



## EFFECTIVE DOCUMENTATION OF HAZOP STUDIES UTILIZING THE IOMOSAIC EXCEL BASED HAZOPTIMIZER VERSION 5.0

An ioMosaic Corporation Software



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## **EFFECTIVE DOCUMENTATION OF HAZOP STUDIES UTILIZING THE IOMOSAIC EXCEL BASED HAZOPTIMIZER VERSION 5.0**

Over the last twenty years, the staff of ioMosaic Corporation have conducted and documented several hundred HAZOP studies. In the conduct of these studies, accurate and retrievable recording of this safety exercise is vital. We have had occasion to use various commercially available software packages for HAZOP recording and found all of them to be somewhat useful but they are expensive and have serious shortcomings which detracts from the completeness of the recording.

Over time, we have concluded that the readily available software, Excel, is ideally structured for recording HAZOPs. Basically, the very structure of Excel consists of a workbook composed of many sheets. It allows for the recording of information on one study section of a HAZOP on one sheet and permits the labeling of the sheet to identify the study section. This information includes the equipment and lines in the section being studied, the drawings of the study section and its design intent. Excel has the inherent versatility to be the ideal HAZOP recording tool.

Other capabilities available in Excel that are useful in recording a HAZOP study include:

1. Insertion of sheets in a workbook.
2. Copy sheets between workbooks.
3. Insert or delete lines.
4. Spell checking of sheets.
5. Copy and paste within a study section.
6. Copy and paste between study sections in the same or different workbooks.
7. Sort columns for reporting purposes.
8. Filter sheets as needed.
9. Highlight items that need attention by the use of color.
10. If necessary, digitized pictures or sketches can be inserted into a study sections sheet for further clarification or documentation.

We have automated most of the above functionality by writing appropriate Macros to make it easier and faster for the HAZOP Scribe to appropriately record the study.

As Excel is available on virtually all the computers in any organization, all of the records for follow-up can be handled electronically and reported back easily. This allows generating of timely reports on follow-up status for management and demonstrating that follow-up is proceeding in a timely manner. To ensure the security of information, parts of the HAZOP record that do not have to be modified by those responsible for the follow-up, can be locked and password protected. This also improves the likelihood that a backup copy of the HAZOP record will be saved as it is dispersed to many computers rather than just one. Finally, continuous PHA revalidation has been a goal of many organizations and in this day of electronic



data storage this is now a reality. With Excel and the ioMosaic Corporation HAZOP template available on all the computers in the organization any time there is a Management of Change (MOC) HAZOP the results can be recorded in the template and at the completion of the study e-mailed to the HAZOP record custodian for the affected study. He or she can then insert the MOC record into the appropriate study section (sheet) or if necessary insert an additional sheet. If a sketch showing the change is available in electronic format it to can be inserted into the study section effected as well. As a result the HAZOP study is kept up to date by being continuously revalidated.

Based on our vast experience as team leaders, team participants as well as prime recorders of innumerable HAZOPs, we have customized Excel to create a software tool specifically for the recording of HAZOPs. This customized tool is extremely easy to use and is free of the shortcomings that plague the far more costly, commercial software packages available on the market. A comparative analysis of the features of ioMosaic Corporation's customized HAZOPTimizer Excel tool and commercially available competitors is shown in attachment A. The ioMosaic Corporation's HAZOPTimizer recording tool comes with a comprehensive "help file" to ensure rapid proficiency in the use of this customized Excel software.

We intend to make our customized Excel HAZOPTimizer recorder software available to all our customers, our clients and other interested parties free of charge.



## Comparison of ioMosaic Corporation tool with commercially available HAZOP recording software

Many of the companies that market HAZOP recording software and consulting services claim that you have to use their software and pay their prices to get the job done. The first column in the Table below lists the so called advantages they claim. The second column of the Table explains how you can do the same thing with an ioMosaic Corporation customized Excel HAZOP spreadsheet. The Table also lists a few features of the ioMosaic Corporation tool not available in other HAZOP recording software.

No.	Claim	Excel Capability
1.	Designed for conducting PHA studies, but includes the flexibility to customize worksheets.	Can do the same thing with Excel.
2.	Can use different PHA techniques such as: HAZOP, What-If?, FMEA, Checklist and Preliminary Hazard Analysis.	Can make templates for all the listed PHA methods with an Excel spreadsheet as well.
3.	Using the prepared software for HAZOP studies eliminates the IT requirements of supporting non-HAZOP software.	IT is already supporting Excel on everyone's computer, so is this really an advantage?
4.	A consistent framework to improve the quality of studies.	Excel standard templates also result in a consistent framework. The quality of HAZOP studies is determined by the experience of the Leader in the HAZOP technique not the software.
5.	Create custom reports in HTML, Word, Excel and PDF format.	Can save the Excel worksheets in all of the listed formats.
6.	Use of a viewer allows anyone to view but not change the HAZOP record.	An Excel workbook can be password protected against changes so it can be viewed by everyone.
7.	The HAZOP software is designed by consultants and users who use the software as you would to facilitate HAZOP studies.	Our staff have lead numerous HAZOP studies and have come to the conclusion that the best way to record a HAZOP study is to use a template based on Excel.
8.	The user base for these HAZOP recording packages is worldwide.	So is Excel.
9.	Have undo and redo capabilities	So does Excel.
10.	The sellers of the packaged software supply support to their customers.	Microsoft supports Excel.
11.	Have templates available in four languages.	In Excel can have a template available in any language and record the results in that language. This is due to the ability to setup Microsoft Windows in numerous languages.
12.	Copy data between projects	Can do the same thing with an Excel spreadsheet or workbook.



No.	Claim	Excel Capability
13.	Customize accelerators for commonly used tasks.	Can do this in Excel by writing Macros. Not limited only to the allowed customization.
14.	Thousands of studies have been recorded using special HAZOP recording software. This software not only leads you through the HAZOP process but saves you time and money.	<u>Totally False</u> . Software is not what saves you time and money! Rather a qualified HAZOP Leader who is completely familiar with the methodology and the control of HAZOP teams. The real cost of a HAZOP study is not the Leader and Scribe, but the four to eight team members participating in the study. Many look at the Leader and Scribe cost as it is an out of pocket expense. However if you calculate the payroll cost of the people at the table and the overtime to have their jobs covered it is a lot greater than the Leader and Scribe Cost. Having an experienced Leader who can do a quality study quickly is how you save money in a HAZOP study.
15.	The special recording software does not get in the way.	Neither does the use of Excel for recording a HAZOP study.
16.	Can provide means to manage the follow-up of the recommendations	Can be done in Excel as well, or can be exported to ioXpress for web-based action tracking.
17.	No Claims	If necessary sketches, drawings and pictures can be imported into Excel and added to the appropriate study section. None of the HAZOP software packages claim they can do this now.
18.	No Claims	None of the software suppliers claim that they have a spell checking capability, but you do in Excel.
19.	Calculates vessel volumes	Included in HAZOPTimizer toolbar.
20.	No Claims	For unit conversion it is possible to write the necessary formulae into an Excel spreadsheet or convert units as appropriate.

## About ioMosaic

Founded by former Arthur D. Little Inc. executives and senior staff, ioMosaic Corporation is the leading provider of safety and risk management consulting services. ioMosaic has offices in Salem New Hampshire, Houston Texas and Minneapolis Minnesota.

Since the early 1970's, ioMosaic senior staff and consultants have conducted many landmark studies including an audit of the Trans-Alaska pipeline brought about by congressional whistle blowers, investigation of the Bhopal disaster, and the safety of CNG powered vehicles in tunnels. Our senior staff and consultants have authored more than ten industry guidelines and effective practices for managing process safety and chemical reactivity and are recognized industry experts in LNG facility and transportation safety.

ioMosaic Corporation is also the leading provider of pressure relief systems design services and solutions. Its pressure relief system applications are used by over 250 users at the world's largest operating companies. It holds key leadership positions in the process industries' most influential and active pressure relief system design, and chemical reactivity forums, and plays a pivotal role in defining relief system design, selection and management best practices.

### Safety & Risk Management Consulting Services

- ◆ Auditing
- ◆ Calorimetry, Reactivity, and Large-Scale Testing
- ◆ Due Diligence Support
- ◆ Effluent Handling Design
- ◆ Facility Siting
- ◆ Fire and Explosion Dynamics
- ◆ Incident Investigations, Litigation Support and Expert Witness
- ◆ Liquefied Natural Gas (LNG) Safety
- ◆ Pipeline Safety
- ◆ Pressure Relief Design
- ◆ Process Engineering Design and Support
- ◆ Process Hazards Analysis
- ◆ Process Safety Management
- ◆ Risk Management Program Development
- ◆ Quantitative Risk Assessments (QRAs)
- ◆ Structural Dynamics
- ◆ Training

### Software Products:

**ioXpress™** is a web-based enterprise application for corporate electronic information management.

**SuperChems™** is an advanced tool for pressure relief design, consequence analysis and thermal hazards assessment.

**HAZOPTimizer™** is a software product for recording and managing process hazard analysis.

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discovering solutions