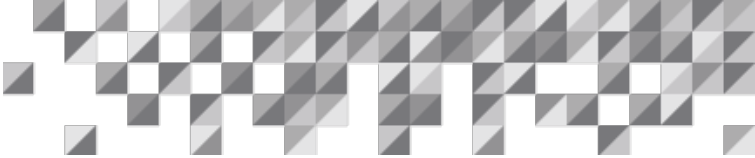# PHA Studies and Compliance Made Easy

## Introducing Process Safety Office® PSMPro™

An ioMosaic White Paper

## Marcel Amorós-Martí

amoros.m.ca@ioMosaic.com

## John Barker

barker.j.uk@ioMosaic.com

# Introducing PSMPro™

Since its inception in 2001, ioMosaic Corporation has conducted several hundred Process Hazard Analysis (PHA) studies. In the conduct of these studies, accurate and retrievable recording of this safety exercise is vital. We have had the opportunity to use various commercially available software packages for PHA recording to support the studies. All have their own strengths and weaknesses. We therefore decided several years ago to develop our own in-house tool – Process Safety Office® PSMPro™ – to provide the features we believe should be the priority for the PHA Leader, all accessible in a simple interface. We describe PSMPro™ further in this white paper.

PSMPro™ is one of the several tools within Process Safety Office® which provides process safety and risk professionals with an integrated suite of tools for process hazards analysis, auditing, consequence analysis, risk analysis, facility siting, and pressure relief and flare systems evaluation and design.

Figure 1: Customize the risk matrix based on your risk ranking criteria
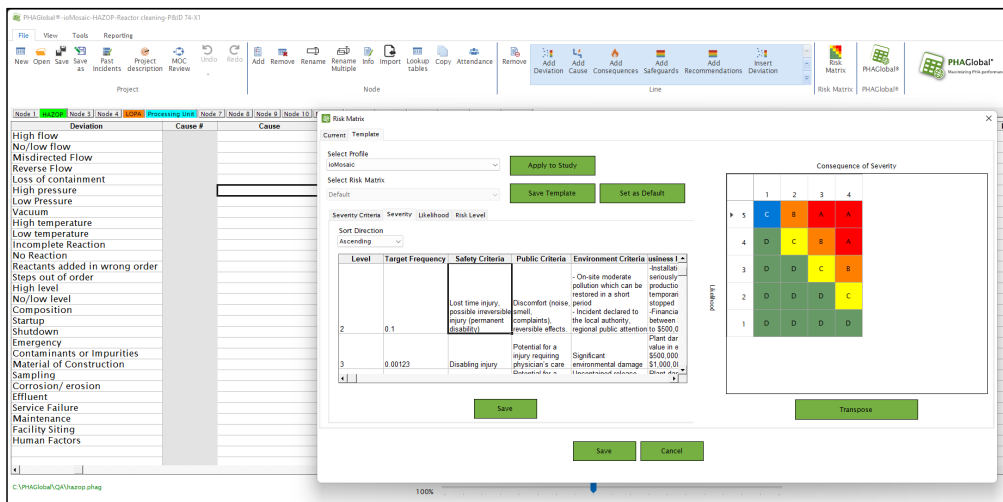


One of the main advantages of PSMPro™ over other commercially available software is that it contains pre-populated templates for conducting risk analyses using different techniques such as Hazard and Operability (HAZOP), What-if?, and Checklist (including Facility Siting and Human Factors). In addition, PSMPro™ also contains pre-populated checklists to address combustible hazards as part of your Dust Hazard Analysis (DHA), and pre-populated templates to perform Layer of Protection Analysis (LOPA) and Failure Mode and Effects Analysis (FMEA). We now additionally provide PSMPro™ users with the option to centrally manage and distribute these
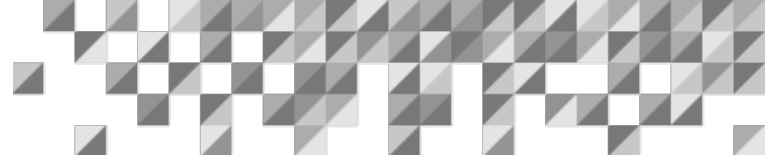
templates to users within their organization, which we find simplifies study management when an organization requires a specific template to be shared.

---

Figure 2: Update all pre-populated templates to meet your needs
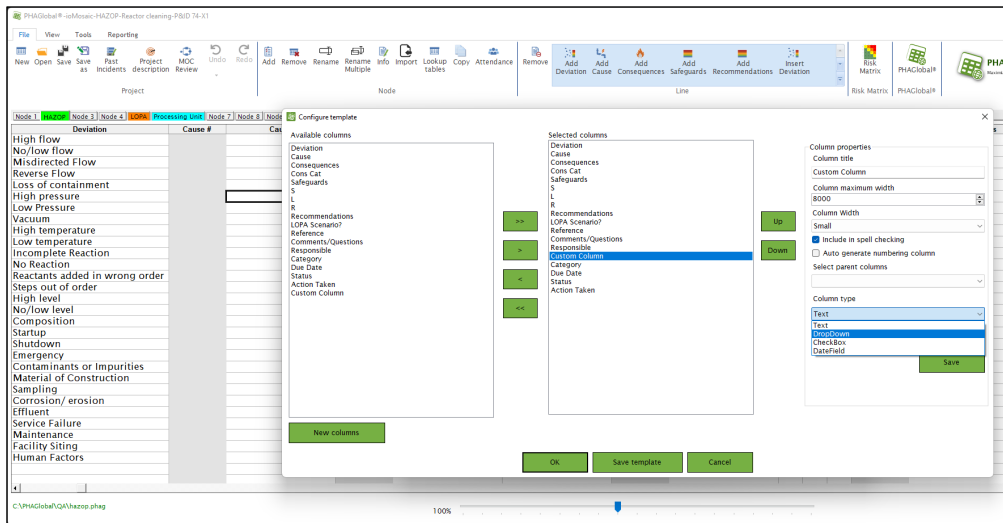


Other capabilities available in PSMPro™ include but are not limited to:

- Import studies from other commercially available software (requires studies to be exported in a shareable format such as Comma Separated Values, etc.)
- Export studies to Microsoft Excel®.
- Update all pre-populated templates to meet your needs (add/remove columns, specify the numbering of the columns, create your own hierarchy, etc.)
- Manage templates via a web-based application to share updated templates with other software users within your organization.
- Copy sheets (nodes) between workbooks (studies).
- Insert or delete lines.
- Spell checking of sheets (now available in English, Spanish, and Portuguese).
- Copy and paste within a study section or between different studies.
- Highlight by the use of color or format items that need attention.
- Use formulae for unit conversation or simple math.
- Customize the risk matrix based on your risk ranking criteria, including the ability to add an unlimited amount of consequence and frequency levels.

A significant advantage of PSMPro™ over other typical PHA commercial software is the ability to easily print reports. Fully formatted reports can be printed in either PDF or Word format, and the user can decide to include or exclude report sections such as executive summary, team
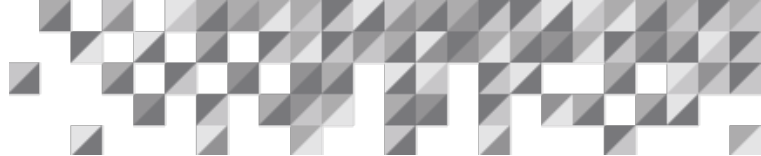
composition, node composition, recommendations, and worksheets. In addition, when printing the report, the user can decide whether to hide certain columns from the worksheets: for example, the user may decide to only print deviations, risk, and associated recommendations.

Figure 3: Choose which sections you wish to include in your reports
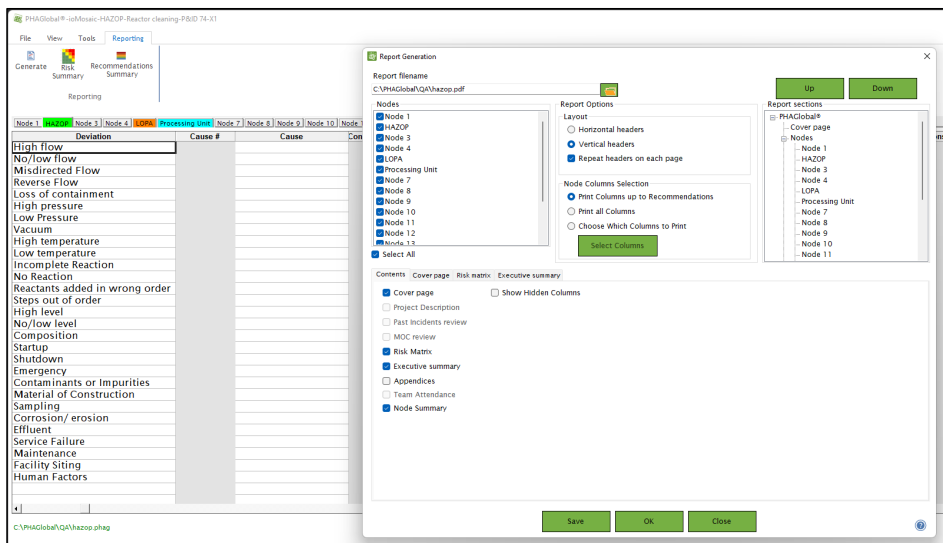


Because PSMPro™ is structured similarly to the interface provided in Microsoft Excel®, it is a very user-friendly PHA tool that requires little to no time to master. In addition, a user manual is included with this tool to ensure rapid proficiency in the use of this software. As a stand-alone application, it enhances the performance of PHA studies, provides more flexibility to the user, simplifies the installation process for an organization's administrators, and it is fully backward compatible with previous iterations.

Integration of PSMPro™ into Process Safety Office® provides the user with several additional features not typically available in other commercially available software. For example, you can estimate specific frequencies using the Fault Tree Analysis (FTA) methodology and perform Bow-Tie analysis via Process Safety Office® ioLogic™, track the status of recommendations and/or action items using Process Safety Enterprise®, and perform consequence modeling calculations via SuperChems™.

In summary, based on our experience conducting PHAs, we believe that we have created a user-friendly and flexible software product that is free of many of the shortcomings that we have encountered in other commercially available software.
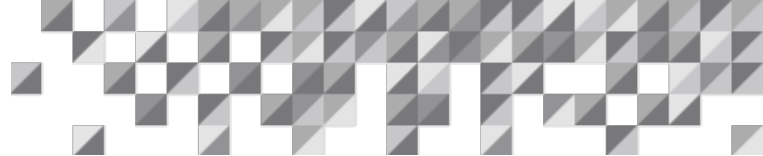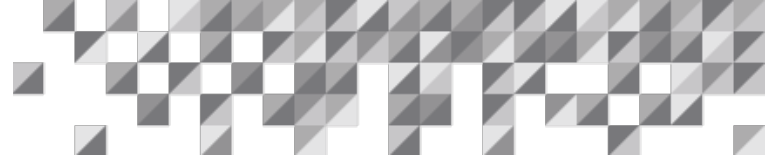
# PSMPro™ Important User Features

An analysis of the features available in Process Safety Office® PSMPro™ software and users' needs are listed below. The first column highlights users' most needed functionality when conducting PHAs or DHAs. The second column highlights the current version capabilities of PSMPro™ along with upcoming version enhancements.

Table 1: User requirements and PSMPro™ capabilities

| No. | User Requirements | PSMPro™ Capabilities |
|-----|-------------------|----------------------|
| 1. | Ability to use different PHA techniques such as: HAZOP, What-if?, and Checklist. | Pre-populated templates within PSMPro™ include HAZOP, What-if?, and Checklist, in addition to Combustible Hazards Checklists, FMEA, and LOPA techniques. |
| 2. | Customizable pre-formatted templates (worksheets). | PSMPro™ provides customizable pre-formatted templates (worksheets). |
| 3. | Ability to link HAZOP and LOPA templates. | PSMPro™ has the capability to link HAZOP and LOPA templates. |
| 4. | Attach technical drawings, sketches, and images to the worksheet. | Sketches, drawings, and images can easily be added as an Appendix to a report in PSMPro™. |
| 5. | Create and export custom reports in Word, PDF & HTML format. | PSMPro™ generates fully formatted studies in PDF and Word** formats, and the user can select which sections to include in their report. |
| 6. | Import certain file formats. | PSMPro™ supports importing comma-separated files (CSV). |
| 7. | Drag and drop (copy/move) data. | PSMPro™ supports drag and drop (copy/move) data functionality. |
| 8. | Record PHA team members, sessions, and attendance. | PSMPro™ records PHA team members, sessions, and attendance. |
| 9. | Advanced search capability throughout worksheets. | PSMPro™ supports advanced searching throughout worksheets. |
| 10. | Create and apply risk rankings (Risk Matrices). | PSMPro™ creates and applies risk rankings, and risk matrices are customizable based on your risk ranking. |

| No. | User Requirements | PSMPro™ Capabilities |
|---|---|---|
| 11. | Assign color coding to cells in risk matrix indicating risk level. | PSMPro™ provides color-coding assignments to cells to help identify the risk level. |
| 12. | Editing functions are available such as 'undo' and 'redo' capabilities. | PSMPro™ has these capabilities and also a spell check engine available in English, Spanish, and Portuguese. |
| 13. | Conduct PHA and DHA studies using flexible and customizable templates. | PSMPro™ provides flexible and customizable templates which can be easily shared with other users*. |
| 14. | A consistent framework to improve the quality of studies. | PSMPro™ pre-populated templates are designed to provide a consistent framework and approach for your PHA or DHA study. |
| 15. | Viewer capability to view PHA/DHA record but not be able to change a PHA/DHA record. | PSMPro™ exports the study to an Excel format with password protection for 'viewing only' capability. |
| 16. | Software is designed by and with consultants/users in mind to be able to use the software as you would when facilitating PHA/DHA studies. | PSMPro™ is used daily by our staff of consultants who have led numerous PHA studies. Our consultants agree that PSMPro™ is by far the best tool to use when conducting a PHA/DHA study. It is extremely user-friendly and does much more than the typical PHA tool. |
| 17. | PHA software needs to be supportive of a worldwide user base to conduct and record PHA/DHA studies. | We are proud to share that PSMPro™ has an extended, global user base that has been using our software for over 20 years. |
| 18. | Software support needs to be readily available to the user. | As an ISO 9001 certified company, we take immense pride in our excellent customer service and software support system. |
| 19. | Have templates available in languages other than English. | Pre-populated templates are available in English, Spanish, and Portuguese. More languages will be available soon. |
| 20. | Copy data between projects. | This feature is available in PSMPro™, as well as the ability to copy data within the same project file. |

| No. | User Requirements | PSMPro™ Capabilities |
|-----|-------------------|----------------------|
| 21. | Customize accelerators for commonly used tasks. | This feature is available in PSMPro™, along with templates that can be customized by you to meet specific needs. |
| 22. | Ability to manage the follow-up of the recommendations. | Tracking the status of recommendations and/or action items is possible using PSMPro™****. |
| 23. | BowTie visualization. | Estimating frequencies using FTA methodology and performing BowTie analysis is available in PSMPro™ via ioLogic™***. |
| 24. | Additional feature(s) not available with any other software. | For a unit conversion or calculation, it is possible to write the necessary formulae in any cell of a sheet, similar to Microsoft Excel®. |

* Web-based platform available in version 11.3 and above
** Feature available in version 11.2 and above
*** Feature available in version 11.4 and above
*** Requires a separate Process Safety Enterprise® License
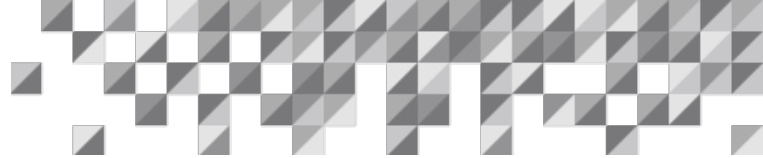
# Case Study – Chemical Supplier

## Challenge

A leading chemical supplier relocated their microbiology and environmental labs from one location to another one in 2008. A Process Hazard Analysis (PHA) was conducted when the labs were set up. The client wanted to have a revalidation of that PHA by conducting a new PHA to review the basic design and practices. Specifically, this new PHA study focused on conceptually identifying any hazards associated with the labs from the point of view of general housekeeping, emergency equipment, piping, electrical, and ergonomics which could have direct impacts on the people, environment, property, and/ or public relations.

## Approach

Since the previous PHA in 2008 was based on the What-if methodology, ioMosaic proposed to use the Checklist technique, and What-if, to conceptually identify hazards. ioMosaic's experts used dedicated What-if and Checklists templates to facilitate the brainstorming process during the PHA. These templates ensure a comprehensive identification of all possible hazards and are included in our PSMPro™ software team.

During the PHA, a risk-ranking was performed to determine criticality and need for further attention. For those scenarios that posed an unacceptable risk, recommendations were made to reduce risk to acceptable levels. The client's risk matrix was used, which was included in PSMPro™.

## Benefits

The PHA was completed in one day. The PHA was documented, and a report was issued. Included with the PHA report were the PHA worksheets from PSMPro™ and a summary of the recommendations in a format that allowed tracking action items to completion.
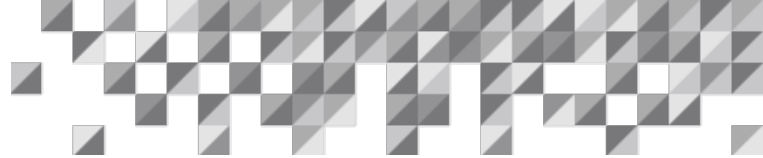
# Case Study - MOC/PHA of a Coal Fired Power Plant

### Challenge

A coal fired power plant which produces enough energy to supply 190,000 households had observed leaks from their break away anhydrous ammonia unloading connections. The client wanted to initiate a Management of Change (MOC) to replace the connections with non-break away connections. The plant uses anhydrous ammonia in its NOx scrubbing processes, a chemical that is unloaded from tanker trucks and tank railcars. The electric utility company had expanded their NOx scrubbing system in 2009.

OSHA 29 CFR 1910.119 Process Safety Management (PSM) requires that operators perform a Process Hazard Analysis (PHA) as part of the MOC when a design element is being altered. The client wanted to complete a PHA of the ammonia truck unloading process. The analysis and documentation were prepared using PSMPro™ software.

### Approach

A PHA uses qualitative techniques to judge risk qualitatively and to pinpoint weaknesses in the design and operation of facilities that could lead to accidents. PHAs focus on equipment, instrumentation, utilities, human factors and external events that might impact the process.

This PHA was performed using the Hazard and Operability (HAZOP) methodology without credit for the breakaway fittings in order to examine the risk of the unloading operation with/without them.

### Benefits

The ioMosaic team delivered worksheets created within PSMPro™ software which reported the details of the hazards and their associated causes, consequences and safeguards. PSMPro™ quickly identifies any compliance gaps and tracked action items. The client found that the risk level of the unloading process without breakaway connectors was acceptable, after reviewing the project deliverables. They were most pleased with the attention to detail and completeness that ensured their compliance with OSHA 29 CFR 1910.119.