Inherently Safer Technology Workshop

New Jersey DEP

Bureau of Release Prevention

June 17, 2008

What Is IST

- Concept first introduced by Dr. Trevor Kletz, noted process safety expert, about 30 years ago
- Inherently Safer Chemical Processes, a Life Cycle Approach, 1996, by the Center for Chemical Process Safety of the American Institute of Chemical Engineers
- New Jersey is the only State or Federal agency with IST requirements
- Contra Costa County California requires IST reviews

IST is not New to the TCPA Rule

- Incorporated into the July 14, 2003 TCPA rule
- Applied to newly designed and constructed covered processes

Best Practices Standards and IST

- Signed by the Attorney General and DEP Commissioner November 21, 2005 and approved by the Governor
- Authority under the NJ Domestic Security Preparedness Act
- Applied to existing and new facilities in the Chemical Sector
- 43 TCPA facilities
- Due March 21, 2006

IST Principles

- Reduce the amount of Extraordinarily Hazardous Substances (EHS)
- Substitute less hazardous materials
- Using EHS in the least hazardous process conditions or form
- Designing equipment and processes to minimize the potential for equipment failure and human error

Application of IST

- Cover the entire process – transportation, raw material receipt and handling, storage, process equipment, treatment, product shipment
- Applies to the layers of protection of the process (i.e. some layer of protection alternatives may be "inherently safer" than others)

IST success stories

- **Substitution of a less hazardous substance**
  - wastewater treatment facilities have switched from using chlorine to sodium hypochlorite for disinfection of their treated wastewater.
  - electric generation and cogeneration plants substituted anhydrous ammonia with aqueous ammonia for use in their air pollution control systems.
  - a facility switched from chlorine to bromochlorohydantoin for use as an algicide in treating cooling water.

IST success stories

- **Reduction in the amount of a hazardous substance stored on-site**
  - a facility switched from bulk storage of liquid sulfur trioxide to on-site generation of gaseous sulfur trioxide for direct consumption into the process.
  - a facility switched from bulk storage of chlorine to on-site generation of ozone for disinfection of potable water.
  - a facility switched from bulk storage of chlorine to on-site generation of chlorine dioxide as a bleaching agent.

TCPA IST Rule

- Proposed in the April 16, 2007 New Jersey Register
- Effective upon May 5, 2008 New Jersey Register publishing
- Applies to all TCPA facilities (Program 2 and Program 3, new and existing)
- Intended to provide improved risk reduction
- Penalties for noncompliance

TCPA IST Rule Requirements N.J.A.C. 7:31-3.6 and 4.12

- (a) IST review report must be submitted to DEP by September 2, 2008
  - IST review report conducted under the Best Practices Standards may be submitted to comply
- (b) Update required every five years (on same schedule with hazard review or PHA/RA), for new processes, and for major changes

TCPA IST Rule Requirements N.J.A.C. 7:31-3.6 and 4.12

- (c) Conducted by team of qualified experts with expertise in environmental health and safety, chemistry, design and engineering, process controls and instrumentation, maintenance, production and operations, and chemical process safety
- Include front line workers and their representatives

TCPA IST Rule Requirements
N.J.A.C. 7:31-3.6(d) and 4.12(d)

- Analysis of the 4 IST principles and techniques to identify IST alternatives or combinations of alternatives that minimize or eliminate the potential for an EHS release

TCPA IST Rule Requirements
N.J.A.C. 7:31-3.6(e) and 4.12(e)

- Determine whether IST is feasible, capable of being accomplished in a successful manner, taking into account factors:
  - Environmental
  - Public health and safety
  - Legal
  - Technological
  - Economic

Feasibility Factors

Environmental and Public Health and Safety

- There would be a significant negative environmental impact
  - Consideration of water resources, water pollution, air pollution, solid and hazardous wastes, noise, etc.
- The IST could decrease the hazard but would increase the overall risk
- The risk would be shifted to another location where the risk would be the same or higher
- If infeasibility claimed because of risk, need to document the difference in frequency and/or consequences with and without the IST
- All qualitative and quantitative

Legal Feasibility Factors

- The IST would result in a conflict with existing federal, state, or local laws
- The IST would violate a license agreement and the license agreement cannot be modified and must remain in effect
- Qualitative

Technological Feasibility Factors

- Is in conflict with Recognized and Generally Accepted Good Engineering Practices (qualitative, cite reference documents)
- Product quality specifications cannot be met (qualitative and quantitative)
- Availability of materials (qualitative and quantitative)
- Space restrictions (qualitative and quantitative)
- Impact on production rate (qualitative and quantitative)
- Commercially available, not intended to develop new process from research stage

Economic Feasibility Factors

- Life Cycle Analysis
- Capital investment, including design and implementation
- Net operating costs
  - Change in the cost of materials including transportation and handling related costs
  - Change in energy consumption
  - Change in human costs such as number of operators, training
  - Any other direct manufacturing costs
- Net regulatory compliance cost, change in fees
- Demolition and future clean-up and disposal cost

Economic Feasibility Factors

- "Not" affordability of an IST alternative relative to the o/o's facility
- Generally feasible if IST has been successfully applied to similar processes, or similar situations – focus on significant cost differences
- Quantitative – provide cost/benefit analysis

Documentation of Qualitative and Quantitative Infeasibility Justification

- Vendor data
- Engineering Codes and Standards
- Reference books, published articles, reports
- Citations of Federal, State, or Local laws and regulations
- Industry organizations such as CCPS, IIAR, Chlorine Institute
- Risk Assessment

IST Review Report
N.J.A.C. 7:31-3.6(f) and 4.12(f)

- Identification of process, team members, completion date, review method
- IST questions asked and answered
- List of IST already present
- List of additional IST identified
- List of IST selected to be implemented with schedule
- List of infeasible IST
- Written justification of infeasible IST. Substantiate using a qualitative and quantitative evaluation of the feasibility factors.

New Covered Processes

- 4.2(g) deleted and replaced with similar requirements at 3.4(e) and 4.11(e)
- IST review report must be submitted with other required documents for the new covered process submittal

Annual/Triennial Reports

- Submit each IST review report completed during:
  - Previous three years (for Program 2 triennial report) - N.J.A.C. 7:31-3.3(b)6
  - Previous year (for Program 3 annual report) - N.J.A.C. 7:31-4.9(b)6

Contact Information

Paul Komosinsky, Section Chief
Bureau of Release Prevention
NJDEP
Station Plaza 4, 22 S. Clinton Ave.
P.O. Box 424
Trenton, NJ 08625-0424
(609) 633-0610
paul.komosinsky@dep.state.nj.us