



Advanced Applications to Guard against Theft and Fines

Jodi Bash, Energy Solutions International
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SUMMARY

The loss of product in a pipeline can occur for a variety of reasons. In many parts of the world today theft is a major cause of product loss and one that can require sophisticated techniques to combat. At the same time Environmental Health & Safety (EH&S) regulations are also on the rise. Because of these two phenomena companies can get hit with costs from both the loss of their product and the costs to the environment of undetected leaks from theft or other causes. This article will examine one way that pipeline companies can safeguard their assets and the environment while positively impacting their bottom line. The use of advanced model-based leak detection systems, has helped companies guard against theft and has also been able to help avoid costly EH&S fines.

REDUCING ENVIRONMENTAL, HEALTH & SAFETY COSTS THROUGH ADVANCED LEAK DETECTION

Tightening regulations and increasing public concern has intensified the scrutiny over Environmental, Health & Safety of pipelines. Inspection requirements and fines for pipeline integrity and maintenance violations are on the rise. Some juries have sentenced executives to jail time while awarded enormous damages against pipelines that were judged as lax in their efforts to ensure environmental protection and public safety.

To reduce EH&S costs, a pipeline using advanced model-based leak detection software can improve its identification and response capabilities. In the event of a pipeline leak, model-based leak detection can dramatically increase system sensitivity, thus reducing detection time and more precisely locating the leak as compared to various non-model-based leak detection systems. This enables operators to respond promptly to an incident and seek corrective action sooner and more effectively than they could otherwise. Faster response time minimizes costs related to lost product, property damage, clean-up, and fines and penalties. The sensitivity of the leak detection software can be modified based on the needs of the individual pipeline company.

Following is an example of how incident costs can be dramatically reduced through advanced leak detection software. According to data gathered from the Texas A&M University and the US Office of Pipeline Safety (OPS), the average crude oil spill in Texas cost \$1.5 million per spill. The costs consisted of lost product, property damage, and clean-up. According to OPS data (http://ops.dot.gov/stats/LQ05_CM.HTM), in 2005, 50 crude spills accounted for 76,843 barrels lost, equating to 1,537 barrels per spill. These spills caused on average \$356,387 in property damage. According to Texas A&M University (<http://ceprofs.tamu.edu/rhann/links/Test.asp>), a spill of 1,537 barrels equates to \$1,075,802 per clean-up. In addition, product lost equates to \$107,580 at \$70 per barrel.

Model-based software can often detect leaks as small as 0.5% of mainline design flow (and sometimes less) and can substantially reduce the spill volume by alarming operators to shut down the pipeline sooner.

For this return on investment example we have assumed a 100,000 bbl/d crude pipeline with advanced software in use, and a leak of 1%. Using a very conservative detection time of one hour, a 1% leak of 42 bbl/hr can be detected and responded to, reducing the cost of that leak to as low as \$50,000.

For leak detection, the return on investment is highest when a leak occurs soon after installation, because the cost was avoided sooner rather than later. In other words, if leak detection were installed and a leak occurred a year after installation, the ROI would be higher than if the leak occurred two years after installation. This is because the cost difference between the average \$1.5 million leak versus the leak that is identified sooner (and therefore cost less) is realized in year one versus year two.

The numbers used below are based on a conservative (higher cost, more complex pipeline system) cost estimate of software and services. Other tangible and direct economic benefits have not been factored into the ROI calculation including lower costs associated with fines, penalties, and lawsuits. Depending on the size of the pipelines and sensitivity levels even greater returns could be possible. When compared to the initial cost of the software and ongoing maintenance, the ROI of a leak occurring even as long as five years after software installation is a very healthy 27%.

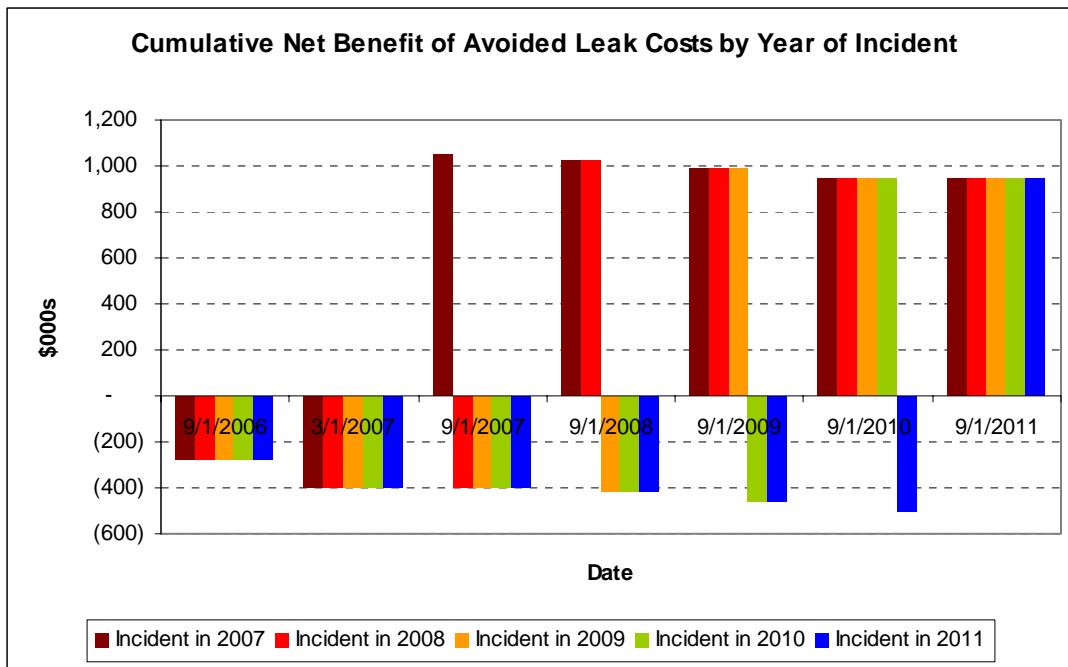


Table 1. Summary of ROI of leak detection

	Jan 2007	Apr 2007	Jan 2008	Jan 2009	Jan 2010	Jan 2011	Jan 2012	Total
Software and services	(208)	(120)	--	(20)	(40)	(40)	--	(1875)
Avoided cost if event occurs								
1/1/2008	--	--	1450	--	--	--	--	1450
1/1/2009	--	--	--	1450	--	--	--	1450
1/1/2010	--	--	--	--	1450	--	--	1450
1/1/2011	--	--	--	--	--	1450	--	1450
1/1/2012	--	--	--	--	--	--	1450	1450
Net cash flow if event occurs								
1/1/2008	(280)	(120)	1450	(20)	(40)	(40)	--	950
1/1/2009	(280)	(120)	--	1430	(40)	(40)	--	950
1/1/2010	(280)	(120)	--	(20)	1410	(40)	--	950
1/1/2011	(280)	(120)	--	(20)	(40)	1410	--	950
1/1/2012	(280)	(120)	--	(20)	(40)	(40)	1450	950
ROI if event occurs								
1/1/2008	326%							
1/1/2009	95%							
1/1/2010	53%							
1/1/2011	36%							
1/1/2012	27%							

REDUCING PRODUCT THEFT COSTS THROUGH ADVANCED LEAK DETECTION

The pipeline business is changing rapidly as the emerging markets play an increasingly important role in hydrocarbon production and consumption. Through 2010, nearly 180 new projects totaling 130,000 kilometers are planned for Asia, Eastern Europe, the Middle East, Africa and Latin America. In all, 40% of the projects and 60% of new pipeline miles worldwide will be constructed in the emerging markets. This growth in infrastructure is disproportionately high when compared to the installed base of pipelines (industrialized nations account for about 75% of the worldwide pipeline mileage). Large scale development of oil and gas fields in Africa, Latin America, the Middle East and Eastern Europe has accelerated and expanded to capitalize on high energy prices and to meet infrastructure development needs and sustain growth.

Because of the large role oil and gas plays in the emerging markets as a source of revenue for producing nations and as an increasing need for consuming nations, protecting pipeline assets and the surrounding environment has become more important than ever. In many producing nations, poverty, high commodity value, and an active black market have increased the frequency and cost of pipeline theft. Many pipelines operating in emerging market economies incur significant product losses (up to 4% in some cases) and suffer extended operational downtime as a result of theft.

To reduce theft losses, advanced model-based leak detection software can be used to improve breach identification and security response. These software systems can dramatically reduce the detection time in the event of a breach and can detect breaches at lower thresholds than various non-model based systems. This is very important because pipeline thieves often tap at low flow levels specifically to avoid detection. Upon detection, pipeline operators can respond quickly and effectively by shutting down the pipeline to avoid further losses, while dispatching security to the location of the leak to respond to perpetrators and maintenance personnel to make necessary repairs.

The use of leak detection software will not stop theft activity, but it will reduce the amounts stolen. The return on investment is measured by the level of product theft losses before and after software installation and by adjusting the theft reduction by the benefit attributable to the software. Actual results from a large state-owned oil and gas company in Latin America have shown that advanced leak detection has accounted for 15% of their theft reduction. Other means of theft reduction include security presence and product tagging.

If product theft was reduced from 4% to 1% of transported product and leak detection accounted for 15% of this reduction, the avoided loss contributed by software would be 0.45% of transported product ($4 - 1\% = 3\% * 15\% = 0.45\%$). The greater the avoided loss attributable to the model based leak detection system the higher the ROI of that system.

For the purpose of the following examples assume a pipeline system totaling 150,000 bbl/d with advanced software in use, an initial product loss of 4% with products at an average price of \$2.00/gallon and a 15% loss reduction attributable to software. The pipeline system can save between \$6.8 million and nearly \$20 million annually. The savings can be astounding. The following cash flow table summarizes the ROI calculation:

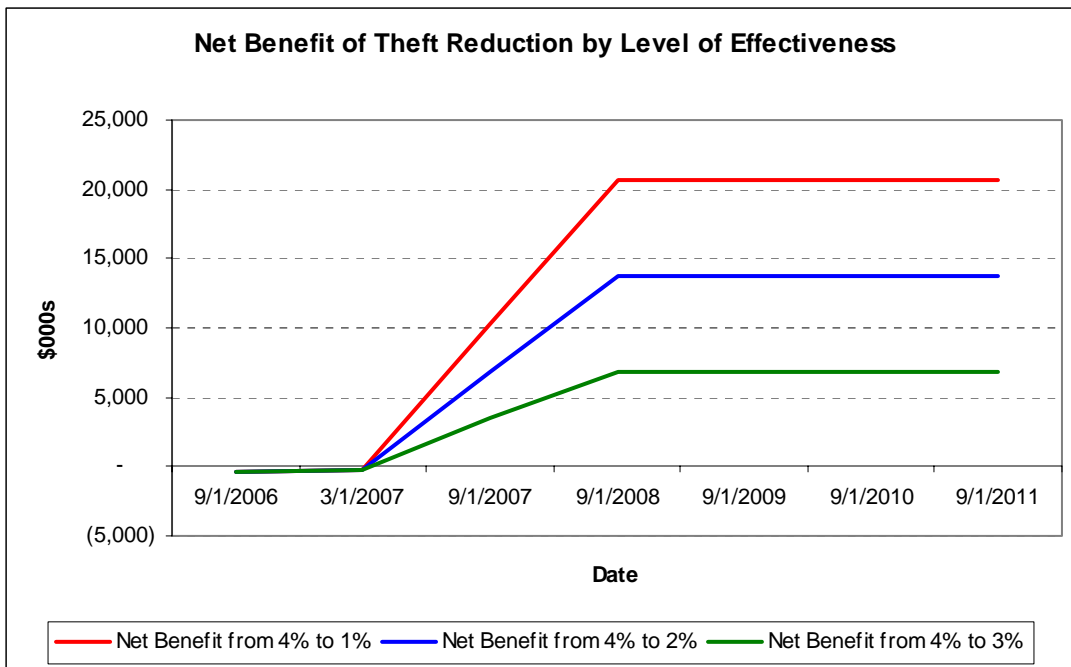


Table 2. Summary of the ROI calculation								
	Jan 2007	Apr 2007	Jan 2008	Jan 2009	Jan 2010	Jan 2011	Jan 2012	Total
Software and services	(420)	(180)	--	(30)	(60)	(60)	--	(750)
Theft losses from 4% down to:								
1%			10 348	20 696	20 696	20 696	20 696	93 130
2%			6899	13 797	13 797	13 797	13 797	62 087
3%			3449	6899	6899	6899	6899	31 043
Net cash flow at each theft %								
1%	(420)	(180)	10 348	20 666	20 636	20 636	20 696	92 380
2%	(420)	(180)	6899	13 767	13 737	13 737	13 737	61 337
3%	(420)	(180)	3449	6869	6839	6839	6899	30 293
ROI for theft reduced to:								
1%	2356%							
2%	1572%							
3%	796%							

For a conservative estimate, other tangible and direct economic benefits have not been factored into the calculation including lower opportunity costs associated transporting products that are stolen and increased pipeline uptime. Also, the cost of software and services has been overestimated to account for a large complex installation.

NEW GENERATION OF SOFTWARE PRODUCTS

Today's generation of pipeline management software, like that offered by Energy Solutions, has evolved into intuitive and easy-to-use Windows-based tools that are affordable and easy to maintain. This has been made possible by dramatic improvements in software productization and architecture enabling easier, quicker and cheaper installation of systems. Additionally, the leak detection system can be integrated with other software applications to improve the accuracy and turnaround time of decision making that requires communication and collaboration between functional groups within a pipeline company (e.g., operations and commercial functions) creating a true end to end solution.

CONCLUSIONS

Substantial EH&S costs and theft-related losses can be avoided by improved asset monitoring and better response to pipeline leaks and breaches. These operational improvements are achievable with the latest in pipeline management software which provides a host of analytical tools that offer recommended actions for managing assets to achieve greater profitability and lower risk.

New generation technologies come at an opportune time. Energy markets remain very active and the importance and profile of the pipeline infrastructure has risen to levels never before seen. This heightened attention has also raised performance expectations. As a result, profitability, operating performance and regulatory compliance are increasingly under the microscope. In response to these market pressures, today's software products are also more focused on delivering to the bottom line while improving risk management.

In an environment that combines increasing EH&S costs and scrutiny with high value commodities, advanced leak detection should be viewed as a standard tool for the control room. Whether pipelines are deploying leak detection to lower their operating risk profile or to reduce losses to theft, the software provides pipeline companies with ROIs that far exceed the required rates of return for acquisitions or for most capital expenditures. In this highly competitive pipeline market where protecting pipeline assets and the surrounding environment impact financial performance more than ever, pipelines can no longer afford to overlook advanced leak detection.