

# IO MOSAIC STATEMENT OF QUALIFICATION

## INVESTIGATION OF INDUSTRIAL INCIDENTS

### OVERVIEW

The investigation of fires, explosions and toxic substance releases generally requires expertise in a variety of technical disciplines. In addition to an understanding of the nature, causes and effects of such events, expertise in, structural analysis, statistical analysis, analytical chemistry, thermodynamics, reaction kinetics, chemical processing and heat transfer are often needed. Thus, ioMosaic Corporation is retained by insurance companies, industry representatives, and attorneys to investigate incidents to determine the most probable cause, given the available information. Specific services we provide are briefly described below.

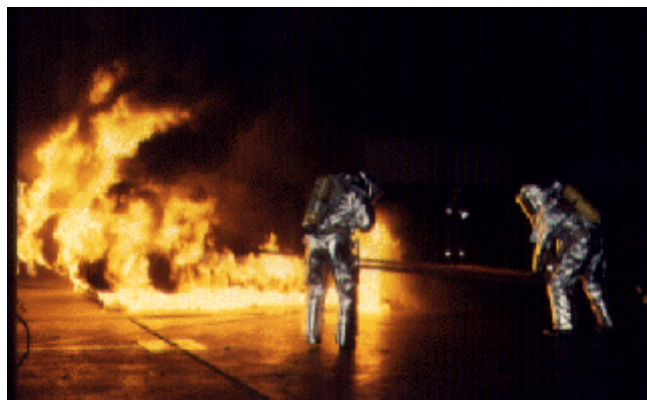
### SERVICES

#### Directing the Investigation

The quality of the leadership of an investigation can have a significant influence on the effectiveness and quality of the process. Since most companies do not experience serious incidents very often, the safety staff may not have acquired the skill set to effectively conduct an incident investigation. For these situations, ioMosaic Corporation can provide senior process safety engineers with experience in incident investigation. Having led and participated in many investigations for process industry companies, they have hands-on knowledge of what does and doesn't work. We are also cognizant of the need to be at the site of the incident shortly after the event has occurred. In most cases, we can have our personnel on-site within 24 hrs. from the time we are notified of an incident.

#### Root Cause Analysis

Utilizing our fault tree analysis (FTA) experience, we help facilitate root cause analysis. The application of fault tree logic diagramming to incident investigations has several benefits:



- ◆ Quick and efficient capture of initial brainstorming of possible causes
- ◆ Assessment of the relative importance of contributing events
- ◆ Assists with proper sequencing of events
- ◆ Ensure investigation is thorough and complete
- ◆ Effective means for documentation of investigation proceedings

#### Verification of Physical Evidence

For many incidents, particularly those involving energetic chemical reactions, the investigation team is presented with physical evidence that can be conflicting or incomplete. In such situations, an option is to conduct experiments that attempt to duplicate the postulated conditions and determine the outcome. Our professionals have been involved in many investigations where we have devised and conducted experiments to verify the ultimate cause of an incident. In addition to extensive state-of-the-art computational capabilities, ioMosaic Corporation has a strategic alliance with TIAx, who have a reaction engineering laboratory. This facility is equipped with a variety of advanced reaction characterization apparatus including:

- ◆ Automatic Pressure Tracking Adiabatic Calorimeter (APTAC)
- ◆ Accelerated Rate Calorimeter (ARC)
- ◆ Differential Scanning Calorimeter (DSC)



Data obtained from the use of this equipment is processed with SuperChems™, a rigorous dynamic process simulator, to accurately predict the behavior in large-scale systems.

For mechanical failure evaluation, we frequently utilize other company resources in the areas of finite element analysis, computational fluid dynamics, and corrosion engineering.

### Incident Investigation Training

The first 15 minutes after an incident are crucial for gathering the facts about what happened. After that, valuable information is quickly lost—information that can deeply affect a company's operations.

We have a training course, *Modern Incident Investigation and Analysis*, that offers proven techniques for obtaining the right information from incidents and near misses, and meeting the incident investigation and reporting requirements of the OSHA PSM Standard (29CFR1910.119). In the course, we embrace the principal of the Center for Chemical Process Safety that: "Incidents should be viewed as opportunities to improve management systems rather than as opportunities to assign blame."

The two-day course covers the following topics:

- ◆ Overview of Incident Investigation Process
- ◆ Developing a Investigation Strategy
- ◆ Getting Underway with the Investigation
- ◆ Gathering Data and Interviewing Witnesses
- ◆ Analysis Techniques
- ◆ Writing the Report and Follow-up
- ◆ Improving the Process
- ◆ Case Study Exercise

### SELECTED STUDY EXPERIENCE

Our professionals investigated a major fire accident that destroyed a sulfur prilling plant in Saudi Arabia. Sulfur dust on the walls of one of the prilling towers ignited, setting off a chain of events that totally destroyed two adjacent prilling towers. We inspected the evidence collected by the operator, and also conducted a hazard identification analysis using the Hazard and Operability (HAZOP) study technique. The results were utilized in addressing safety issue in the reconstruction of the facility.

For a independent oil company our professionals determined the cause of failure of a flare line and recommended modifications that would prevent the failure from recurring. A 24 inch diameter flare line was dislodged from its 30 ft. supports immediately following an emergency pressure release from a process pressure vessel. We were on site within 30 hours of the failure to conduct detailed examination of the equipment and to collect information on the conditions surrounding failure and on the design, construction and normal operation of the system. Gas dynamics and finite element structural calculations were then conducted to evaluate several hypotheses. The most likely cause of failure was determined, recommendations were made and the client was able to rebuild and run the system with assurance of safety within four days of the accident.

Our professionals were engaged as experts for a class action case that involved the release of toxic vapor due to the improper handling of a railroad tank car full of oxidizer at a customer's site. The investigation involved establishing the chemistry of what happened. The analysis included material characterization of various aqueous solutions of the oxidizer, and their corrosiveness. This required conducting visual calorimetry and bench-scale corrosion tests. Our results defined the chemistry involved, and provided evidence for the supplier of the material to show how the customer improperly handled the unloading of the tank car.

### ABOUT US

ioMosaic Corporation is a leading provider of safety and risk technology consulting services and software solutions.

At ioMosaic, we are helping our clients discover practical and cost effective solutions to safety, risk, and business challenges.

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