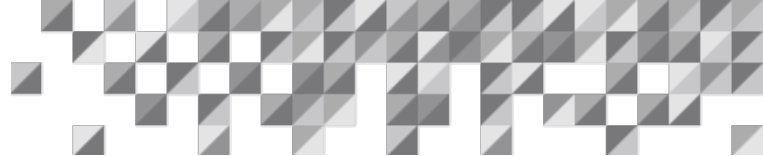# PSM Compliance Made Easy with Process Safety Enterprise®

Realizing Cost and Safety Benefits from Process Safety Knowledge Management and Workflow Automation Solutions

An ioMosaic White Paper

The Challenge

How often has a project in your facility been delayed or endured budget overruns due to a lack of readily available and accurate engineering and safety information?

How many times have you updated the same information in a piping and instrumentation diagram (P&ID) and other process safety information (PSI) in successive process hazard analyses (PHAs)?

How much time does your average plant engineer spend locating and verifying information required in executing day-to-day functions such as Management of Change (MOC)?

How many times has your facility incurred a near-miss or worse, an incident due to poorly documented procedures, training, or other safe work practices?

How much money and lost opportunity is all this costing your company?

Finally, how many times have you thought about fixing the problem?

A recent survey of engineering and safety information management, across diverse process industries, identified three primary problems which are summarized below:

Table 1: Primary Problems Associated with Engineering and Safety Information Management

Problems	Implications
Accessibility – easy and quick access to basic information such as equipment / instrumentation data, operating procedures, process data, PSI, etc., for all stakeholders continues to pose a significant challenge.	The site faces schedule delays in plant projects, PHAs, audits, etc. Project delays directly affect the bottom-line due to "lost" production, contract overruns, etc.
Accuracy – MOC programs have not proven effective in keeping the information updated. Many sites have MOC backlogs that run in the hundreds.	At best, the site incurs redundant costs to verify information prior to a project (such as an outdated relief system design basis). At worst, a serious incident could be the result of inaccurate information, such as an outdated maintenance procedure.
Fragmentation – information management systems largely operate in functional silos (engineering, maintenance, safety, etc.) and are incapable of leveraging the knowledge stored in them beyond their inherent functions.	The site is unable to utilize resources expanded in previous initiatives and historical engineering, operating and safety data to improve safety and reliability and overall financial performance.
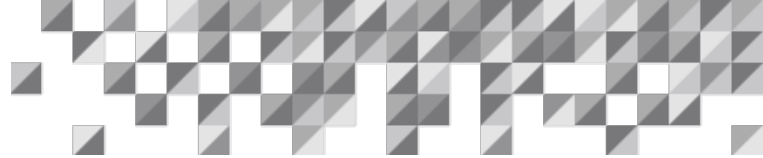
In summary, ineffective engineering and safety information management has direct consequences on cost, schedule, safety, and reliability.

Moving forward, our challenge is how to harness the power of process safety knowledge and workflows to leverage our existing information (in many different formats), prior investments in information updates, existing information management systems, and explicit understanding of our work processes to realize the hidden value of effective engineering and safety information management.

What are the Benefits of Process Safety Knowledge and Workflow Automation?

Practical automation solutions, designed specifically for the process industries, can deliver the following benefits to plants *immediately* upon implementation:

- Ensure plant information (PSI, engineering, safety) is available to all users whenever required
- Ensure plant information is accurate, i.e. kept current with plant changes
- Decrease the cost of managing, locating, and distributing information
- Ensure compliance with engineering standards and regulations
- Enforce standardization and adherence to best practices for critical functions such as MOC, Incident Reporting, etc.
- Leverage knowledge in other plant systems for wider benefit (i.e., achieving continuous PHA revalidation by integrating MOC and PHA systems)
- Eliminate/reduce errors inherent in paper-based systems, procedures, and work processes
- Accelerate and streamline plant projects
- Gain business intelligence / decision-support due to knowledge stored and analyzed in the system

Most of the benefits mentioned above are hard to quantify in terms of actual dollars saved, however, facilities continue to incur hidden costs due to the lack of accurate or readily available information. *i.e. a facility expansion project that has to perform an in-depth flare header capacity calculation because the design basis information was not adequately maintained is absorbing a redundant cost.* As is the norm, the flare header revalidation cost simply gets charged to that specific project without appearing as a PSI update line item. There are countless such examples where redundant information verification and update costs are simply absorbed by plant projects.
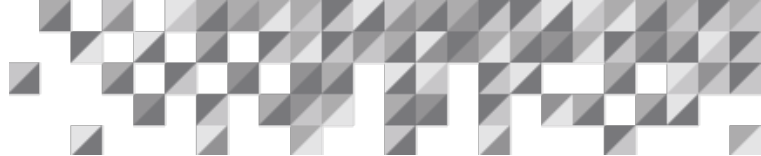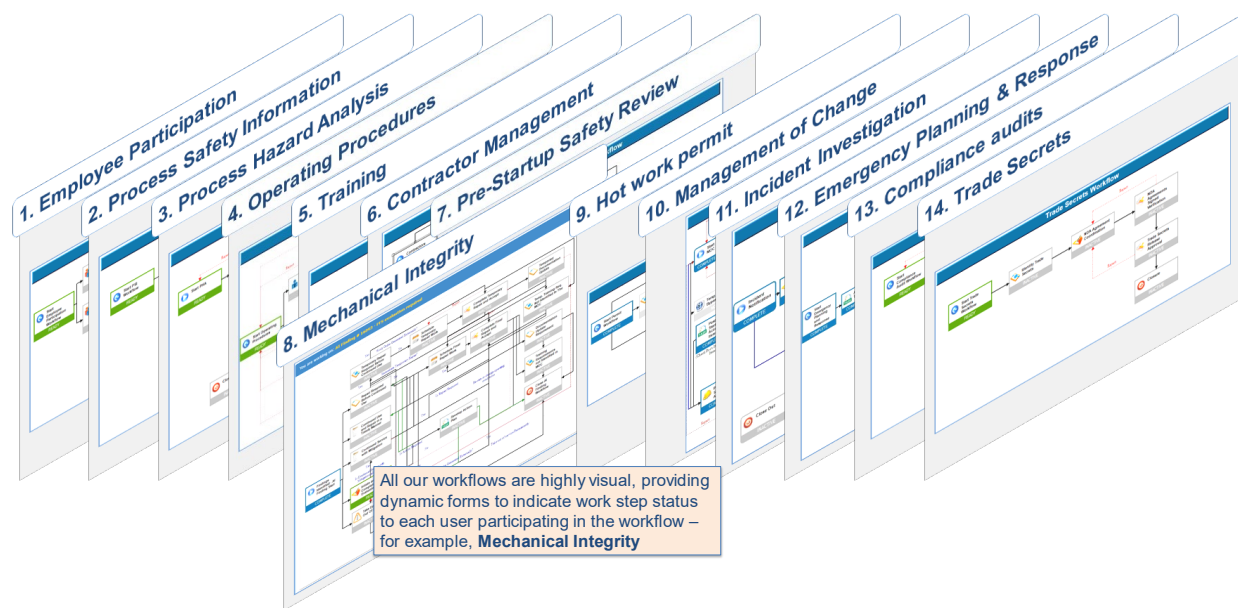
These redundant costs represent the hidden value inherent in PSI and engineering information. The *practical* implementation of process safety knowledge and workflow automation solutions can help companies realize this hidden value.

The word 'practical' is stressed above, as all too often, operating companies embark on overly ambitious technology implementation projects; and in the process, lose sight of the basic objectives and end-user perspective, resulting in inevitable failures.

The Solution

ioMosaic developed the first process industry's leading web-based process safety knowledge and workflow system, Process Safety Enterprise®, **designed specifically** to address the challenges mentioned above and ensure maintaining and supporting compliance is easy and accessible:

Process Safety Enterprise® contains proven workflows for all 14 of the elements comprising the OSHA PSM framework, *plus* comprehensive equipment forms for the management of asset integrity across your site.

All our workflows are highly visual, providing dynamic forms to indicate work step status to each user participating in the workflow – for example, **Mechanical Integrity**

Each workflow contains customizable approval steps that can be assigned to one or more roles within your organization. Process Safety Enterprise® can be used as an out-of-the-box system ready to deploy with the existing workflows, or it can be customized to meet the specific needs of your organization for the control of PSM arrangements.
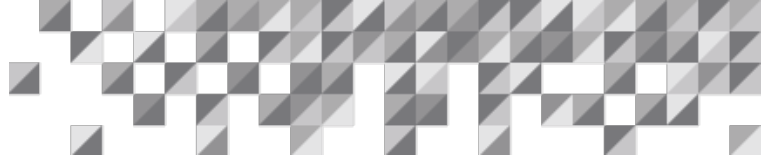
Process Safety Enterprise® additional provides a comprehensive package of Key Performance Indicators, which can be customized to create an organizational dashboard to monitor the performance across each of your PSM Elements.

The functionality included in Process Safety Enterprise® is designed to be fully scalable across your organization from use by a small SME team to deployment for the entire workforce. Specific functionality and the advantages offered are shared in the table below.

| Process Safety Enterprise® Functionality	Ensures Accessibility	Ensures Accuracy	Eliminates Fragmentation
Web-based Interface			
Information can be easily accessed from anywhere, including but not limited to, remote sites with required security clearance and authorization.	✔		
Advanced Search			
Data and documents can be retrieved using powerful and flexible search criteria, including full-text search capabilities.	✔		
Content Management & Library			
Information in different and often incompatible formats (such as spreadsheets, text files, scanned images, PDFs, etc.) can be organized in a systematic manner.	✔		✔
Documents are required to be checked-out / in using a regimented procedure.		✔	
Document revisions are archived systematically.		✔	

Process Safety Enterprise® Functionality	Ensures Accessibility	Ensures Accuracy	Eliminates Fragmentation
Information from various sources (such as P&IDs, isometrics, relief device data sheets, etc.) can be linked and cross-referenced.	✅		✅
Data and Document Lifecycle Management			
Manages and controls the complete data lifecycle (for instance, for a pressure relief device, Process Safety Enterprise® ioXpress™ can streamline the entire process from sizing to procurement to maintenance, etc.).			✅
Maintains complete audit trails of changes to data and documents for easy reference.		✅	
Provides instant notification to all involved as data and documents are modified.		✅	
Workflow Automation and Business Rules Engine			
Streamlines and automates complex functions such as MOC, Incident Investigations, etc.		✅	✅
Allows rapid configuration of client-specific workflows.		✅	
Group Collaboration and Project Management			
Share and disseminate information using a central platform.	✅		✅
Streamline project execution and management.			✅

The Process Safety Enterprise® Advantage

Process Safety Enterprise® is the only comprehensive process safety platform delivering the following advantages over traditional electronic document management systems (EDMS) and generic workflow automation solutions:

- **Ease of Configuration** – Process Safety Enterprise® was specifically designed for the process industries by engineers with years of relevant plant experience. As such, its modules incorporate best practices and methodologies prevalent in the process industries. Operating companies can rapidly configure the base modules to conform to their specific needs and requirements (i.e. the Incident Investigation module is based on guidelines published by the Center for Chemical Process Safety, and in part by senior staff within ioMosaic).

- **Ease of Implementation** – Many operating companies have struggled for years to implement EDMS applications with poor or marginal results. Built on industry standard technology, Process Safety Enterprise® can be implemented in days – not weeks or months.
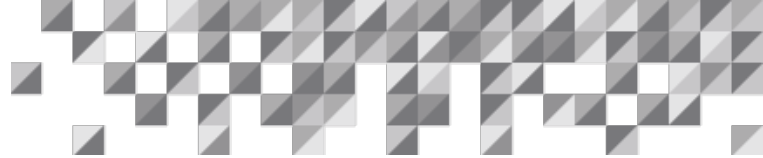
- **Integration with Existing Systems** – Process Safety Enterprise® easily integrates with commonly used solution in the process industry such as leading ERP, CMMS, and existing EDMS systems. Integration with such systems allows Process Safety Enterprise® to leverage past investments in technology to deliver sustainable benefits to the process site. As an example, our MOC module can interface with existing EDMS systems to update PSI and PHA data.

- **User-friendly** – Most EDMS and workflow applications are extremely complicated and therefore present barriers to their widespread adoption in an operating company. Process Safety Enterprise® provides a user-friendly and intuitive graphical user interface that enables site personnel to utilize the software with minimal training.

- **Process Safety Knowledge** – Traditional EDMS and generic workflow automation solutions address document management and workflow automation needs only. A key benefit of Process Safety Enterprise® is to allow operating companies the ability to analyze past performance in areas such as EH&S, engineering, project management, etc. to drive improvements in efficiency, productivity, and safety. Business and operational intelligence gained from Process Safety Enterprise®' capabilities can provide tangible decision support criteria.

- **Low Cost** – Due to its easy configuration, implementation, and integration capabilities, the overall cost to adopt Process Safety Enterprise® is significantly lower than other EDMS and generic workflow automation solutions.

Single-Point Access to all Plant Information

The Problem

Plant information to a large extent is highly fragmented. Each department (engineering, maintenance, operations, safety, etc.) manages and maintains information relevant to its function and most software applications and information management systems (process simulation software, CMMS, inspection database, asset management system, etc.) operate strictly in functional silos. As such, information managed by a certain department is not easily accessible by other departments.

Further plant information comprises multiple software formats such as databases, spreadsheets, text files, scanned images, PDF files, etc. Coupled with sheer volume of information (a medium-sized refinery can have as many as five to ten thousand pieces of equipment; the number of instruments will be much higher), it becomes apparent why plants have not attempted to organize the information to deliver benefits beyond the requirements of each department.
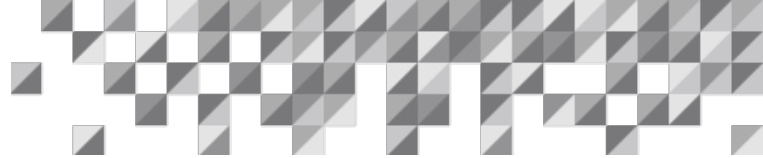
As a result, operating companies continuously incur cost and schedule inefficiencies due to fragmented engineering and safety information and lack of an effective mechanism to access plant-wide data.

The Process Safety Enterprise® Solution

Process Safety Enterprise® provides an intuitive web-based user interface from which plant data in any electronic format, including other information management systems may be accessed, easily and securely. The user-interface is configured to retrieve information using a highly structured mechanism that allows site personnel to drill down from the unit level to various pieces of information such as equipment files, instrument specification sheets, PHA data, etc.

Plant data in existing information management systems is accessed through connectivity established with Process Safety Enterprise®, whose open architecture enables seamless integration. As existing systems are updated with ongoing plant activities or new systems are added to the site, the information is simply organized and linked using the existing hierarchy.

Benefits

- Single source access for all plant data
- Productivity enhancements across the site

Streamlining ERS Design and Documentation

The Problem

Operating companies often need to evaluate their existing pressure relief systems due to compliance or other project needs, or to design new systems due to environmental / capital expansion needs. In all cases, companies have historically adopted a disjointed approach towards ERS design, documentation, project management, and related functions such as inspection and maintenance programs.

For the most part, companies have relied on software solutions only for the ERS design element. Little or no thought has been given to implementing solutions to help maintain the ERS design information, leverage past efforts to streamline future design projects, or integrating project management into the design and documentation process.

As a result, operating companies continue to absorb redundant and unnecessary costs due to inadequate documentation systems, fragmented design / documentation tools, and lack of sophisticated project management systems.
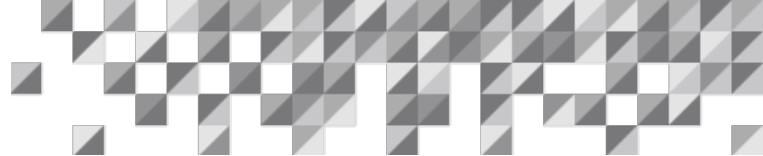
The Process Safety Enterprise® Solution

Process Safety Enterprise® integrates seamlessly with the world's industry standard ERS design tools (such as Process Safety Office® SuperChems™) to offer a comprehensive ERS design, documentation, project management, and process safety knowledge management solution.

Process Safety Enterprise® functionality provides a powerful tool to help manage the ERS information after the design / analysis phase has been completed. Inherent features such as check-in / out, revision control, document linking (linking a relief device on a P&ID to the relief device specification sheet or the contingency form in Process Safety Office® SuperChems™), integration with the MOC workflow, and others ensure that the ERS design documentation is accessible when required and maintained in accordance with plant changes.

Additionally, Process Safety Enterprise® helps streamline ERS design and documentation projects by incorporating project management capabilities and workflows such as progress reporting / monitoring, approval of design basis calculations, communications, QA / QC, etc.

As an example, with Process Safety Enterprise® it is possible to streamline the creation of a specification sheet (in the operating company's format) based upon information fed directly from the ERS design tool. This specification sheet passes through Process Safety Enterprise® and after being reviewed / approved by the engineering and is routed electronically to the procurement department. The procurement department may then attach a standard request for proposal (RPF) to the specification sheet and send it to approved vendors for quotes – all without generating a single sheet of paper, and achieving substantial cost and schedule savings.

Benefits
- Achieve cost and schedule benefits in ERS design, documentation, and project management
- Maintain the accuracy of ERS design information
- Leverage ERS design information to support downstream functions as procurement
- Link ERS design information with other pertinent information such as inspection records, relief device maintenance procedures, etc.

Streamlining the MOC Process

The Problem

The MOC process is highly complex due to the variety and extent of potential changes and the involvement of multiple departments. A typical MOC would be routed through engineering, operations, safety, etc. each with its own set of criteria regarding its approval and resolution.

Most sites rely on paper-based systems or simple database tracking tools to manage the MOC program. The most critical aspect, the MOC workflow, is largely handled via manual processes. In addition to significant delays in updating relevant PSI (in many cases the disappearance of the MOC altogether), manual systems are highly prone to errors, as they cannot enforce the desired best practice / methodology followed by the company.

As a result, most process sites have MOC backlogs in the hundreds and are ineffective in keeping the information current.

The Process Safety Enterprise® Solution

Process Safety Enterprise® MOC workflow incorporates all basic elements of the MOC process. A business rules engine allows easy configuration of this workflow to mirror a site's process, down to the structure of the reports.

The Process Safety Enterprise® MOC workflow allows a site to manage and update almost all relevant PSI online. For instance, if a change affects a pressure relief device's set pressure, the MOC would identify (amongst others) the relief device specification sheet and the respective P&ID as PSI elements requiring updates. Existing PHAs can be updated for each change, thereby enabling the facility to achieve continuous PHA revalidation.

Benefits

- Enforce MOC best practices, regulatory guidelines, and corporate methodologies (PHAs, PSSRs, training, etc.)
- Ensure PSI updates
- Reduce MOC BACKLOG
- Expedite MOC processing (identify bottlenecks – process and personnel)
- Enhance audits and reporting
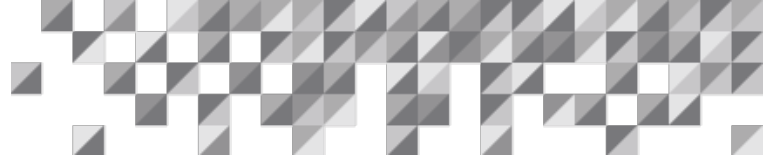
Author

Henry Ozog, (2009)

Updated: John Barker (2023)

Useful Links

Additional PSE White Papers:

- [Effectively Manage Mechanical Integrity in PSE](#)
- [Effectively Manage Changes to Processes, Chemicals, Equipment, and Personnel Using PSE](#)
- [Process Safety Enterprise® Asset Integrity Management Service (AIMS) and KPI Dashboard](#)