

STATEMENT OF QUALIFICATION

OLEFIN SAFETY AND TECHNOLOGY

EXPERIENCED STAFF

Our principals have extensive experience in safety management and technology assessment of olefin processes including:

- ◆ Olefin plants (*gas liquids to heavy liquids cracking*)
- ◆ LD Polyethylene
- ◆ LLD Polyethylene
- ◆ HD Polyethylene
- ◆ Polypropylene
- ◆ C₃/C₄ Catalytic Dehydrogenation

LEADING SERVICES

We provide quality consulting support to the olefins industry in a number of safety and technology related areas:

Emergency relief system design and revalidation

Using our SuperChems Expert Version 5.0 software, we can handle simple and complex relief system evaluations. SuperChems Expert is a sophisticated computer code that is capable of handling all the modeling requirements of individual relief devices and relief headers, including the rating of two-phase headers and interlinked vessels. The American Institute of Chemical Engineers' DIERS Users Group recently selected SuperChems as a replacement for the existing SAFIRE code.

API 521 flare design

Using the flame modeling capabilities of SuperChems, we can evaluate the radiation impact of flare stack location, height and flame tilt at multiple XY coordinates. We have also modeled the combined radiation effect from multiple flare tips in the same support structure.

Process safety management compliance audits and audit training

Our principals wrote the book "*Guidelines for Au-*



ditig Process Safety Management Systems" for the Center for Chemical Process Safety and have conducted/participated in many PSM compliance audits of olefin facilities. We can audit your PSM program to ensure compliance with 29 CFR 1910.119 OSHA Process Safety Management. Alternatively, we can train your staff in effective techniques to perform self-audits of your PSM program.

SELECTED CLIENT CASE STUDIES

LD Polyethylene Reactor Decomposition Containment

We assisted an engineering design contractor with the evaluation of the structural integrity of their proposed design of an ethylene decomposition containment system for a LD polyethylene reactor operating at 30,000 psig. The results of the SuperChems analysis indicated that the containment system would be subjected to severe loads during an ethylene decomposition event. The evaluation identified reaction force and internal stress issues for the reactor support structure and several piping components that needed to be addressed in the final design.



Flare Relocation Study

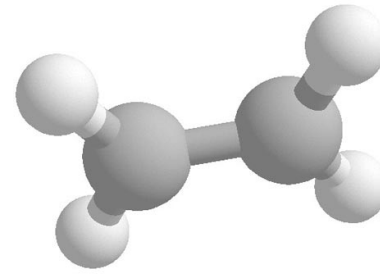
This study was for a middle east petrochemical company and involved relocating existing flares for the olefins, ethyl benzene, and ethanol units. A fourth flare stack for a new ethyl benzene plant was also evaluate.

We evaluated the radiation at various site locations for the worst-case flaring events from each unit, and the worst-case simultaneous flaring from all four units. For the three relocated flares, it was also necessary to evaluate the additional developed back-pressure due to extending flare headers to the new flare location.

For the final design, all four flare stacks were suspended from the same support structure which had a 90 meter elevation.

Olefin Plant PSM Audit

Our principals participated in a company led PSM audit of the largest single train ethane-based olefin plant in North America. We audited the Management of Change, Pre-startup Safety Review and Mechanical Integrity programs.



SELECTED OLFIN INDUSTRY CLIENT LIST

- BP Chemical
- Chinese Petrochemical Company (CPC)
- EniChem
- Erdol Chemie (Bayer)
- EssoChem
- HiMont
- KTI
- NOVA
- Oi Nesti
- Pequiven
- SADAF
- Solvay Polymers
- Union Carbide
- Westlake Group

ioMosaic Consulting Services

- ◆ *Auditing*
- ◆ *Calorimetry, Reactivity, and Large-Scale Testing*
- ◆ *Due Diligence Support*
- ◆ *Effluent Handling Design*
- ◆ *Facility Siting*
- ◆ *Fire and Explosion Dynamics*
- ◆ *Incident Investigation and Litigation Support*
- ◆ *Pressure Relief Design*
- ◆ *Process Engineering Design and Support*
- ◆ *Process Hazards Analysis*
- ◆ *Risk Management Program Development*
- ◆ *Risk Assessments*
- ◆ *Software*
- ◆ *Structural Dynamics*
- ◆ *Training*

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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