MARY KAY O'CONNOR PROCESS SAFETY CENTER
TEXAS A&M ENGINEERING EXPERIMENT STATION

18th Annual International Symposium
October 27-29, 2015 • College Station, Texas

Managing Risk and Capturing Corporate Memory with Internal Best Practices

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1.0 *Introduction – What are Best Practices*

In today's environment where industry expertise is diminishing and safety standards are increasing, knowledge transfer and sharing become paramount to success as companies continue to operate leaner. In addition, managing risk by setting corporate requirements to define the risk profile is more important than ever as companies continue to buy and sell facilities. One method to accomplish the aforementioned needs is to incorporate a collection of Best Practices.

For the purposes of this paper, a Best Practice is defined as a technique or methodology that upon rigorous evaluation through experience and research demonstrates success, has had an impact, and can be replicated. Best Practices are frequently used by facility owners and operators to provide their requirements and guidelines for construction and maintenance. As is required by Recommended and Generally Accepted Good Engineering Practices (RAGAGEP), Best Practices need to at least meet minimum industry requirements but may be more stringent based on experience and unique attributes of a facility. For this reason, Best Practices typically utilize and direct users to a published industry standard to set baseline requirements then clarify options or provide additional requirements above the industry standard based company preferences and experience.

When companies seek a solution for how to add a Best Practices collection to their organization, the options most commonly considered are purchasing a general industry Best Practices collection and using it as is (i.e. without customization), utilizing an Engineering and Construction (E&C) firm's collection previously used for projects, or creating an internal Best Practices collection by updating a legacy collection. The issue of building a Best Practice collection becomes more complicated with companies that have been created through mergers or acquisitions because of cultural differences and approaches to new construction and mechanical integrity.

In this paper, we will include insight as to why we advocate developing an internal Best Practices collection over the other options. In addition, we will provide recommendations for how to best develop, implement, and maintain an internal Best Practices collection. Finally, we will provide examples that illustrate how organizations of varying sizes benefit from incorporating a customizable set of internal Best Practices.

2.0 *OSHA Interpretations and Recommendations*

In June 2015, the Occupational Safety and Health Administration (OSHA) published new guidance for industry standard 29 CFR Part 1910.119 "Process Safety Management of Highly Hazardous Chemicals" with interpretations for Process Safety Management (PSM) and RAGAGEP, including clarifications and interpretations regarding:

- What is RAGAGEP and what are its sources
- "Shall" vs. "Should"
- The use and acceptance of internal employer documents as RAGAGEP
- Considerations for maintaining compliance with the standard

In this recently published memorandum, OSHA provides not only clarification that appropriate internal standards are considered to be acceptable RAGAGEP documents, but also includes reasons why OSHA recommends facilities to develop and use internal standards. Per the memorandum:

Facility internal standards can serve a number of legitimate purposes, including:

- *Translating the requirements of published RAGAGEP into detailed corporate or facility implementation programs and/or procedures*
- *Setting requirements for unique circumstances for which no published RAGAGEP exists*
- *Supplementing published RAGAGEP that only partially or inadequately address the employer's needs*
- *Controlling hazards more effectively than available codes and standards*
- *Addressing hazards when the codes and standards used for existing equipment are outdated and no longer describe good engineering practice*[(1)]

As a provider of customizable Best Practices for over a decade, we at The Equity Engineering Group, Inc. wholly agree with OSHA's recommendation for internal standards and would like to further add that internal Best Practices also offer additional benefits:

- Promote safety, manage risk and improve reliability
- Capture Corporate Memory
- Transfer knowledge
- Cost effectiveness.

3.0 *Life Cycle Management and Improved Reliability*

To improve reliability, facility owners and operators need to address the overall process of whole-life management for their equipment by considering Life Cycle Management (LCM). LCM is defined as the process of managing the entire life-cycle of assets including design, construction, in-service use, repair if required, and retirement. The LCM process for fixed pressurized equipment including pressure vessels, piping, and tankage is shown in Figure 1.

Each step is required to understand and consider potential damage mechanisms in the design process, selection of appropriate construction codes to ensure reliable designs, establishment of in-service inspection programs to monitor both anticipated damage and to determine the presence of unanticipated damage mechanisms, application of Fitness-For-Service (FFS) technology if unanticipated damage is discovered, and implementation of effective repair procedures, as required, to ensure mechanical integrity of in-service equipment[(2)].

The LCM framework shown in Figure 1 is built upon published industry codes and standards to implement the process. Technology Integration identified in Figure 1 relates the industry codes and standards developed to define the relationship how each standard relates to the LCM, creating a common technology core. While Technology Integration provides the relationship roadmap, the current challenge is that most industry codes and standards do not provide complete guidance; thus, additional information in the form of Corporate Memory and Best Practices is required for complete guidance. As a result, Best Practices overlay the LCM Framework to document requirements from construction to in-service equipment issues (i.e. inspection, FFS, and repair guidelines).

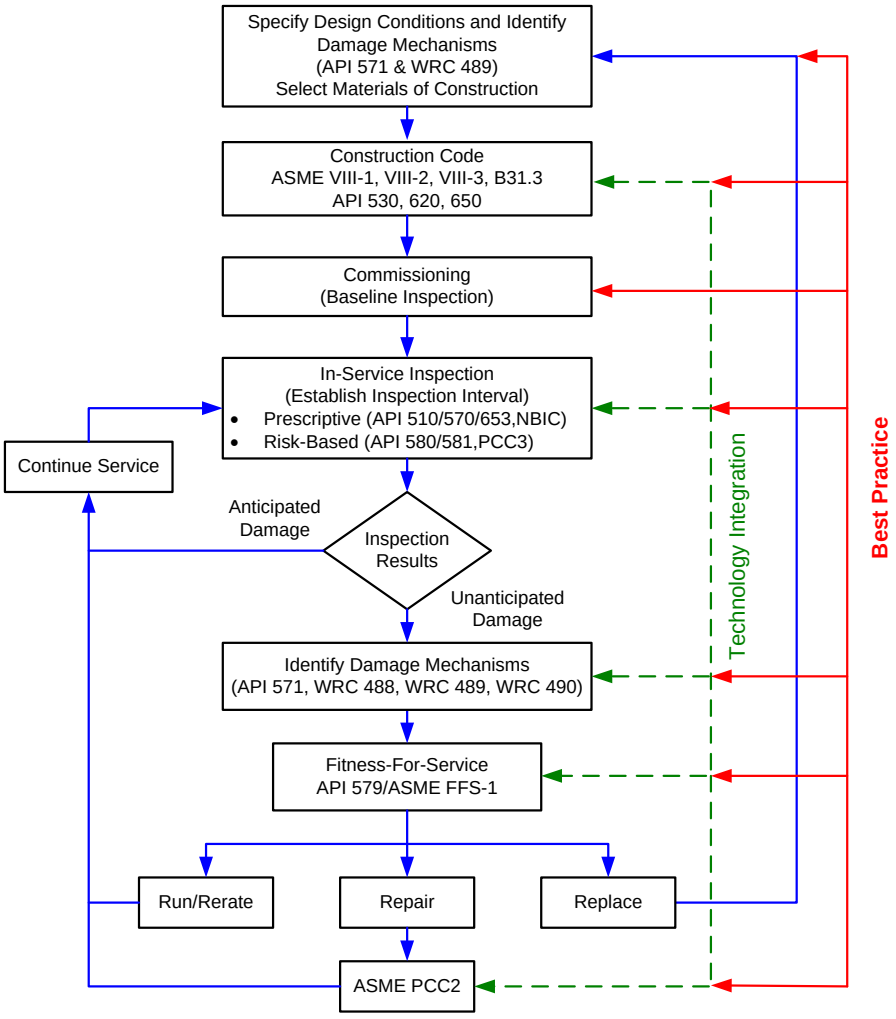

Figure 1 – Life Cycle Management Block Diagram

As previously described, Best Practices in pressurized fixed-equipment technology are becoming more difficult to cultivate due to lack of infrastructure (Corporate Memory) and/or expertise. Without internal Best Practices, corporations must rely on industry forums and/or codes and standards.

4.0 *Best Practice Customization – A Best Practice!*

The challenge in selecting a Best Practice platform is that neither general industry Best Practices nor an E&C firm's Best Practices account for each facility's and company's unique requirements, risk profiles, and preferences. For these reasons, we believe facilities need a set of internal Best Practices to take advantage of the most important attribute of an internal Best Practices collection – customization. Customization is vital because it allows facilities to narrow the level of detail required to provide users with adequate information to perform tasks and make decisions in alignment with the organization's unique requirements to manage risk and improve long term reliability.

5.0 *Capturing Corporate Memory*

Along with promoting improved reliability, customizable internal Best Practices can be used to capture Corporate Memory. We define Corporate Memory as the total body of knowledge, comprised of both documented and undocumented memories and experiences, created over the course of an individual organization's existence. Corporate Memory may also come from an organization's documenting of equipment deficiencies and failures through its Mechanical Integrity Program. To take full advantage of Corporate Memory, each organization should have a goal to document the accumulated knowledge so that information is not lost over time. As it is its core function, an internal Best Practices collection provides an ideal forum to document Corporate Memory and to capture lessons learned from the Mechanical Integrity Program as the organization's experience evolves.

6.0 *Knowledge Transfer*

As is well documented, many organizations battle with the potential gap in expertise as the baby boomers near retirement. If these experienced employees' knowledge and expertise is not recorded as Corporate Memory, 40+ years of practical experience and knowledge will be lost. Therefore, we believe organizations should focus on capturing Corporate Memory to support knowledge transfer. By making the effort to transfer expertise, organizations are confident that their next generation of employees can be trained and provided with valuable resources to continue to operate the facility safely and with improved reliability.

7.0 Cost Effectiveness

The LCM serves as a reminder that costs may occur at different stages during equipment's life. Components purchased at a lower cost may be sufficient for certain applications, whereas the same component may lead to significant long term expenses stemming from unanticipated damage in a different application. By documenting these lessons learned as Corporate Memory in Best Practices, corporations can greatly improve their mechanical integrity resulting in higher equipment availability.

Internal Best Practices indicate where over-engineering is not required and where there are benefits to larger initial purchase costs to greatly increase long-term savings by limiting the need

for ongoing inspection and maintenance costs. For example, if a certain type of pump seal proves to be successful for a particular application, an organization should document its use as a Best Practice to prevent over-engineering and over-spending on similar future designs. In addition, for some wet H_2S services, carbon steel clad plate is initially more expensive, but the upgraded material significantly reduces inspection and maintenance costs over the life of the equipment, making the decision to upgrade material cost effective.

There are costs associated with maintaining internal Best Practices, capturing Corporate Memory, and transferring knowledge. However, the benefits from reducing risk as a result of improved reliability, minimizing future engineering efforts by capturing Corporate Memory and transferring knowledge, and the reduction in costs related to reducing inspection for unanticipated damage greatly outweigh the costs to maintain the collection, making a set of internal Best Practices cost effective over the long term.

8.0 *How to Develop Internal Best Practices*

We have demonstrated why you should choose to create internal Best Practices. Next we will use our experience to offer insight and recommendations on how to most effectively develop, implement, and maintain an internal and customizable Best Practices collection. The most likely options for internal Best Practices development include the following:

- Create a new collection from scratch
- Create a new collection by writing overlays to general industry Best Practices
- Update an outdated legacy collection
- Consolidate multiple legacy collections
- Purchase an up-to-date collection that allows customization

8.1 *Recommendations for Selecting a Best Practices Collection*

Before you decide which option to choose, the most important factor to remember is Best Practice collections need to be aligned with current industry Best Practices to be considered RAGAGEP. You need to think not only about the time involved to create and develop a collection but also the long term investment required to maintain it. It is especially important if you decide to purchase an up-to-date collection that it can be customized as your organization and industry requirements change.

In addition, we recommend you consider how the collection will be provided to users, both internal and external. As industry moves towards more accessible solutions to provide users the information they want when they need it, you should consider that many users, particularly in the pipeline and midstream industries, will need to access this information via mobile devices. For this reason, we recommend selecting a collection that can be delivered through a web-based solution to improve accessibility. In addition, to improve usability on all devices, we recommend providing the information in a format other than PDF (i.e. HTML) so the collection is designed to open and adjust properly for all devices.

8.2 *Recommendations for a Consolidation Effort*

If it is decided to consolidate multiple legacy collections into one master collection, based on our experience, we highly recommend the following:

- Focus on the most critical documents that affect covered equipment in the Mechanical Integrity Program first
- Set and keep the timeline as short as possible
- Perform the review using the 80/20 rule
- Focus on aligning major philosophical differences

It is important to remember that this internal collection is comprised of living documents and can be modified over time. Do not become tangled in minor details, which can very quickly slow progress, causing loss in project momentum, increasing frustration, and exponentially increasing both cost and time.

8.3 *Recommendations for Developing a Management System*

No matter which option is chosen to develop an internal collection, it is important that every Best Practices collection has a management system to detail the rules for use. While management systems vary depending on the needs and concerns of individual organizations, each should include and clearly document the following:

- Roles and Responsibilities
    - Coordinator – Responsible for the collection and overall coordination
    - Subject Matter Experts (SMEs) – Assigned to own and maintain specific documents
    - Documentation Staff – Responsible for processing requests
- Workflows
    - Revisions – Modifications to the documents
    - Deviations – Exceptions to the requirements in the collection

When developing a management system, it is important to remember that one size doesn't fit all. It is necessary to consider building flexibility into the management system to allow for differences when needed. For example, add tables to define known site differences which are still acceptable within the company risk profile. Flexibility can also include allowing deviations for sites, projects, and equipment as long as the proper justification is provided and approval is obtained.

9.0 *How to Implement Internal Best Practices*

Once the collection is developed, it is important to create and utilize an implementation strategy. An implementation strategy should clearly define the start date for when documents shall be required for use as well as the corporation's philosophy on retro-activity. The OSHA philosophy on the retro-activity of changes to RAGAGEP should be the basis for the philosophy for a corporation's philosophy on Best Practices. The statement on retro-activity is essential for projects completed prior to or in progress before the mandatory start date. Most organizations will clarify that while the Best Practices can be used for current projects, they shall be used for new projects after the mandatory start date. In addition, an implementation plan may need to include training and additional projects such as piping class cross-references.

10.0 *Recommendations for a Piping Class Cross-References*

A piping class cross-reference is a matrix relating like legacy piping classes to the new set of piping classes. The primary benefits of performing a piping class cross-reference is

consolidation of the many legacy piping classes at a site or within a corporation to a single system that will be maintained without the costly effort to update the many site drawings. While it may seem relatively straight forward to link like classes, there are potential pitfalls to a piping class cross-reference. When completing a piping class cross-reference, we recommend the following:

- Prior to the project, define corporate requirements for piping systems
- When executing the project, cross-reference the legacy piping class to a class meeting the current requirements rather than the original design of the legacy class

It is crucial to follow these recommendations, because you will most likely have legacy piping classes built to past requirements that do not align with your current Best Practices. For example, if a legacy piping class was designed with zero corrosion allowance, but you now want to set a corporate minimum corrosion allowance of 0.0625 inches, you should cross-reference the legacy piping class to a class with a corrosion allowance of 0.0625 inches rather than zero so that portions of the system are replaced with components that meet the organization's current Best Practices.

11.0 *How to Maintain Internal Best Practices*

RAGAGEP and Best Practices are constantly evolving, so no matter the method used to develop and implement an internal Best Practices collection, the collection will need to be continually maintained over time to keep it evergreen.

When developing a long-term maintenance plan, based on our experience, we recommend the following:

- Assign an SME to each document
- Clarify that the SME owns the document and is responsible for reviewing and reaffirming it to maintain alignment with RAGAGEP and Best Practices
- Develop a schedule for planned reaffirmations

Maintaining an internal Best Practices collection can be time consuming and requires the most experienced personnel on staff who are typically very busy. As a result, it may be advantageous for the SMEs to utilize additional internal and external expertise to help maintain the collection.

12.0 *Examples and Additional Benefits*

While companies of all sizes benefit from maintaining an internal Best Practices collection for the aforementioned reasons, based on our observations, companies of different sizes have additional benefits to utilizing an internal Best Practices collection. Following are examples from three companies with collections of Best Practices and the additional benefits they received.

12.1 *Example 1 - A Single Facility*

Organizations with a single facility or a facility that operates independently from an organization's central engineering group typically have staff members with numerous responsibilities. Without working with other facilities, these single-site facilities typically operate in a vacuum with limited perspective and without the added value of knowledge sharing with other sites or organizations. Finally, as they typically utilize an E&C's piping classes for each project, most single sites have a significant number of piping classes, many of which are

identical or very similar making it difficult to manage. By purchasing a set of Best Practices, a single facility can:

- Rapidly inherent a plethora of experience and lessons learned from those outside of their organization
- Review new documents and force discussions when requirements differ from current internal Best Practices
- These documents can form the basis for a Mechanical Integrity Program at a site too small or under-staffed to develop their own
- Use discussions to lead to improved Best Practices, modifications to document the site's preferences, and to transfer knowledge from an already typically short-staffed facility
- Request a piping class cross-reference to consolidate the hundreds and sometimes thousands of piping classes down to a more manageable number.

12.2 *Example 2 – A Multi-Site Facility*

Medium-sized organizations with multiple facilities which may or may not have a central engineering group typically operate independently, leading to limited or even no sharing of information with other facilities in the company. As they operate independently, each facility manages risk differently and re-engineers similar problems multiple times using only the knowledge from within the facility. By purchasing a set of Best Practices, multi-site facilities can:

- Have a set of rules to force discussions to define minimum corporate requirements to meet mechanical integrity requirements and help manage risk
- Open lines of communication via a common forum to share knowledge and lessons learned across the sites, preventing re-engineering similar problems and filling gaps at facilities that may have weaknesses in areas where another facility may be strong.

12.3 *Example 3 – Large Corporations*

While similar to the multi-site facilities, large corporations are typically more likely to purchase additional facilities over time. By purchasing a set of Best Practices, large corporations can:

- Define minimum company requirements to help set the risk profile and define corporate rules when onboarding a newly purchased facility
- Drastically improve purchasing power by being able to show all sites require similar components, resulting in bulk order savings.

10. *In Closing*

In summary, internal Best Practices are an OSHA-recognized and time-tested way to manage risk, promote safety, and improve reliability for an organization. This is achieved by addressing each stage of the equipment life cycle, by capturing Corporate Memory, and by functioning as a tool to transfer knowledge. There are multiple methods for developing, implementing, and maintaining an internal Best Practices collection. However, no matter the option selected, each internal Best Practices collection should have a management system and assigned SMEs to own and maintain each document. If performing a consolidation effort to develop your internal Best Practices collection, it is best to focus on what is important and to use the 80/20 rule to minimize effort and maximize results. When adopting a new collection, you may want to consider

performing a piping class cross-reference, as it is a beneficial way to adopt a new system without spending time and money to update site drawings. Whether your organization is large or small, there are many benefits to having an internal set of Best Practices, and we hope you consider using this type of collection to help your organization manage risk and capture Corporate Memory for years to come.

Bibliography:

1 – Galassi, Thomas. (2015, June 5) *Memorandum for Regional Administrators and State Plan Designees, RAGAGEP in Process Safety Management Enforcement*. Retrieved from: https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=INTERPRETATIONS&p_id=29414

2 – Osage, David. (2009, May 21) European Federation for Welding, Joining and Cutting. Presented at Eurojoin 7. *Modernization of Pressure Vessel Design Codes, ASME Section VIII, Division 2, 2007 Edition and Fitness-For-Service Codes, API 579-1/ASME FFS-1, 2007 Edition with Applications*.

Keywords:

Principles, Leadership, Commitment, Continuous Improvement, Integration, Safety Culture, Project Management, Risk, Risk Management, Organizational, Facility, Mechanical Integrity, Reliability, Materials, Fabrication, Maintenance, Inspection, Training and Performance, Lessons Learned