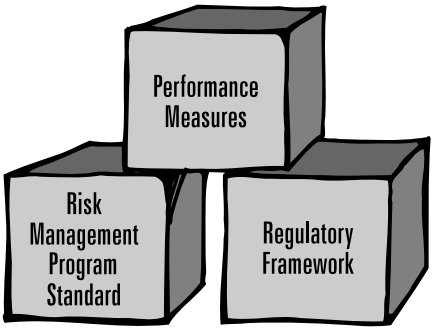
PIPELINE RISK MANAGEMENT

A Publication of the Joint Risk Assessment Quality Team

September 1996 *Volume 1, Issue 2*

Fundamental Building Blocks of the Risk Management Demonstration Program



Three building blocks are currently under development to form the basis for the risk management demonstration program. These include 1) the risk management program standard, 2) the regulatory framework, and 3) the performance measures. In addition to the fundamental building blocks, training and communications plans are being developed to educate the pipeline industry and regulators about risk management and to implement a stakeholder education campaign.

The risk management **program standard** defines the elements and characteristics of a pipeline company's risk management program. The standard will provide guidance on how to identify and develop a risk management demonstration project. The Joint Risk Management Technical Team, co-chaired by John Gawronski of the New York Public Service Commission and Denise Hamsher of Lakehead Pipeline Company, is chartered to develop this standard.

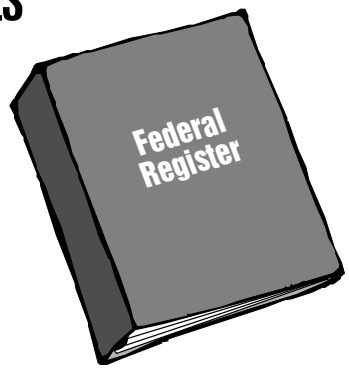
The **regulatory framework** describes how the Office of Pipeline Safety (OPS) will receive, review, approve, and monitor the pipeline operators' risk management demonstration projects. Initial ideas on this framework were described in a December 1995 *Federal Register* notice. The comments received were summarized and discussed at the Risk Management and the Pipeline Industry Conference held in Houston in April. OPS has been discussing the substance of the framework with federal and state regulators and with the joint risk management quality teams. DOT plans to publish the framework for demonstration programs in a September 1996 *Federal Register* notice.

Performance measures will be used to ensure that safety is maintained or improved and to gauge the effectiveness of risk management as a regulatory alternative. The performance measurements team has met each month from May 1996 to the present and has identified three types of measures: local, company, and industry.

The three building blocks will be presented at a public meeting in New Orleans on January 28, 1997. During the fall of 1996, these blocks will be tested against prototype risk management demonstration project proposals. The prototype proposals will be based on several pipeline companies' proposed risk management programs. **The test results will be used to improve the building blocks and will also be discussed at the public meeting on January 28, 1997.**

Inside This Issue

Joint Risk Management Quality Team Progress Reports



Risk Management Program Standard–The team has made significant progress on the draft technical standard. An initial draft, consolidating the work of smaller teams, was redrafted and reviewed during the May meeting. Various contentious issues were discussed and the document was edited at the June meeting. The July meeting resulted in changes in the descriptions of performance measures that were incorporated in the newest draft. The draft standard will be offered to the public in a *Federal Register* notice that will introduce the latest regulatory framework concepts.

Regulatory Framework–A *Federal Register* notice describing the regulatory framework is scheduled for publication in late September or early October 1996. It specifies a timeline and the steps OPS and operators must complete before a demonstration project can begin. OPS is considering beginning the screening process by asking operators to submit letters of intent in the first quarter of 1997. Demonstrations could start as soon as the review and approval process is complete and an order is issued, possibly by the summer of 1997.

OPS is meeting with operators to develop case studies for testing the framework and for training both corporate and government demonstration participants. A fourth and final framework will be published before the letters of intent are due, incorporating lessons learned from the case study exercise, public comment, and continued interactions between OPS and the Joint Risk Assessment Quality Team.

Performance Measures–Members of the Program Standard Joint Risk Assessment Quality Team and the Performance Measures Workgroup have worked toward identifying means of demonstrating that 1) safety is being maintained and 2) risk management is an effective regulatory alternative. The July 15, 1996, draft of the Technical Standard identifies three levels of performance measures: industry, company, and local.

Local measures "measure the performance of a subset of a pipeline system, for example, a segment, based on changes in conditions (e.g., coating condition, soil type, class location). Local performance measures would be monitored by the operator."

The Performance Measures Workgroup determined that the regulator would use local measures to audit company performance to ensure that safety is better than or equal to current levels. Both groups worked extensively on identifying these measures.

Risk Management and the Pipeline Industry – II

The second risk management conference, held on April 14-15, 1996, in Houston, TX, attracted more than 400 people from industry, the public, and government. This event featured reports on developing risk assessment and risk management as an alternative to traditional regulation and the progress that has been made since the first risk management conference in November 1995.

The conference focused on crafting three fundamental building blocks for implementing the risk management demonstration project: the risk management program standard, regulatory framework, and performance measurement plans. Conferees were divided into groups to discuss issues being addressed by the three quality teams developing the demonstration model.

Rich Felder, DOT Associate Administrator for Pipeline Safety, thanked the conference co-sponsors: the American Petroleum Institute, Association of Oil Pipelines, American Gas Association, Gas Research Institute, Interstate Natural Gas Association, American Public Gas Association, the National Association of Regulatory Utility Commissioners, and the National Association of Corrosion Engineers International, as well as the conference speakers and participants for their hard work in making this meeting a success.

Conference proceedings and copies of presentation slides are available from the Office of Pipeline Safety. Contact Janice Morgan at (202) 366-2392, fax (202) 366-4560, e-mail at morganj@rspa.dot.gov.

The Risk-Based Regulatory Continuum

The Office of Pipeline Safety (OPS) is pursuing various activities to implement risk assessment and risk management concepts within its overall regulatory program. In its report, *Risk Management Within the Liquid Pipeline Industry*, the Liquid Risk Assessment Quality Team (RAQT) proposed ways to apply risk management in the pipeline safety program.

OPS, in partnership with state regulators and the pipeline industry, is developing approaches to apply the proposed risk management principles. Several approaches are being drafted to address risk-based prioritization planning, risk management, and risk-based regulation.

Beginning in 1995, OPS implemented the Risk Based Prioritization Process (RBPP) to help identify safety issues and their proposed solutions. The office also wanted to evaluate the potential benefits and cost factors to set regulatory priorities and to assign resources. The RBPP process, incorporating improvements from suggestions made by industry at a public meeting in January 1996, will begin its second cycle this fall.

The best known of the three risk management applications is the OPS risk management demonstration program. This program will enable operators to develop and submit demonstration projects to test the proposed risk management process. Operators will submit projects that allow them to:

- Better allocate their resources on the basis of an assessment of the risks to their pipelines;
- Determine the best set of design, operation, maintenance, and surveillance activities to control the identified risks; and
- Monitor performance to ensure the risk management project will lead to equal or greater levels of safety.

The risk management program standard, regulatory framework, and baseline performance measures needed to implement this program are discussed in other articles in this newsletter.

Risk management programs can be used to manage safety in lieu of compliance with prescriptive requirements. However, this approach may not be suitable for all operators. Compliance with the pipeline safety regulations will remain the primary basis to ensure safe pipelines for many years to come.

Interesting Documents

This section lists a sampling of basic, introductory documents related to risk management. If you want us to include other documents, or wish information on how to obtain any of these documents, contact Janice Morgan at 202-366-2392.

Pipeline Risk Assessment Technical Models and Methods

1 *Pipeline Risk Management Utilizing the Pipeline-Prioritization Model,* S.D. Bash and J.F. Kiefner. Pipeline Risk Assessment Rehabilitation and Repair Conference Proceedings. Marriott Houston Westside Hotel, Houston, TX, September 12-15, 1994.

2. *Improving System Integrity and Managing Cost Through Risk Analysis,* Jess Brown and Tom Choi. Pipeline Risk Assessment, Rehabilitation and Repair Conference Proceedings. Marriott Houston Westside Hotel, Houston, TX, September 12-15, 1994.

3. *Risk Assessment Techniques for Pipeline Systems,* Canadian Association of Petroleum Producers, May 1993.

4. *Pipeline Risk Management Manual,* W.K. Muhlbauer, Gulf Publishing Company, Houston, TX, 1992.

5. *Pipeline Integrity Program Helps Optimize Resources,* Philip J. Dusek, *Pipeline & Gas Journal* (ISSN 0032-0188), Vol. 221, pp. 36-38, March 1994.

6. *Risk Assessment: An Integrity-Management Tool,* B. Trefaneko, R. Coutts, N.D. Ronsky, and M. McManus. Pipeline Risk Assessment Conference. Sponsored by Gulf Publishing Company, Houston, TX, May 18-21, 1992.

Starting with this issue, Pipeline Risk Management *begins "Talking About Risk," a new column focusing on public participation in the risk management process. As a regular feature, "Talking About Risk" will discuss risk communications and community relations.*

If you would like to include experiences from your company or to suggest a case study for a future column, please contact Suzanne Crandall at Bivings Woodell, Inc., at 202-835-1600.

Talking About Risk

By Suzanne R. Crandall and Mary I. Woodell

As every regulated industry knows, public disclosure of risk information—whether mandatory or voluntary—can be a challenge. And the trend is clear: Americans demand increasing levels of detail about the products and processes that affect their health.

What's the Goal?

The goal? Informed consent: assurance that people affected by industrial operations know enough about their impact to make informed decisions. For example, a community needs information to decide whether to accept—or reject—a proposed pipeline route.

Regulations such as OSHA Process Safety Management rule and EPA's new Risk Management Plan rule require the facilities they govern to provide risk information to surrounding communities. But what industry sometimes fails to see is that talking about risk issues can be an opportunity as well as an obligation.

What's the Opportunity?

Experience from many fixed facilities strongly suggests that effective risk communications can go a long way toward earning public trust—so long as it is backed up by performance. Trust, in turn, can translate into support for sound initiatives—and helps defuse potential controversies that can arise from misinformation or from lack of understanding. In short, experience shows that:

- Performance drives perception. No communications program can substitute for responsible operations.
- "An educated consumer is your best customer." The slogan comes from retail business— but the concept applies to industry: people who know about industrial processes almost always make better decisions about risk.

What's the Relationship to OPS and Risk Management?

OPS, like the pipeline industry itself, clearly recognizes that community opinions and attitudes have a significant influence on the regulatory process and on the pipeline business. Historically, community information needs have tended to be addressed, if not as an afterthought, then certainly as an adjunct to risk assessment and risk management, rather than as an integral component. Experience shows this kind of fragmentation can yield fragmented results, for example, when pent-up community concerns flare up at a public hearing, creating barriers that could have been foreseen, or avoided altogether.

The risk management demonstration pilot offers participants a unique opportunity to factor community information requirements into the essential framework of risk management—as the process is developed, rather than after the fact. By considering these requirements during the research and development phase, the industry can get ahead of the curve by defining a programmatic approach to risk communications.

What's Next?

In the coming months, "*Talking About Risk"* will highlight a series of risk communications concepts and discuss how they can be effectively integrated into the risk management initiative. Each column will present proven techniques and ideas.

Like all effective risk communications, "Talking About Risk" is a two-way street; please let us hear from you.

Bivings Woodell is a Washington, DC-based consulting firm specializing in risk communications and the management of public controversy.

The Risk Tutor — Basic Concepts in Risk Management

The first issue of *Pipeline Risk Management* described the basic elements of a risk management program, including risk assessment, risk control and decision support, and performance monitoring and feedback. In this issue, the risk assessment process element is described in more detail; other risk management elements will be described in future issues.

The Risk Assessment Process Element

The first step in the risk management process is to identify and understand the specific risks to be managed. The risk assessment portion of a risk management program addresses the questions:

- What adverse events can happen to the pipeline?
- How likely are these events to occur?
- How severe would the consequences be if the events did happen?

The risk assessment process element and its relationship to the other risk management process elements are illustrated in Figure 1.

Scope Definition

A key first step in risk assessment is defining the scope of the analysis, including the physical boundaries of the pipeline system that will be addressed. Although successful risk management programs usually expand their scope and become more comprehensive, it is often not necessary to perform a detailed risk assessment of an entire pipeline system as

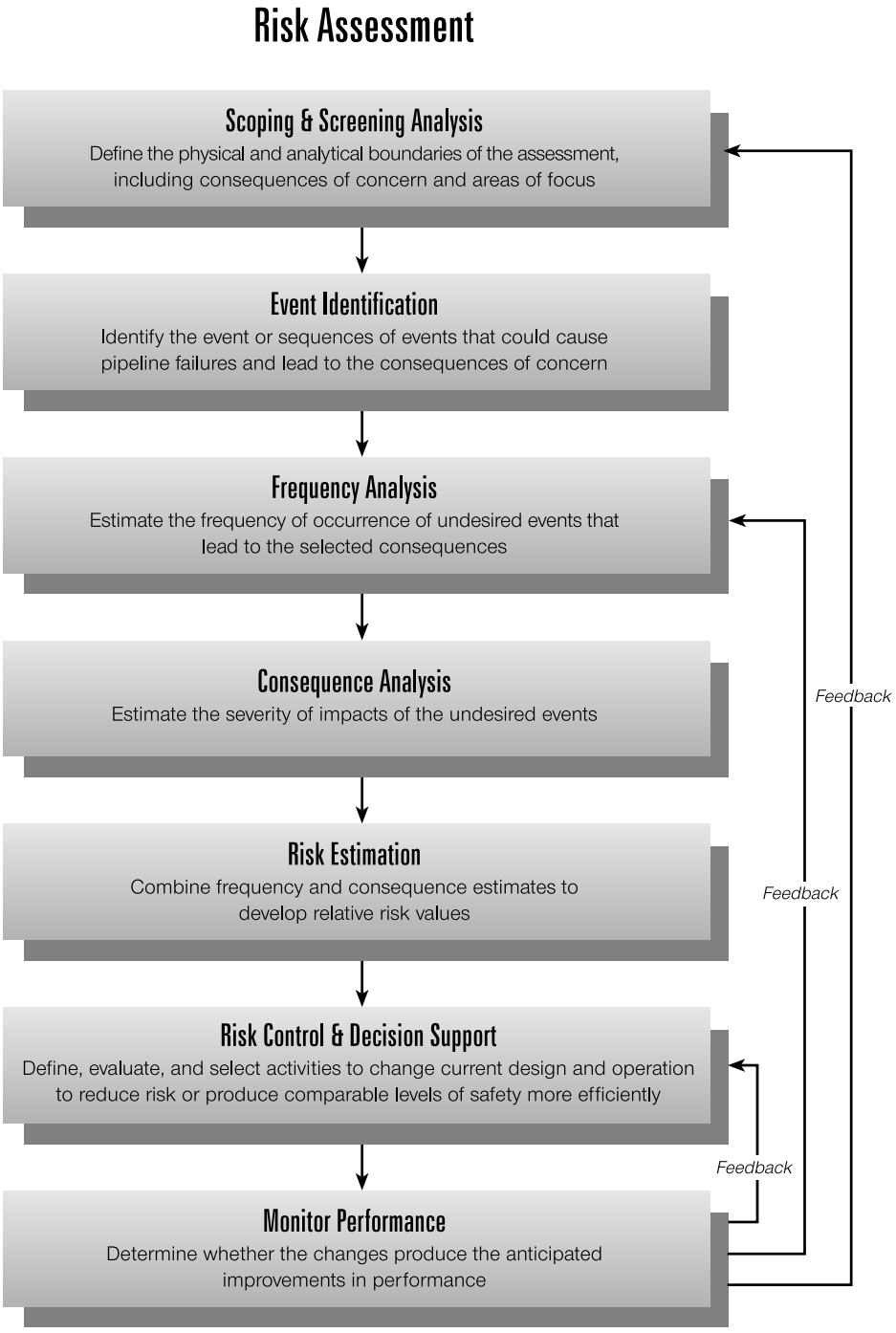


Figure 1. The Risk Management Process

the first step of a pipeline risk management program. The scope of a detailed risk assessment can be limited in various ways, including the following:

- A screening analysis can be used to identify segments of the pipeline that could reasonably be expected to pose relative higher risks than other segments because the former have experienced poor operating histories or are in or near high population zones or environmentally sensitive areas.
- Operators or regulators can identify specific issues that appear to pose higher-than-average risks or provide opportunities for more cost-effective risk control.
- Special circumstances or characteristics of a specific segment of the pipeline can be noted (e.g., it is about to be transferred to another company, it shares characteristics with another pipeline in which a serious event has occurred, etc.).

Limited, focused-scope risk management programs are often a prudent way of introducing risk management into an organization since they allow experience and skills to be developed in a controlled manner.

Event Identification

In pipeline risk management, the condition that can potentially cause undesirable consequences (i.e., the hazard) is the presence of hazardous liquids or natural gas within the pipeline. An accidental release of these substances can cause uncontrolled dispersion of these substances, with the possibility of associated fires, explosions, property damage, human harm, or environmental impacts.

A pipeline incident results from one or more events in a sequence that lead to loss of pipeline integrity and, eventually, the release of the liquid or natural gas product. Each of these events in the accident sequence may have one or more potential causes. For example, a rectifier failure can lead to loss of cathodic protection, which can lead to corrosion, which can lead to loss of containment. The rectifier failure may be caused by random component failure, lightning, or some other circumstance.

A risk assessment identifies the specific events or combinations of events that could lead to loss of pipeline integrity and accidental release of product, and delineates the potential causes of these events.

Frequency Analysis

Once the event(s) that could lead to pipeline accidents and the resulting impacts are identified, the likelihood that these events will occur must be determined. Frequency analysis provides estimates of the likelihood of the event or events that lead to pipeline failure and to impacts of concern.

Event frequencies can be estimated qualitatively, quantitatively, or both. Qualitative processes often use relative categories such as “frequent,” “likely,” “unlikely,” or “rare” to depict the likelihood of an event. Often, these categories are calibrated to ranges of quantitative frequencies (e.g., “likely” may be assigned to events with an expected frequency between one and five events per year).

Technology Corner

Do you have an idea, example, or suggestion that would help others implement new or existing technologies to improve current levels of safety? If so, the Joint Risk Assessment Quality Team (JRAQT) encourages you to submit your ideas for publication in this newsletter.

One of the expected benefits of risk management is the rapid implementation of new technologies that can maintain current levels of safety at a significant cost advantage, or can substantially increase safety at a reasonable cost. Our objective is to bring the latest technological developments and risk management applications to the attention of potential users.

If you have ideas to share, please submit your articles for consideration to Cheryl Whetsel at the Office of Pipeline Safety, 400 Seventh Street, SW, Room 2335, Washington, DC 20590. The editors of this newsletter reserve the right to accept or reject any submission, or to make editorial changes with the author’s approval. We intend to inform our partners, not to print marketing proposals.

Quantitative processes calculate the expected number of events per unit time (e.g., 10 times per year). Semiquantitative processes often use a numeric index to estimate the relative frequency of events. For example, the frequency of third-party damage events may be assigned an index score of 30, and corrosion events may be assigned an index score of 10, indicating that third-party damage events are expected to occur three times as frequently as corrosion-induced events.

Consequence Analysis

Consequence analysis involves estimating how severe the impacts of the identified event or sequence of events will be on human health and safety, the environment, availability of service, or other factors included in the operator's risk management program.

Consequence analysis must consider not only the events that lead up to loss of pipeline containment, but also other events (e.g., success/failure of isolation valves) and considerations (e.g., population distribution) that could affect the severity of these consequences. Consequence analysis usually considers the following:

- The amount of hazardous substance released;
- The physical pathways and dispersal mechanisms by which the substance can reach and affect workers, the public, environmental resources, etc.;
- The amount of substance that would actually be expected to reach the workers, public, and environmental resources through these pathways; and
- The expected effect of the released substance on the person, environmental resource, etc.

Consequences of events can be estimated qualitatively, quantitatively, or both. Qualitative processes often use relative categories such as severe, significant, moderate, or insignificant to depict the severity of these consequences. Often the qualitative categories are calibrated to ranges of quantitative consequences (e.g., "significant" might be assigned to events with an expected consequence of between one and five serious injuries per year).

Quantitative processes calculate the expected severity level in number of fatalities, serious injuries, and so forth. Semi-quantitative processes often use a numeric index to estimate the relative consequences of events. For example, an event that is expected to lead to a fatality may be assigned an index score of 100; an event that leads to a serious injury may be assigned a smaller index score; and an event that leads to moderate property damage may be assigned a still smaller index score to indicate the relative importance, or value, placed on these impacts.

Risk Estimation

Risk estimation is the process of combining frequency and severity estimates into a risk value. The frequency and consequence estimated for each of the various identified events or sequences of events are combined into a risk value for that event sequence. The risk values for all identified event sequences then can be combined into an overall risk value for the pipeline. These values may be qualitative, quantitative, or a combination of both, depending on the processes used for frequency and consequence analysis, and the objectives of the operator's risk management program.

This portion of the risk assessment process results in a "risk profile," or an overall depiction of pipeline risks and its constituent parts. This risk profile will be used in the subsequent risk management process element to define and assess potential actions of controlling existing risks. Risk profiles that maintain discernible estimates of frequency and severity allow distinctions to be made between low frequency/high severity events and high frequency/low severity events, as well as total risk values.

Credits

Pipeline Risk Management is published once each quarter by the Joint Risk Assessment Quality Team (JRAQT). The goal of this newsletter is to communicate information to our sponsors and stakeholders on the activities of JRAQT and related risk management activities within OPS and the pipeline industry.

If you have article ideas, contact the newsletter editor:

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