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Continuous PHA Revalidation

An ioMosaic White Paper

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Summary

Operating companies covered by OSHA's Process Safety Management (PSM) standard or EPA's Risk Management Program (RMP) rule are required to revalidate their Process Hazard Analysis (PHA) every five (5) years. However, resource-efficient revalidation after a five-year time span can be very challenging. It is not uncommon for an organization to consume resources conducting a complete "redo" PHA. This is due to a multitude of factors, such as:

- Personnel and/or system changes within the organization that make navigating the documentation of the previous PHA nearly impossible.
- Identifying the impact on the PHA from industry and internal incidents or near misses that were either overlooked in the previous PHA or deemed to have adequate protection.
- Inadequate documentation from the previous PHA.

Clearly, PHA revalidation is an essential and critical activity. However, *how* and *when* the PHA is performed determines whether it is effective in identifying gaps in design, is ultimately required to prevent incidents.

This paper discusses the merits of an approach geared towards increasing the effectiveness and efficiency of PHA revalidations. Called *Continuous PHA Revalidation,* this approach may be summarized by asking a simple question:

Every time a change is made or an incident investigation is completed, why not revalidate your existing PHA?

The Old Way

As the industry has learned the hard way, PHA revalidation every five (5) years has proved to be much more challenging than originally perceived. At a minimum, the following information is required in order to revalidate an existing PHA:

- The previous PHA worksheets
- The piping and instrumentation diagrams (P&IDs) used to conduct the previous PHA with study-sections clearly highlighted
- Resolution of each recommendation from the previous PHA
- Copies of each process change, pre-startup safety review (PSSR) if applicable, and resolution of each action item since the last PHA was completed.

- Copies of each incident report since the previous PHA was completed and resolution of each action item
- A set of current P&IDs

A typical revalidation effort focuses on the same study-sections as defined in the previous PHA and updates them accordingly using the following general process:

- Determine if the study-section has been subject to any process / field changes.
- Modify the applicable hazard scenarios to reflect the change, referencing the relevant Management of Change (MOC) item and/or Incident Investigation report. This would entail the addition of new scenarios or the deletion of scenarios that are no longer applicable.
- Review action items associated with recommendations from previous PHAs. If the action items provide additional protection against the identified hazard, they should be documented as new controls. If they serve to reduce the potential consequences, the potential consequences must be revised accordingly.
- Review and update risk ranking to reflect changes to the frequency or consequence of the mitigated scenarios. Verify that the current risk rank is tolerable.
- Incorporate documentation from any PHAs conducted as part of a MOC or incident investigation.
- Evaluate the process safety information (PSI) to ensure it is complete, current and accurate.

The approach outlined above, which is followed by many in industry, has a serious shortfall. In order to identify process changes that may have an impact on the current PHA on file, it essentially waits for the five-year revalidation period. This includes addressing recommendations proposed in the previous PHA as documented and resolving action items to mitigate risk to a tolerable level, as the previous PHA team intended. In either case, there is an inherent risk of a hazardous incident in the interim.

The solution to this problem lies in *continuous PHA revalidation.*

What is Continuous PHA Revalidation

Continuous PHA Revalidation requires an operating facility to treat its PHA program as an evergreen document, rather than one requiring update every five (5) years. In practical terms, Continuous PHA revalidation would:

- Require the existing PHA and associated documentation be updated as recommended changes are implemented
- Require the existing PHA be updated after each incident

Clearly, updating a PHA after each change is much simpler because the individuals responsible for conducting the PHA and executing assigned action items are easily accessible. After five (5) years, several people involved in the PHA may not be available and the PHA team has to rely on second-hand information.

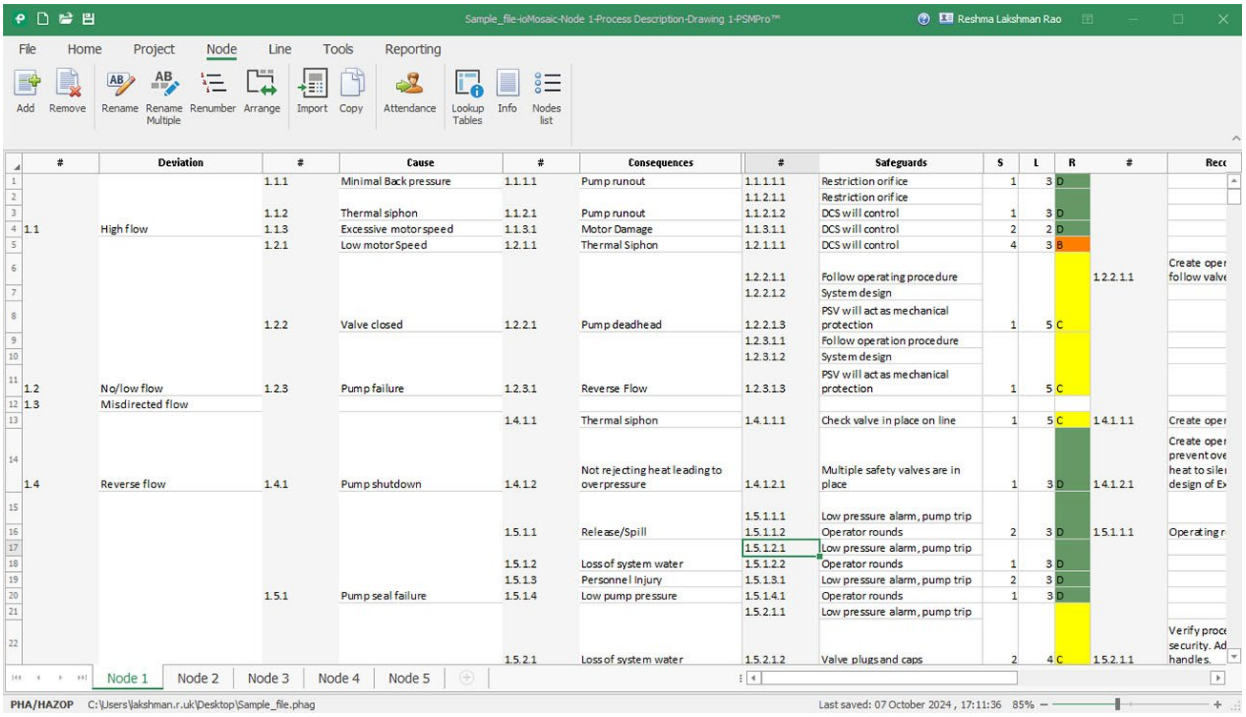
Continuous PHA Revalidation requires that a PHA team be assembled on short notice to update the PHA for changes made to a process. This may sound like a lot of work, but most changes do not have a significant impact on an existing PHA. It is recommended that sites employ a screening process to determine whether changes to the existing PHA are necessary, as this will eventually help to expedite the process.

If the change does require an update of the PHA, it entails the simple task of reviewing the study sections and documenting any recommendations. Since most operating companies have implemented electronic PHA and process safety information (PSI) management solutions, updating existing PHAs is straightforward. Some companies have taken electronic systems a step further with web-based platforms that greatly enhance information accessibility at all levels, thereby making it even easier for the PHA team members to update information.

To successfully implement Continuous PHA Revalidation, it is important that all study-sections (and deviations contained therein) affected by an MOC or incident investigation be properly identified. To facilitate this, the comments associated with each line item need to reference the MOC number or Incident Investigation number. That way, a simple search can be executed to find the affected study-sections and deviations, then those can be updated. It is also very important that the original unique deviation reference numbers are not modified if new deviations are introduced from incidents or process changes. The simple solution is to add additional deviations at the end of the impacted node.

As briefly discussed above, the concept of Continuous PHA revalidation is simple. This PHA revalidation model is already in use by many organizations. This does not change the regulatory requirement of a PHA revalidation every five (5) years, but it does greatly simplify the formal PHA revalidation by having an evergreen document that can be reviewed, rather than a five-year-old document. This approach ultimately saves many hours of highly technical resource time by preventing a complete “redo” of the PHA every five (5) years. This approach also avoids "defaulting" or failing due to incomplete reviews, outdated information, or failure to address risks.

Implementing this model of PHA revalidation is easily done when the PHA is performed in PSMPro™. This user-friendly software contains pre-populated templates for conducting risk analyses compliant with OSHA and EPA. There are many pre-built templates available for key methodologies, such as Hazard and Operability (HAZOP), What-if?, and Checklist (including Facility Siting and Human Factors). Also included are facilities, as well as unit specific checklist templates for Dust Hazard Analysis Revalidation. The DHA checklist templates are based on the most current and best practices, including the new 2025 NFPA 660 Combustible Dust Standard, CCPS publications, as well as other applicable NFPA standards such as NFPA 68 (Deflagration Venting) and NFPA 69 (Explosion Prevention). These templates streamline the completion of a required DHA.



Source: ioMosaic Corporation

Example of a Common Scenario

An operating company used a tank farm to store flammable liquid raw material. One of the tanks containing a highly reactive material was protected by a pressure safety valve (PSV) set at the tank maximum allowable working pressure (MAWP) of 100 psig. The previous PHA identified the plugging of the PSV inlet as a potential concern. This concern was substantiated by the PSV's annual inspection reports that verified plugging.

The PHA team recommended the installation of a rupture disc upstream of the PSV. An MOC item was initiated, and the rupture disc was installed.

A month later an overpressure event (triggered by contamination) caused the tank pressure to reach 180 psig before the ruptured disc blew and vented the tank contents. The ensuing incident investigation revealed that the rupture disc had developed a pinhole leak and the space between the rupture disc and PSV had pressurized to the normal tank pressure of 80 psig. The MOC review had not identified the need for a burst detection device, commonly known as a "telltale" between the rupture disc and relief valve. The incident investigation generated a recommendation to install a telltale.

Following this, another MOC was initiated to address the telltale installation. However, four (4) years later during a PHA, the PHA team discovered that the telltale was located such that it could not be read from ground level and was therefore never monitored.

The PHA team issued another recommendation to relocate the telltale to enable readings from ground level. Additionally, the team recommended a weekly inspection to verify that pressure was not building up in the space between the rupture disc and relief valve.

This example illustrates a common scenario that occurs when operating facilities implement a change with the intent of making the process safer. Instead, the recommended action item inadvertently introduces a new hazard to the facility. All changes must be reviewed with the same rigor and thoroughness as a PHA.

And most importantly, *do not wait for five (5) years to expose hazards you can identify today.*

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