

Pipeline Mechanical Damage Assessment



A HIGHER LEVEL
OF RELIABILITY®



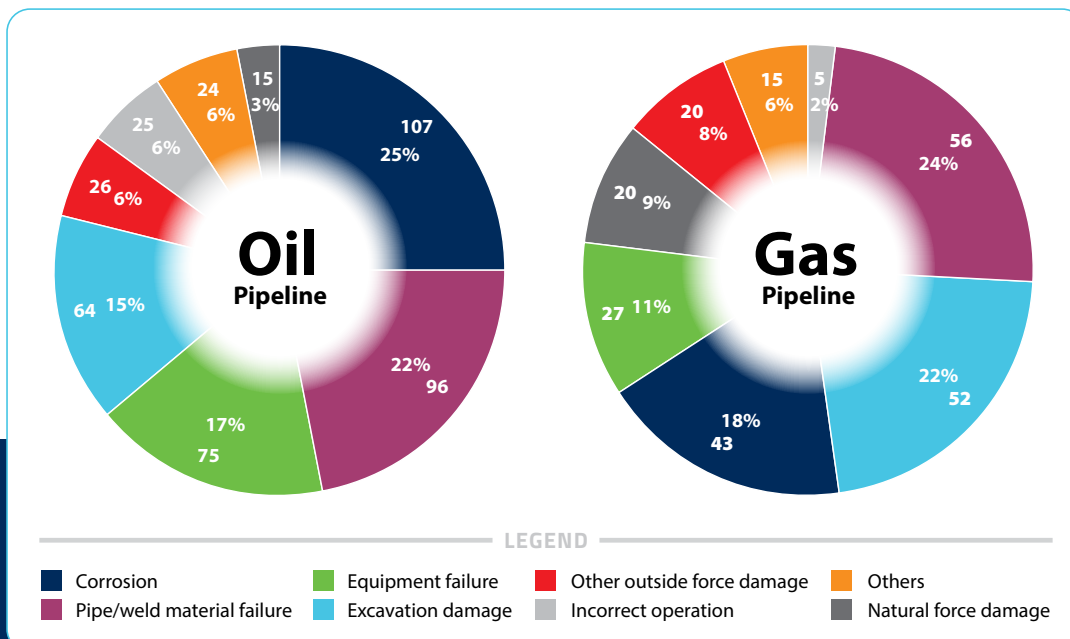
PIPELINE MECHANICAL DAMAGE ASSESSMENT

PHMSA DOT has reported that excavation damage played a major role in pipeline incidents from 2000 - 2008. Subsequently, from 2010 - 2015 up to 22% of pipeline incidents were related to the third-party excavation damage according to a recent work published in the journal of Petroleum Engineering. 432 crude oil and 238 natural gas lines failures were analyzed and it was determined that in addition to corrosion and pipe material/weld failure, excavation damage was a leading contributor to pipeline failures.

Regulatory requirement and significant percentage of failures due to excavation damage highlight the importance for owners and operators to accurately assess all types of pipeline mechanical damage such as complex shape dents, gouges, and dent with gouge or crack as well as other forms of pipeline deformation including wrinkles, ripples, and buckles.

Causes of Serious Pipeline Incidents - All Pipeline Systems (PHMSA 2000-2008 data) (Leading Cause Category Highlighted)									
Cause Category	2000	2001	2002	2003	2004	2005	2006	2007	2008
Corrosion	8.1%	7.5%	5.6%	0.0%	6.3%	4.9%	8.6%	6.4%	5.3%
Excavation Damage	32.3%	42.5%	33.3%	50.8%	18.8%	19.5%	31.4%	27.7%	18.4%
Human Error	6.5%	7.5%	13.9%	6.6%	12.5%	19.5%	5.7%	4.3%	7.9%
Material Failure	11.3%	2.5%	11.1%	8.2%	10.4%	2.4%	2.9%	2.1%	5.3%
Natural Force Damage	4.8%	7.5%	0.0%	4.9%	12.5%	4.9%	2.9%	2.1%	2.6%
Other Outside Force Damage	0.0%	0.0%	2.8%	4.9%	14.6%	26.8%	25.7%	19.1%	23.7%
All Other Causes	37.1%	32.5%	33.3%	24.6%	25.0%	22.0%	22.9%	38.3%	36.8%
Total No. Incidents	62	40	36	61	48	41	35	47	38

Taken from PHMSA DOT report at: <https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/technical-resources/pipeline/gas-distribution-integrity-management/65991/mechanicaldamagefinalreport.pdf>



Dai, Frank & Wang, Dongpo & Wang, Ting & Feng, Qingshan & Yang, Xinqi. (2017). Analysis and Comparison of Long-Distance Pipeline Failures. Journal of Petroleum Engineering. 2017. 1-7. 10.1155/2017/3174636.



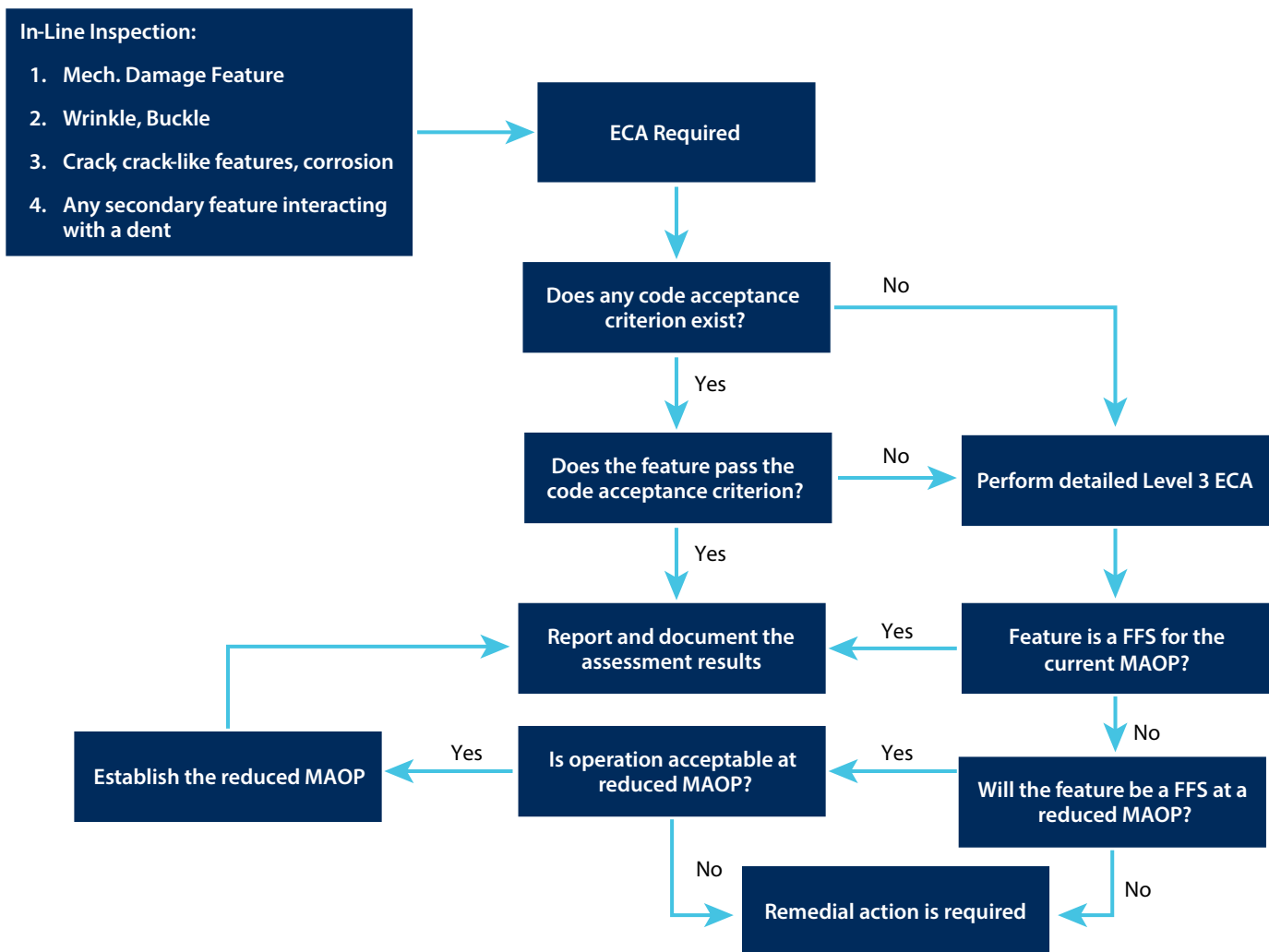
Acuren's pipeline mechanical damage assessment solutions are part of our Fitness-for-Service program designed to demonstrate the structural integrity of an in-service component.

Acuren's in-house FE modeling tool is validated against a wide range of full-scale test data and is compliant with the requirement for advanced Level 3 numerical analysis as specified by API-579 FFS.

Acuren leads the industry as the one true supplier that can be the **single turnkey vendor** to execute a comprehensive FFS program.

Our integrated program and diverse offerings make us the only provider needed to identify problems and provide solutions. Acuren provides Level I and II assessments in accordance with the applicable codes/standards. When mechanical damage features cannot be assessed using a Level I or Level II assessment, our advanced Level III FE assessment is deployed. Many field dents need Engineering Critical Assessment (ECA) in accordance with the applicable local jurisdiction. Acuren can issue ECA reports for our clients in accordance with the regulatory requirement. We also support our clients with training courses on engineering assessment of pipeline mechanical damage.

Our process is positioned to support our partners every step of the program.



OUR EXPERTISE

Our engineers are leading industry experts with vast experience and involvement in past research and service projects. Acuren supports our clients in areas that current industry practices are not capable of addressing such as complex shape mechanical damage features with complex loading.

Acuren's detailed Level 3 assessment incorporates in-depth knowledge of continuum mechanics, dent deformation mechanism, and nonlinear FE analysis. Our integrated engineering expertise allows our experts to use burst, fatigue, and fracture analysis when dents are found close to or at secondary features such as weld, gouge, crack, or corrosion.

WHY ACUREN?

- Acuren employs a cohesive team of engineers, scientists, technologists, and technicians with expertise in a wide spectrum of engineering disciplines
- Advanced analysis techniques save clients time and money in avoided repairs, reduced business interruption and improved reliability
- Field inspection services to verify the assessments when digs are performed.
- Provide solutions to improve operation and extend life of fixed equipment
- Deepest pool of expertise and solutions in the market
- In-house experts across all disciplines available through our North American network, eliminating the need to outsource
- Rather than simply reporting results, we lead the industry by going a step further – we assist customers in interpreting results and designing solutions

Reduce Risk and Failure with a Comprehensive Program

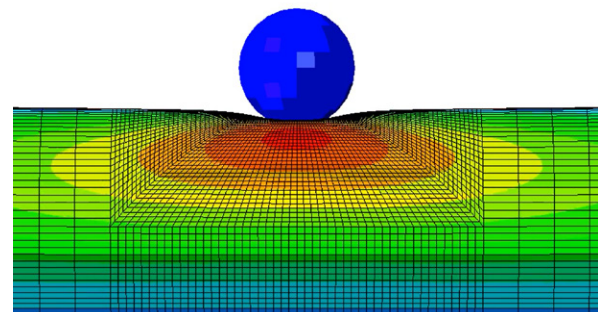
Pipeline Mechanical Damage Program Elements

Below is the additional service that Acuren can provide (this applies when the damaged pipe should be cut out and removed from the pipeline upon the Fitness-For-Service assessment Acuren provides to the client)

01	02	03	04	05	06	07	08	09	10	11	12	13
ASSESSMENT						PROGRAM RUN & MAINTAIN						
ILI Data	Pipeline Material	Operational History	Geohazard Activity	Data Analysis	Advanced Level 3 Analysis	MAWP & Fatigue Life Assessment (FFS)	Reporting	Guidance for Required Remedial Actions	Laser Scan of the Pipe Sample (Cut-Outs)	Material Characterization	Full Scale Burst Test & Cyclic Fatigue Testing	Post-Test Metallurgical Analysis

ENGINEERING & TESTING SERVICES

- Failure Analysis
- Fitness-For-Service
- Corrosion Engineering
- Field Services
- Fracture Mechanics
- Material Analysis
- Finite Element Analysis
- Asset Integrity Management
- Thermal Analysis
- Nondestructive Examination Programs
- Materials Engineering and Testing



BEYOND INSPECTION



VIEW OUR BROCHURES



CONTACT OUR EXPERTS TODAY

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