CANADA'S OIL & NATURAL GAS PRODUCERS

Guide

Process Safety Management Strategy & Data Roadmap

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The Canadian Association of Petroleum Producers (CAPP) represents companies, large and small, that explore for, develop and produce natural gas and crude oil throughout Canada. CAPP's member companies produce about 80 per cent of Canada's natural gas and crude oil. CAPP's associate members provide a wide range of services that support the upstream crude oil and natural gas industry. Together CAPP's members and associate members are an important part of a national industry with revenues from crude oil and natural gas production of about $110 billion a year. CAPP's mission, on behalf of the Canadian upstream crude oil and natural gas industry, is to advocate for and enable economic competitiveness and safe, environmentally and socially responsible performance.

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Overview

CAPP's Safe Operations Strategy *Enabling Zero* identifies objectives and collective initiatives CAPP can do to support members' efficient operations and improvement of safety performance. The strategy is a new approach including

- a more inclusive safety scope (people, process and product stewardship),
- high-risk focus (severity/consequence),
- and analysis based upon data-driven decision making.

The first foundational years of Enabling Zero includes member-driven development of strategic guidance for process safety management.

This document delivers CAPP's strategic guidance for Process Safety Management, and a supporting plan for the development of the required data management support necessary to support the success of the PSM strategy.

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1 Introduction

Oil and gas operations involve complex processes with intrinsic hazards with the potential for catastrophic accidents involving large scale loss of life, harm to health, and extensive environmental damage that needs careful risk management. The management of process safety is globally recognized as the primary approach for establishing the required level of safe operations required to manage high-hazard processes.

In response to the needs related to PSM, CAPP initiated the development this member-driven strategy for PSM.

Key to the success of the PSM strategy, will be establishing a modern, and efficient data management system to enhance decision-making abilities. This document lays out a multi-path plan for the development, deployment, and sustainment of such a data management system designed to support the PSM strategy.

1.1 How to Use This Guide

The guide is divided into two main parts:

1) Section 2 describes the Strategy itself.
2) Section 3 provides a Roadmap for developing a sufficiently robust data management system to support the strategy.

While data management is not the only necessary foundation for the development of a robust response to PSM in the industry, it is an essential underpinning to nearly all efforts. Without reliable and relevant data, initiatives can't be targeted for the highest return, nor evaluated.

2 Process Safety Management Strategy

2.1 Rationale

Oil and gas operations involve complex processes with intrinsic hazards that have the potential for catastrophic accidents involving large scale loss of life, harm to health and extensive environmental damage that needs careful risk management.

The management of process safety is globally recognized as the primary approach for establishing the required level of safe operations required to manage high hazard processes.

2.2 Current State

Over the last several decades, well publicized major incidents have raised concerns with the public, regulators, and other stakeholders. While improvements in technical knowledge and management systems have helped to reduce the risk, major accidents continue to happen around the world (e.g., Deepwater Horizon Accident in 2010; Lac Mégantic Rail Disaster in 2013). These significant events have brought attention to the risks held in the oil and gas industries and has raised concern regarding asset and infrastructure integrity and corporate leadership. These events have also resulted in public reluctance to accept projects that involve the presence of crude oil and natural gas in their community. These events have evolved corporate governance, including the management of major accident hazards, and have led to member-driven systematic efforts to prevent major accident hazards.

Canada does not have an explicit process safety management (PSM) regulation, as the control of major accident hazards is a provincial, not federal, area of responsibility. CAPP conducted a Process Safety Regulatory Scan in 2014 of existing regulations that address process safety. The result of the scan revealed that many of the requirements of a PSM system are addressed by current regulations across multiple regulators and jurisdictions. In addition, Canada has been at the forefront of a voluntary cooperative approach to process safety, including the development of a CSA Z767 Process Safety Management Standard.

2.3 Scope

In oil and gas operations, PSM can be applied to well, facility, and pipeline assets. Assuring asset integrity is integral to maintaining safe operations.

Multiple regulators (energy, technical safety, and occupational safety regulators) across federal and provincial jurisdictions govern different aspects of process safety in our industry.

2.4 Business Case

While oil and gas operations involve risks, they can be effectively managed and/or eliminated when appropriate measures are taken. Operating safely is the most basic feature of business efficiency and has proven to improve productivity.

The value proposition for CAPP members in addressing process safety management is the increase in the cross-corporate knowledge transfer which results in an accelerated uptake and uniformity of industry tools and practices.

2.5 Goals

The primary goal of PSM is to develop systems and procedures which will prevent unwanted releases which may cause injury, toxic impacts, local fires or explosions. PSM also addresses issues related to operability, productivity, stability, quality output of processes and product stewardship.

2.6 Objectives

1) Responsible Collaboration between government, industry, and the public to encourage the reporting of incidents, development of reporting databases, and promote mutual understanding of risks and effective process safety systems.
2) Harmonization of Standards by multiple regulators across jurisdictions and by organizations that produce guidelines for the safe design, operation, and maintenance of equipment, to streamline practices, eliminate redundancy and cooperatively address emerging issues.
3) Use of Objective Information to Enhance Performance by establishing modern, efficient and integrated information technology and data management systems to enhance decision making abilities and add credibility with external stakeholders (See Section xxx).
4) Enhanced Stakeholder Knowledge to improve risk literacy and analysis to enable decision making based upon technical discussions on business and engineering concepts in oil and gas operations.

2.7 Principles

The primary principle behind process safety management is to eliminate events involving the release of highly volatile or toxic substances, or to mitigate the severity of such events. Prevention of these process safety events is supported by the following foundational components:

1) Authentic commitment to process safety is the cornerstone of process safety excellence.
2) Understanding of hazards and risks to allow better allocation of resources in the most effective manner.
3) Product stewardship and risk management of operations and maintenance processes, while also preparing for and responding to incidents that may occur.
4) Learning from experience which involves monitoring and acting on internal and external sources of information.

2.8 Outcomes

Process safety management can be used to mitigate risk and drive performance improvement with the following outcomes:

- A Committed Culture in which the senior executives are personally involved, managers drive excellent execution every day and workers maintain a sense of vigilance and vulnerability.
- Vibrant Management Systems where all personnel have a clear understanding of the expectations of senior management which are documented and shared to promote safer design principles in accordance with fit-for-purpose policies and procedures.
- Disciplined Adherence to Standards for new and existing equipment to minimize opportunities for error in design, operation, and maintenance.
- Intentional Competency Development to ensure that all personnel who impact process safety are fully capable of meeting the technical and cultural requirements for their roles.
- Improved Application and Sharing of Lessons Learned including an expectation and ability to benchmark, rapidly share lessons learned (both positively and negatively), and use those lessons to drive procedural or mechanical change across organizations and industries.
- Enhanced Social Responsibility and Sustainability through operations and stewardship of products which are safe, secure, and environmentally responsible.

Driven by operational excellence, which leads to improved image, reputation and brand, as well as sustained value through boost in productivity and reduction in total cost of risk.

This roadmap lays out the conceptual approach to be used in creating a system sufficient to meet all elements of Objective 3 in the Strategic Guidance for Process Safety:

Objective 3: Use of Objective Information to Enhance Performance by establishing modern, efficient and integrated information technology and data management systems to enhance decision-making abilities and add credibility with external stakeholders.

The establishment of such a system will support for the other three objectives in the strategy:

- Objective 1: Responsible Collaboration
- Objective 2: Harmonization of Standards
- Objective 4: Enhanced Stakeholder Knowledge

This roadmap does not predetermine a timeline for completion of each stage, and does not preclude other parallel activities to meet or partially meet Objective 3. The roadmap does require tangible deliverables for each stage to act as a foundation for subsequent stages, and to lockdown results.

The key driver to achieve the above objectives is effective use of relevant data. Therefore, the Roadmap focus is on Process Safety Key Performance Indicators.

3 Roadmap: Developing a Robust PSM Data Management System

As identified in CAPP's *Strategic Guidance for Process Safety* establishing a modern, and efficient data management system can enhance decision-making abilities related to Process Safety Management (PSM), with the additional benefit of adding credibility with external stakeholders.

This Roadmap lays out a multi-path plan for the development, deployment, and sustainment of such a data management system

3.1 Twin Path Roadmap

The roadmap involves two mains mutually supporting paths:

1) Improved and more refined understanding, and collection of KPI data.
2) Improved delivery of KPI data and KPI guidance through a single clear, comprehensive, active and simple web portal.

Each path is meant to be pursued roughly (but not precisely) in parallel. For example, both paths start out with by identifying the requirements, and the combined results inform the next stage of each path.

The two paths are further supplemented with a continuous improvement feedback loop whereby lessons learnt could and should be used to revisit the findings of previous stages, or to refine the current stage. If experience and/or feedback requires changes, the rationale and changes should be documented.

The diagram below illustrates the two main paths that will occur over the next 3-5 years. More detailed discussion of each stage and the associated deliverable follows.

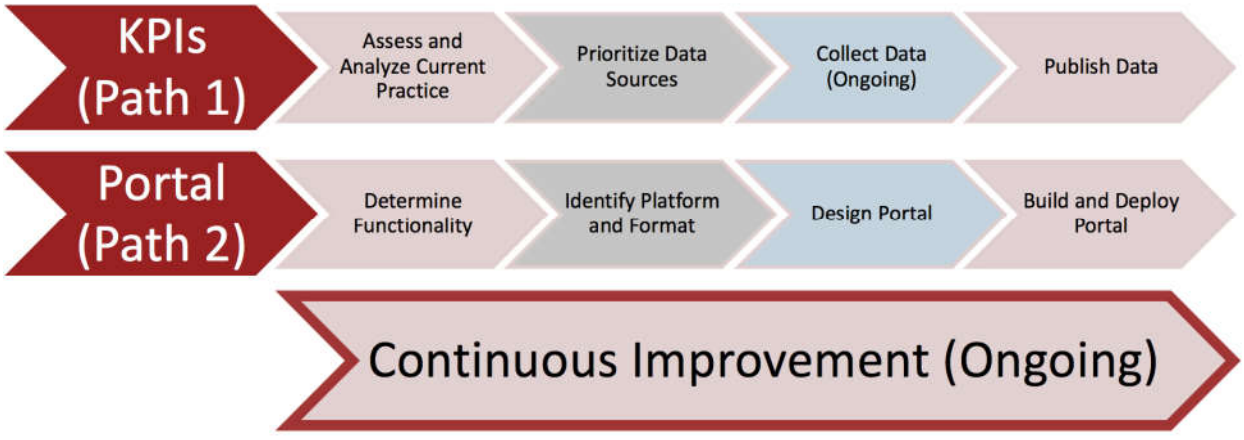

Figure 1: Illustration of Roadmap

3.2 Path 1: KPIs

The end result of Path 1 is the ongoing collection of useful, and relevant data for publication to the portal. This data will align with generally accepted industry standards/guidelines (i.e. CCPS, IChemE, API 754, etc).

This path's trajectory is heavily dependent on the success of the initial assessment and analysis stage, and the second prioritization stage. It will be critically important to determine what KPIs are economically available, and then thoughtfully choose the relevant KPIs that support defined ends.

3.2.1 Path 1, Stage 1: Assess and Analyze Current Practice

The deliverable for this stage is a report detailing the available KPIs, the current level of use of KPIs within industry, and the advantages and disadvantages of various KPIs. Particular attention should be paid to the effectiveness of the various KPIs to inform different issues, e.g. lagging and leading indicators.

3.2.2 Path 1, Stage 2: Prioritize Data Sources

Relying on the results of Stage 1, the deliverable for this stage is a report identifying which KPIs should be tracked by level of importance. The report should detail how they would be tracked, the resources required, and the risks. The choice of KPIs to be tracked should be in the context of a clear and well-defined end purpose(s) including markers for success (e.g., reduced occurrence of Process Safety Events, greater awareness of Process Safety Management, etc.)

3.2.3 Path 1, Stage 3: Collect Data (Ongoing)

With the KPIs identified, data collection starts in Stage 3. Data collection could be retroactive, but a large element of it would be ongoing with no single deliverable, through significant changes in data collections activities should be documented.

3.2.4 Path 1, Stage 4: Publish Data

The fourth and final stage in this path is to publish the data on the portal developed through Path 2. This stage would be ongoing and involve a vigorous application of continuous improvement practices. Feedback from users via the portal should be used to tune data collection and publication as part of ongoing continuous improvement activities.

3.3 Path 2: Portal

The result of Path 2 is a deployed web portal for KPI data. As with Path 1, the early stages of Path 2 will be critical. What do we want this portal to do? Is it merely passive? Or, do we want to create some sort of interactive community? These are all questions that should be answered prior to designing, building, deploying the Portal.

3.3.1 Path 2, Stage 1: Determine Functionality

The deliverable for this stage is a report identifying content-related objectives for the portal. Some relevant questions might include:

- Will the Portal refer to other sources and not just the KPI data?
- How prescriptive is the content intended to be?
- How does the portal interact with other industry sources? And are there risks of duplication?
- Is the intent to create a virtual community? Or, is it simply a go-to resource?
- Will the portal act not only to publish data, but also to input data?
- How will the portal facilitate continuous improvement of the portal itself, and KPI data collection?

Essentially, this stage will determine what we want the Portal to do with the minimal requirement that it act as a publishing point for KPI data.

3.3.2 Path 2, Stage 2: Identify Platform and Format

Relying on the results of the previous stage, various platforms will be assessed for suitability and cost effectiveness in this, the second stage of Path 2. The deliverable is a report identifying a platform and format for the Portal (e.g., whether the portal is a new interactive website, a new passive website, an extension of a current website, PDF documents, Excel files, etc.)

The report should explain the risks and advantages of the suggested platform, including costs, funding issues, and lines of responsibility for the ongoing maintenance of the Portal.

The Portal need not be new. It could leverage other platforms, such as CAPPs own website. The Portal might also extend beyond a website and include other venues such as presentations if they effectively supported the content delivery identified in Stage 1.

3.3.3 Path 2, Stage 3: Design Portal

The deliverable in this stage is a portal structure plan. The plan should include how the Portal is organized, functionality, process for improvement, how content is managed and updated, and cost estimates.

3.3.4 Path 2, Stage 4: Build and Design Portal

In the last stage of this Path, the portal will be built, and then deployed. Once active, continuous improvement of the portal would be ongoing, documented, and regular. Continuous improvement would apply to all aspects including how the Portal itself works and looks, the collection method for KPIs, and the type of KPIs collected.

Since the Portal will support all the objectives outlined in the *Strategic Guidance for Process Safety,* continuous improvement of the Portal would be guided by more than a narrow focus on Objective 3. Improvements could, for instance, be added to support Objective 1: Responsible Collaboration.

4 Definitions

Process Safety is a disciplined framework for managing the integrity of operating systems and processes handling hazardous substances. It is achieved by applying good design principles, engineering, and operating and maintenance practices. It deals with the prevention and control of events that have the potential to release hazardous materials and energy. Such incidents can result in toxic exposures, fires or explosion, and other releases of hazardous energy that could ultimately result in serious incidents including fatalities, injuries, property or environmental damage, lost production (IOGP 2011).

Asset Integrity is related to the prevention of major incidents. It is an outcome of good design, construction and operating practice. It is achieved when facilities are structurally and mechanically sound and perform the processes and produce the products for which they were designed. The emphasis is on preventing unplanned hydrocarbon releases that may, either directly or via escalation, result in a major incident. Structural failures may also be initiating events that escalate into major incidents (IOGP 2011).

Operating Integrity is the application of technical, operational and organizational solutions to reduce risk of uncontrolled release of process fluids throughout the life cycle of an asset.

Major Incident is an incident that has resulted in multiple fatalities and/or serious damage, possibly beyond the asset itself. Typically initiated by a hazardous release, but may also result from structural failure or the loss of stability that has caused serious damage to an asset (IOGP 2011).

5 References

CAPP 2014-026. *Process Safety Regulatory Scan Report*. Canadian Association of Petroleum Producers. August 2014.

IOGP Report No. 456. *Process Safety – Recommended Practice for Key Performance Indicators*. International Association of Oil and Gas Producers. November 2011.