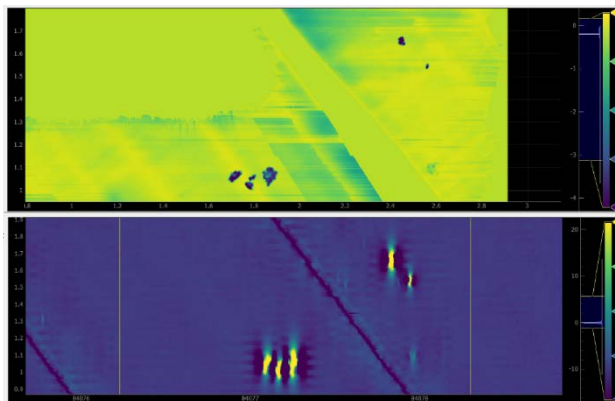


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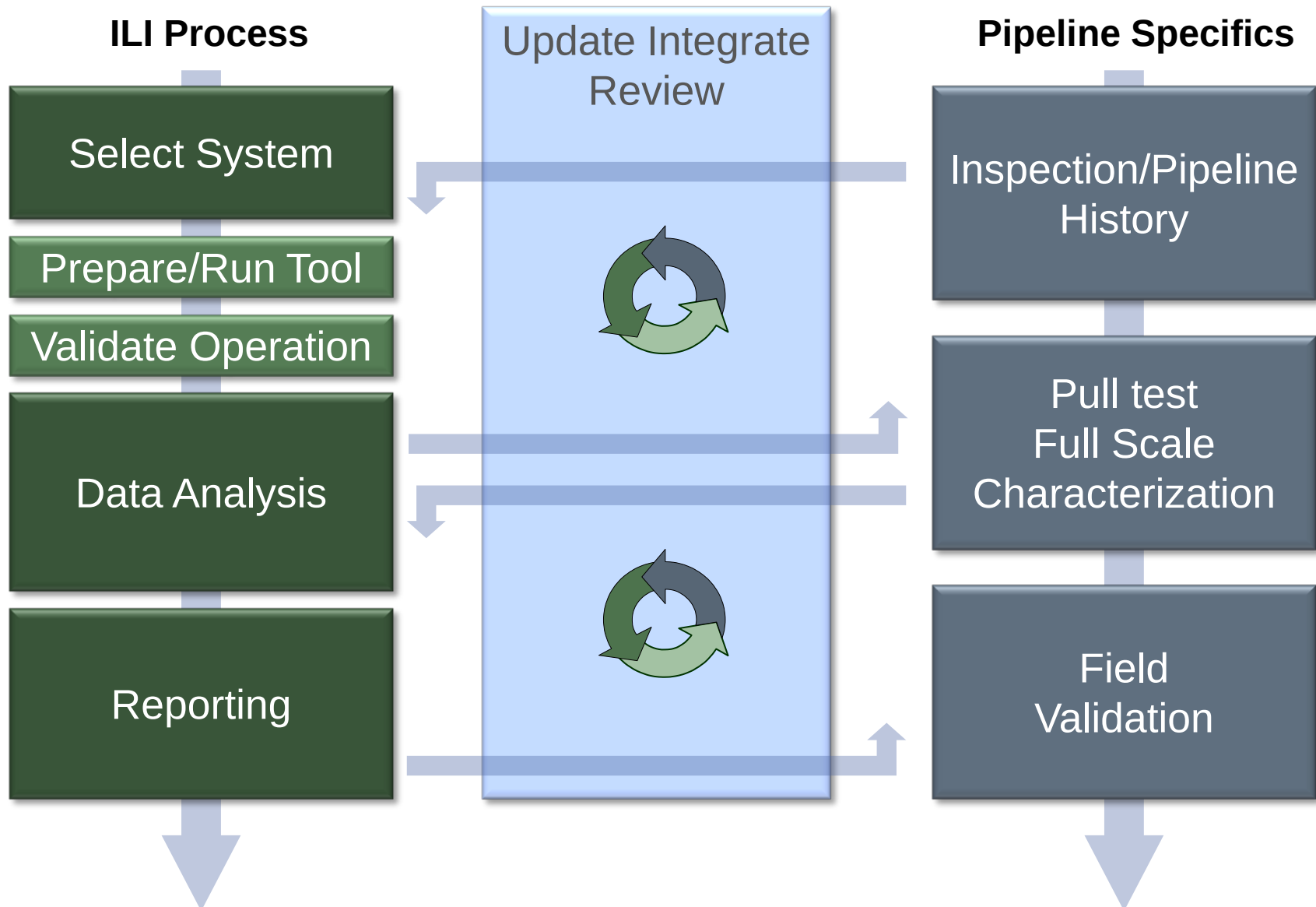
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Increased significance placed on Field Verification Activity

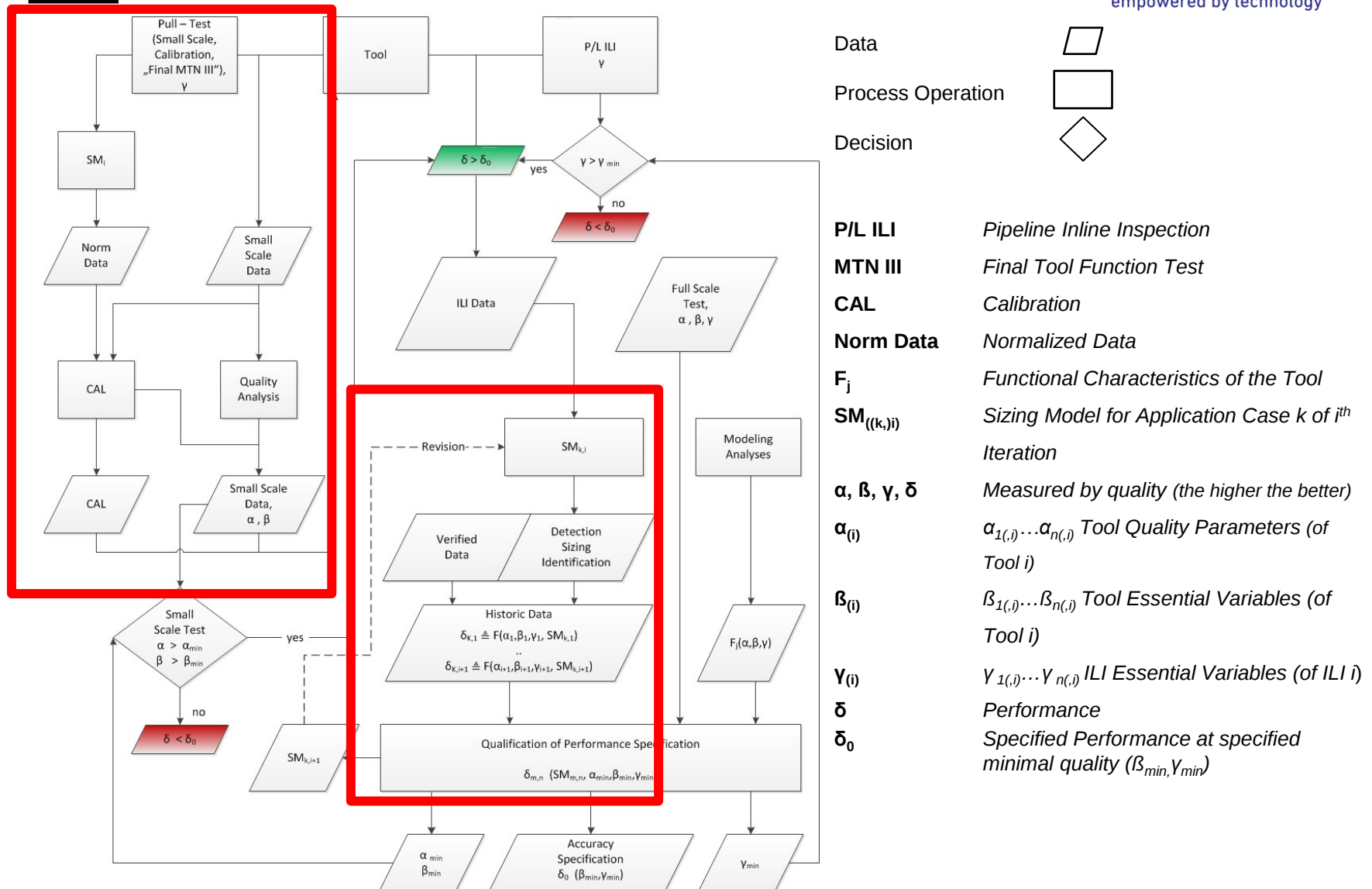
- Understanding quality of ILI reported results
 - Adaptation for improved characterization (continuous improvement)
- Advanced NDE technologies being employed
 - Some destructive testing, in addition
- Written practices (standards) needing to be developed
- NDE Technician qualifications being questioned/reviewed (competence)
- Validating the ILI Performance in the specific pipeline
- Robustness of Machine Learning database
- Consideration of “Sharing the Data”, next step



QUALIFICATION OF PERFORMANCE SPECIFICATION



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COLLABORATION

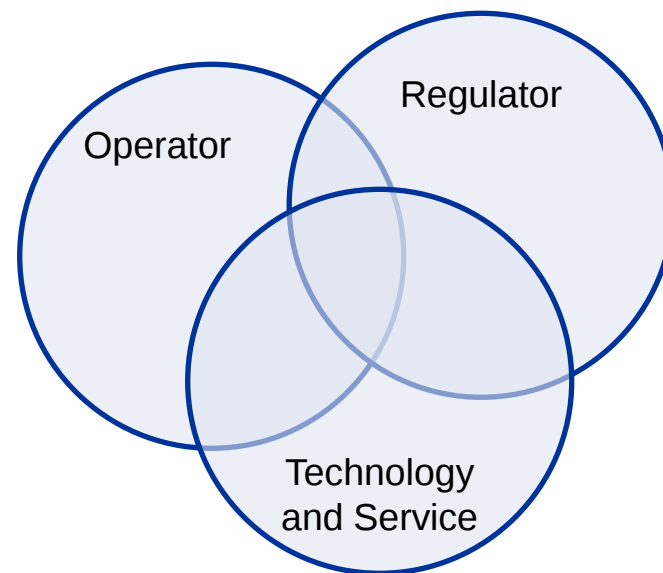
Collaboration is vital to success.

- Customer, Project and Market driven
- Establish relationship, understand needs (wants), capabilities (limitations)
- Validation of Technology
 - Performance Testing
- Specific Developments (to the threat and/or pipeline)
- Establishing Confidence (with Transparency)



Collaboration is vital to success.

- Continuous Improvement
- Field Verifications
- Increased Feedback
- API 1163 (process ⇔ application)
- Supporting Industry (AGA, API, INGAA)
- Participating in Industry R&D (PHMSA, PRCI)
- Understand Gaps (access to data)
- Study Gaps with appropriate simulations
- Develop Process/Framework





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**THANK YOU FOR JOINING
THIS PRESENTATION.**

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www.rosen-group.com

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