SNU-WPI PROGRAM

Element of Process Safety Management System

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Introduction

- Definition
  - Application of management principles and systems to the identification, understanding, and control of process hazards to prevent process-related injuries and incident

    (defined by CCPS)

Element and Component of PSM

- Accountability
- Process Knowledge and Documentation
- Capital Project Review and Design
- Process Risk Management
- Management of Change
- Process and Equipment Integrity
- Human Factor
- Training and Performance
- Incident Investigation
- Standards, Codes and Laws
- Audits and Corrective Action
- Enhancement of Process Safety Knowledge

- Major considerations for developing and implementing a process safety management system
  - Company and plant organization
  - Existing policies and procedure
  - Resource availability
  - Time frame available for development of program and training courses
  - Budget allocations
  - Adequacy of existing management systems
  - Existing or enhancement of feedback systems

Characteristics of Management Systems-1

- Planning
  - Explicit goals and objective
  - Well-defined scope
  - Clear-cut desired output
  - Well0defined inputs and resource requirements
  - Identification of needed tools and training
- Organizing
  - Strong sponsorship
  - Clear line of authority
  - Explicit assignment of roles and responsibility
  - Formal procedures
  - Internal Coordination and Communication

Characteristics of Management Systems-2

- Implementing
  - Detailed work plan
  - Specific milestones for accomplishments
- Controlling
  - Performance measurement and reporting
  - Internal review
  - Variance procedure
  - Audit mechanisms
  - Corrective action mechanisms
  - Procedure renewal and reauthorization

Accountability Objective and Goal

- Objective
  - Demonstrate the status of process safety as a management function in relation to other business objectives
  - Reinforce the value of setting process safety goal
- Component
  - Continuity of operation
  - Continuity of systems
  - Continuity of organization
  - Quality process
  - Control of exception
  - Alternative method
  - Management accessibility
  - Communications
  - Company Expectations

Process Knowledge and Documentation

- Example of components included in process knowledge and documentation
  - Process description
  - Process hazard identification
  - Process control program and documentation
  - Operating procedure description and guidelines
  - Safety documentation
  - Industrial hygiene documentation
  - Environmental program documentation
  - Training program documentation
  - Process material and energy balance
  - Documentation of abnormal operating conditions and response

Process Safety Review procedure for Capital Project

- Objective
  - Provide that adequate capital and resource to minimize exposure to employee and the public and to protect the assets and continuity of operation
  - Include the recognition to comply with federal and local regulation and company or plant standards and guidance

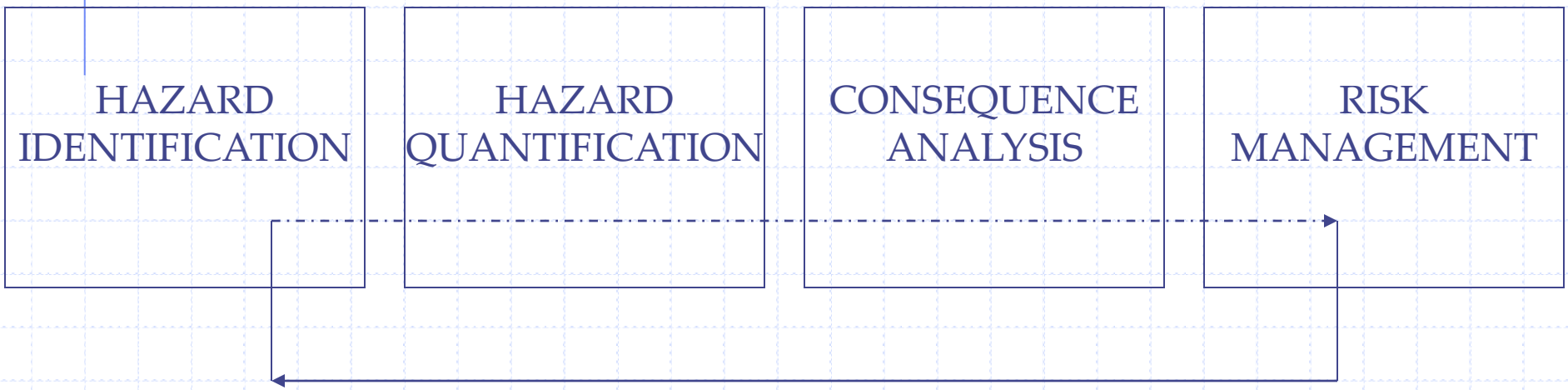
Process Risk Management-1

- Object
  - Provide plant management with the tools to determine the magnitude of potentially significant hazards and to evaluate the ability of existing chemical processes, safety system and procedures to prevent and control these hazards
- Team composition
  - Safety/health engineering representative
  - Engineering representative
  - R&D technology representative
  - Impartial representative
  - Operation representative
  - Maintenance representative
  - Electrical engineer, Instrument/process control engineer, project manager, mechanical engineer

Process Risk Management-2

- Category of process hazards/risk
  - Flammable/combustible mixture inside vessel
  - Flammable liquid spills
  - Vapor cloud/undesirable release
  - Chemical reactions
  - Mechanical failure
  - Life-threatening injury

Process Risk Management-3



Management of Change-1

- Objective
  - Help to plant identify changes that might lead to an unsafe condition and subsequent increase in risk
  - Provide plant procedure designed to trigger the actions necessary to assure that modifications in the plant are reviewed

Management of Change-2

- Process or equipment changes
  - Define
    - Any change in safety alarm setting, interlock etc.
    - Any change in safety relief valve setting or capacity
    - Any physical change in the plant in either process equipment, piping, instrumentation or electrical component
    - Any change in operation outside limits specified in standard operating procedures
    - Any changes in safety or protective equipment as to location and type

Management of Change-3

- Control of change management system must contain the following
  - The definition of change for the system
  - Change evaluation process
  - Change approval process
  - Training for the change
  - Specification for the change to be made
  - Verification that the completed change code
  - Update of plant documentation
  - Sign-off process

Process Equipment Integrity

- Objective
  - Provide management system designed to prevent the accidental use of improper materials or equipment
  - Include measures that the managers to fully understand the equipment design specification so that they can be sure it is properly operated and maintenance

Human Factor

- Objective
  - Provide the tools for evaluation of human-equipment interfaces that play a significant part in many chemical processes
- Method of achieving reduction of human errors
  - Guidelines to minimize human error
  - Management action plans
  - Human factor audits
  - Communications
  - Control of man-machine interfaces

Training and Performance

- Objective
  - Provide the formal training program needed for various departments in a plant, instructor selection, skills needed by employee, documentation requirement and performance evaluation
  - Operator process safety training program
    - Benefits
      - Improved operational safety
      - Higher level of employee competence, confidence
      - Improved efficiency
      - Improved quality
      - Increased profitability

Incident Investigation

- Objective
  - Assure that proper corrective actions are taken to prevent recurrence of a process safety failure
  - Include protocol that focus on all the underlying reasons for the unplanned event
  - Include definition of major incident, third-party participation, follow-up and resolution and near-miss analysis

Incident Investigation

- Accident reporting procedure
  - When an accident occurs, the employee most closely associated with the event shall promptly notify the supervisor of the unit
  - The supervisor shall investigate the event and take the following action
    - Secure the area
    - Gather facts
    - Special notification
    - Estimate loss
    - Submit report
  - The 2nd level supervisor shall review the report

Company Standards, Codes and Regulation-1

- Objective
  - Provide both internal and external standards, regulations and guidelines
  - Assist the manager in the implementation of a program that assign responsibility of compliance with company standards codes and regulations
- Types of external standards
  - Legal
    - Effluent disposal and pollution laws
    - Personnel protection laws
    - Planning laws
  - Industry-wide standards
    - API codes
    - ASME Standards
  - Professional technical bodies
    - CCPS, AIChE, CMA(Chemical Manufacturers Association)
  - National / International Codes

Company Standards, Codes and Regulation-2

- Types of Internal Standards/Procedure
  - General
    - Maintenance practices(hot work permit, inspection etc)
    - Reporting procedures(accident recording, equipment data etc)
    - Behavior in plant areas(smoking, driving etc)
  - Process specific
    - Special construction procedures or materials
    - Unique operating methodology
    - Chemistry
    - Design principles
  - Design specific
    - Design of equipment
    - Selection of equipment
    - Selection of safety device
    - Design data
    - Layout procedure

Company Standards, Codes and Regulation-2

- Important aspects of standards / procedures
  - Must be reviewed regularly and updated
  - Must be checked against actual performance and revise
  - Must be monitored to ensure usage
  - Must be flexible enough to allow experienced judgment without giving license for misuse

Audits and Corrective Actions-1

- Objective
  - Provide feedback on process safety efforts such as
    - Determining whether the set procedures are timely, complete, up-to-date and compliant with applicable governmental regulations, company policies and good process safety practice
    - Determining the status and effectiveness of safety management efforts versus goals or progress toward goals

Audits and Corrective Actions-2

- Criteria to determine the frequency of audits
  - Age of facility
  - Maturity of plant's chemical process safety program
  - Level of ongoing process/equipment change
  - Degree of risk
  - Result from previous audits
  - Past history of unplanned upsets in operations or near misses

Audits and Corrective Actions-3

- Process safety management systems audits
  - Should include verification of the following items
    - Company and plant policies and procedures
    - Plant management organization
    - Plant planning process
    - Risk assessment and risk management activities and capabilities

Enhancement of Process Safety knowledge

- Objective
  - Provide continuous improvement in the management of storing, using or manufacturing hazardous material
  - Include accident reports maintenance records, case histories and trend analysis of upset condition to help prevent catastrophic event