Washington UTC Pipeline Safety Seminar

DIMP IMPLEMENTATION

"Getting to the Next Level"

National Association of Pipeline Safety Representatives

&

US DOT PHMSA Office of Pipeline Safety

June 6, 2018

Everyone Must Be Involved

- Everyone must be involved in safety and do their part to support an Integrity Management System
- Every significant incident results in pressure on Government to promulgate more Regulations
- In Failure Investigations, Regulators commonly find that Human Performance is the root cause, not training and resources
- Our world must move from a “checkbox” mentality to understanding the health of our pipeline systems by analyzing and understanding data and information and promptly acting to reduce risks

Addressing Risks to Improve Safety

- **§192.605(c)(4) & 195.402(d) Abnormal operation.** Periodically reviewing the response of operator personnel to determine the effectiveness of the procedures controlling abnormal operation and taking **corrective action where deficiencies are found**.
- **192.613 Continuing surveillance** (a) Each operator shall have a procedure for continuing surveillance of its facilities to determine and **take appropriate action** concerning changes in class location, failures, leakage history, corrosion, substantial changes in cathodic protection requirements, and other unusual operating and maintenance conditions. …
- **192.617 & 195.402(c)(4&5) Investigation of failures** Each operator shall establish procedures for analyzing accidents and failures, including the selection of samples of the failed facility or equipment for laboratory examination, where appropriate, for the purpose of determining the causes of the failure and **minimizing the possibility of a recurrence**.
- **Part 192 SubParts O & P; Part 195, Part 195.450 & 452 - Identify risks & implement measures to address risks.**

Safety Culture is Relevant

- Safety Culture stresses doing the right thing regardless of competing interests or who is watching
- Integrity and Safety Management Systems provide mechanisms for Industry to fix their own problems before precursor events lead to incidents
- Safety Culture provides a platform from which to drive continuous improvement in the safe operation and integrity of a pipeline system
- Continuous improvement is a requirement to meet the minimum safety regulations for integrity management programs.

Safety Culture - API 1173

Safety Culture can be described as the shared values, actions, and behaviors that demonstrate a commitment to safety over competing goals and demands.

Critical elements of a strong safety culture:

1. Leadership is Clearly Committed to Safety
2. Open and Effective Communication Across the Organization
3. Employees Feel Personally Responsible for Safety
4. The Organization Practices Continuous Learning
5. There is a Safety Conscious Work Environment
6. Reporting Systems are Clearly Defined and Non-Punitive
7. Decisions Demonstrate that Safety is Prioritized Over Competing Demands
8. Mutual Trust between Employees and the Organization
9. The Organization is Fair and Consistent in Responses
10. Training and Resources are Available to Support Safety

Evidence of Safety Culture in Your Life

Positive Safety Culture

- An operator's contractor reported his foreman for gouging a plastic main with a digging bar during construction and covering it up.
  - This report was made to the Operator's "non-punitive" reporting system.
  - Operator dug up the main and discovered it was gouged over 10% . The damaged portion was cut out and replaced.
  - Reporting individual had only been in the gas business , for less than 6 months
  - Appropriate actions were taken regarding the foreman.

Prudent Proactive Oversight Actions

An operator inspector discovered a bad fusion with a new contractor crew.

- Rather than just making the crew redo that fusion, he pulled OQ cards until he could re-examine other work performed recently.
- After finding another bad fusion, the operator dug up 100% of this crew's work and found numerous issues.
- This process uncovered that despite the crew being qualified, they were taking intentional short cuts – the crew had been on the job for a week.
- The quick and diligent response allowed for timely reaction by the operator.

Safety During Leak Response

- An operator responded to an odor call and found 18% gas in air readings near a building wall (Grade 1 Leak).
  - After the initial action, readings dropped to near zero.
  - Rather than downgrading the leak, the operator's crew stripped the line back, foot by foot and soap tested each exposed foot of pipe until they found the pin hole leak which caused the initial gas migration.

Safety Culture in TIMP Above and Beyond

- A superintendent on a transmission replacement job, detailed each action ranging from which crew personnel are on each pipe segment, to each heat number on each pipe, to how and where each cut, weld, coating application were performed, etc. and incorporates all on his mapping of the project.
- When asked why he was capturing data that far exceeded operator requirements, he responded because that is what the intent of TIMP is…
- "… *that in 20 years, something might occur where they need to know the type and amount of coating, who did a weld, or discover that a specific heat number was bad and need to know where exactly it is on this 20 mile project*."

Planning of Work Safely

- A contractor working to install a new service line to a new home determined that the proposed route of a service line would conflict with numerous utilities.
  - Rather than place the service line as prescribed where it crossed multiple utilities and therein risk future damage to the line,
  - The crew foreman worked with engineering and the homebuilder to re-route the service where it would not cross any utility thereby reducing risks.

DIMP Inspection Results and Findings

High Level Observations

- DIMPs must Mature and be Continuously improved to mature to fit the operator's unique operating environment - a learning experience
- DIMP Rule is a performance based regulation to be flexible and allow operators to implement their DIMP in the most efficient and effective manners to improve pipeline safety

High Level Observations

- Treat DIMP as a tool to analyze needs and progress, not as a regulatory exercise or a book on the Shelf
- The Plan should culminate in a ranked/prioritized list of threats, risk reduction measures, and performance measures
- Operators are required to Know their Systems and the Environments in which they operate

Measures to Address Risks (Threats)

	Primary Threat Category	Threat Subcategory, as appropriate	Measure to Reduce Risk implemented	Performance Measure
1	Corrosion	External Corrosion on Copper Service Lines	Replace approximately 100 copper service lines each calendar year	Track number of leaks caused by external corrosion per 1000 copper service lines annually
2	Excavation Damage	Third Party Damage	Conduct pre-construction meetings or Monitor locate for life of ticket	Track frequency of failures per 1000 excavation tickets annually
3	Equipment Failure	Mechanical Fittings, Couplings or Caps/Seals	Repair or replace problem materials as found	Track frequency of failures by equipment type annually

Concerns

- Inconsistent Training of All personnel regarding DIMP requirements
- Lack of Awareness of DIMP by all personnel – not just at the headquarter or compliance level
- Data quality is a common concern, and an appropriate level of resource allocation is required;
  - Outdated Field data acquisition forms
  - Incomplete Forms with obvious errors
  - Data cleanup and scrubbing is often required

Potential Threats Often Not Considered

- Over pressurization events
- Regulator malfunction or freeze-up
- Cross-bores into sewer lines
- Materials, Equipment, Practices, etc. with performance issues
- Vehicular or Industrial activities
- Incorrect maintenance procedures or faulty components
- Mechanical fitting failures (Vintage Plastic and Steel)
- Operator error/quality of workmanship
- Age of system and equipment
- Electrical arcing onto the gas systems
- Other potential threats specific to the operator's unique operating environment

Employee Retention and Training

- Vacancies created by an aging workforce (turn-over) have created voids in operating knowledge of pipeline systems, and trained personnel have not always been available for inspections.
- Retention of trained and qualified employees has been identified as a common issue requiring transition planning and training
- Documentation of pipeline system and OM&I procedures is important to retain knowledge

Improving Safety through Performance Measurement and Trending Analyses

“What gets measured, gets done.”

- To ensure Risk Mitigation Measures are Improving Safety, Performance must be Measured and Trended
- There are many websites that provide performance monitoring for Stakeholders on public websites at the National, Regional, and Operator level

PHMSA Data and Statistics Overview - www.phmsa.dot.gov/data-and-statistics/pipeline/data-and-statistics-overview

PHMSA National Pipeline Performance Measures - www.phmsa.dot.gov/data-and-statistics/pipeline/national-pipeline-performance-measures

PHMSA DIMP Website – www.primis.phmsa.dot.gov/dimp/perfmeasures.htm

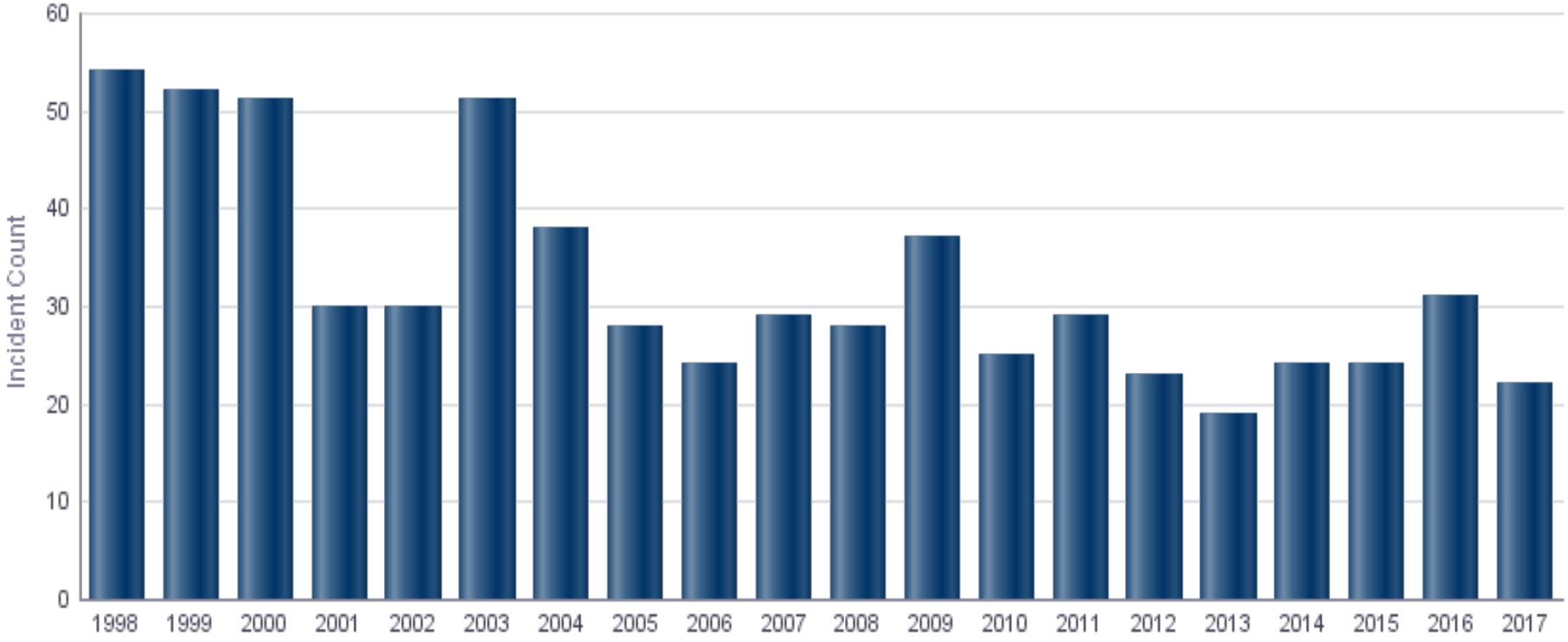
PHMSAState Pipeline Performance Metrics - www.phmsa.dot.gov/data-and-statistics/pipeline/state-pipeline-performance-metrics

Serious Incidents - Nationally

Serious Incident - an incident which causes:

- Fatality or injury requiring in-patient hospitalization

Gas Distribution – Flat trend in recent Years

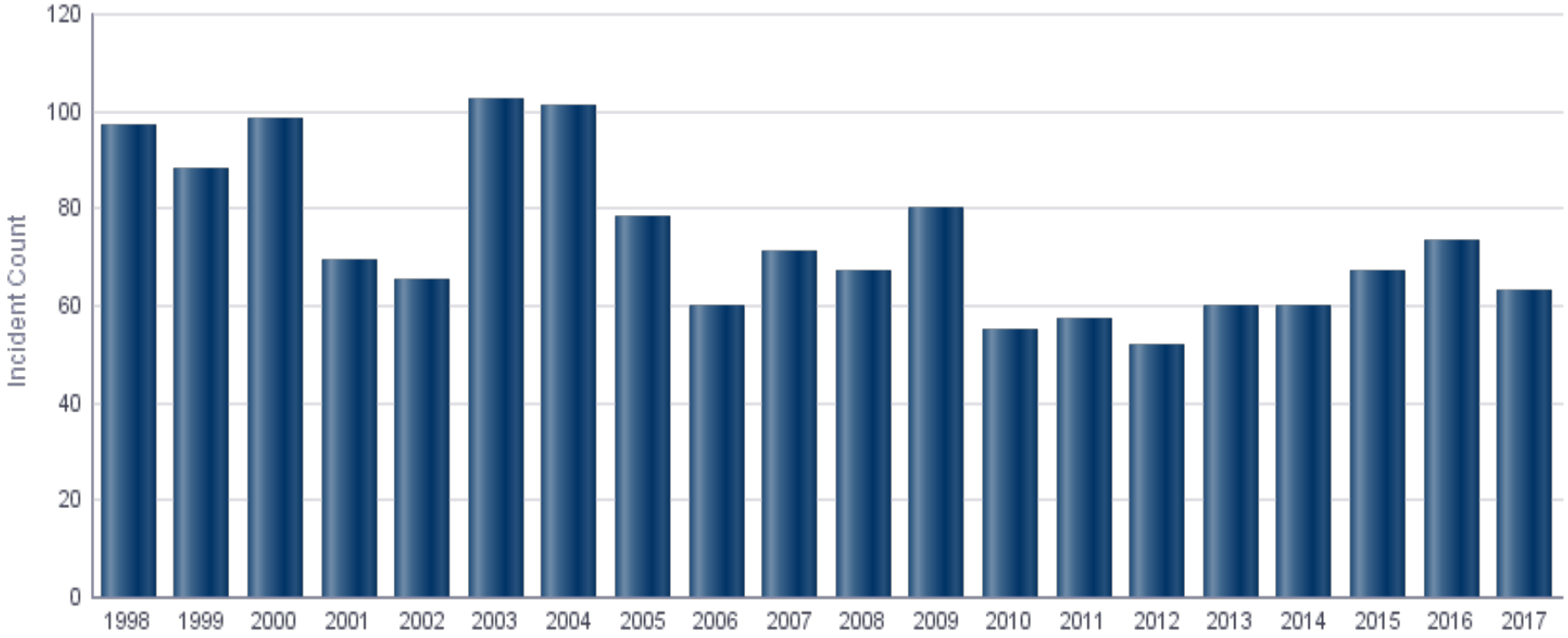


Significant Incidents - Nationally

Significant Incident - an incident which causes:

- Fatality or injury requiring in-patient hospitalization
- $50,000 or more in total costs, measured in 1984 dollars
- Highly volatile liquid releases of 5 barrels or more or other liquid releases of 50 barrels or more
- Liquid releases resulting in an unintentional fire or explosion

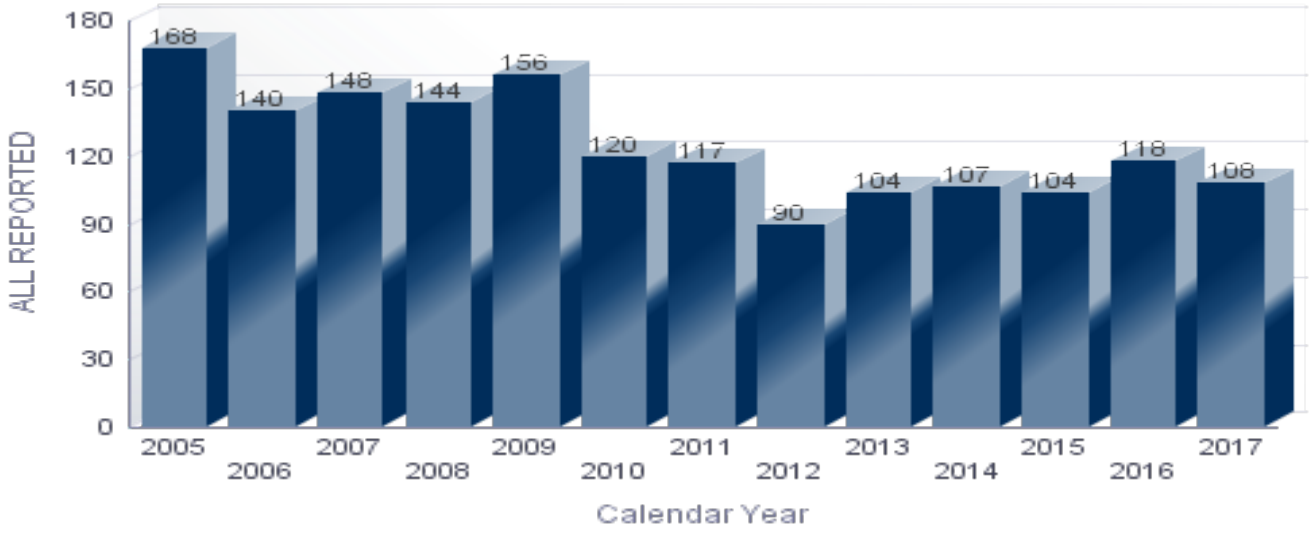
Gas Distribution – Upward Trend last 8 years since DIMP



Trends in GD Incidents by Cause
- National Data -

Geo Region: (All Column Values) Geo State: (All Column Values)

	ALL REPORTED													Total
Incident Cause Type	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
ALL OTHER CAUSES	15	23	22	16	21	15	14	7	9	12	12	14	13	193
CORROSION	2	3	1	5	2	5	4	3	1	2		1	1	30
EXCAVATION DAMAGE	67	49	58	35	43	24	30	18	35	31	37	43	31	501
INCORRECT OPERATION	7	4	1	6	5	9	9	7	4	8	3	8	8	79
MATERIAL/WELD/EQUIP FAILURE	11	7	13	9	12	8	13	11	16	12	8	14	17	161
NATURAL FORCE DAMAGE	15	11	12	11	13	9	12	6	5	8	14	6	6	127
OTHER OUTSIDE FORCE DAMAGE	51	43	41	62	60	50	35	39	34	34	30	32	32	543
Grand Total	168	140	148	144	156	120	117	90	104	107	104	118	108	1,624



Trends in Gas Distribution Leaks by Cause - State or Region Specific data -

Geo Region: WESTERN Geo State: WASHINGTON

Gas Distribution Hazardous Leaks by Cause

Time run: 4/22/2018 12:17:47 PM

Portal Data as of **4/19/2018 3:25:10 AM**

Geo Region: WESTERN Geo State: WASHINGTON

	2010	2011	2012	2013	2014	2015	2016	2017
Leak Cause								
Corrosion	75	70	66	48	50	51	42	44
Natural Force	32	47	33	35	34	54	35	60
Equipment	71	110	87	53	70	33	66	104
Material or Weld	135	137	119	114	117	114	119	106
Excavation	917	949	982	1,039	1,086	1,226	1,279	1,254
Operations	37	31	26	30	31	24	27	27
Other Outside Force Damage	80	68	91	87	98	83	105	125
Other Cause	142	157	85	44	61	145	117	49

data as-of 3/30/2018

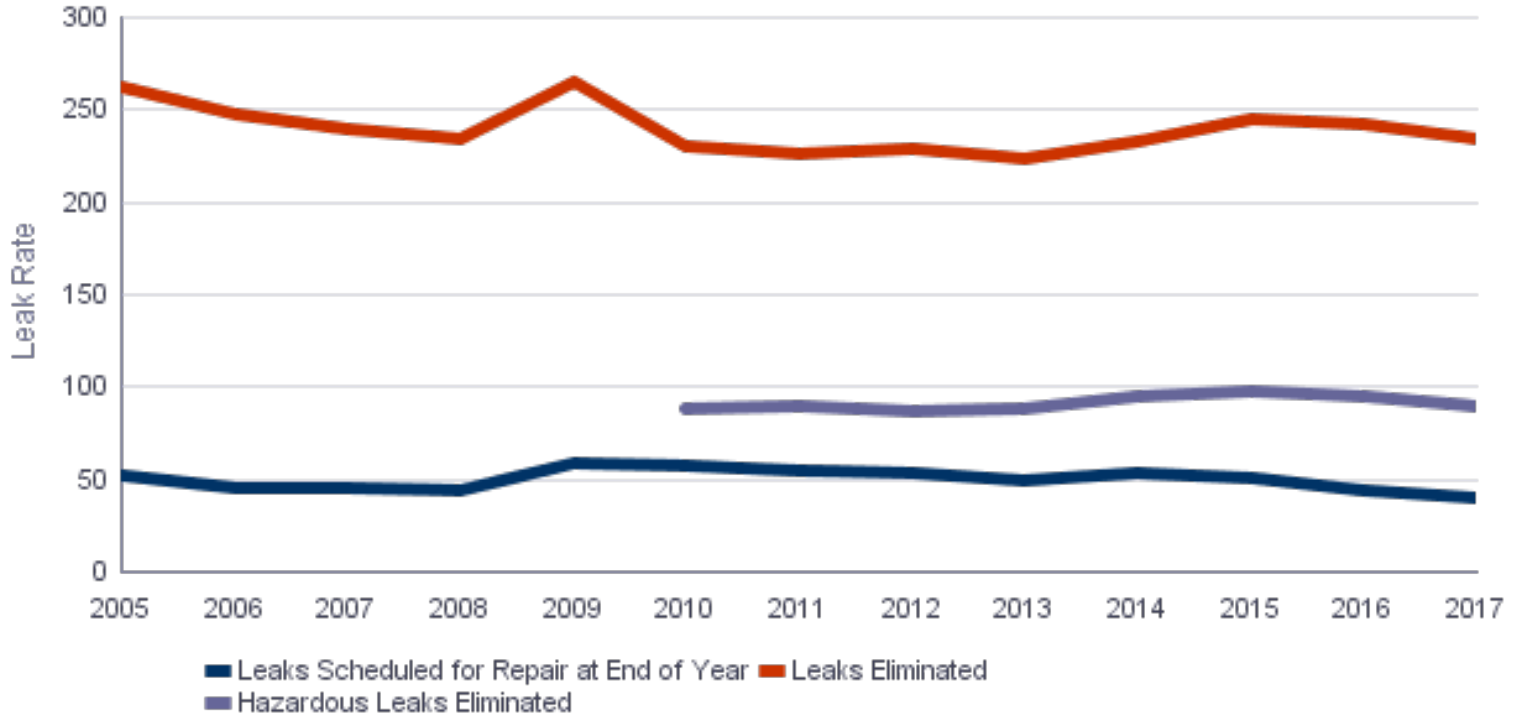
Performance Measurement

- Gas Data Quality & Analysis Team posted Gas Distribution and Gas Transmission Performance Measures on the OPS website at www.phmsa.dot.gov/data-and-statistics/pipeline/national-pipeline-performance-measures
- Key Performance Indicators (KPIs) are identified and trended

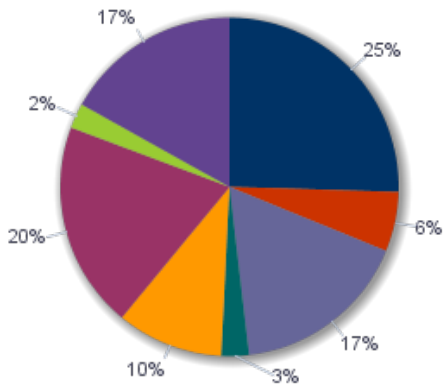
Gas Distribution Performance Measures

- Serious Incident per Mile - trends & "by cause" pie chart
- Significant Incident per Mile - 3 trends
- Leaks per Mile - 3 trends & 2 cause pies
- Excavation Damage - 2 trends
- Cast and Wrought Iron - 2 trends
- Steel Miles (Bare/Unprotected) -3 trends
- Miles by Decade Installed - 6 trends

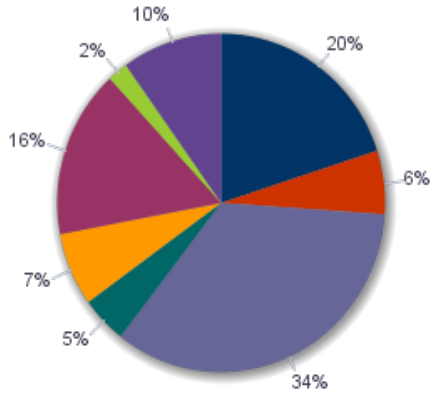
National Trends in Gas Distribution Leaks

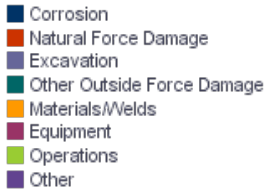


Leaks Eliminated



Hazardous Leaks Eliminated





Trends in Gas Distribution Leaks Operator Level – Examples from Website

Gas Distribution Leaks – Operators with 10,000 miles or more
Time run: 4/3/2018 10:29:11 AM

Data Source: US DOT Pipeline and Hazardous Materials Safety Administration
Data as of: 03/30/2018

Operator ID	Operator Name	5 Year Average Hazardous Leaks Eliminated (leaks per 1,000 miles)	10 Year Average Leaks Eliminated (leaks per 1,000 miles)	5 Year Average Leaks Eliminated (leaks per 1,000 miles)	10 Year Average Leaks Scheduled for Repair (leaks per 1,000 miles)	2017 Miles
1640	BOSTON GAS CO	400.88	784.84	728.71	18.09	10,860.76
1088	BALTIMORE GAS AND ELECTRIC COMPANY	211.70	527.50	601.39	72.16	13,653.28
2364	DUKE ENERGY OHIO	197.93	473.84	409.00	79.42	11,533.27
21349	VIRGINIA NATURAL GAS	187.12	414.70	367.92	41.02	11,023.69
18532	TEXAS GAS SERVICE COMPANY, A DIVISION OF ONE GAS, INC.	168.22	351.56	365.54	113.03	15,011.97
4499	CENTERPOINT ENERGY RESOURCES CORPORATION	157.78	457.62	424.39	87.49	67,245.81
180	SPIRE ALABAMA INC.	147.75	340.48	269.83	67.84	23,883.71
12350	CENTERPOINT ENERGY RESOURCES CORP., DBA CENTERPOINT ENERGY MINNESOTA GAS	145.17	297.84	274.80	16.64	25,745.82
22182	WASHINGTON GAS LIGHT CO	143.69	195.67	227.53	48.04	26,999.96
4060	DOMINION ENERGY OHIO	140.41	451.06	327.30	106.12	31,053.88

Rows 1 - 10

Export

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Rows 1 - 10

Export

Gas Transmission Performance Measures

- Serious Incident per Mile - trend & “by cause” pie charts
- Onshore Significant Incident per Mile - 3 trends, also HCA and non-HCA trends & “by cause”
- HCA Immediate Repair per Mile - trend
- HCA Leaks & ILI Detectability - 2 trends & “by cause” pie charts
- Steel Miles (Bare and Unprotected) - 2 trends
- Miles by Decade Installed - 5 trends
- Onshore Pipeline Significant Incident Rates per Decade - rate chart and “by cause” pie charts

“What gets measured, gets done.”

Reactive –> Proactive -> Predictive

Management Systems Improve Safety

Integrity Management Systems Performance Measurement

- Guidance is available on methods to develop and use metrics that provide for meaningful insights into reducing risks of specific threats and system wide risks
- ADB 2014-05 - Guidance for Meaningful Metrics
  - ADB–2012-10 Using Meaningful Metrics in Conducting Integrity Management Program Evaluations
- ADB 2014-02 - Lessons Learned from the Marshall, Michigan, Release

ADB – 2012-10

- Remind operators of their responsibilities, under Federal IM regulations, to perform evaluations of their IM programs using meaningful performance metrics. Program evaluation is a required integrity management program element as established in §192.911(i)
- A critical program element of an operator's integrity management program is the systematic, rigorous evaluation of the program's effectiveness using clear and meaningful metrics.
- When executed diligently, this self-evaluation process will lead to more robust and effective integrity management programs and improve overall safety performance.
- This process is critical to achieving a mature IM program and a culture of continuous improvement and learning.

ADB – 2012-10

- Metrics that measures and provide insights into how well an operator's processes associated with the various IM program elements are performing.
- Specific threats that include both leading and lagging indicators for the important integrity threats on an operator's systems, including:
  - Activity Measures that monitor the surveillance and preventive activities that are in place to control risk
  - Deterioration Measures that monitor operational and maintenance trends to indicate if the program is successful or weakening despite the risk control activities in place
  - Failure Measures that reflect whether the program is effective in achieving the objective of improving integrity.

ADB – 2014-05

- PHMSA developed guidance on the elements and characteristics of a mature program evaluation process that uses meaningful metrics
- Major topic areas addressed in the guidance document include:
  - Establishing Safety Performance Goals
  - Identifying Required Metrics
  - Selecting Additional Meaningful Metrics
  - Data Collection and Metric Monitoring
  - Program Evaluation Using Metrics

ADB – 2014-05 Guidance

- Tables 1 & 2 are lists of metrics required by Part 192 and ASME B31.8S-2004 **TO BE USED!**

Table 2 - Other Required Metrics for Gas Transmission and Distribution Systems

Required by §192.945 and ASME B31.8S-2004, Table 9 for Gas Transmission Pipelines:

Threat	Performance Metrics for Prescriptive Programs
External corrosion	Number of hydrostatic test failures caused by external corrosion
	Number of repair actions taken due to in-line inspection results
	Number of repair actions taken due to direct integrity assessment results
	Number of external corrosion leaks
Internal corrosion	Number of hydrostatic test failures caused by internal corrosion
	Number of repair actions taken due to in-line inspection results
	Number of repair actions taken due to direct integrity assessment results
	Number of internal corrosion leaks

ADB – 2014-05 Guidance

Table 3 - IM Programmatic Performance Metrics

Table 3 - IM Programmatic Performance Metrics

	Leading ----------Indicators----------*Lagging*		
Program Element	**Selected IM Process, Operational or Activity Metrics**	**Operational Deterioration Indicators**	**Failure or Direct Integrity Metrics**
1. Identification of pipeline segments that could impact HCAs	• Frequency of updates to segment identification analysis • Frequency and nature of reviews conducted to identify new HCAs • Frequency of field district surveys or ROW inspections identifying new HCAs – or segments that could affect HCAs • Frequency and nature of review of procedures and assumptions made in identifying segments that could affect HCAs • Frequency of updates to aerial photography used for HCA segment analysis • Frequency of contacts with public safety officials and others having local knowledge for information on potential "identified sites" or could affect segments	• No. of newly acquired or newly identified assets not incorporated within the IMP within the required timeframe • No. of previously mis-identified HCAs identified as HCAs in updates to the segment identification analysis • No. of PIR calculations using an inappropriate formula for product transported (Gas Trans) • No. of new HCAs or could affect segments identified due to changing conditions (pipeline modifications, new public construction, change in public use of existing buildings, etc.) • No. of abnormal weather conditions (e.g., stream flow rate) that exceed assumptions used in HCA or could affect segment identification	• No. of releases which reached an HCA from pipe that was not determined to be a "could affect" segment (Haz Liq) • No. of releases with adverse impacts beyond the PIR (Gas Trans) • No. of releases which had different impacts to HCAs than determined by the "could affect" analysis • No. of releases which reached different HCAs than determined by the "could affect" analysis • No. of releases that exceeded the highest estimated volume that could be released in a segment (Haz Liq)

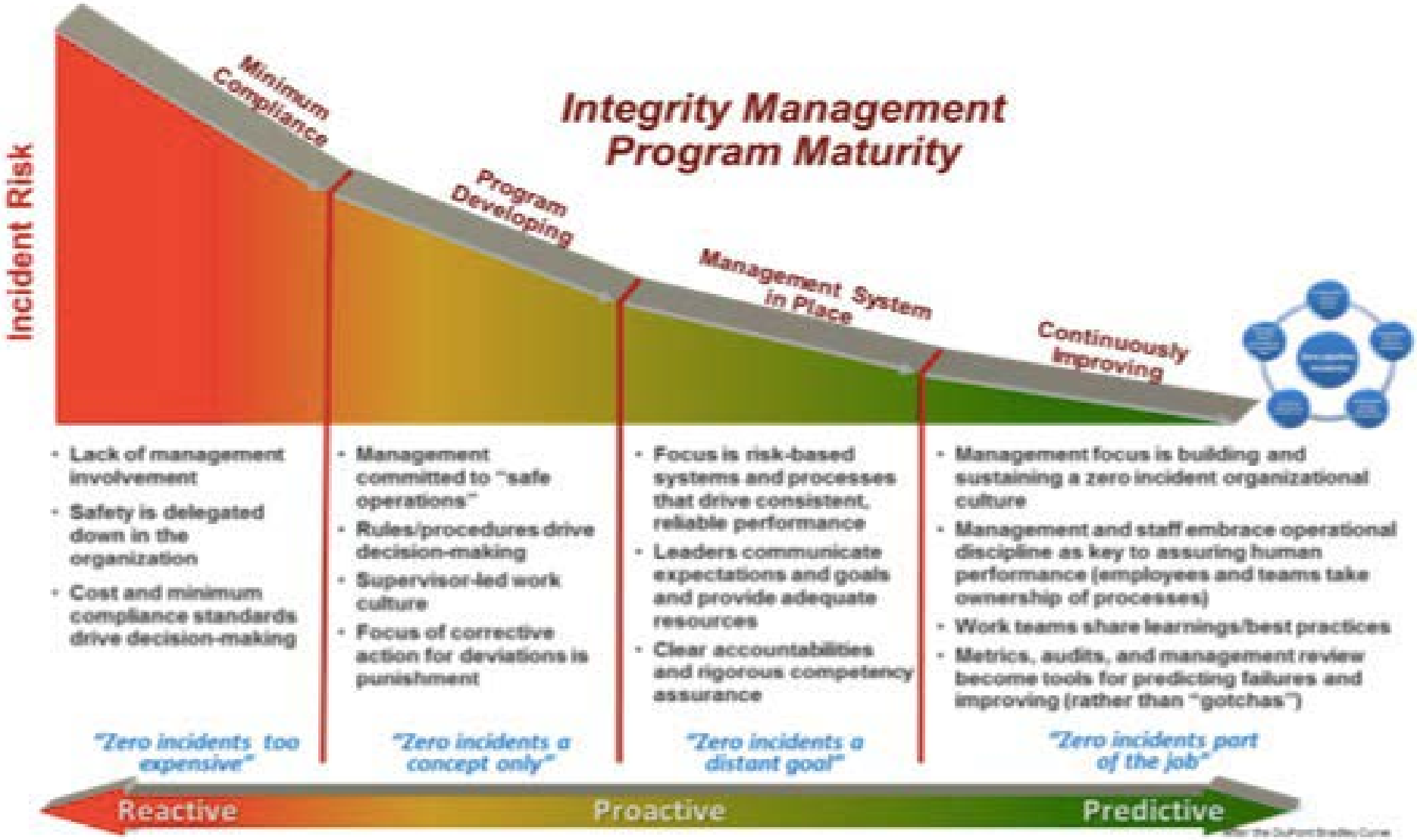
ADB – 2014-05 Guidance

Table 4 - System and Threat-Specific Performance Measurement

Table 4 - System and Threat-Specific Performance Measurement

	Leading ----------Indicators----------*Lagging*		
Failure Mechanism	**Selected Process or Operational Activities for Threat Prevention or Management**	**Deterioration Indicators**	**Failure or Direct Integrity Metrics**
Mechanical Damage			
First-party (operator) and second-party (contractor) damage	• Operator procedures for excavation on or near its own pipeline • Contractor procedures for excavation on or near the pipeline • Use of current system / facility maps	• No. of improper locates • No. of excavations outside locate area • No. of incidents / accidents where procedures were not followed or where appropriate care was not exhibited • No. of damages not reported • No. of enforcement actions taken by enforcement authority • Increase in frequency of damage	• Releases due to first or second party damage

Assessing Maturity



DIMP Enforcement Guidance

- DIMP Enforcement Guidance is posted and publicly available on PHMSA's website with the other Enforcement Guidance documents at http://www.phmsa.dot.gov/foia/e-reading-room
- This posting allows Operators to understand Regulators' expectations with regards to the DIMP Regulation and supports their implementation of their programs

Questions and Comments?

Thank you for your participation in Pipeline safety!