Pipeline Safety Management Systems

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Introduction

This Recommended Practice (RP) provides guidance to pipeline operators for developing and maintaining a pipeline safety management system (PSMS). The elements of this RP are structured to minimize nonconformity with other pipeline safety processes and procedures. While this RP may include some elements of other management systems (such as those particular to environmental management, occupational health, personnel safety management, financial management, or insurance risk management), it does not include all requirements specific to those systems. This RP may be used either in conjunction with or independent of other industry-specified documents. Finally, this RP builds upon and augments existing requirements and is not intended to duplicate requirements of any other consensus standards or regulations.

Managing the Safety of Complex Processes

Safe and effective pipeline operation requires awareness and management of many linked activities, yielding complex processes. Examples of such activities include designing, constructing, operating, and maintaining the pipeline. Major accidents with high consequences rarely occur but when they do, the accident occurs because of an alignment of weaknesses or failures across multiple activities. While safety efforts may be applied individually to each activity, more effective safety performance is achieved when viewing the linked activities as processes that are better dealt with holistically.

Managing processes requires different techniques than managing individual activities. Pipeline safety management includes determining needs throughout the pipeline life cycle, provisioning sufficient qualified human and financial resources, identifying the proper sequence of a series of activities, monitoring and measuring the effectiveness of the activities performed, and applying changes or corrections to those activities as needed.

Safety Management Systems

Managing the safety of a complex process, as well as simpler systems, requires coordinated actions to address multiple, dynamic activities and circumstances. Pursuing the industry-wide goal of zero incidents (see Note 1) requires comprehensive, systematic effort. While process-related incidents are relatively infrequent, they can lead to serious consequences. The elements of a safety management system address ways to continually (see Note 2) operate safely and improve safety performance.

NOTE 1 Incident as used in this RP applies to both incidents as defined in 49 *CFR* 192.3 and accidents as defined in 49 *CFR* 195.2.

NOTE 2 “Continuous” is used to indicate constant; “continual” is used to indicate periodic or incremental. “Continuous improvement” is used so widely and is used herein even where improvement is periodic or continual.

The following principles comprise the basis of this safety management system recommended practice.

a) Commitment, leadership, and oversight from top management are vital to the overall success of a PSMS.

b) A safety-oriented culture is essential to enable the effective implementation and continuous improvement of safety management system processes and procedures.

c) Risk management is an integral part of the design, construction, operation and maintenance of a pipeline.

d) Pipelines are designed, constructed, operated, and maintained in a manner that complies with Federal, state, and local regulations.

e) Pipeline operators conform to applicable industry codes and consensus standards with the goal of reducing risk, preventing releases, and minimizing the occurrence of abnormal operations.

f) Defined operational controls are essential to the safe design, construction, operation, and maintenance of pipelines.

g) Prompt and effective incident response minimizes the adverse impacts to life, property, and the environment.

h) The creation of a learning environment for continuous improvement is achieved by investigating incidents thoroughly, fostering non-punitive reporting systems, and communicating lessons learned.

i) Periodic evaluation of risk management effectiveness and pipeline safety performance improvement, including audits, are essential to assure effective PSMS performance.

j) Pipeline operating personnel throughout the organization must effectively communicate and collaborate with one another. Further, communicating with contractors to share information that supports decision making and completing planned tasks (processes and procedures) is essential.

k) Managing changes that can affect pipeline safety is essential.

Plan-Do-Check-Act

The above principles are applied in a recurring manner to achieve continuous assessment and improvement. The Plan–Do–Check–Act (PDCA) cycle is a four-step model for carrying out these efforts within ten elements (Figure 1). This methodology can be applied to the management system as a whole as well as to all individual elements and processes within the system. The PDCA principle is at the core of many management systems, and its principal aim is to encourage creating strategies and plans, executing those strategies and plans in line with guidelines, checking those actions for conformity, and using those results to adjust the next generation of plans. This cycle is iterative and is maintained to achieve continuous improvement.

There are inputs (e.g. data, information, and resources) to the processes within each element yielding a set of outputs (e.g. prioritized work that reduce risk and ultimately improve safety performance). The pipeline operator defines PSMS inputs and outputs within the execution of each of the essential elements. The pipeline operator defines these inputs and outputs for each of the elements to be described and, through the PSMS, reviews them periodically.

The PDCA cycle is useful when starting a new improvement project; when developing a new or improved design of a process, product, or service; or when defining a repetitive work process.

The PDCA cycle is also useful for the management system as a whole as a model for continuous improvement and when planning data collection and analysis, when selecting and prioritizing threats or causes, and when implementing any changes.

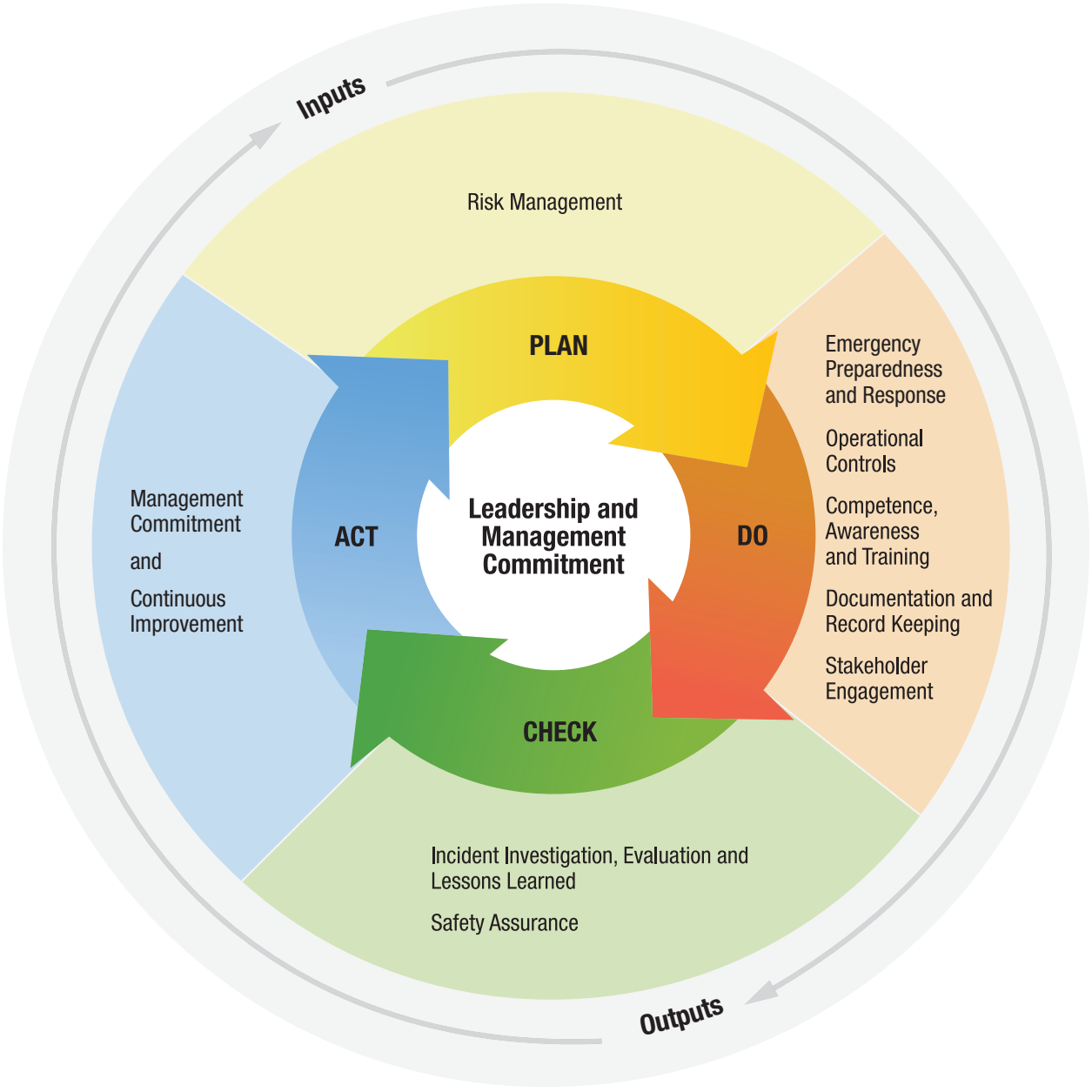
The components of the PDCA cycle are:

Plan: This step entails establishing the objectives and processes necessary to deliver results in accordance with the organization's policies and the expected goals. By establishing output expectations, the completeness and accuracy of the process is also a part of the targeted improvement.

Do: This step is the execution of the plan designed in the previous step.

Check: This step entails the review of the results compared with established objectives. Comparing those results to the expected goals to ascertain any differences; looking for deviation in implementation from the plan.

Act: This step is where a pipeline operator takes actions to continuously improve process performance, including corrective actions on significant differences between actual and planned results, analyzes the differences to determine their root causes, and determines where to apply changes that will include improvement of the process or product.



NOTE Elements to be identified in Section 4 that serve as the framework for this RP are depicted with PDCA. The placement of elements is provided as an example. The designation and placement of particular elements may differ among operators. Some elements bridge across multiple aspects of PDCA.

Figure 1—Plan–Do–Check–Act (PDCA) Cycle

Reflecting the cyclical nature of PDCA and the dynamic/evolutionary nature of the PSMS, the entire process begins again from the start. Each cycle through PDCA produces opportunities for improvement. In addition, the application of PDCA logic to individual elements within the process can provide similar insights and opportunities for improvement within that element.

Goal of this Document and its Safety Management System Framework

The goal of this document is to provide pipeline operators with a framework to review an existing PSMS or develop and implement a new PSMS. Newly developing or improving a PSMS will enhance effectiveness of risk management and enable continuous improvement of pipeline safety performance. Operators seeking to conform to this document will work to build upon existing safety processes and establish new safety processes. Operators should seek to mature their PSMS consistent with continuous improvement. Regardless of an operator's starting point relative to existing systems or processes, the iterative or cyclic nature of the approach described provides the opportunity for continuous improvement. While operators should seek to gain conformance with a sense of urgency, timeframes to reach significant and widespread maturity across all elements are measured in years. As a PSMS matures, it is subject to assessment and continuous improvement.

The framework builds upon an operator’s existing pipeline safety management programs by drawing upon industry experiences, lessons learned, and existing standards. The intent of the framework is to comprehensively define elements that can identify, manage and reduce risk throughout the entirety of a pipeline’s life cycle and, at the earliest stage, help prevent or mitigate the likelihood and consequences of an unintended release or abnormal operations.

NOTE “Pipeline” is defined in Section 3 to address, more broadly, pipeline systems.

Particular emphasis is placed on increased proactivity thinking of what can go wrong in a systemic manner, clarifying safety responsibilities throughout the pipeline operator’s organization (including contractor support), the important role of top management and leadership at all levels, encouraging the non-punitive reporting of and response to safety concerns, and providing safety assurance by regularly evaluating operations to identify and address risks. These factors work together to make safety programs and processes more effective, comprehensive, and integrated.

Flexibility

The framework is to be applied with flexibility to account for the current state of development of particular elements of management systems within a company. In cases where an operator is already operating under its own comprehensive PSMS, this framework serves as a basis of comparison and review between the industry recommended practice and the operator’s system. Other operators may have some number of individually established safety systems but no comprehensive PSMS. For them, this RP provides a means to integrate and add to those efforts to establish a comprehensive PSMS. Still other operators may have no formal safety systems. For those operators, adoption of the recommended framework would be a starting point to build a PSMS, while learning from more advanced operators. In all cases, operators are intended to have the flexibility to apply this RP as appropriate to their specific circumstances.

Scalability

The framework is also intended to be scalable for pipeline operators of varying size and scope. The number of employees at a liquid pipeline operator can range from a handful to thousands. A local gas distributor or municipal operator may have only a few employees. An interstate transmission pipeline company may have entire divisions of subject matter experts. The 10 essential elements comprising the framework apply to organizations of any size and sophistication. Specific application of those elements to the operations and processes of a given operator will reflect the scale of that operator. The framework elements and principles underlying it are broadly applicable, and strongly recommended, for energy pipeline operators of all sizes. It is the clear view of the committee generating this document that the level of detail in each pipeline operator’s PSMS should be appropriate for the size of their operations and the risk to the public and the environment. For very small operators with a handful of employees, adoption of all provisions within this RP may not be practical. However, even small operators can build on selected provisions herein.

Safety Culture

A positive safety culture is essential to an organization's safety performance regardless of its size or sophistication. Safety culture is the collective set of attitudes, values, norms, beliefs, and practices that a pipeline operator's employees and contractor personnel share with respect to risk and safety. A positive safety culture is one where employees and contractor personnel collaborate; have positive attitudes towards compliance (meeting and exceeding minimum standards); feel responsible for public safety, and protection of the environment, for each other's safety, and for the health of the business; and fundamentally believe in non-punitive reporting.

Because of their number and complexity, pipeline operational activities with safety impacts are best managed cohesively and systematically using a PSMS rather than piecemeal using various, discrete processes and procedures. And, although a positive safety culture can exist without a formal PSMS, an effective PSMS cannot exist without a positive safety culture. Therefore, operators should actively work to assess and improve their safety cultures.

Maintaining a positive safety culture requires continual diligence throughout an organization to address issues including complacency, fear of reprisal, over confidence, and normalization of deviance. Examples of indicators of a positive safety culture within an organization are listed below.

The organization:

— embraces safety (personnel, public, and asset) as a core value;

— assures everyone understands the organization's safety goals;

— fosters systematic consideration of risk, including what can go wrong;

— inspires, enables, and nurtures change when necessary;

— allocates adequate resources to assure individuals can successfully accomplish their PSMS responsibilities;

— encourages employee engagement and ownership;

— fosters mutual trust at all levels, with open and honest communication;

— promotes a questioning and learning environment;

— reinforces positive behaviors and why they are important;

— encourages two-way conversations about learnings and commits to apply them throughout the organization; and

— encourages non-punitive reporting and assures timely response to reported issues.

Adopting and implementing a PSMS will strengthen the safety culture of an organization. Leaders, managers, and employees acting to make safety performance and risk reduction decisions over time will improve pipeline safety, thereby strengthening the safety culture of an organization. With this RP, operators are provided a framework to manage and reduce risk and promote continuous improvement in pipeline safety performance. The individual elements, when executed as deliberate, routine, and intentional processes, are designed to result in improved communication and coordination, which yield a cohesive system and a stronger safety culture.

Pipeline Safety Management Systems

1 Scope

This recommended practice (RP) establishes a pipeline safety management systems (PSMS) framework for organizations that operate hazardous liquids and gas pipelines jurisdictional to the US Department of Transportation. Operators of other pipelines may find this document applicable useful in operating to their systems.

This RP provides pipeline operators with safety management system requirements that when applied provide a framework to reveal and manage risk, promote a learning environment, and continuously improve pipeline safety and integrity. At the foundation of a PSMS is the operator's existing pipeline safety system, including the operator's pipeline safety processes and procedures. This RP provides a comprehensive framework and defines the elements needed to identify and address safety for a pipeline's life cycle. These safety management system requirements identify what is to be done, and leaves the details associated with implementation and maintenance of the requirements to the individual pipeline operators. The document does not explicitly address personnel safety, environmental protection, and security, but the elements herein can be applied to those aspects of an operation.

Information marked "NOTE" are not requirements but are provided for guidance in understanding or clarifying the associated requirement.

NOTE This document defines the requirements of a safety management system applicable to pipelines. When the document refers to a requirement of a safety management system, it can mean a requirement specified by this pipeline safety management system or another safety management system in use by an operator that meets the intent of this document.

2 Normative References

No other document is identified as indispensable or required for the application of this standard. A list of documents associated with API 1173 are included in the bibliography. The bibliography includes references a pipeline operator may consider in developing or improving a PSMS.

3 Terms, Definitions, Acronyms, and Abbreviations

3.1 Terms and Definitions

For the purposes of this document, the following definitions apply.

3.1.1
accountability
Answerable for the correct and thorough completion of work.

3.1.2
allocation
Assignment, distribution, or apportionment.

3.1.3
audit
An examination of conformity with this RP and implementation of the PSMS.

NOTE An audit may be performed by qualified external or internal personnel not involved in the operations being audited.

3.1.4
authority
Assigned power to control work by an organization, including power to delegate.