FFC PSM Talk No. 13

PROCESS HAZARD ANALYSIS

PURPOSE

To ensure the timelines, consistency, and adequacy of process hazard analyses (PHAs) across the site. PHAs are examinations of each new or existing facility to assure that hazards of "catastrophic and major" safety or environmental consequences are identified and adequately controlled to an acceptable risk level.

PHILOSOPHY

Process hazards analysis (PHAs) are used to identify, evaluate and develop methods to control significant hazards associated with Higher Hazard Processes (HHP) and Lower Hazard Operations (LHO). These hazards generally represent the potential for fires, explosions and/or release of toxic materials. PHAs use an organized, methodical study approach, seek to achieve a multi-disciplined consensus on hazard control and document results for future use in follow-up, emergency planning and training of personnel involved in operating and maintaining the process. Process Hazard Analysis systematically identifies the potential safety hazards and is a well-defined program to remove or lower these hazards.

Qualitative Techniques

- What If
- Hazard and Operability Study **(HAZOP)**
- Failure Mode and Effect Analysis **(FMEA)**
- Fault Tree Analysis **(FTA)**

For each hazardous event identified, the PHA team shall document:

Consequence (C1-C8)

Frequency Rating (F1-F8)

Risk Level

Process	Frequency (Year)
HHP	5
LHO	10

PHA ACTIVITY FLOW

1. **When to conduct PHA**
2. **Planning & Preparing to Conduct a PHA**
3. **Define PHA Charter and Scope**
4. **Team Preparation**
5. **Team Responsibilities**
6. **Start PHA Activities**
7. **Hazards Identification**
8. **Process Hazard Review**
9. **Human Factors, Facility Siting and Inherently Safer Processes**
10. **Develop PHA Recommendations**
11. **PHA Report & Presentation to Management**
12. **Recommendations Follow-up, Tracking, Monthly Stewardship**
13. **Closing Recommendations**

REVALIDATION PHA

It must be considered in following cases:

- The previous PHA no longer meets the needs or requirements of the program
- There are significant opportunities to improve the PHA.
- For new facilities with significant changes during start-up that could affect process safety, a revalidation of the baseline PHA shall be done within one year of start-up.

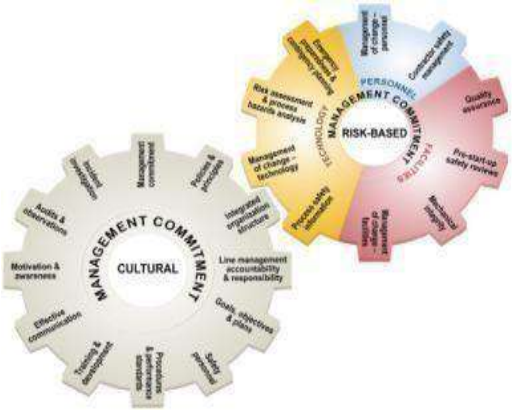
Emergency Preparedness & Contingency Planning

FFC PSM Talk No. 14

Philosophy

The objective of this plan is to ensure the safety and well-being of all company employees, contractors, customers and communities in the event of an emergency.

In-depth planning for Potential Emergencies is essential to ensure Effective Response by Site personnel for safety of people and assets.



Purpose

In case of incident such as major fire, explosion, toxic gas / liquid release etc., all necessary actions are taken for protection of Company Personnel, Contractors, the environment, surrounding communities and the assets.

Key Elements

Risk Assessment: Regular risk assessments to identify potential hazards and risks that could impact operations or surrounding communities.

Emergency Response Teams: Trained emergency response teams are in place to respond quickly and effectively in the event of an emergency.

Communication: Clear communication protocols are established to ensure that employees, contractors, civil authorities and communities are kept informed during an emergency.

Evacuation Planning: Evacuation plans are in place for all facilities and roles are clearly assigned to ensure a coordinated response in the event of an evacuation.

Training: Regular training of employees on emergency procedures and response procedures is carried out.

Continuity Planning: Emergency handling procedures are in place to ensure that critical operations can continue in the event of an emergency.

Testing and Exercises: Drills are conducted on regular basis to evaluate effectiveness of emergency plans and to ensure that emergency squad is prepared to handle all scenarios.

Consequence Analysis/ Risk Assessment

- Major hazards at site: fire, flammable / toxic gas release or explosion, ammonia release, bomb threat or sabotage and acid release.
- Emergency planning is based on worst case scenario for each hazardous event.
- Consequence analysis of each hazard has been conducted and specific firefighting pre-plans, emergency shutdown procedures and evacuation plans are in place.
- Risk evaluation includes estimated release amount and conditions, effected areas, environmental impact, property damage etc.

Site emergency response program consists of:

Comprehensive site wide fire-fighting and disaster handling plans are in place which includes:

- Emergency handling techniques
- Emergency handling manual
- Emergency shutdown procedures
- Emergency rescue guidelines
- Emergency repair procedures

Liaison with Civil Authorities

Program includes communication with NDMA (National Disaster Management Authority) / Civil Administration based upon nature / extent of emergency situation.

Training on Emergency Preparedness

- Initial training of company & contractor employees for role statement
- Weekly Exercises (Weekly Fire Drill)
- Annual Exercises (Annual drill for heavy ammonia release)
- Drill critique sessions are conducted and recommendations are assigned to relevant interfaces
- Training of Emergency Squad

Community Awareness Program

- Employees are educated about public concerns of plant operations
- Government, community & management representatives are educated on Emergency Response
- Community awareness about handling of personnel exposed to ammonia and chlorine

MANAGEMENT OF CHANGE - PERSONNEL (MOC-P)

FFC PSM Talk No. 15

Purpose

FFC believes that safe operations of facilities require an effective personnel change management system. People are the essential ingredient in "Process Safety Management" and play the most important role in its implementation. It is important to maintain a minimum level of job specific experience and knowledge and skill in managing process safety.

MOC Personnel

- Review process to ensure that personnel changes at all levels are controlled according to a pre- established criteria so that minimum levels of experience and knowledge are maintained at the site. Minimum acceptable knowledge is required in:

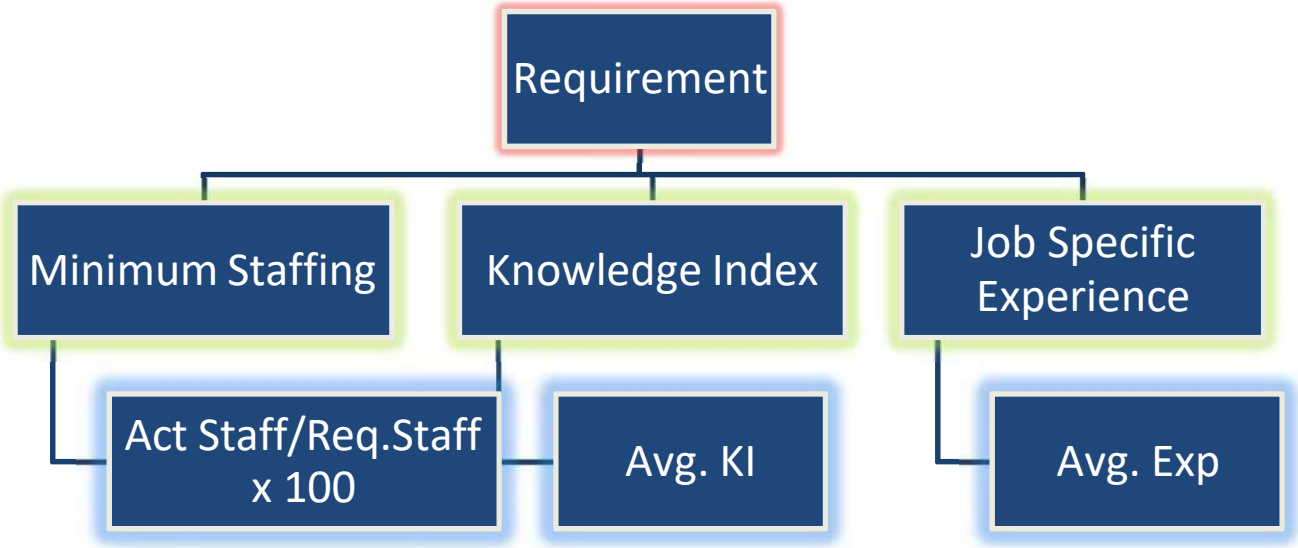
  - **Job Specific Knowledge**
  - **PSM Knowledge**

Competency index [CI]

- Competence Index is a calculative figure comprising of **Knowledge Index** & **Job Specific experience** used for benchmarking the requirement of individuals at site.

- If with the personnel movement, CI level drops below the certain defined level then it to be improved through training or direct hiring of the experienced staff.

How to Calculate Competency Index [CI]



Competency Calculation Formula

C. I = Avg. Knowledge Index No. [KI] x Average Specific Experience

Responsibility

- Department Managers shall establish goals for review, at least once in 02 years, the current level of Job Specific Experience, Knowledge and Skills (Competence Index – CI) required in order to ensure that they a have the required competency for decision making that can affect process safety.

Prepared By: Asim Ur Rehman SE-E (PRS)

FFC PSM Talk No. 16

CONTRACTOR SAFETY MANAGEMENT

Purpose

It is to ensure that Plant Safety Management (PSM) goal of the Contractor safety is met effectively. Furthermore, health and safety aspects of the contractor employees are managed in a systematic way.

Philosophy

FFC believes that all jobs must be safely completed in accordance with the established procedures, safe work practices, consistent with the PSM whether undertaken by the FFC's employee or the "contractor".

Contractor

Contractor is defined as "**any organization or person who works for but is not the employee of FFC**". They are broadly classified as:

- Workers supervised by FFC employees. Also referred as "**daily contractors**."
- Workers under contractor's own supervision e.g. "**turnaround contractors**."
- Workers who are not supervised. This category includes **technical service contractors** like **VSMs,Consultants.**

"Steps of the "Contractor Management Safety"

1. **Contractor Pre-Qualification**
   Safety performance of the contractor is considered as top most priority at the time of contract award.
2. **Contract Preparation**
   Document the safety performance expectations, standards for execution of the work, capabilities of key personnel & expected behaviors.
3. **Bid meeting, bidding, contract awarding and post contract award items**
   Award the contract with clear understanding of safety expectations, reprimand and awards. Safety plan for project is defined and understood by the contractor at pre-bid / bidding stage.
4. **Orientation & training**
   Prepare the contractor team for success including safety performance and full compliance with FFC safety policy and procedures.
5. **Monitoring & supervision – Auditing & monitoring the work**
   Assure that contractor is performing as per the contract expectations and the trainings imparted.
6. **Contract evaluation & record**
   Assess the level of success and lessons learned. Determine whether to retain the contractor and what changes to be made in administrative and operational controls.

FFC PSM Talk No. 17

QUALITY ASSURANCE

Quality assurance (QA) – an Element of RB(PSM), is focused on the process used to measure and provide confidence that quality requirements will be fulfilled, thereby preventing defects and consequent incidents.

Purpose

QA Plan is important for new process facilities, alterations/revisions or repairs to existing facilities to ensure that Safety Critical Equipment, *which handles hazardous materials*, are suitable for the intended process application. It also ensures that the installed Safety Critical equipment is consistent with design specifications and manufacturer's recommendations.

Philosophy

Fauji Fertilizer Company (FFC) believes that Quality Assurance program is a systematic way to ensure that Safety Critical Equipment is manufactured / fabricated in accordance to design specification, inspected and tested, transported, stored, assembled and installed correctly. QA bridges the gap between design specifications and the initial installation.

Quality Assurance Program

QA/QC Program for Safety Critical Equipment will comprise of Technical Specification Preparation, Vendor / Supplier Selection, Purchase Order, Materials of Construction and its Control, Drawings and documentation, Technical Review, Fabrication Plan, Inspection Plan/Brief, Defined Hold Points & Witness Points, Testing and Certification, Construction and Installation Plans. Other necessary plans, based on specific types of equipment, can also be supplemented.

Dedicated site-specific QA/QC Program will include Materials Control, Field construction/fabrication and installation, Inspection and Testing plans.

Vendor / Supplier / Contractor Selection

Assessment of vendor's technical expertise and capabilities, safety records, past performance and similar job references, Clientele, Vendors' quality control program, quality of personnel / workforce. Economic stability of vendor & demonstrated reliability in meeting scheduled goals / delivery times and schedule.

Testing & Techniques–Equipment Acceptance

Verification of Safety Critical Equipment and checking thru Manufacturer Databook, Material of construction, Inspection Record (Destructive and Non-destructive Testing, Welding, Heat treatment, Radiography, Integrity and Leakage testing), Dimensional verification, Box-up checks (specified gaskets and bolting), Dry/inert gas blanketing during transportation and storage, Packing, Internals check, Site Internal/External inspection, Painting, Packing, proper supports & impact absorbers, lashing and fixing during transportation.

Audits

Audits are important independent evaluations conducted to compare quality performance with a standard for that performance. The purpose of an audit is to examine and evaluate objective evidence to verify that elements of a quality system have been developed, documented and implemented under Quality Assurance (QA) regime. Quality Assurance audits are conducted by a multi-disciplined team as per defined frequency in accordance with the PSM Auditing guidelines.

Prepared By: Umar Sharif, April 08, 2023

FFC PSM Talk No. 18

Purpose:

PRE-STARTUP SAFETY REVIEW (PSSR)

Pre-Startup Safety Review (PSSR) provides a final checkpoint for new and modified equipment and facilities to confirm that all appropriate elements of PSM have been addressed satisfactorily and the equipment / facility is safe to start- up.

PSSR ensures that:

- ✓ Construction is in accordance with design specifications.
- ✓ The facility is safe to startup, operate and maintain.
- ✓ Process Hazards Analysis (PHA) recommendations addressed.
- ✓ Elements of PSM have been appropriately addressed.
- ✓ Process Safety Information is available.
- ✓ Training, procedures and communications have been addressed.
- ✓ Operating and Maintenance Procedures have been adequately updated before commissioning.
- ✓ Quality Assurance requirements have been met.
- ✓ Mechanical Integrity plans have been established.
- ✓ Emergency Planning and Response requirements have been addressed.

Prepared by:
PSSR TEAM (FFC-GM)

PSSR STEPS:

- PSSR Request & Planning
- Team Formulation
- Team Meeting
- Field Inspection
- PSM Element Assessment
- PSSR Completion
- Communication of the Deficiencies picked during PSSR
- Recommendations Tracking, Follow up & Closure
- Closure of Recommendations to be completed **Before Commissioning**
- Facility Commissioning Authorization

Protocol to conduct:

- Called by Area Owner (Mandatory).
- Butt List is developed & points are addressed before PSSR.
- Conducted by multi-disciplined team.
- Chaired by Safety Engineer.
- Documented on checklist developed as per DuPont guidelines.
- Area/site visit is mandatory.
- Actions consist of BC (Before Commissioning) & AC (After Commissioning) points.
- Facility MUST NOT BE commissioned until all BC points are addressed adequately. Non-compliance is ranked as a safety incident.

Exemption:

Temporary Change: Document Change & Analytical Change
Test Run Authorization: Operations Change

Mechanical Integrity (MI)

FFC PSM Talk No. 19

Philosophy

FFC believes that a comprehensive Mechanical Integrity (MI) program is necessary to ensure that the system integrity to contain the hazardous substances is maintained from the time of initial installation and throughout the life of the facility.

Its target is to eliminate the "breakdown" maintenance, with respect to equipment whose failure could adversely affect the process safety.

> The key to success of an MI program is written procedures and its implementation

Developed by:
PSM – Mechanical Integrity Team

Purpose

To ensure that integrity of critical equipment is maintained throughout the life of all process facilities across the Site. Thus the challenge is to develop and implement a MI program that shall assure Equipment Integrity, Reduce Unplanned Downtime, Eliminate Unplanned Capital Expenses for Replacement Equipment, and Cost Effectively meet OSHA and EPA requirements

Mechanical Integrity Sub Elements

Test, Inspection and Preventive Maintenance Program

Predictive and preventive maintenance program shall be established, consisting of a series of inspections and tests to detect impending or minor failures and to mitigate their potential before they can develop into more serious failures.

Maintenance Procedures (Mechanical and E & I)

Procedures shall be established & implemented to ensure the Mechanical Integrity of Critical devices, systems and equipment on an ongoing basis and will cover a range of maintenance measures including administrative procedures, overhauls, shutdowns etc

Reliability Engineering

Reliability Engineering is the process of evaluating how long a system and its individual components can be operated safely before they must be taken out of service for maintenance or replacement

Quality Assurance Procedures

Quality Assurance Procedures shall be established to ensure that Critical maintenance materials, spare parts and equipment meet design specifications as delivered and to protect against inadvertent use of improper materials

FFC PSM Talk No. 20

MANAGEMENT OF CHANGE – FACILITIES

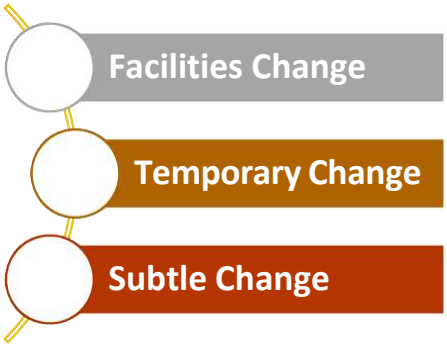
Purpose

FFC Believes that the plant is designed as per standard engineering practices. The changes to the documented process safety information (e.g. hazard of material, equipment design basis and process design basis), subtle or temporary changes can lead to catastrophic events. Therefore, these changes must be made in such a manner that safety, integrity of the plant and environment is not compromised.

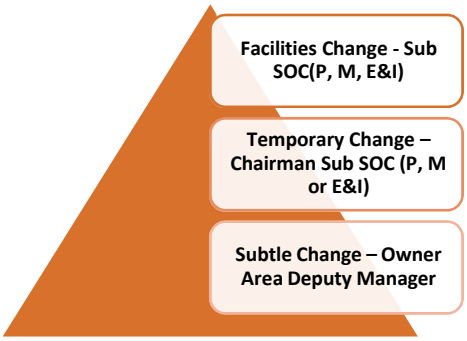
Facilities Change

A systematic procedure, change of design, or test authorization procedure for the analytical review of changes (including subtle changes) to the documented Process Safety Information (PSI) package and/or facilities for consideration of potential hazards being introduced to the process, system or operation, and their elimination or control.

Three types of MOC – Facilities



APPROVING FORUMS / AUTHORITIES



Temporary Change

- Box-up of leaks
- Temporary electrical connection
- Flushing of lines with a media not specified in the procedure
- Installation of temporary winch or lift
- Equipment replacement or repair using non-conforming spares

Subtle Change

- Replacement of a different brand bearing but same type
- Replacement of a gasket type (*gasket material is superior to previous one*)
- Higher grade piping
- Minor Rerouting of piping

Facilities Change – Changes That Are Permanent

Change in PSI Package

- Change in equipment & instrumentation related to firefighting / emergency response system
- New process facilities
- Addition or deletion of an equipment
- Changes to material of construction
- Replacement of type of valve
- Changes to process control hardware or software
- Changes to assembly points such as buildings designated as assembly points in case of emergency, emergency control centers etc.

FFC PSM Talk No. 21

Process Safety Information

PURPOSE

Purpose of this procedure is to ensure that Process Safety Management (PSM) goals for protecting health, safety, environment, and company assets are met by providing complete& accurate information through Process Safety documentation that identifies the hazards involved with process operations and must by communicated to employer & employee.

Process Safety Information procedure provides direction and information to identify, document and manage Process Safety Information package.

Importance

Quality & Sanctity of this procedure is of prime importance and governed through OSHA standards of process safety information, process hazard analysis and hazard communication. During lifetime of process, PSI to be kept & updated whenever changes other than "In kind replacement" are made especially in term of Managing process safety information records, Determining Safety Critical Systems, Equipment andComponents, Documenting codes and standards.

Record Management

This procedure covers the requirements and guidance review of below record:

- Hazards of materials
- Process design basis
- Equipment design basis
- Safety critical system identification and listing
- Documentation in line with Recognized & generally accepted good engineering practices
- Documentation of compliance with ap
- Management systems
- Responsibilities
- Chemicals List for High Hazard Proce
- Process Safety Information Package D

applicable codes and standards

ocess

Documents

Prepared By: Muhammad Qaim Abbas Dated April 10, 2023

FFC PSM Talk No. 22

Management of Change Technology

Purpose

FFC believes that the plant is designed as per standard engineering practices. The changes to the documented process safety information (e.g. hazard of material, equipment design basis and process design basis), subtle or temporary changes can lead to catastrophic events. Therefore, these changes must be made in such a manner that safety, integrity of the plant and environment is not compromised.

Philosophy

- All changes must receive appropriate review and authorization before being implemented. A systematic procedure, change of design, or test authorization procedure for the analytical review of changes (including subtle changes) to the documented Process Safety Information (PSI) package and/or facilities for consideration of potential hazards being introduced to the process, system or operation, and their elimination or control.

Approval Forum

- **Document Change:**
  - Relevant Department Manager.
- **Operations Change:**
- Non SC alarm/trip set point : **Area DM**
- SC Alarm/Logic set point : **Sub SOC (P)**
- SC Logic Change : **Sub SOC (P)**
- **Analytical Change**: **TS Manager**
- **Test Run Authorization** : **Sub SOC (P)**

Four types of MOC-Technology

Document Change

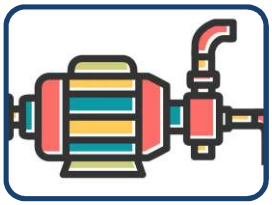
Includes changes, revisions, additions, deletions to controlled documentation and data base e.g changes in PSM procedures, start-up/shutdown, emergency handling & normal SOPs, P&IDs change and mechanical, E&I SOPs change etc.

Operations Change

- Any changes to appropriate items which could deviate from safe operating range shall constitute an operations change & subject to management of change. e.g changes to alarms, shutdown set point, interlock logics including both SC & non SC devices.

Analytical Change

Any change in analytical method need to be reviewed and approved e.g SOPs of Laboratory.



Test Run Authorization

- Test runs are generally based on changes beyond the safe operating ranges or to an extent which has not practiced earlier.ch experimentations need a proper safety review before commencement .e.g change of CW treatment chemical system, plant operation at higher than design load, GT operation at conditions other than recommended etc.

Prepared By: Asim Ur Rehman SE-E (PRS)