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

22nd Annual International Symposium
October 22-24, 2019 | College Station, Texas

Are you struggling with your Asset Integrity program?

Katherine Anderson*, CCPSC
ioMosaic
93 Stiles Rd #102, Salem, NH 03080
*Presenter E-mail: anderson.k.nh@iomosaic.com

Abstract

Asset Integrity (also referred to as Mechanical Integrity) [1] findings remain on top of OSHA's citation list during PSM inspections. Violations most frequently found include failure to address equipment deficiencies, lack of AI written procedures, and failure to perform internal AI inspection(s) and test performance. Establishing systems to collect equipment information to develop proper, effective AI procedures that maintain equipment integrity, schedule inspections, and track deficiency resolutions are a major challenge – especially for smaller companies. This paper describes how electronic database management along with proper information collection practices as well as the use of workflows to track inspection and deficiency status can greatly improve efficiency of an asset integrity program.

Keywords: Management, Mechanical Integrity, Technical Tools, Risk Management Tools

Asset Integrity (AI) findings remain on top of OSHA's citation list during OSHA Process Safety Management regulation 1910.119 inspections. Violations most frequently found include failure to address equipment deficiencies, lack of MI written procedures, and an absence of MI inspections.

Data from 2016-2017 showed asset integrity was the most cited element [1]. The top three cited requirements for asset integrity were [1]:

- AI Inspection and Testing
- AI Written Procedures

[1] Center for Chemical Process Safety (CCPS) refers to OSHA Mechanical Integrity as Asset Integrity in the latest "Guideline for Asset Integrity Management" book and this term will be used throughout this paper.

- AI Equipment Deficiencies

This trend continued in 2018 and these three AI issues were identified in the top ten on the OSHA citation list [2]:

- AI Written procedures (#2)
- AI Equipment Deficiencies (#3)
- AI Inspections and Tests (#7)

Like process design, asset integrity is critical to the safe operations of facilities. Its criticality is demonstrated by the fact that it is one of the 14 elements of the OSHA PSM standard as well as a pillar of the risk management foundation in the risk-based process safety management system. Its implementation is a challenge for companies of all sizes but becomes very hard for smaller facilities with minimal resources. An effective AI program requires a large amount of effort and resources not only to set-up the initial program but also to execute the inspection schedules on time and address any recommendations/deficiencies that were identified. This paper identifies how three key components: electronic database management, proper information collection practices, and the use of workflows to track inspection and deficiency status, can greatly improve the efficiency of an AI program.

The goal of an AI program is to implement elements and steps that establish and maintain safety for processes and equipment in order to prevent failures and accidental releases. The initial set-up of the asset integrity program includes:

- Defining company policies and management system procedures
- Identifying equipment to be included in the program
- Defining equipment criticality
- Defining required inspection types and their frequency

After the initial program is set-up the inspection schedule must be tracked and executed on time, the results have to be analyzed, and identified recommendations/deficiencies have to be corrected in a timely manner.

I. Electronic Data Management System

The biggest struggle in the initial set-up phase is to be able to collect and manage all the information required for proper equipment evaluation. Equipment specifications are required to identify the maximum allowable operating condition. Process conditions are required to identify equipment criticality, possible damage mechanisms, and proper inspection techniques to be used for detection.

Depending on the age of the facility or the systems used for Process Safety Information (PSI) much of this information may not be easily available or may be out-of-date. An electronic data management system can help with this task, however proper set-up must be followed to allow for easy information retrieval. Electronic equipment folders can be used to organize and store

information. Naming convention must make sense to the user(s). The electronic folders should be set-up using location, equipment type, and equipment ID number that user(s) are familiar with allowing ease in searchability by any of these identifiers. Using equipment numbers from P&IDs makes it easy for operating personnel to cross reference with Process Hazard Analysis (PHA) and procedures. Identifiers such as functional location in computer maintenance management system (CMMS) can be very cumbersome for information retrieval. Storing information in capital project files may work well during project execution, however it becomes difficult to find by the operating unit personnel after project is completed.

The electronic data system is most useful if it allows users to link the equipment number to its operating conditions, P&IDs referenced, equipment specifications, U-1 forms, safety devices protecting the equipment, and/or sizing calculations as well as all asset integrity information.

II. Proper Information Collection Practices

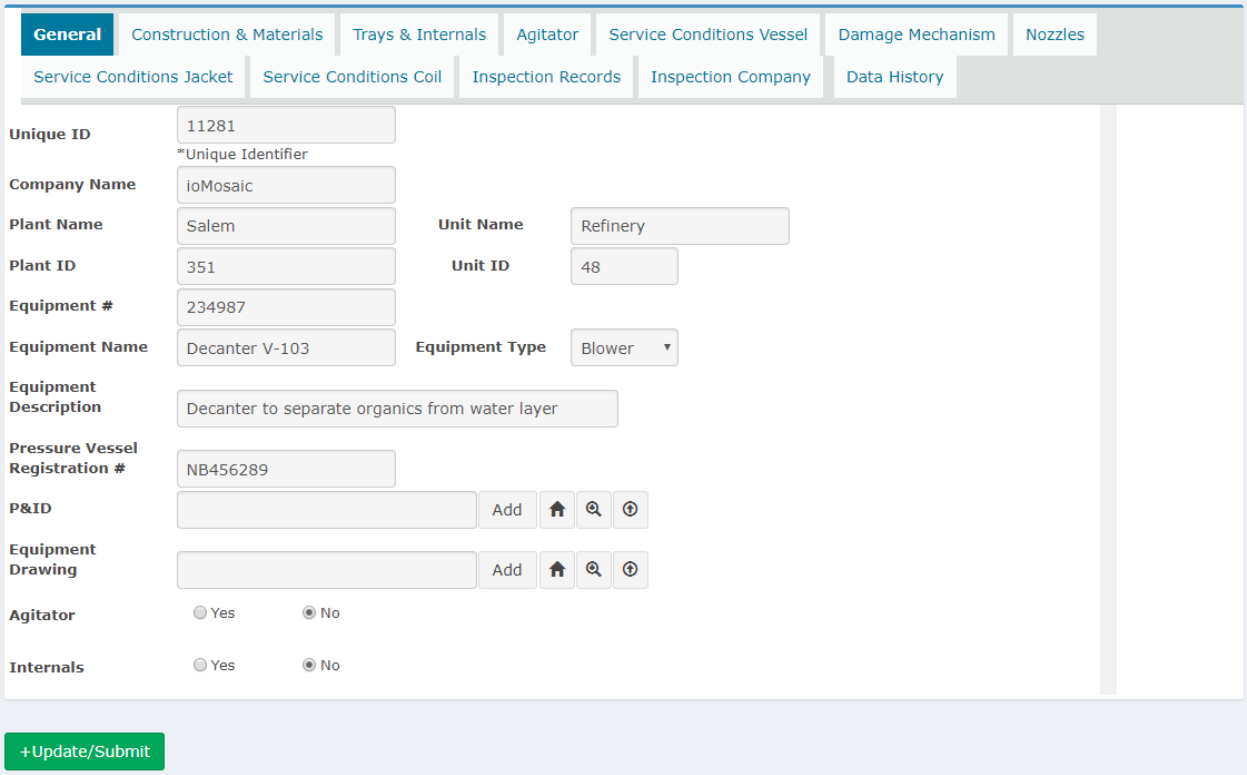
The electronic system should be set-up to allow users easy access to information and also to assure that the information is current or up to date. Given the sheer volume of information surrounding asset integrity, proper information collection practices are crucial during a program start-up. At minimum the asset integrity information should include:

- Equipment criticality
- Possible damage mechanisms
- Type of inspections to be performed
- Frequency of inspections
- Results of inspections
- Corrective actions to be taken
- Status of repairs

Proactive collection and documentation followed by proper storage in an electronic system is key to managing and maintaining an effective and compliant AI program. Allowing for all equipment specific information being accessible to all staff from a single electronic form, including reports and back-up documentation makes the retrieval system more efficient. For instance, pressure relief valve information would automatically be linked to the protected equipment information. Document control of PSI is critical to proper asset integrity implementation. This information should be current and easy to find to ensure it will be used properly and more importantly support compliance.

Figure 1 is an example of how the equipment information can be documented and linked together using an equipment form. Data linked to this equipment form can be stored in electronic document-controlled PSI folders and should also be accessed from the specific equipment form without having to search the folders. This makes identifying equipment criticality and possible damage mechanisms more efficient.

Fig 1 – Pressure vessel equipment form example from Process Safety Enterprise®



Source: Process Safety Enterprise®, ioMosaic Corporation

Facilities should provide guidance on what equipment should be included in the AI program but also provide the electronic means to properly manage the information. Scattered data located in several places increases the time it takes to do proper evaluations of equipment criticality and determine correct inspection techniques and frequencies.

III. Using Workflows to Track Inspection and Deficiency Status

A final common struggle in implementing the program after equipment is identified and inspection frequencies are defined is to manage the inspection program to assure inspections are done on time and results are documented.

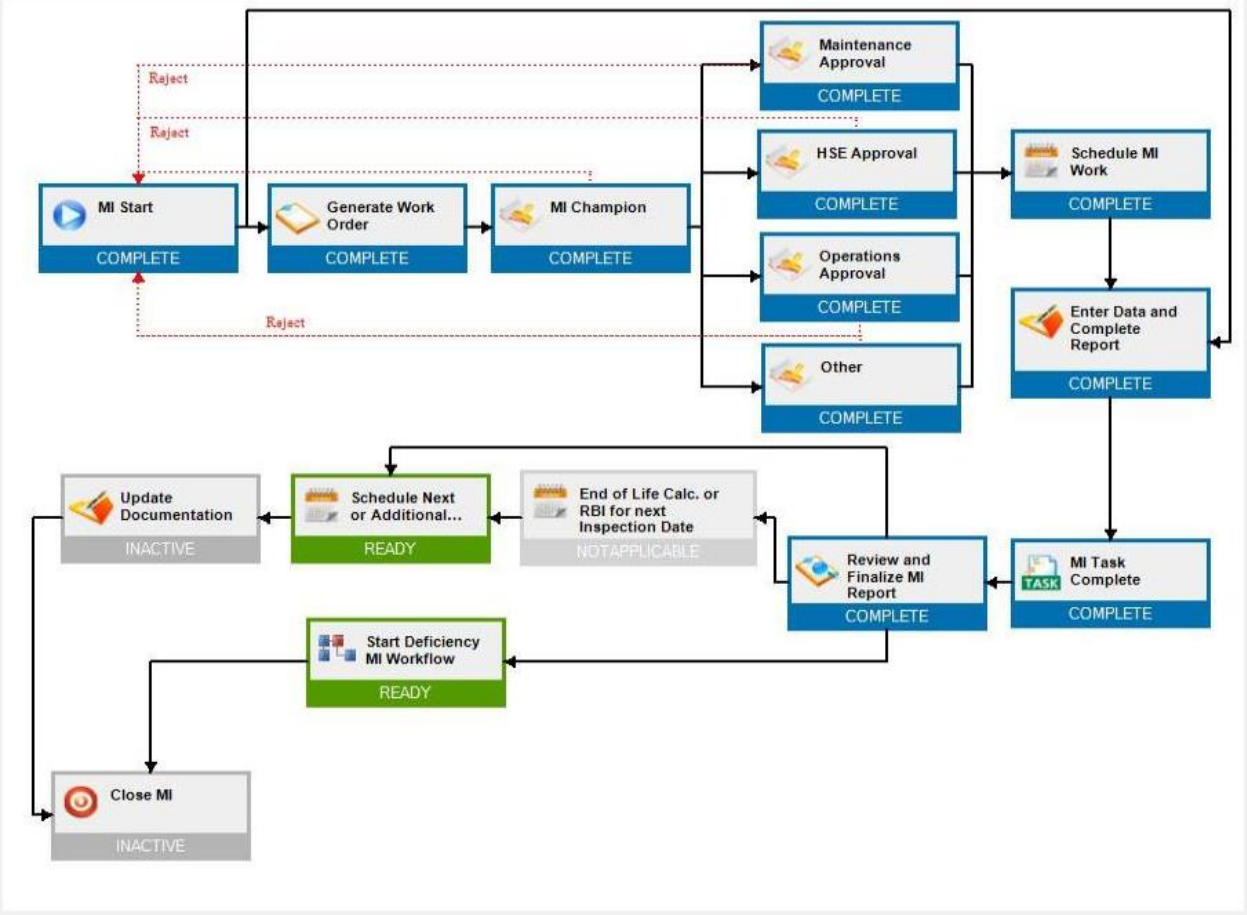
That can sometimes be a challenge within a CMMS depending on the configuration of the work order system. Workflows can be used to manage specific inspection tasks and deficiency corrective actions to improve this management system. Using a workflow to track inspections provides visual progress of the inspection tasks and the automatic reminders for tasks that need to be completed help to resolve issues quickly. Moreover, AI workflows can be used throughout or applied to different stages of equipment life cycle.

Figure 2 is an example of an AI Inspection Workflow that can be used for tracking a specific inspection. Such a workflow or module can simplify RAGAGEP (Recognized And Generally

Accepted Good Engineering Practices) questions by automatically selecting and suggesting applicable RAGAGEP inspection tasks and frequency for each piece of equipment added to the AI program. This type of workflow can still use the CMMS for actual work order generation, but it can also track the status of other steps in the inspection process such as proper approvals, review of inspection data, and equipment end of life determinations.

Steps are identified in the facility's mechanical inspection execution process and a workflow step is created for each individual requirement. Workflow systems can track the status of each step, send reminders to responsible parties to complete their tasks, and keep the workflow open until all actions are completed. This allows the work order for the inspection task in CMMS to be closed and still provides for proper tracking of the inspection related activities. Reports can be run to track inspections progress at every step in the workflow.

Fig 2 – Asset integrity inspection workflow from Process Safety Enterprise®

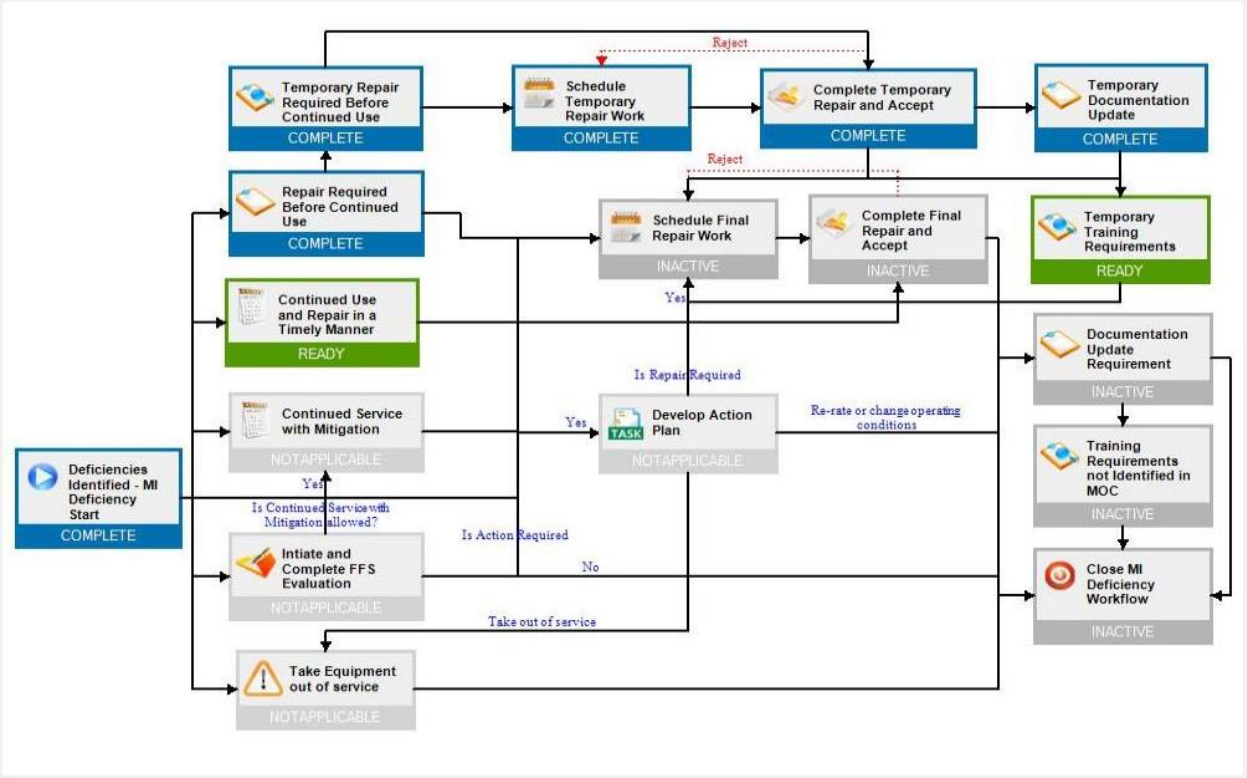


Source: Process Safety Enterprise®, ioMosaic Corporation

The same workflow concept can be used to manage equipment recommendations or deficiencies. The steps needed to take corrective actions are identified based on facility's procedures and workflow created to manage the recommendation to completion. Using a workflow for corrective action can also assure the Management of Change (MOC) procedures are being followed when equipment is repaired, modified, run with mitigation or taken out of service. The deficiency workflow can be set-up not to move forward until proper MOC workflow is created and approved. The workflow also assures that proper documentation was completed. The reminder function of a typical electronic workflow is an important and reliable tool that keeps tasks in front of the personnel responsible for their completion.

Without a workflow in place, it is not unusual to lose track of a temporary repair such as a pipe clamp, because the work order used for the temporary repair was closed and no system was in place to create a final repair plan. A properly implemented workflow system can identify these and other oversights and help to manage backlog more efficiently.

Fig 3 – Asset integrity deficiency workflow from Process Safety Enterprise®



Source: Process Safety Enterprise®, ioMosaic Corporation

Workflows are a great tool to assure proper steps are accounted for and implemented into any process safety management activity and improve the efficiency in execution and reporting. Properly implemented equipment data information storage and AI workflows will minimize the

amount of time and effort that personnel have to spend on these activities. To make asset integrity implementation easier and more efficient data should be easily retrievable from a single location. AI tasks should be trackable and their status easily visible with proper reminders to assure completion.

Conclusion

This paper has identified and outlined many of the common challenges companies face when it comes to asset integrity. As one of the 14 elements of the OSHA PSM standard, a thorough AI program is essential for compliance and risk reduction. The overall efficiency and compliance of an AI program can be greatly improved by the three key components that were the focus of this paper: implementation of an electronic database management, proper information collection practices, and the use of workflows to track inspection and deficiency status ultimately ensuring the establishment and maintenance of safe operations. Although these components are recommended to be applied during asset integrity program set-up, they can be successfully applied to any process and to any company size to improve safety.

References

[1] Schmoyer, N. “Review of Recent OSHA PSM Citations”. Inspectioneering. 3 January 2019. Inspectioneering.com

[2] Occupational Safety & Health Administration (OSHA). Top 10 Most Frequently Cited Standards for Fiscal Year 2018 (Oct. 1, 2017, to Sept. 30, 2018). Online: https://www.osha.gov/Top_Ten_Standards.html