The oil pipeline industry has undertaken a voluntary environmental performance tracking initiative, recording detailed information about spills and releases, their causes and consequences.

The pipeline members of the American Petroleum Institute and the Association of Oil Pipe Lines believe that tracking and learning from spills will improve performance, thus demonstrating the industry's firm commitment to safety and environmental protection by its results.

This is one of a series of fact sheets and industry advisories drawn from the data compilations of the Pipeline Performance Tracking System, PPTS.

PPTS ADVISORY FOR OPERATORS: PUBLIC SAFETY IMPACTS OF PIPELINE INCIDENTS

Pipeline incidents rarely cause public safety impacts

Of all the spills reported to PPTS between 1999 and 2001, less than 3% (or 51 incidents) had any impact on the general public safety. A general public safety impact is defined as a spill involving a death, injury, fire, explosion, or a public evacuation. Of these, 20 were classified as such only because they involved evacuations; these incidents did not involve a death, injury, fire, or explosion. Also included are 15 incidents that involved a fire or explosion, but none of the other measures – no death, injury or evacuation. PPTS participants report all spills to water and spills of 5 gallons or more on land. If the incident involves any of these public safety impacts, the respondent provides additional detail about the circumstances and conditions surrounding the spill. The petroleum pipeline industry places great emphasis on practices and processes to maintain the integrity of pipeline systems. The industry continues to work on reducing the total number of spills and, in particular, on eliminating those that could impact the general public.

More than 70% of incidents with a public safety impact occur on pipe

Public safety incidents occur at a greater rate in onshore pipe. As shown in the table on page 4, "Summary of PPTS Incidents Involving a Public Safety Impact, 1999-2001," more than 70% of public safety incidents occurred on onshore pipe (as opposed to facilities, tanks or offshore pipelines), as compared to the onshore pipe share total of all PPTS incidents of 43%. All of the deaths and 75% of the injuries occurred in onshore pipe incidents. In contrast, only 18% of the public safety incidents occurred in facilities piping and equipment, the system location that accounts for the largest share, 48%, of all PPTS incidents. Thus, the incidents that occur on facilities piping and equipment infrequently have a safety consequence.

Third Party Damage and Operator Error are important causes of incidents with a public safety impact

The total number of pipeline spills or incidents that impact the safety of the general public or pipeline workers is relatively small. A disproportionate number are due to third party damage (damage to a pipeline caused by a person or persons not involved with operating or maintaining the pipeline, for example farmers and/or homeowners). Another important cause of incidents involving a public safety impact -- injuries in particular -- is operator error. Operator error may involve excavation damage that is caused by an operator or operator's contractor working directly for/on a pipeline or other operator error such as may occur in facilities operation: these are people who should know better. While equipment malfunctions and other non-pipe failures caused the second largest share of public safety incidents, just 1% of all equipment malfunction and non-pipe failures involve a public safety impact (including three that involved a fire and no other impact, and 4 that involved an evacuation and no other impact). In contrast, 2.5% of all operator error incidents and 13% of all third party damage incidents involved a public safety impact.

Third Party Damage is a significant contributor to fatalities, to injuries, and to other safety events like fires and explosions

While causing 8% of all incidents, third party damage was a factor in 100% of the incidents involving a fatality, in 39% of the incidents involving an injury, in 28% of the incidents involving a fire, in 57% of the incidents involving an explosion, , and in 52% of the incidents involving an evacuation.

In 1999 and 2000, there were 3 pipeline incidents involving a total of 5 fatalities. (There were no liquid pipeline fatalities in 2001, or in 2002.) Third party damage was either the immediate cause or a contributing factor in each of the incidents. All 5 people were members of the general public. Furthermore, these incidents also involved other public safety impacts: injury (2 incidents), fire (3), explosion (2), or evacuation (2).

In addition, 5 incidents involving third party damage resulted in 12 injuries, again all members of the public: 8 injuries in the same refined product spill that caused three fatalities; the other 4 each occurred in a separate HVL incident. This reinforces the need to continue to work on activities that reduce chances of a third party strike, such as public awareness programs and one call.

Operator Error is a significant contributor to injuries

Operator error caused 13% of all incidents, but caused 31% of the incidents with injury over the 1999-2001 period. All were employees or contractors, not members of the general public. One of the incidents involved operator excavation damage. While pipeline operations in general have a good record with respect to worker safety, threats to worker safety should be constantly re-evaluated and should be the subject of training from the control room to the field.

Corrosion causes many pipeline incidents, but almost no public safety impacts

Between 1999 and 2001, corrosion accounted for about 30% of the total number of incidents, and 49% of the incidents that involved onshore pipe (as opposed to facilities and/or tanks). But these corrosion spills, while numerous, rarely impact the general public: no corrosion incidents caused a death or an injury over the period, 1 involved an evacuation, and 3 involved a fire.

HVL incidents more commonly involved public safety impacts, crude oil incidents seldom involved public safety impacts

HVL was the transported commodity in only 9% of all PPTS incidents, but those incidents have a greater likelihood of having a public safety impact. HVL was the transported commodity in 43% of the incidents involving public safety impacts, a ratio in the shares of nearly 5:1. The nature of the commodity is an important factor: when released, LPG's gaseous form is heavier than air and can settle near the ground in a flammable cloud, and when a pipeline ruptures, a high volume of product may be released. Refined product also accounted for 43% of the incidents involving a public safety impact, but it accounts for 37% of all incidents, for a ratio approaching 1:1. Crude oil accounts for 14% of the public safety incidents, but 54% of all incidents, a ratio in the shares of 1:4. Thus, while more numerous, these crude oil spills seldom involve public safety impacts. Of the 7 incidents that involved a public safety impact, 2 involved only an evacuation; there were no deaths associated with crude oil spills.

Considerations for Operators

The oil pipeline industry addresses safety issues at every venue in their operations, from board rooms to contractors' tailgate meetings. This advisory is designed more to report the findings from PPTS than to suggest new strategies for safe operation. Because safety issues are so important and PPTS provides the first opportunity to observe some of these patterns industry-

wide, however, it is useful to reiterate safety lessons and messages as they present themselves. These "Considerations for Operators" are some of the points that industry experts gleaned:

- *Implications for Integrity Management Programs*: As the industry moves into the heavy work load associated with integrity testing and repair, particularly as it conducts more excavations to examine anomalies identified by ILI, it is important that people working on a pipeline or within a pipeline right of way are properly trained and qualified. Operators may need to balance a required repair schedule with the imperative to work with the best-trained contractors most familiar with the operator's system. It is also vital to know not only where your pipelines are, but where any adjacent pipelines are located before undertaking a dig. PPTS allows us to observe that not all excavation and mechanical damage is caused by parties outside the pipeline industry; operators, their contractors and other pipeline operators have also caused pipeline damage.
- *Third Party Damage*: The need to guard against excavation or mechanical damage, whether caused by true third parties or by operators, is demonstrated again and again, and the prevalence of this damage in the public safety incidents is just one more illustration. The industry is already active on many fronts on this issue.
  - The Common Ground Alliance (http://www.commongroundalliance.com/), sponsored by pipelines, underground facility operators, excavation contractors, and others with a stake in preventing damage to underground facilities, is a nonprofit organization that promotes damage prevention overall and the diligent use of best practices for damage prevention. These cover all aspects of damage prevention from planning through completion, including public education and awareness, one-call use and administration, mapping, locating and marking, and safe digging practices.
- *Operator Error*: The pipeline industry is already pursuing aggressive programs on training. Some are driven by the regulations on operator qualification, but many are driven simply by the desire to reduce the occurrence of all incidents and in particular to reduce the incidents with a safety impact. While the PPTS data focus on operator error as a primary cause, neither PPTS nor other industry-wide compilations examine contributing causes that may also involve operator error (i.e., an error by an employee or a contractor) and almost certainly include management failure.
  - Operators should consider setting volume or consequence-related thresholds for conducting full-scale accident investigations or root-cause analyses for accidents that happen on operated systems. Such analysis should include fault tree or other types of analyses that drives understanding to decisions or actions by individuals.
  - Operators should conduct root cause analysis for every incident with a death or injury.
- *HVLs have special characteristics and require special attention*: According to PPTS data, 1 out of every 144 incidents involving crude oil had a public safety impact of some type, while 1 out of every 8 HVL releases had a public safety impact. Looked at another way, an HVL release ***if one occurs*** is nearly 20 times more likely to have a public safety impact than a crude oil leak. Thus, operators should consider this disparity in impacts in conducting risk assessments and in designing public awareness programs for HVL systems.

SUMMARY OF PPTS INCIDENTS INVOLVING A PUBLIC SAFETY IMPACT, 1999-2001							
	Incidents Involving a Public Safety Impact						Memo:
	Fatality	Injury	Fire	Explosion	Evacuation	Total	All PPTS
BY SYSTEM LOCATION							
Number of Incidents							
Aboveground Storage Tank		1	3		2	5	
Belowground Cavern		1	1			1	
Facilities Piping and Equip		1	8	1	2	9	
Offshore Pipe	0	0	0	0	0	0	
Onshore Pipe	3	10	13	6	23	36	
Grand Total	3	13	25	7	27	51	
Share of Incidents (%)							
Aboveground Storage Tank	0.0	7.7	12.0	0.0	7.4	9.8	7.2
Belowground Cavern	0.0	7.7	4.0	0.0	0.0	2.0	0.2
Facilities Piping and Equip	0.0	7.7	32.0	14.3	7.4	17.6	47.6
Offshore Pipe	0.0	0.0	0.0	0.0	0.0	0.0	1.8
Onshore Pipe	100.0	76.9	52.0	85.7	85.2	70.6	43.3
Grand Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
BY CAUSE							
Number of Incidents							
Aboveground storage tank failure	0	1	3	0	2	5	
Corrosion			3		1	4	
Equipment malfunction, non-pipe fail		1	3		4	8	
Natural forces			1		1	2	
Operator error		4	4	1	2	6	
"Other"			2		3	4	
Pipe material, seam or weld failure		2	2	2		3	
Third party damage	3	5	7	4	14	19	
Grand Total	3	13	25	7	27	51	
Share of Incidents (%)							
Aboveground storage tank failure	0.0	7.7	12.0	0.0	7.4	9.8	2.8
Corrosion	0.0	0.0	12.0	0.0	3.7	7.8	29.4
Equipment malfunction, non-pipe fail	0.0	7.7	12.0	0.0	14.8	15.7	33.7
Natural forces	0.0	0.0	4.0	0.0	3.7	3.9	1.2
Operator error	0.0	30.8	16.0	14.3	7.4	11.8	12.6
"Other"	0.0	0.0	8.0	0.0	11.1	7.8	6.8
Pipe material, seam or weld failure	0.0	15.4	8.0	28.6	0.0	5.9	5.8
Third party damage	100.0	38.5	28.0	57.1	51.9	37.3	7.7
Grand Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
BY COMMODITY							
Number of Incidents							
Crude		2	4	2	2	7	
HVL's	2	8	10	5	11	22	
Refined Products	1	3	11		14	22	
Grand Total	3	13	25	7	27	51	
Share of Incidents (%)							
Crude	0.0	15.4	16.0	28.6	7.4	13.7	53.9
HVL's	66.7	61.5	40.0	71.4	40.7	43.1	9.0
Refined Products	33.3	23.1	44.0	0.0	51.9	43.1	37.1
Grand Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: The column "Memo: All PPTS" provides the overall context for understanding the public safety impacts of pipeline incidents from 1999-2001, allowing a comparison of the share of incidents involving a public safety impact with the share of all PPTS incidents for each system location, or cause, or commodity.