PHMSA

U.S. Department of Transportation
Pipeline and Hazardous
Materials Safety Administration

Hazardous Liquid Integrity Management Progress Report

January 2011

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EXECUTIVE SUMMARY

In 2000 and 2002, the Office of Pipeline Safety (OPS) published regulations requiring Integrity Management (IM) Programs for hazardous liquid pipeline operators. This landmark set of regulations is broad-reaching and fundamentally different from the approaches used in the past for improving pipeline safety. These regulations supplement PHMSA's prescriptive safety requirements with new requirements which are very performance and process-oriented, setting expectations for operators, yet giving them the flexibility in how they choose to comply with several programmatic requirements. The primary objectives for the hazardous liquid IM Program are to:

- Accelerate and improve the quality of integrity assessments conducted on pipelines in areas with the highest potential for adverse consequences (High Consequence Areas – HCAs),
- Promote a more rigorous, integrated, and systematic management of pipeline integrity and risk by operators,
- Strengthen government's role in the oversight of pipeline operator integrity plans and programs, and
- Increase the public's confidence in the safe operation of the nation's pipeline network.

It has been a decade since the first IM rule was published on December 1, 2000, and the baseline assessments of pipe that could potentially affect HCAs have been completed. Thus, PHMSA is taking this opportunity to evaluate the progress and effectiveness of this major initiative, as it has at previous program milestones. This report provides a discussion of PHMSA's progress in achieving the above program objectives as well as an examination of accident trends over this same period of time.

Recent Accident History

The ultimate objective of the hazardous liquid pipeline IM regulations is to reduce pipeline risk through reducing the likelihood and consequences from releases that could affect HCAs. PHMSA expects that actual reductions in accident frequency and consequences due to operator activities in response to the IM requirements will be observable over the long term. While some impacts may be observable in the short term (e.g., from operators making repairs to the most severe anomalies), other impacts from the IM programmatic requirements may not be apparent for several years.

Some measures developed using recent hazardous liquid pipeline accident history appear to indicate that the IM rule is having a positive impact on accident frequency and consequences.

- The yearly number of significant accidents[1] from all causes has fluctuated somewhat since December 31, 2001 (the deadline for large pipeline operators to identify pipeline segments that could affect HCAs), but there is an overall decreasing trend over this period (see Figure 1). A similar decreasing trend is observed when considering only the subset of accident

[1] Significant Incidents are those incidents reported by pipeline operators when any of the following conditions are met: 1) Fatality or injury requiring in-patient hospitalization; 2) $50,000 or more in total costs, measured in 1984 dollars; 3) Highly volatile liquid releases of 5 barrels or more or other liquid releases of 50 barrels or more; 4) Liquid releases resulting in an unintentional fire or explosion.

causes that are detectable by the rule's line pipe integrity assessment requirements (e.g., corrosion, dents, and material defects).[2]

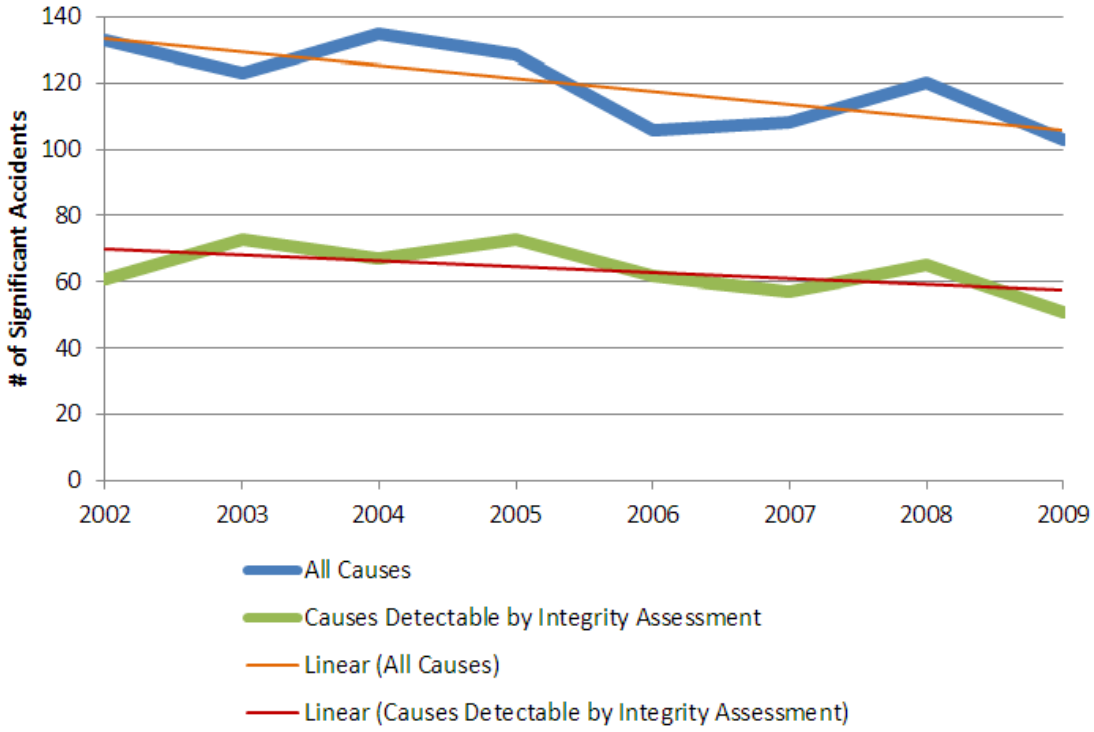


Figure 1 - Hazardous Liquid Pipeline Significant Accidents 2002 – 2009

- Comparing the yearly average of significant accidents for the eight years since operators were required to identify HCAs and develop IM Programs (2002-2009) with the eight years immediately before (1994-2001) provides another perspective which may give insight into the IM rule's impact. The average number of significant accidents is 20% lower since the rule took effect. Looking just at the yearly average of significant accidents caused by corrosion, there is a 14% reduction when comparing 2002 – 2009 with the 1994 – 2001 period. Corrosion is one of the primary threats detected by the integrity assessment provisions of the IM rule.
- A similar comparison for spill volume shows a reduction in spill volume in the years since the IM rule took effect. The average yearly spill volume for significant accidents is 32% lower since the IM rule has been in effect for all accident causes, and 19% lower for accidents caused by corrosion. Since spill volume is often a major factor in influencing the consequences of an accident, these data appear to indicate that the IM rule also be having a positive impact on accident consequences.

[2] The results shown here are not normalized by the number of pipeline miles that hazardous liquid pipeline operators have reported in annual reports. Liquid operators have only been reporting pipeline miles since 2004. Over 2004-2009, pipeline miles reported in annual reports have increased slightly, but the increase is not considered to have a significant effect on the trends shown here.

Additional examinations of pipeline accident frequency and consequence are provided later in this Progress Report.

Accelerate and Improve Integrity Assessments

The IM rule requires that operators conduct an initial baseline assessment of their HCA-affecting pipeline segments within seven years and then perform reassessments on a period not to exceed five years thereafter. Large operators[3] were required to complete their baseline assessments by March 31, 2008, and small operators by February 17, 2009. PHMSA inspections and the mandated annual reporting by operators (certified by company executives) have shown that operators met these deadlines.

In addition, the threat identification and risk analysis work leading up to operators' creation of their Baseline Assessment Plans has yielded benefits, as has PHMSA's efforts – working with numerous Federal and State agencies – to catalogue and locate those areas across the nation most susceptible to damage from pipeline failures (HCAs). Not only is there a vast increase in the awareness of these susceptibilities by operators (as well as responders), there is now for the first time a universal understanding of precisely where they are located and where additional protection is warranted. All operators now have a much better understanding of which particular portions of their pipelines, as well as other facilities, have the potential to impact these sensitive areas.

Not only are these most sensitive sections of pipelines now more secure, but the assessments required by the IM rule are providing additional protection beyond HCAs. While operators are only required to assess the pipeline segments that can affect HCAs (~44% of the pipeline mileage, nationwide), they have in fact smart pigged, pressure tested, or otherwise assessed more than 80% of the total hazardous liquid pipeline mileage, thus increasing safety in locations well beyond the originally designated HCAs.

These assessments have revealed a large number of potentially injurious conditions which pipeline operators have remediated in accordance with the IM rule. To date, more than 7600 serious pipeline anomalies or defects have been repaired immediately after they were discovered. In addition, some 28,000 other, less serious anomalies have been repaired within the 60 and 180 day timeframes allowed in the rule – all of these occurring in sections of pipeline systems which could adversely impact the nation's HCAs. Finally, an additional 79,000 anomalies have been remediated, many that were in other portions of pipelines outside of HCAs. These anomalies were not required to be repaired by the IM rule, but were discovered and proactively remediated as a result of assessments required by the rule.

Promote Rigorous Operator IM Programs

The IM rule goes beyond simply assessing pipeline segments and repairing defects. Improving all operators' management of pipeline integrity, including their associated analytical processes, and their across-the-board application of rigorous risk management is also a critical objective of PHMSA's IM rule. The ability to integrate and analyze threat and integrity related data from many sources is critical to proactive safety management. In creating a robust IM Program, PHMSA's regulations

[3] Large operators are defined as operators owning or operating 500 or more miles of pipe.

identify eight essential Program Elements, all of which must be fully developed by operators in order to comply with the Rule.

PHMSA inspections have shown that operators have made substantial progress in developing these Program Elements. However, there are areas that still require significant industry attention. These include the Program Elements that go beyond assessing and repairing line pipe to prevent and mitigate accidents (i.e., the Preventive and Mitigative Measures Program Element). PHMSA recognizes that each pipeline is unique with a pipeline-specific risk profile dependent on the pipeline location, operating environment, commodity transported, and numerous other factors. For this reason, PHMSA's IM rule requires operators to develop the processes and tools needed to identify and analyze these unique risks – risks which can vary considerably both from one pipeline to another, as well as from end-to-end of any given pipeline. The IM rule also requires operators to have systematic approaches to use this risk information to identify and implement additional preventive and mitigative measures to prevent releases and further reduce risk beyond the level achieved through repairing defects identified through integrity assessment. While operators have understandably devoted significant resources to completing their baseline assessments to meet the initial deadlines in the regulations, they still need to devote more effort and resources to those elements considered to be crucial for a mature IM Program - specifically risk analysis, the identification and implementation of additional preventive and mitigative measures, and the ongoing and continuing improvement of all IM Program processes.

Strengthen Government Oversight

Accompanying the new IM rule, PHMSA launched a new inspection program in 2002 to assure compliance with the new IM requirements and promote improved operator IM Programs. A comprehensive set of inspection protocols was developed that not only checked for compliance with the rule's prescriptive requirements, but also supported a detailed audit of an operator's management and analytical systems, processes, and practices to manage pipeline integrity. To date the IM Program of every operator PHMSA regulates has been inspected at least once. All major hazardous liquid pipeline operators have been inspected a second time to be sure they are continuing to manage pipeline integrity and making progress in building the robust IM programs PHMSA expects. To date, more than 80 operators have received a second IM inspection. The insights from these inspections are summarized later in this report.

When operators fall short of meeting the rule's requirements for IM Program development, PHMSA takes enforcement action to accelerate program development and address program deficiencies. Through the first two rounds of IM inspections, PHMSA has issued enforcement letters for 79% of all inspections. When violations of the rule's prescriptive requirements occur, PHMSA has not hesitated to exercise its civil penalty authority. For the initial set of operator IM inspections, the average civil penalty was ~$45,000. However, for the second round of IM inspections, PHMSA's average proposed penalty has increased to ~$127,000, indicative of PHMSA's commitment to improving IM Program development and performance.

Increase Public Assurance in Pipeline Safety

Transparency to the public and the regulated community has been a hallmark of the IM Program since its inception. After the rule was issued, PHMSA developed the Implementing Integrity Management web site to provide information on the rule and PHMSA's oversight efforts. This

publicly accessible web site includes more than 200 Frequently Asked Questions to explain the rule provisions and PHMSA's expectations. This resource also provides access to inspection protocols, an IM fact sheet, a glossary of IM terminology, a flow chart of the IM process, reference documents, and industry performance measures. With the 2007 launch of PHMSA's enforcement transparency web site, the public also has access to information on enforcement cases stemming from PHMSA's IM inspections. The recent addition of operator-specific reports to the Stakeholder Communications web site now makes it even easier for information on IM inspections and enforcement to be accessed for a given operator. During the development of these web sites, as well as in several public meetings, PHMSA has engaged its public stakeholders as well as the operator community for input on how to improve communication and understanding of the IM Program.

HAZARDOUS LIQUID INTEGRITY MANAGEMENT PROGRESS REPORT

Recent Accident History

The ultimate objective of the hazardous liquid pipeline integrity management regulations is to reduce pipeline risk through reducing the likelihood and consequences overall, as well as in particular risk due to releases in HCAs. PHMSA expects that actual reductions in accident frequency and consequences due to operator activities in response to the IM requirements will be observable over the long term. Some impacts may be observable in the short term (e.g., from operators making repairs to the most severe anomalies), other impacts from the IM programmatic requirements may not be apparent for several years. This section of the Progress Report examines some accident-related metrics to show trends since the IM rule has been in place.

In selecting time periods for this analysis, the following dates are relevant:

- December 31, 2001 – Large liquid operators were required to complete their identification of segments that could potentially affect HCAs.
- September 30, 2004 – Large liquid operators were required to complete baseline integrity assessments of at least 50% of their HCA-affecting pipeline miles.
- March 31, 2008 – Large liquid operators were required to complete baseline integrity assessments of all of their HCA-affecting pipeline miles.
- February 17, 2009 – All operators were required to complete baseline integrity assessments of all of their HCA-affecting pipeline miles.

Requirements for integrity assessment and repair primarily address risks from a subset of possible accidents causes that may be detected during integrity assessments, such as corrosion and certain materials defects. The assessment requirements for integrity assessments do not affect many accidents caused by mechanical damage (i.e., excavation damage, natural forces damage, other outside force damage), incorrect operation, or equipment failures.[4] In order to examine the impact of the assessment provisions of the rule, accidents caused by the subset of causes that are detectable are considered separately from the total number of accidents. Figure 1 shows that since 2002 there has been a reduction in both the number of significant accidents and the number of significant accidents attributed to causes which the integrity assessment provisions of the rule are designed to detect.

As shown in the following graph (Figure 2), hazardous liquid significant accidents have been decreasing over the last 20 years. Accidents caused by corrosion[5] show a slight decreasing trend over this time period.

[4] However, other provisions of the IM rule, specifically the preventive and mitigative measures requirements, do address these other pipeline failure causes.

[5] Accidents caused by corrosion are used in this comparison, rather than the larger category of causes that could be detected by integrity assessments (corrosion plus weld failures, etc.). The reason for this treatment is that accident cause categorization was changed extensively in the accident report form and instructions that were introduced in 2002. These changes make some accident cause data comparisons difficult for data that covers both the period before 2002 and the period after.

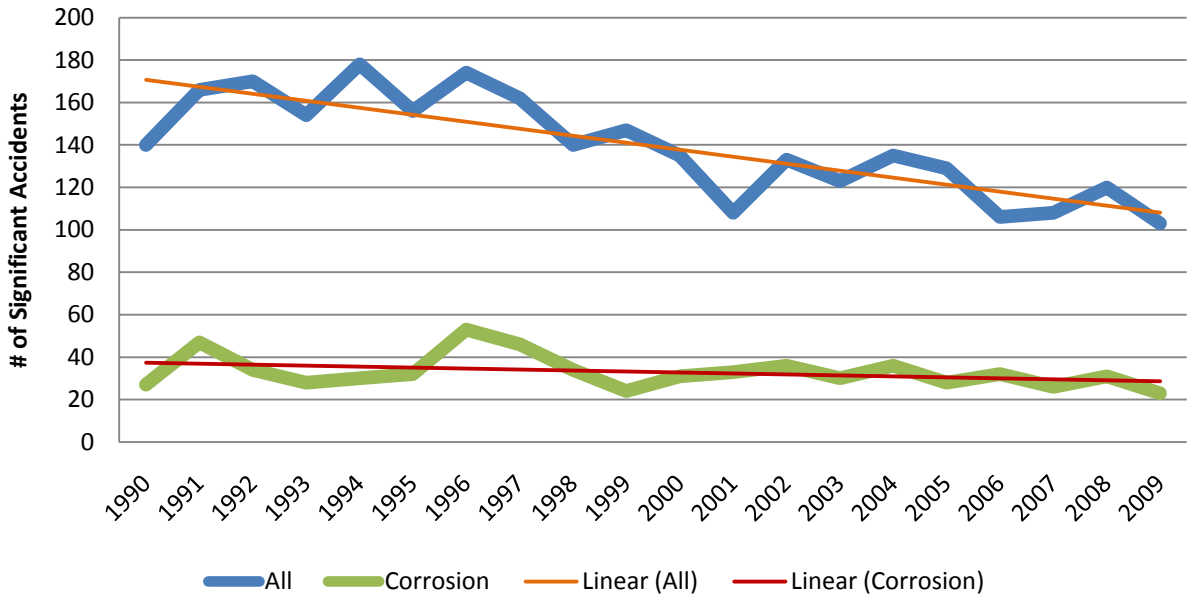


Figure 2 - Hazardous Liquid Pipeline Significant Accidents 1990-2009

Comparing the eight years since operators were required to identify high consequence areas (2002-2009) with the eight years immediately before (1994-2001) shows a lower average number of significant accidents in the period since the IM rule has been in effect.

Table 1 – Comparison of Significant Accidents Before and After IM Rule Effective Date

Period	Yearly Average Number of Significant Accidents - All Causes	Yearly Average Number of Significant Accidents - Caused by Corrosion
2002-2009	120	30
1994-2001	150	35

The average number of accidents per year is 20% lower from 2002 – 2009 for all causes, and 14% lower for accidents caused by corrosion.

The IM rule is also aimed at reducing the consequences of pipeline accidents. To understand the impact on the consequences of pipeline accidents, several trends of pipeline spill volume are presented below. While spill volume is not a direct measure of consequences such as environmental damage, in general the greater the volume released, the greater are the adverse consequences. The graph below shows the trend in total volume spilled for significant accidents over the period since the IM rule took effect.

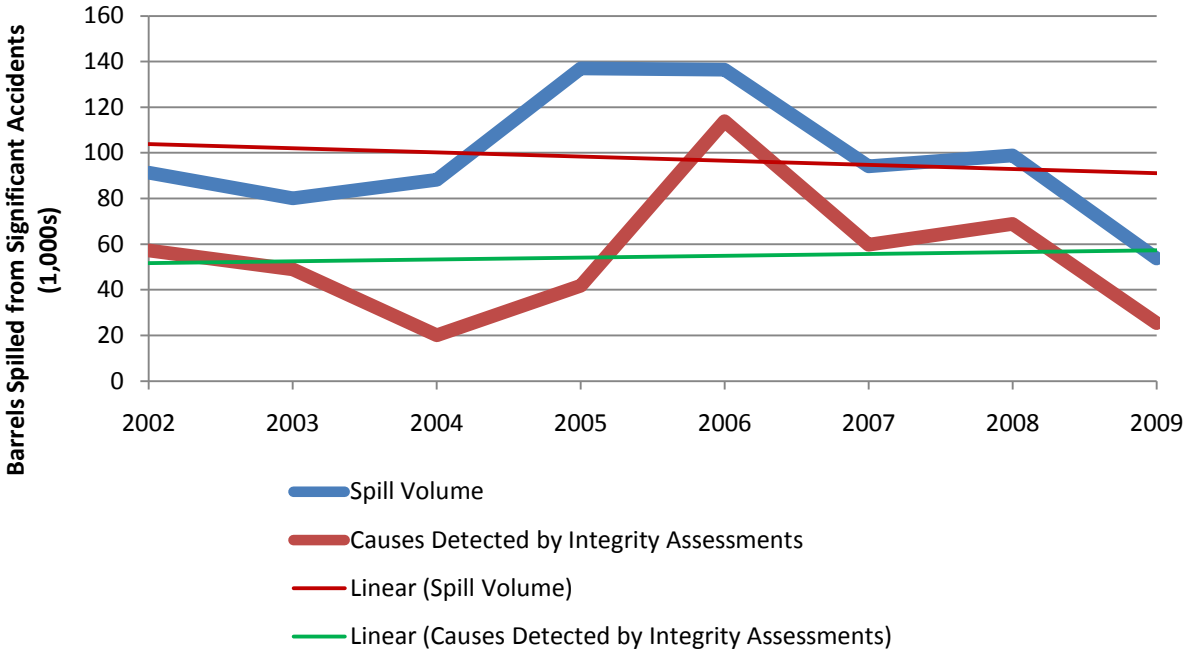


Figure 3 - Spill Volume from Hazardous Liquid Pipeline Significant Accidents 2002-2009

The yearly volume of liquid spilled as a result of significant accidents shows greater fluctuation over 2002-2009 than the number of accidents, because a few large-volume spills in a year can drive the total spill volume for the year. The overall trend for spill volume from all causes does appear to be slightly downward during these years. The yearly spill volume for causes detected by integrity assessments does not show a decreasing trend. The relatively high totals for 2005 and 2006 have a significant effect on the trends. These totals are strongly affected by a few accidents with high spill volumes:

Date	State	Spill Volume (bbl)	Commodity	Cause	System Part
8/30/2005	LA	25,400	Crude Oil	Hurricane	Tank
9/2/2005	LA	23,600	Crude Oil	Hurricane	Pump/Metering Station
2/20/2006	OK	49,000	Crude Oil	Corrosion	Tank
12/28/2006	MS	24,700	CO_2	Seam Failure	Line Pipe

Although some of the IM requirements address risks for all parts of a pipeline system, the requirements for integrity assessment and repair primarily affect risks from line pipe and do not directly apply to other pipeline facilities such as storage tanks and pump/metering stations[6]. If only line pipe accidents are considered, and accident causes are limited to corrosion and other causes that

[6] Risks from these facilities are addressed by other IM requirements, such as requirements to implement other preventive and mitigative measures.

could be detected by integrity assessments, some trends are apparent that may show the impact of IM.

First, operator accident reports indicate if a spill has contaminated surface or ground water. Figure 4 shows the yearly spill volume for significant accidents that contaminate water for line pipe accidents whose causes are detectable by integrity assessment.

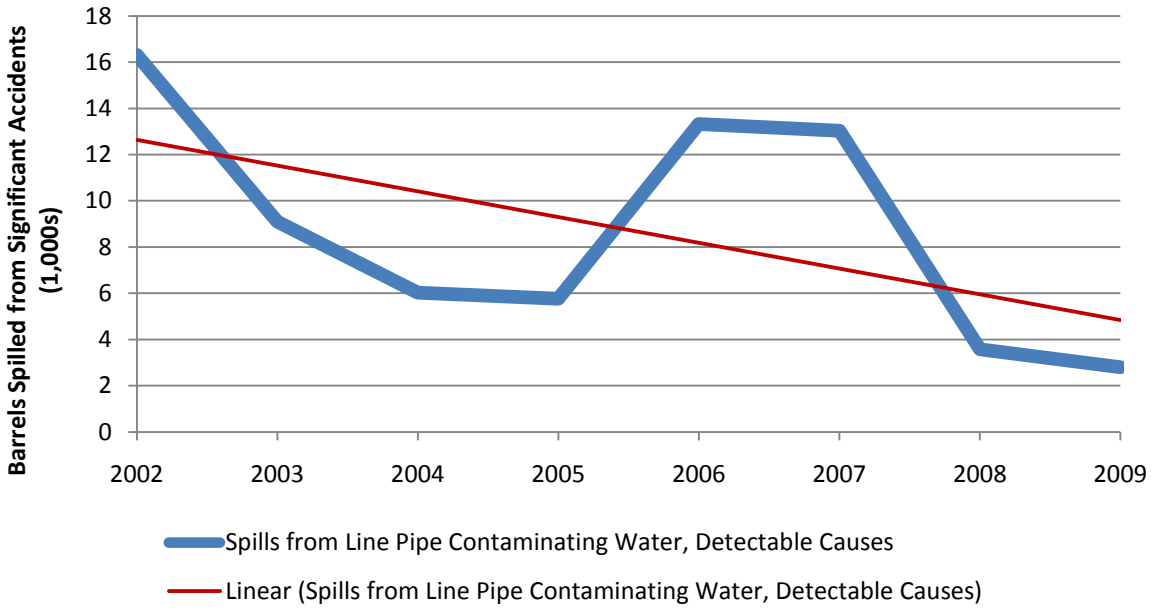


Figure 4 - Spill Volume from Significant Accidents Contaminating Water 2002-2009 (Line Pipe, Causes Detected by Integrity Assessment)

This data shows a decreasing trend over 2002-2009, although higher totals are shown for 2006 and 2007.

In filing their accident reports, operators are also required to designate if a spill was located in an HCA. Figure 5 shows the yearly spill volume for spills in HCAs for line pipe accidents whose causes are detectable by integrity assessment.

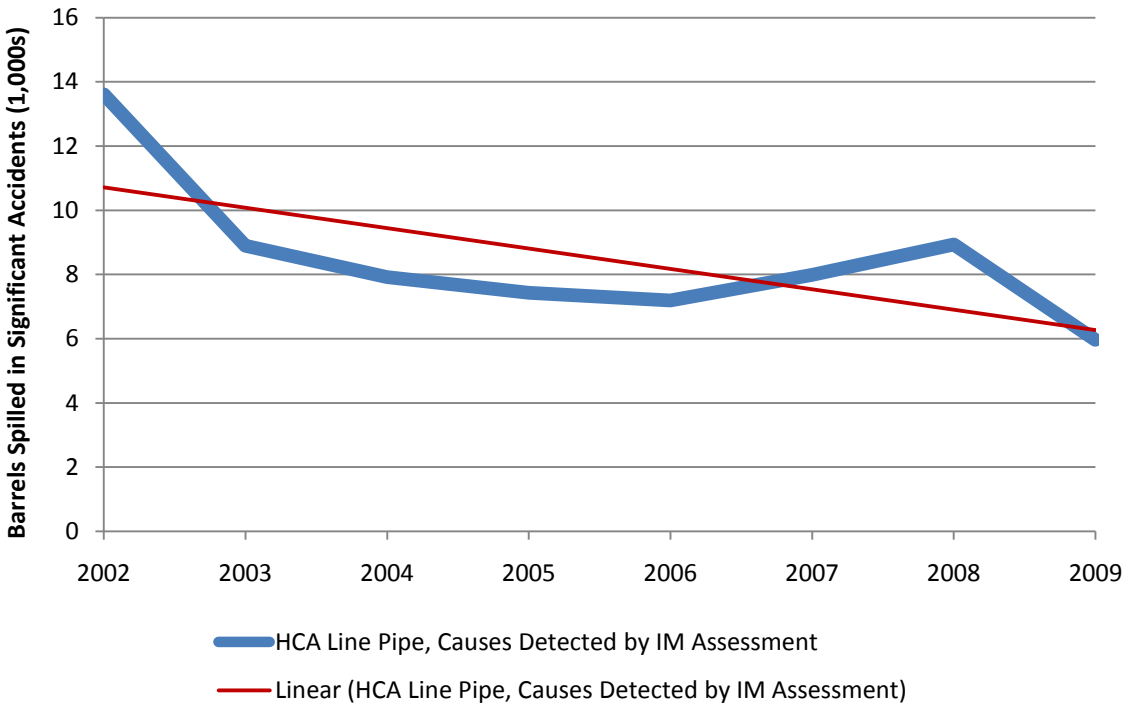


Figure 5 - Hazardous Liquid Pipeline Significant Accidents Located in HCAs 2002-2009

This data indicates an overall decrease in the spill volume from significant accidents "located in HCAs" over 2002-2009. The average spill volume from these accidents is 499 barrels over the eight year period. This is lower than the overall average spill volume of 918 barrels over this same period. The average spill volume for accidents not reported as "located in HCAs" is 1,205 barrels.

While this trend is encouraging, it is unclear if operators consistently and correctly interpreted the "spill in HCA" data field on the accident report form as it was intended to be completed. Thus it is not known whether this data shows the number of accidents occurring on segments that could affect HCAs, spills that occurred in HCAs, or something else. Consequently, this trend and its meaning are uncertain.[7]

Figure 6 takes a longer term perspective, looking at spill volume since 1990 for significant accidents.

[7] PHMSA has provided more explicit guidance in how this data field is to be reported in the recently issued "One Rule."

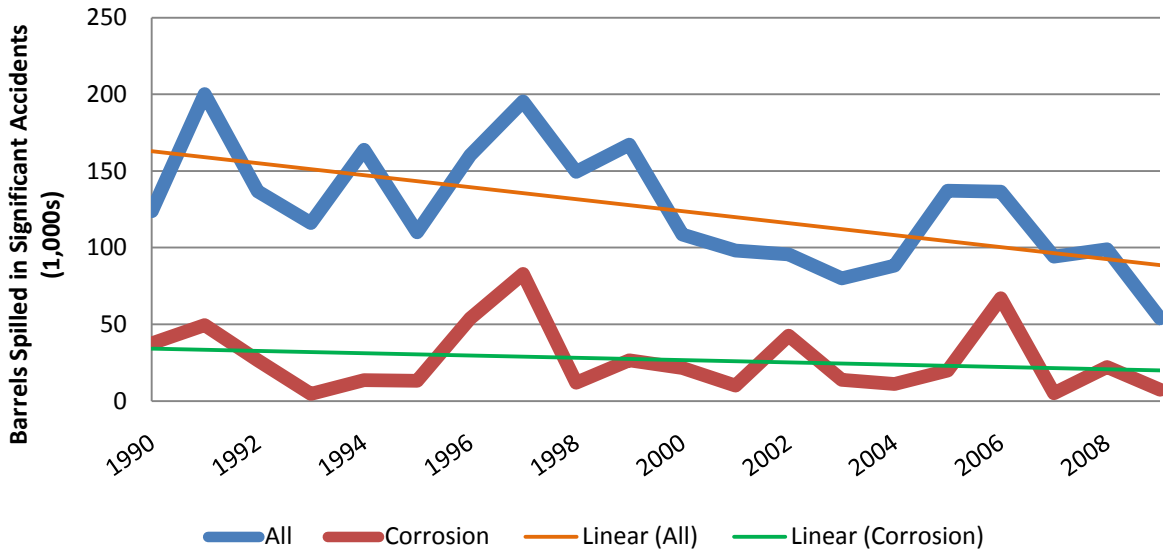


Figure 6 - Spill Volume from Hazardous Liquid Pipeline Significant Accidents 1990-2009

This data show that the yearly spill volume over that last 20 years decreasing – similar to the trend as the number of accidents (Figure 2). Comparing the eight years since operators were required to identify high consequence areas (2002-2009) with the eight years immediately before (1994-2001) shows a lower average spill volume since the rule took place.

Table 2 – Comparison of Spill Volume Before and After IM Rule Effective Date

Period	Yearly Spill Volume from Significant Accidents - All Causes (1,000s bbl)	Yearly Spill Volume from Significant Accidents - Caused by Corrosion (1,000s bbl)
2002-2009	98	24
1994-2001	144	29

The average yearly spill volume is 32% lower in the later period for all causes and 19% lower for accidents caused by corrosion.

In summary, this overview of recent accident frequency and spill volume history shows encouraging trends, for the most part. Although, it's not possible to directly correlate this improved performance with the new IM requirements, the introduction of IM is the most significant change in the pipeline safety program over this period. Thus, PHMSA believes at least some of these positive impacts are attributable to the IM rule and PHMSA's oversight of operator IM Programs. In the remaining sections of this Report, the progress made in achieving each of the individual IM Program objectives is reviewed.

Accelerate and Improve Integrity Assessments

The IM rule requires that operators conduct baseline assessments of the portions of their pipeline systems that can affect potentially HCAs in the event of a release. Assessments can be performed using in-line inspection tools (aka "smart pigs"), hydrostatic pressure testing, or external corrosion direct assessment. Operators were provided seven years in which to complete all of their baseline assessments and then are required to periodically reassess their pipelines at a frequency not to exceed five years. Large operators were required to complete the initial baseline assessments by March 31, 2008, and small operators by February 17, 2009.

As part of each IM inspection prior to these deadlines, PHMSA inspectors carefully reviewed the operator's Baseline Assessment Plan and the progress toward meeting the compliance deadline. These inspections demonstrated that operators were on pace to complete their baseline assessments in advance of the deadline. Since the deadline for completion of baseline assessments has passed, PHMSA inspectors confirm that operators did complete all baseline assessments within the required time frame and are performing the required reassessments within the allotted five year interval. Furthermore, each year operators provide PHMSA with an Annual Report that includes information on their integrity assessments and repairs, including mileage inspected and the types of inspections and assessments conducted. These annual reports, signed by the company's senior executive, likewise showed operators completing their baseline assessments on time.

Some highlights from the Annual Report data include:

- PHMSA regulates approximately 175,000 miles of onshore and offshore liquid pipelines in the United States.
- The number of pipeline segment miles that could potentially affect HCAs is approximately 77,000 miles, representing approximately 44% of the total liquid pipeline mileage in the U.S.
- From 2004-2009[8], approximately 436,000 miles of inspections and tests were performed on hazardous liquid pipelines, covering segments that could potentially affect HCAs as well as many other miles of pipelines. The pie chart (Figure 7) illustrates the different assessment techniques used in these inspections.

[8] 2010 Annual Report submissions are not required until June 2011.

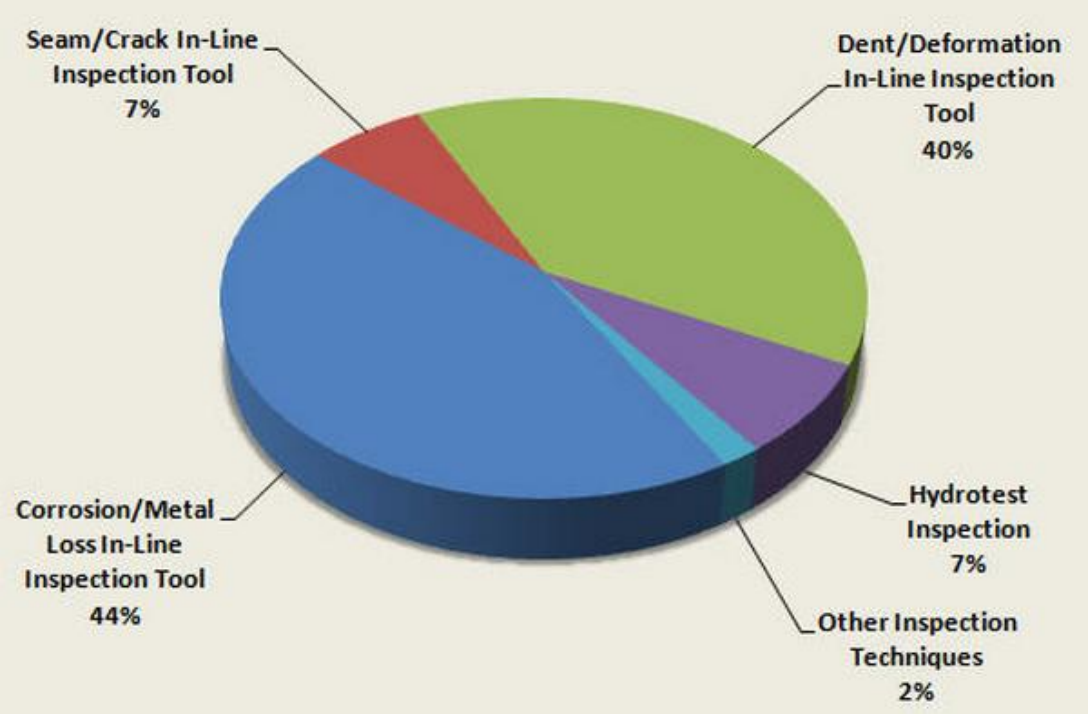


Figure 7 – Types of Pipeline Inspections Under the IM Rule 2001-2009

- Since the IM Program's inception, there have been over 7600 conditions repaired that required immediate attention, over 28,000 other conditions repaired on a scheduled basis, and an additional 79,000 anomalies remediated that were not required by the IM Rule.
- In 2009 alone, 653 conditions were repaired that were deemed by the rule to be serious enough to warrant immediate attention in pipeline segments that could affect HCAs.
- The number of these immediate conditions repaired has generally declined since 2004, suggesting that the rule has achieved two of its associated, primary benefits:
    - Operators were required to identify their highest risk segments and concentrate their initial assessments in the early program years on segments that were likely to have more anomalies.
    - In the more recent years, operators were required to begin reassessing pipeline segments that have already received a baseline assessment. Thus it is expected that fewer serious defects would be discovered.
- Also in 2009, approximately 3,500 other conditions were repaired or mitigated on a scheduled basis as required by the IM Rule. The total number of repairs in the 60 and 180 day condition categories has not decreased significantly since annual report data was first reported in 2004. While the reasons for this continued rate of discovery are not entirely clear, continued operator vigilance in detecting mitigating, and ultimately preventing the anomalies remains a critical element of industry IM implementation.
- In addition to repairs in segments that can potentially affect HCAs, operators are addressing a number of defects that are outside HCA-affecting segments, or are within these segments, but don't meet one of the prescribed conditions in the rule. Since 2001, more than 79,000 anomalies were repaired or mitigated – both within pipeline segments that could affect HCAs

and in pipeline segments that could not - that were not required by the IM Rule. This total is more than twice the number of rule-required immediate, 60 day, and 180 day condition anomalies that were remediated over that period.

While the use of assessment tools is invaluable in identifying pipeline conditions that warrant repair, they are not technically capable of discovering all potential conditions that can lead to a loss of pipeline integrity. Therefore, it is important that all required elements of operator IM Programs – not just those portions specifically related to assessments – be fully developed and implemented to effectively manage pipeline integrity. The next section addresses the broader development of operator IM Programs.

Promote Rigorous Operator IM Programs

The IM Rule identifies eight Program Elements that must be part of an operator's IM Program. These required Program Elements are:

- Identifying pipeline segments that could potentially affect HCAs in the event of a release (Segment Identification)
- Developing and implementing a Baseline Assessment Plan to conduct integrity assessments on these HCA affecting pipeline segments (Baseline Assessment Plan)
- Reviewing the results of the integrity assessments, including the integration of other data sources to better understand pipe condition, by qualified personnel (Assessment Results Review)
- Remediating potentially injurious pipeline anomalies identified through assessments (Remediation)
- Integrating assessment results with other information to fully understand the risks to safe pipeline operation (Risk Analysis)
- Identifying and implementing additional preventive and mitigative measures to address the highest risks identified through risk analysis (Preventive and Mitigative Measures)
- Continually evaluate pipeline risks and conduct re-assessments of pipeline segments that could affect HCAs on an on-going basis (Continual Assessment)
- Measure IM Program performance and make improvements as necessary (Performance Evaluation)

PHMSA's IM inspections are structured to examine both the development and implementation of each Program Element. A comprehensive set of inspection protocols is used by inspectors to assure operators comply with the prescriptive requirements in the IM rule, and are developing IM Programs consistent with the process-based requirements in the rule. Figure 8 shows the number of issues identified per inspection for each of the eight Program Elements. The chart compares the number of issues per inspection for the initial operator IM inspections with those identified in the subsequent operator IM inspections (e.g., round 1 and round 2, respectively).

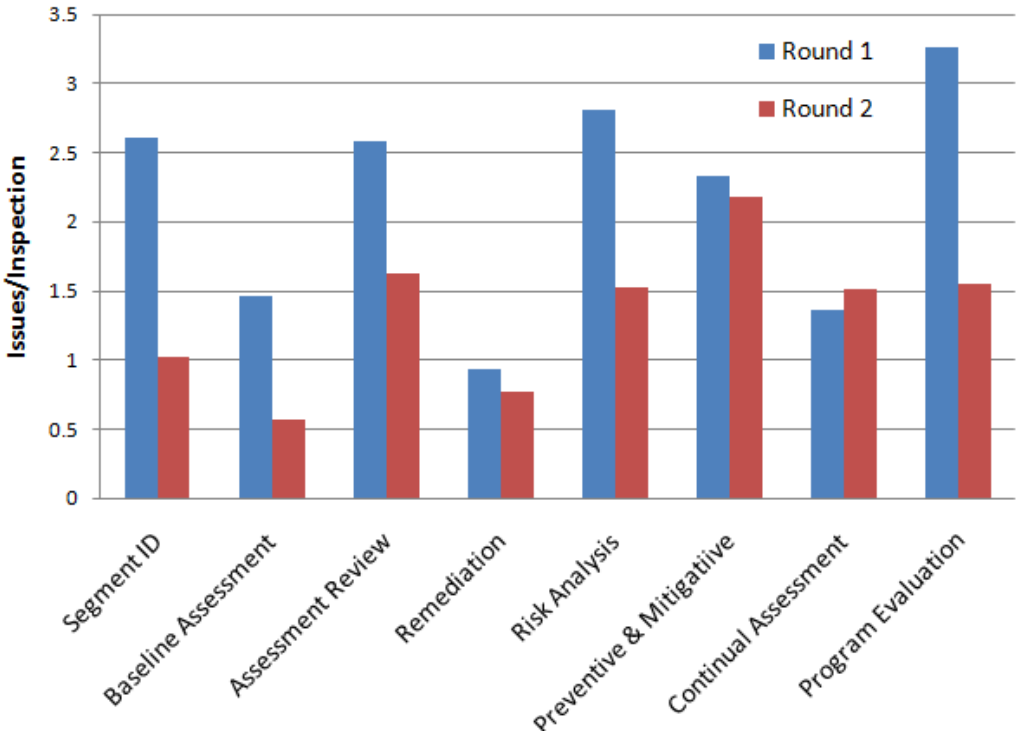


Figure 8 - Number of Issues Identified per Inspection for each Program Element

This chart shows that the number of issues is decreasing in most Program Elements – an indication that operator programs are becoming more systematic and are coming in line with PHMSA expectations. Operators have generally identified their pipeline segments that can affect HCAs and have processes in place to identify when conditions around the line change (e.g., a new housing development adjacent to the pipeline right-of-way). Operators have completed their baseline assessments and are now in the process of reassessing these same pipeline segments as required by the rule. Finally, operator risk analysis methods are improving, though as noted later there is still work to do for these methods to be more useful in supporting broader risk management decisions.

Table 3 lists the most frequently identified problems from the second round of IM inspections. Most of these concerns relate to integrating data and using risk analysis to improve the evaluation of integrity assessment results; identifying and implementing additional preventive and mitigative measures; and determining the appropriate frequency and methods for re-assessment.

Despite the industry's general progress in developing IM Programs, some operators are still struggling to meet PHMSA expectations. Even in the second round of inspections PHMSA still found fundamental problems such as inadequate IM Program processes and level of detail, late assessment discovery dates, inadequate treatment of ILI tool uncertainty, and little or no integration of available information with assessment data. These results indicate some operators are still lagging in their development of an IM Program that meets PHMSA's expectations and the IM rule requirements. This is a significant shortcoming as much of the benefit of IM derives from having a fully functional, fully integrated program that does not merely collect data, but provides a means to readily evaluate the full set of available information and act on it.

Table 3 - Most Frequently Observed Issues – 2nd Round of Operator IM Inspections

Rank	% of Insp	Issue Description	IM Program Element
1	28%	A process to qualify personnel reviewing assessment results was missing or inadequate	Assessment Results Review
2	26%	Adequate detail in one or more areas of the IM Program documentation was not adequately provided	Program Evaluation
3	24%	An evaluation of leak detection capability to protect HCAs was not adequately performed or documented	Preventive & Mitigative
4	23%	An adequate periodic evaluation process was not developed or documented	Continual Evaluation
5	20%	The IM Program did not require anomaly discovery date declaration within 180 days of an assessment or when sufficient information is available	Assessment Results Review
5	20%	Reassessment interval determination did not consider all relevant information, or adequate justifications for intervals was not provided	Continual Evaluation
7	19%	A reassessment interval determination process was not adequately developed or documented	Continual Evaluation
7	19%	Procedures and processes were not adequately developed for all required tasks including documentation, justification, and integration or interface with other Program Elements	Program Evaluation
9	18%	Timely evaluation of preventive and mitigative measures was not adequately performed	Preventive & Mitigative
9	18%	The process did not require a documented justification for decisions regarding additional preventive and mitigative measures	Preventive & Mitigative
11	16%	The process did not specify metrics that adequately evaluate the IM Program	Program Evaluation
12	15%	The process did not adequately require the integration of other pertinent data in a timely manner when evaluating assessment results	Assessment Results Review
12	15%	Facilities (e.g., tanks) were not adequately considered in risk analysis	Risk Analysis
12	15%	An Emergency Flow Restricting Device needs analysis was not adequately performed or documented	Preventive & Mitigative
15	14%	Assessment method(s) were not technically justified	Baseline Assessment
15	14%	Tool tolerance was not adequately considered in evaluating ILI results	Assessment Results Review
15	14%	The process did not adequately require use of the ASME B31.4 Section 451.7 to determine appropriate pressure reduction, or document other acceptable method when this code section is not applicable	Remediation
15	14%	An IM Program effectiveness evaluation was not adequately performed and/or the results were not adequately documented	Program Evaluation
15	14%	Root cause analysis was not adequately integrated into the IM Program	Program Evaluation

In addition to simply counting the issues observed during inspections, PHMSA has also established the relative risk or severity of each inspection issue. Figure 9 shows the relative risk of inspection findings for operators discovered in their first PHMSA inspection compared to the risk of findings discovered during the second inspection.

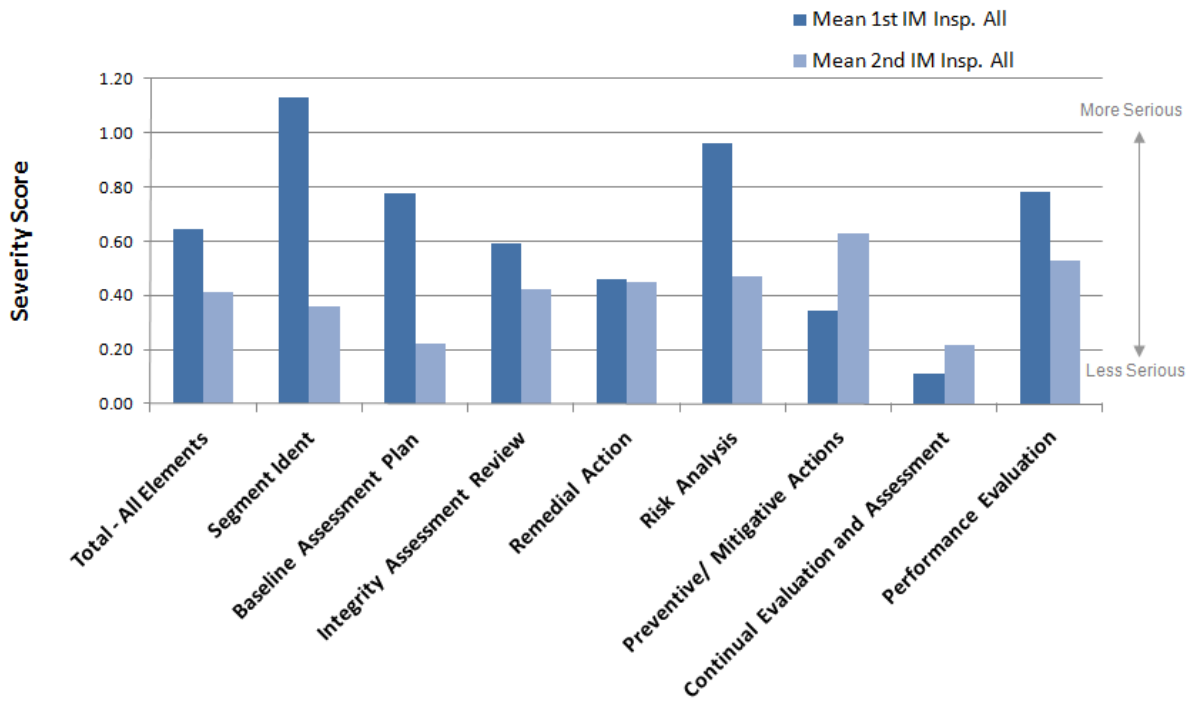


Figure 9 – Severity of Inspection Findings by Program Element

Overall, the risk significance for findings in the second round of PHMSA's IM inspections is less than that observed for the operators' initial IM inspections. Operators have made significant progress in addressing the most serious findings related to their identification of pipeline segments that can affect HCAs, implementation of baseline assessment plans, and in the development of risk analysis approaches. Improvements are being seen in other Program Elements as well.

However, the Preventive and Mitigative Program Element is still proving to be a challenge for industry. As shown in the Figure 8, the number of preventive and mitigative measure inspection issues has changed very little from the initial round of inspections. However, the severity of the issues for this Program Element is increasing as shown in Figure 9 above. While the assessment provisions of the IM rule result in the elimination of many potentially injurious defects, pigging and pressure testing do not address all potential pipeline failure mechanisms. PHMSA requires that operator IM Programs incorporate a Preventive and Mitigative Measures element to address these other pipeline failure causes.

Addressing these broader set of threats requires that operators develop the processes and tools to identify and analyze the risks that are unique to each pipeline. These risks are dependent on the pipeline location, operating environment, commodity transported, and many other factors. The IM rule also requires operators to have systematic approaches to use this risk information to identify

and implement additional preventive and mitigative measures. If operators are to successfully and significantly reduce their operational risk, it is critical that the measures taken are based on a sound understanding of what is actually driving that risk and how those drivers can practically be impacted. As a specific example of the difference between a mature IM Program and one in the early stages of development, the risk analysis approach to support evaluation of potential preventive and mitigative measures is often more detailed than the approach used to prioritize pipeline segments for the baseline assessments.

As operators have completed their baseline assessments of HCA-affecting pipe, they are now into performing the reassessments required by the rule. PHMSA's recent inspections have revealed some areas for improvement in the operator's process to periodically evaluate overall line integrity, and in determining the reassessment method and interval between the baseline and subsequent assessments. This is reflected in the increases in the number and severity of inspection issues in the Continual Evaluation and Assessment Program Element in the previous charts.

Finally, the preceding charts also indicate the continued need for PHMSA vigilance with respect to industry remediation of issues identified during assessments (e.g., completing repairs within required timeframes, implementation of required pressure reductions).

While operators understandably devoted significant resources to completing their baseline assessments to meet the initial deadlines in the regulations, they now need to devote more effort and resources to those elements considered to be representative of a mature IM Program, such as Preventive and Mitigative Measures, Continual Evaluation and Assessment, and their own internal Program Evaluation process.

Strengthen Government Oversight

In 2002, PHMSA launched a new inspection program to assure compliance with the new IM requirements and promote improved operator IM Programs. A comprehensive set of inspection protocols were developed that not only checked for compliance with the rule's prescriptive requirements, but also supported a detailed audit of an operator's management and analytical systems, processes, and practices to manage pipeline integrity. To date, the IM Program of every company PHMSA's regulates has been inspected at least once. All major hazardous liquid pipeline operators have been inspected a second time to be sure they are continuing to manage pipeline integrity and are making progress in building the robust IM Programs PHMSA expects. To date, more than 80 operators have received a second PHMSA IM inspection. In addition to the comprehensive program reviews, PHMSA inspectors perform field verification inspections periodically to observe actions taken by operators to be sure they are in conformance with the operator's IM Program.

When operators fall short of meeting the rule's requirements for IM Program development, PHMSA takes enforcement action to address program deficiencies as well as to accelerate program development. PHMSA issues civil penalties as well as compliance directives which dictate the corrective actions which operators must take to address program deficiencies. PHMSA has issued enforcement letters for most of its IM inspections. When violations of the rule's prescriptive requirements occur, PHMSA has not hesitated to exercise its civil penalty authority. For PHMSA's first round of operator IM inspections, the average civil penalty was approximately $45,000. However, for the second round of IM inspections, PHMSA's average proposed penalty has escalated

to nearly $127,000. Further, when program deficiencies are identified, PHMSA likewise has not hesitated to exercise its directive authorities either. A full 22% of PHMSA's enforcement actions are in the form of a compliance directive known as a Proposed Compliance Order, which along with Notices of Amendment, are used to achieve needed programmatic improvements.

Table 4 – Integrity Management Enforcement Results

	% of Inspections Resulting in Enforcement Action	% of Inspections Resulting in Proposed Compliance Order	% of Inspections Resulting in Proposed Civil Penalty	Average Proposed Civil Penalty[9]
Initial Inspection	87%	25%	21%	$44,759
Second Inspection	65%	16%	9%	$126,571
Combined	79%	22%	16%	$60,667

Figure 10 provides a comparison between the enforcement actions taken following the first set of operator IM inspections with the actions taken following the second operator IM inspections. This clearly shows each type of enforcement action being used less frequently, thus reflecting the improvement and maturation of operator IM Programs.[10]

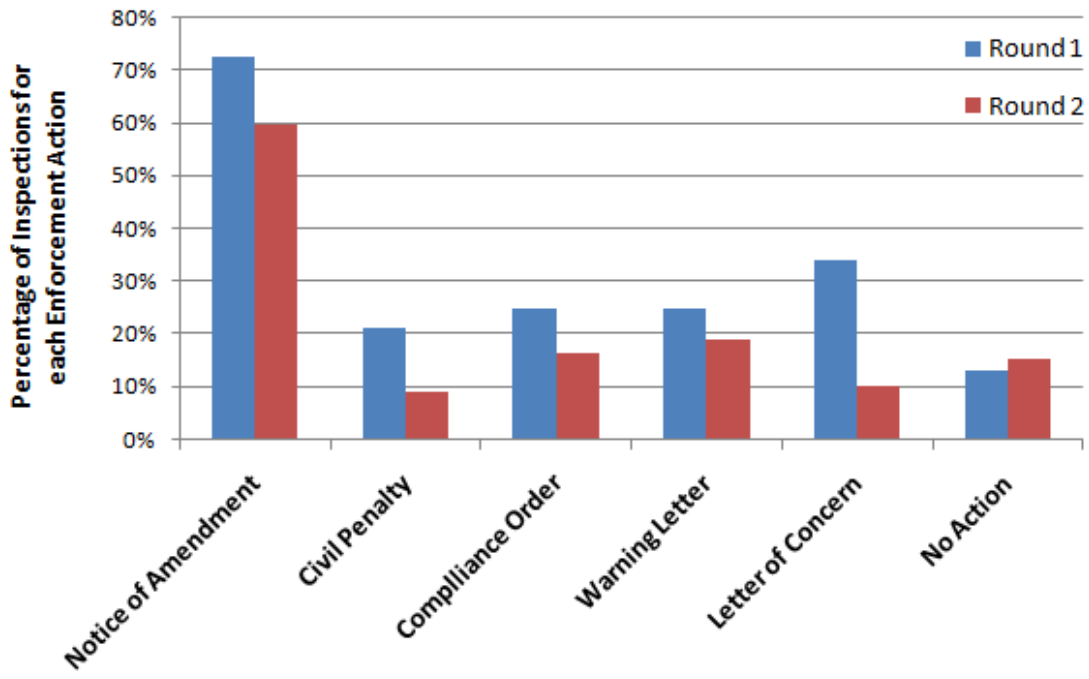


Figure 10 – Comparison of Enforcement Actions for Round 1 and Round 2 IM Inspections

[9] Average does not include cases with no civil penalty proposed.

[10] Some inspections result in more than one type of enforcement action

As can be seen, the Notice of Amendment (NOA) action is the most frequently used compliance tool following IM inspections. NOAs are used to communicate needed program and process improvements to operators. Because the development and maturation of an IM Program takes significant operator time and resources, the NOA has been used frequently in the early stages of the IM oversight program to communicate PHMSA expectations for process-based requirements in the rule and facilitate the timely development of operator programs in the desired direction. The decrease in the percentage of inspections resulting in NOAs reflects a lessening need for substantial revision of operator IM processes, and is indicative of improving operator IM Programs.

Increase Public Assurance in Pipeline Safety

The extensive performance and process-based requirements in the IM rule represent a significant departure from PHMSA's prior practice of issuing largely prescriptive regulations. PHMSA leadership recognized that a major outreach effort was required to both communicate to operators what was expected, and to foster the public's understanding of the rule and its safety improvement objectives.

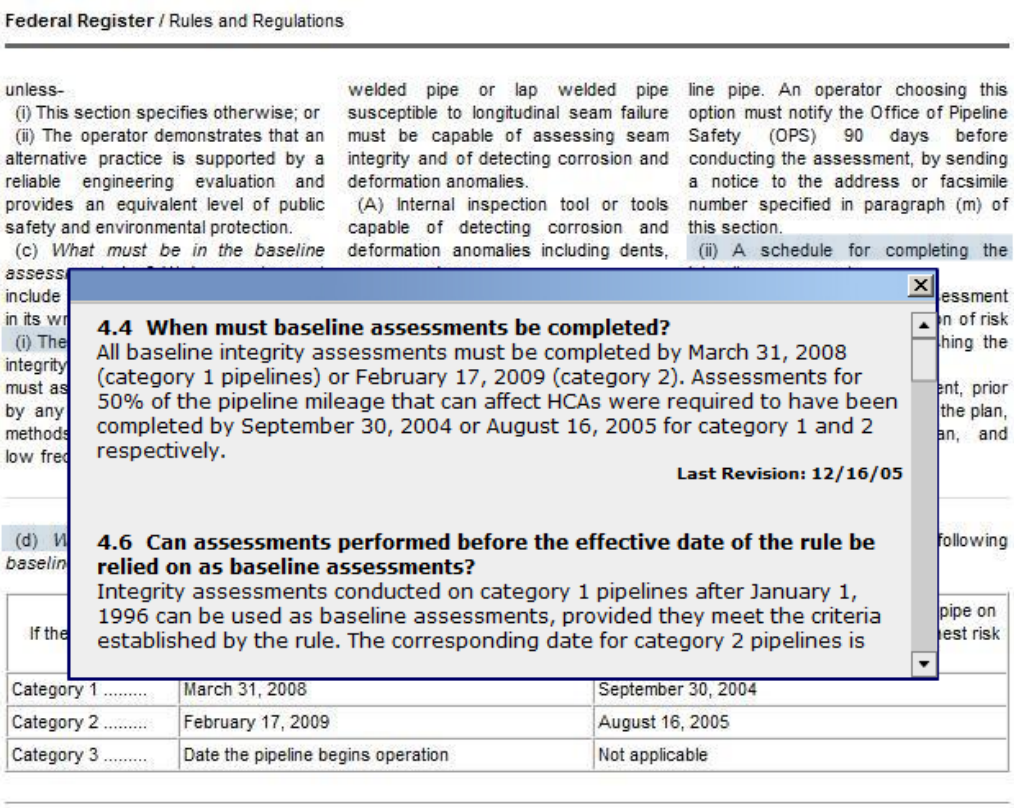
Since the initial publication of the IM rules, PHMSA has taken unprecedented steps to inform and involve the public and its regulated community. PHMSA conducted three public meetings since the rules were published to explain the rule and communicate PHMSA's expectations for compliance. The last of these workshops described some of the lessons learned from the early inspections providing the public with an opportunity to understand how the new rules were being enforced. The workshops also provided an opportunity for operators to share noteworthy integrity management practices and better understand PHMSA's oversight approach for this performance-based rule.

PHMSA has also held several workshops focused on a specific subjects and challenges operators face in managing safety and integrity. In particular, workshops on the Use of In-Line Inspection Devices and Anomaly Assessment and Repair were held in 2005 and 2008, respectively. The presentation material from these workshops was made available to a broader audience through PHMSA's web site.

Shortly after the rule was published, PHMSA launched the "Implementing Integrity Management" (IIM) web site – a comprehensive resource of information related to the new IM rule.

The IIM web site provides copies of the rule language, a flow chart illustrating the IM process, a glossary of terms and other basic reference material related to IM (see menu from the web site to the right). The web site includes more than 200 Frequently Asked Questions (FAQs) to explain the rule provisions, PHMSA's compliance expectations, and PHMSA's oversight program. In the early development of the FAQs, the questions were collected through the previously mentioned public meetings, individual public and operator inquiries, and submissions from industry trade groups. The web site itself has a feature where users can send questions to PHMSA. Furthermore, newly posted FAQs are identified so stakeholders can comment on PHMSA's answers if desired.

The IIM site is heavily interlinked. For example, clauses in the IM rule are linked to related FAQs so users can readily access additional information about key rule requirements.



Since 2004, hazardous liquid operators have been required to file Annual Reports that contain integrity management performance metrics on the number of pipeline miles inspected, the number of HCA segment miles that have been fully assessed, and the number of repairs that are made. The IIM site provides a summary of these statistics and graphs of historical trends, as well as links to PHMSA's data base where the public can view individual operator report submissions.

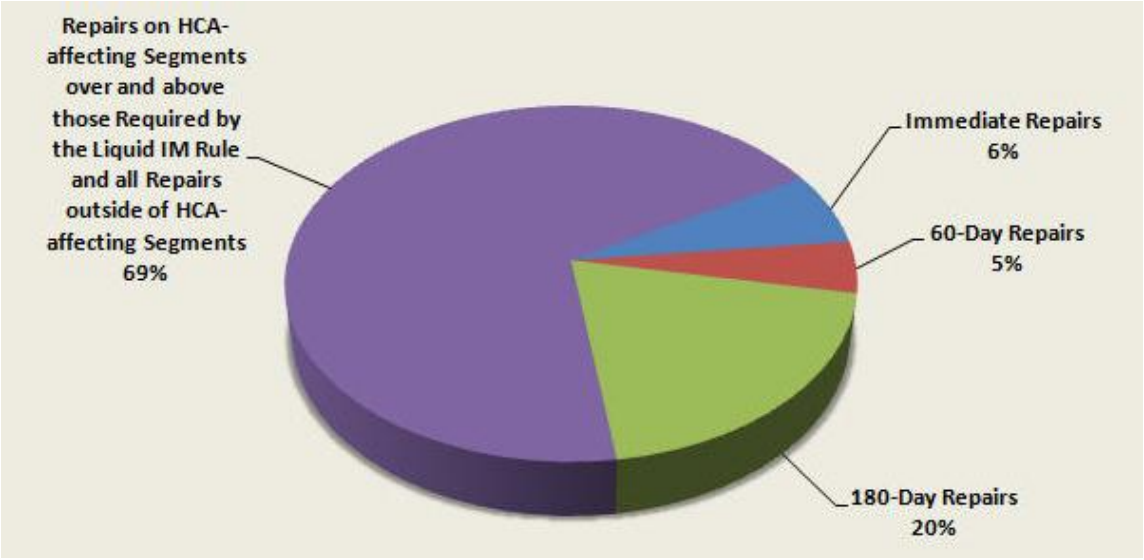
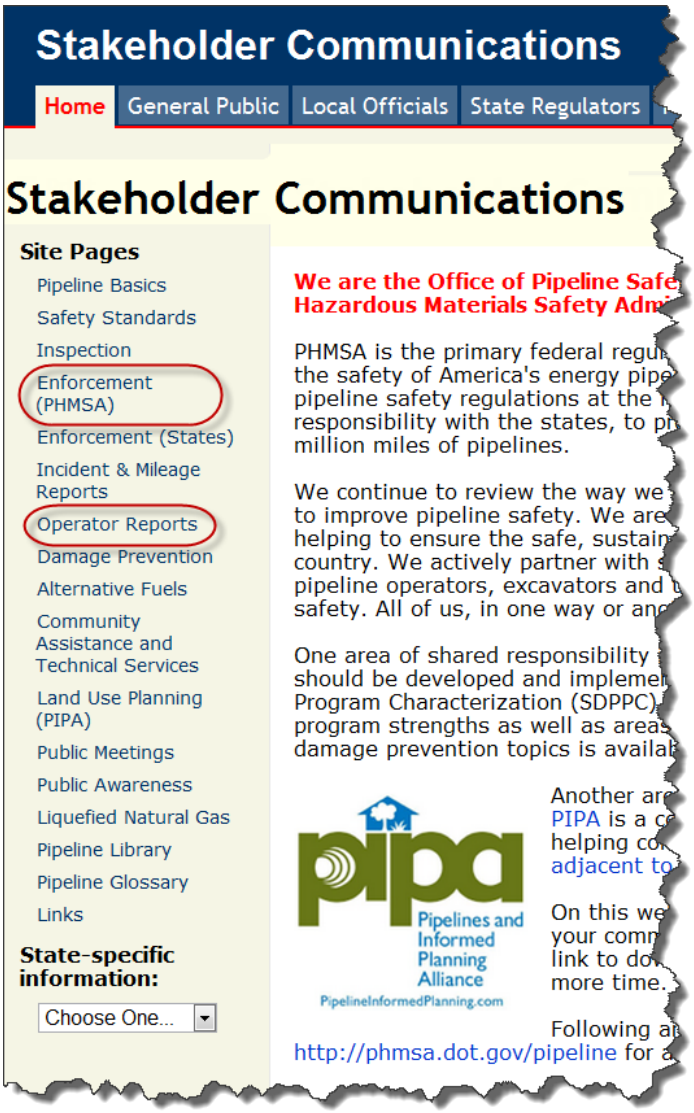


Figure 11: Types of Pipeline Repairs 2001-2009



The IM rule also includes several provisions where operators must notify PHMSA if they are unable to meet certain deadlines or intend to vary from specific rule requirements. Some 371 of these Notifications have been submitted since the rule was published. These individual operator "Notifications" are summarized on the IIM web site, as well as PHMSA's response to the Notification. PHMSA has objected to relatively few notifications (approximately 8 percent overall). The relatively low number of objections indicates that pipeline operators have adjusted to the demands that IM posed on their processes.

In the spring of 2007, PHMSA significantly enhanced the transparency of its enforcement program actions. A new section of the Stakeholder Communications web site was developed to portray industry wide and operator-specific enforcement information

Through this site, the public now has access to enforcement case information, PHMSA notice letters, operator responses to PHMSA's allegations, and final orders directing operator compliance. Thus, the public now has access to what actions PHMSA is taking for all inspections, including IM.

Finally in the fall of 2010, PHMSA introduced a new series of operator-specific reports on the Stakeholder Communications web site. These reports allow the public to readily access information on specific pipeline operators. This information includes pipeline mileage, and accident, inspection, and enforcement history. Within the inspection history portion of these reports is a listing of all specific inspections performed since 2005, including integrity management inspections. The listing of enforcement actions includes those that emanate from integrity management inspections.

In summary, PHMSA has taken unprecedented steps to inform the public and its stakeholders about the IM rule and its oversight for the new rule. The quantity and quality of information is far more than has been made available in the past. Informal communication and feedback from stakeholder groups indicates that this information is being used and found useful by stakeholder groups and the regulated community.

Summary

PHMSA has made substantial progress in achieving its four primary IM Program objectives since the first rule was issued a decade ago.

- Operators have an improved understanding of the precise locations of their HCAs – those areas where integrity assessments and other protective measures spelled out in the IM rule must be taken to assure public safety and environmental protection. Some 44% of the nation's hazardous liquid pipelines can potentially affect HCAs and thus receive the enhanced level of integrity assessment and protection mandated by the IM rule.
- Operators have conducted baseline integrity assessments on all pipelines that could affect HCAs and have begun conducting reassessments of these same pipeline segments as required by the IM rule. Operators now have an improved understanding of the condition of pipelines in these safety-sensitive areas.
- As a result of these assessments, operators have made more than 7600 repairs of anomalies that required immediate attention, remediated over 28,000 other conditions on a scheduled basis, and an addressed an additional 79,000 anomalies that were not required to be addressed by the IM Rule, thus significantly improving the condition of the nation's pipelines.
- The programmatic and process-oriented requirements of the rule have fostered a more systematic, risk-based approach to managing integrity. Operators are generally making progress toward developing the mature, proactive IM Programs which PHMSA expects.
- Improvement is still needed in the areas of risk analysis and the use of this analysis to identify and implement additional preventive and mitigative measures to reduce risk. This aspect of the rule is critical, as the integrity assessment provisions of the rule only address some of the causes of pipeline failures. The Preventive and Mitigative measures program element requirements are the means to achieve a comprehensive approach to reducing risk.
- PHMSA has a robust IM oversight program consisting of both comprehensive IM Program inspections and field validations. PHMSA has not hesitated to use its enforcement authority – nearly 80% of all programmatic inspections result in enforcement action.
- PHMSA has taken unprecedented steps toward communicating its expectations and sharing program results with the public and the regulated community. A special web site was created solely to communicate information about hazardous liquid IM. More recently information on IM inspections and enforcement actions has been made available to the public.

Finally, there has been a noticeable reduction in the frequency of significant accidents when comparing the period prior to the IM rule (1994 – 2001) with the time period since the IM requirements became effective (2002 – 2009). Likewise, the volume spilled in significant accidents shows a similar reduction over these same periods. These, and other metrics described in this Progress Report indicate an overall improvement in industry safety performance. Thus it appears that the IM rule and PHMSA's rigorous oversight of operator compliance with the rule is contributing to improved safety performance.