THE IMPORTANCE OF PROCESS SAFETY INFORMATION IN THE DEVELOPMENT AND IMPLEMENTATION OF MECHANICAL INTEGRITY PROGRAMS

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Why Discuss the Effect of Process Safety Information on Mechanical Integrity Programs?
What OSHA is Finding in Compliance Audits / The National Emphasis Program (NEP)

- Mechanical Integrity appears to be the most significant source of non-compliance
- Process Safety Information is the next most significant source of non-compliance
- There remain a significant number of facilities that do not have these two elements in a controllable program environment
What Is Process Safety Information?

- Information pertaining to the hazards of the highly hazardous chemicals in the process
- Information pertaining to the technology of the process
- Information pertaining to the equipment in the process
How do these items affect Mechanical Integrity?

• The 3 sub-paragraphs of Paragraph (d) require that site process safety information contain or provide at least 2 categories of information essential to mechanical integrity:

  • ONE: DESIGN BASIS OR DESIGN INFORMATION
  • TWO: ACCEPTANCE CRITERIA
Hazards of the Process

• The understanding of process hazards is critical to asset integrity management

• This should include considerations for flammability, toxicity, reactivity, corrosivity and allowable exposure limits

• This data should be used to set inspection and maintenance priorities based on risk

• What is risk? Probability of failure X Consequences of failure
Process Technology

• The understanding of Process Technology is also important to the development of programs to support asset integrity management

• It is the paragraph that requires PFDs / BFDs

• Process technology often provides the guidance map of a system that locates equipment in the areas of activity

• It generally includes important information such as process flow and equipment identification as well as pressures, temperatures and safe upper and lower operating limits

• These are all important considerations for risk classification and inspection plan development
Process Equipment Documentation Requirements

- Materials of Construction: critical data for the assurance of process compatibility and inspection / maintenance activities
- P&IDs: the basic document for detailed process design, the primary drawing document for equipment identification
- PRD Design: should include sizing calculations for device, protected equipment, inlet and outlet design; the basis for safe operation of pressurized equipment; acceptance criteria
- Design Codes: applies to all categories of equipment; is the acceptance criteria
- Etc.: electrical classification / ventilation system design
Mechanical Integrity Review; The PSI Connection

Mechanical Integrity: The regulatory driver for asset integrity management

Applications
  The equipment in the program

Procedures
  For all MI tasks

Training
  For process hazards
  For all MI tasks

Testing & Inspection
  For all categories and all equipment in the program

Correction of deficiencies
  In a timely manner

Quality assurance
  From Project Engineering to spare parts

Process Safety Information:

Hazards of the Process
  Chemical hazards
  Flammability, toxicity, corrosivity, etc.

Technology of the Process
  Process flow
  Pressure and temperatures
  Safe operating limits

Process equipment
  Materials of constructions
  P&IDs
  Electrical classification
  PRD Design
  Ventilations system design

Design codes employed
  (RAGAGEP)
So, Why Perform Risk Classifications?

- Paragraph (j) (4) (iii) states, “The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations (OEM) and good engineering practices (RAGAGEP), and more frequently if determined to be necessary by prior operating experience.”

- The generally accepted interpretation of the last phrase in this sentence is, “setting inspection priorities.”

- It follows that if the effort has been made to base inspection priorities on risk classifications, the classifications should be used for correction of deficiencies to meet the following requirements: (j)(5) “The employer shall correct deficiencies in equipment that are outside acceptable limits (defined by the process safety information in paragraph (d) of this section) before further use or in a safe and timely manner when necessary means are taken to assure safe operation.”
PSI Should Offer the Following to Support an Asset Integrity Management Program

• Unique equipment identification for each piece of equipment in each category that is within the process boundaries of a covered process

• Clear documentation on the hazards of the process

• A connection between the process chemistry, the process design, the equipment design and equipment materials of construction

• The design basis (RAGAGEP) for all of the equipment within the covered process boundaries that establishes acceptance criteria for continued safe service
The Connection Between Asset Integrity Management and RAGAGEP

- CONCEPTUAL DESIGN
- PROCESS APPLICATION
- OPERATING PARAMETERS
- EQUIPMENT REQUIREMENTS
- DETAILED DESIGN
- CODES & STANDARDS
What are the Six Categories of Equipment?

• Vessels, including pressure vessels, storage tanks, heat exchangers, columns, filters, etc.

• Piping and components including valves, fittings, etc.

• Relief devices, including rupture disks, safety valves and conservation vents

• Instruments & controls including process control systems

• Emergency shutdown systems

• Pumps, including all categories of pumps, as well as compressors, blowers, fans, etc.
What is RAGAGEP?

"Recognized And Generally Accepted Good Engineering Practice" (RAGAGEP) – are engineering, operation, or maintenance activities based on established codes, standards, published technical reports or recommended practices (RP) or a similar document. RAGAGEPs detail generally approved ways to perform specific engineering, inspection or mechanical integrity activities, such as fabricating a vessel, inspecting a storage tank, or servicing a relief valve.” (OSHA Definition)
RAGAGEP Reality

- Most codes, standards and/or written practices (RAGAGEP) are driven by an equipment category.

- The codes, standards and/or written practices for the categories of equipment vary based on the category.

- The four basic categories of codes, standards and/or written practices for various equipment types are:
  - Design
  - Inspection
  - Maintenance
  - Repair

- Codes, standards and/or written practices may contain some or all of the four basic categories of activity or practice.

- There are *hundreds* of codes, standards and/or written practices! Regulatory application is subjective!
Categories within Categories

• The categories of equipment have subcategories

• The categories of applicable codes, standards and/or written practices have references to subcategories of documents that may provide details for specific conditions

• It is the responsibility of the owner/user to assure that appropriate research has been conducted to identify the correct RAGAGEP for the considered application

• This presentation does NOT cover all codes, standards and/or written practices for all applications
What is OEM?

- OEM is, “Original Equipment Manufacturer”

- OEM is the source of a piece of equipment, component, or part

- OEM can be the source of materials that are made to be used in a piece of equipment, component or part

- It is generally the responsibility of the OEM to provide the specifications of a piece of equipment, component or part that they may supply, either directly to an end-point customer, as an intermediate supplier to an end-point customer, or as a primary supplier to an intermediate fabricator / supplier to an end-point customer

- It is generally the responsibility of the OWNER/USER to establish specification requirements in purchase orders
Why is OEM Important?

• As the source of equipment, components and parts, the OEM must provide the documentation of the specifications

• The documented specifications must meet the design requirements

• The documented specifications must be retained with the equipment files and reference RAGAGEP
The OEM Connection with RAGAGEP

- Although most categories of equipment may have some form of RAGAGEP that is referenced, some designs for specific applications may not be covered specifically by the RAGAGEP.

- Certain categories of equipment may be more design/application specific; in such cases, the OEM manuals that include the design basis and specifications may be considered the RAGAGEP or at least part of the RAGAGEP as applicable.
Examples of OEM Documents

- DATA SHEETS or OEM specifications for vessels, tanks or piping that may be uniquely designed for a specific process application are RAGAGEP.

- The documented design and operating manual for a process control system in a specific process application is the RAGAGEP.

- The OEM manuals for various types of pumps, compressors and other dynamic equipment that include design specifications, parts lists and other important data are the RAGAGEP.
Steps to Assure Proper Management of OEM

• Include OEM requirements in the conceptual and detailed design process; assure documented specifications

• Include ALL OEM documents that pertain to equipment, components and parts, such as design basis, specifications and materials of construction *in the purchasing process*

• Assure OEM reflects or is qualified as RAGAGEP

• Compare OEM documents to received equipment, components and parts to assure matching information

• Establish and manage locations for OEM documents and data, including physical and electronic storage – this should be associated with equipment files *which are an integral part of an effective asset integrity management system*
Utilization of OEM

• The OEM should be used to verify equipment, components and parts – this should be done upon receipt (it is difficult to get your money back after you pump acid through a piece of equipment for which the verification of compliance to design requirements has not occurred and ultimately were found to not have been met)

• Once verified, the OEM should be used for PM’s and routine inspections – it should be the source of information, particularly for dynamic equipment. **NOTE: PM’s and REPAIRS should NOT occur without documented OEM reference!**

• The OEM should be the reference source for spare parts and components. It should be the only place from which part numbers, replacements and alternative components should be derived
Conclusion: PSI, RAGAGEP and AIM

• PSI is the regulatory requirement for thoughtful documentation of all elements of process design

• RAGAGEP is the vast availability of guidance in the form of codes, standards, recommended practices, engineering practices and design specifications including OEM provided data that apply to all the process equipment, which are assets

• AIM is Asset Integrity Management, and it starts with assuring the management of fundamental data regarding the assets that are in the system, so that the original, as-designed, as-built and as-installed conditions can be properly maintained.
Documentation

Substance

Is the Tool

Of Understanding

Image