


FPST 4333

System & Process Safety Analysis


Lecture PSM Management of Change



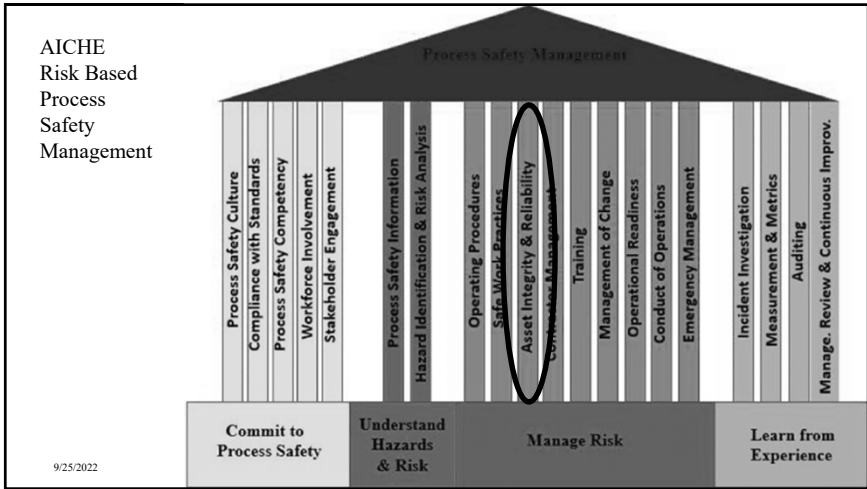
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An Essential Process Safety Management Element

- What is Management of Change (MOC)?
- Why do we need MOC?
- Recognizing Change
- The MOC Program
 - Main Elements
 - Operation
 - Keys to Success



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Definition

- Management of Change (MOC)
 - A management system
 - to identify, review, and approve all modifications
 - to equipment, procedures, raw materials, and processing conditions, other than replacement in kind,
 - prior to implementation
 - to help ensure that changes to processes are properly analyzed (for example, for potential adverse impacts), documented, and communicated to employees affected.

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In other words...

- Policies and procedures which ensure that changes do not result in operations outside of established safety parameters
 - Essential element in a plant's process safety system
 - Managing change can mean managing potential incidents



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MOC practices

- The recognition of change situations
- The evaluation of hazards and risk
- The decision on whether to allow a change to be made, and
- Necessary risk control and follow-up measures.



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Focus of MOC

- To prevent catastrophic accidents and to properly evaluate the concerns of safety and health and to accomplish this review in a timely manner.



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History of MOC

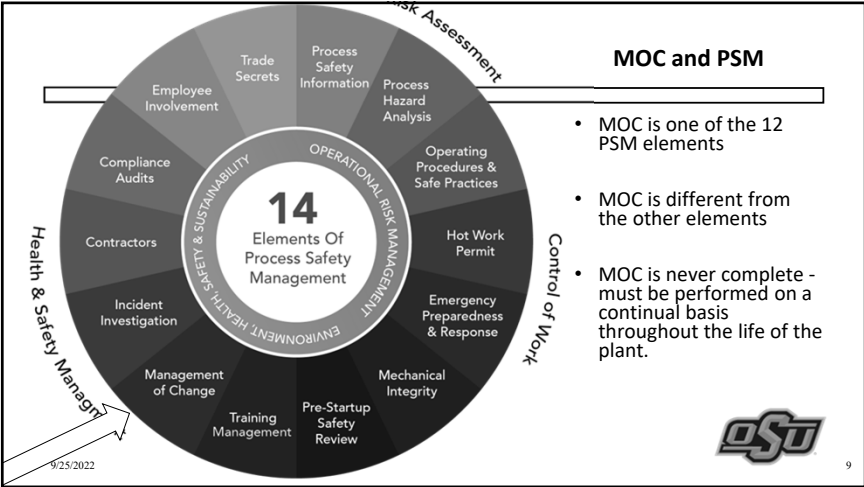
- Early 1960s - Formal procedures first introduced in the nuclear power and defense industries.
- 1976 - First mention of use within chemical industry at Loss Prevention Symposium
- 1985 - CCPA (Canadian Chemical Producers Association) pamphlet, "Essential Components of Safety Assessment Systems"
- 1990 - API recommended practice "Management of Process Hazards"
- 1992 - OSHA 1910.119, "Process Safety Management of Highly Hazardous Chemicals"



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29 CFR 1910.119(l)

- 1910.119(l) Management of change.
 - (1) The employer shall establish and implement written procedures to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures; and, changes to facilities that affect a covered process.
 - (2) The procedures shall assure that the following considerations are addressed prior to any change:
 - (i) The technical basis for the proposed change;
 - (ii) Impact of change on safety and health;
 - (iii) Modifications to operating procedures;
 - (iv) Necessary time period for the change; and,
 - (v) Authorization requirements for the proposed change.

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29 CFR 1910.119(l)

- 1910.119(l) Management of change.
 - (3) Employees involved in operating a process and maintenance and contract employees whose job tasks will be affected by a change in the process shall be informed of, and trained in, the change prior to start-up of the process or affected part of the process.
 - (4) If a change covered by this paragraph results in a change in the process safety information required by paragraph (d) of this section, such information shall be updated accordingly.
 - (5) If a change covered by this paragraph results in a change in the operating procedures or practices required by paragraph (f) of this section, such procedures or practices shall be updated accordingly.

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Why do we need MOC?

80% of all large scale accidents in the process industries trace their origins back to "Change".

The OSU logo is in the bottom right corner.

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Change is Necessary

- *“There is nothing permanent except change.”*
- ~Heraclitus

- Change is essential to a company’s survival
 - –they have to be able to continuously improve their process and keep up with industry standards.



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Everyday Examples of Management of Change

- Adding a course to your schedule
 - does it conflict with your other courses?
 - does it meet your graduation requirements?

- Driving on the highway when it is icy
 - does the speed limit still apply or should you reduce your speed?

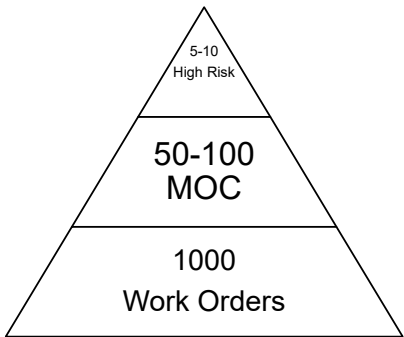


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What is Change?



- Most difficult part of MOC is **recognizing change**.
- Need to be able to distinguish between a change that requires approval using an MOC process and one that does not.



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Replacement-in-kind (RIK)

- **Definition**
 - An item (equipment, chemical, procedure, etc.) that meets the design specification of the item it is replacing. This can be an identical replacement or any other alternative specifically provided for in the design specification, as long as the alternative does not in any way adversely affect the use of the item or associated items.

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RIK or not?

- Raising Temperature Reactor within safety operation envelope
- Replacing equipment meet same spec as original
- Adjustment of production rates
- New technology relief valve
- Recalibrating instruments
- Operating with a critical component deactivated
- Replacement of gate valves with ball valves
- Replacement of valves within plant valve specs

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Major Categories of Changes

- Change of Process Technology
- Change of Facility
- Organization Change
- Variance Procedures

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Permanent vs. Temporary

- MOC should be conducted on both permanent and temporary changes.

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Emergency Changes

- Need a contingency plan
- Evaluate using limited skills and resources - focusing on immediate risk only.
- When normal operations resume - implement a full MOC evaluation ASAP

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Key Elements of an MOC System

Identification System

Change Control Mechanism

Training

Information Management System

Auditing

The requirements for each element are detailed in a company’s MOC policy

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Key Elements of an MOC System

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Auditing

• Screening process for identifying changes.

- Includes risk ranking process based on effect item could have on safety of process

• Requires clear, written, definition of system boundaries and what constitutes “change”

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Key Elements of an MOC System

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Change Control Mechanism

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Information Management System

Auditing

• Explains how to manage the change.

• Must clearly identify:

- the work flow procedures (MOC form)
- responsibility and authority
- approval level

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Key Elements of an MOC System

Identification System

Change Control Mechanism

Training

Information Management System

Auditing

• Anyone who could affect a change must be properly trained in the Management of Change system

• Commitment from all levels of management and staff

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Key Elements of an MOC System

Identification System

Change Control Mechanism

Training

Information Management System


Auditing

“Status Accounting”

- Software/documentation that tracks all changes and their progress
 - Allows access to most current information
 - eg. If two changes are inter-related they will be aware of one another

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Key Elements of an MOC System

Identification System

Change Control Mechanism

Training


Information Management System

Auditing

- Ensures system is working as it should
- MOC system should be constantly evolving and improving in efficiency and effectiveness
- Verifies changes are assessed accurately
- More often while the system is new to ensure all the “bugs” are found

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Flowchart of a Management of Change Program

- An MOC system is very dependent on the specific company
- No two systems will be the same
- eg. one company could require 1 signature for approval while another could require 5.
- They are all based on the same fundamental principles

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graph TD
    A[IDENTIFY CHANGE] --> B{DETERMINE SIGNIFICANCE OF CHANGE}
    B -- LOW --> C{SIMPLE RISK ASSESSMENT}
    B -- MEDIUM/HIGH --> D[REVIEW WITH TEAM LEADER]
    B -- UNCERTAIN --> C
    C --> E[APPROPRIATE RISK ASSESSMENT]
    D --> E
    E --> F[APPROVAL]
    F --> G[TRAINING AND COMMUNICATION]
    G --> H[IMPLEMENT CHANGE]
    H --> I[FOLLOW-UP]
    I --> C
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MOC Form

- A MOC form is used by most companies to guide employees through the procedure
- The MOC form should include:
 - Description, purpose, and tech. basis for the change
 - Assigned level of risk
 - Safety, Environmental, and Health impacts
 - Necessary time period for the change
 - Authorization for the proposed change
 - Interfaces with the PSSR (Pre-startup safety review) program

Change Approval Form			
General Information - MOC			
Title: <input type="text"/>			
Project Manager: <input type="text"/>			
Requester: <input type="text"/>			
Phone Number: <input type="text"/>			
Email Address: <input type="text"/>			
Location: <input type="text"/>			
Please complete the below questions to determine the level of review that is required for this change request:			
1. Does the proposed change introduce a new process or material? <input type="checkbox"/>			
2. Does the proposed change involve the addition of new chemicals, gases, or vapors to the process? <input type="checkbox"/>			
3. Does the proposed change involve the modification of existing equipment? <input type="checkbox"/>			
4. Does the proposed change involve the modification of process control equipment? <input type="checkbox"/>			
5. Is this a temporary change? <input type="checkbox"/>			
6. Is this a permanent change? <input type="checkbox"/>			
7. Is this a change to the design of the process? <input type="checkbox"/>			
8. Is this a change to the design of the equipment? <input type="checkbox"/>			
9. Is this a change to the design of the control system? <input type="checkbox"/>			
10. Is this a change to the design of the safety system? <input type="checkbox"/>			
11. Is this a change to the design of the environmental system? <input type="checkbox"/>			
12. Is this a change to the design of the health system? <input type="checkbox"/>			
13. Is this a change to the design of the fire protection system? <input type="checkbox"/>			
14. Is this a change to the design of the waste management system? <input type="checkbox"/>			
15. Is this a change to the design of the water management system? <input type="checkbox"/>			
16. Is this a change to the design of the air management system? <input type="checkbox"/>			
17. Is this a change to the design of the noise management system? <input type="checkbox"/>			
18. Is this a change to the design of the vibration management system? <input type="checkbox"/>			
19. Is this a change to the design of the thermal management system? <input type="checkbox"/>			
20. Is this a change to the design of the electrical management system? <input type="checkbox"/>			
21. Is this a change to the design of the mechanical management system? <input type="checkbox"/>			
22. Is this a change to the design of the chemical management system? <input type="checkbox"/>			
23. Is this a change to the design of the biological management system? <input type="checkbox"/>			
24. Is this a change to the design of the geological management system? <input type="checkbox"/>			
25. Is this a change to the design of the atmospheric management system? <input type="checkbox"/>			
26. Is this a change to the design of the hydrospheric management system? <input type="checkbox"/>			
27. Is this a change to the design of the lithospheric management system? <input type="checkbox"/>			
28. Is this a change to the design of the biospheric management system? <input type="checkbox"/>			
29. Is this a change to the design of the geospheric management system? <input type="checkbox"/>			
30. Is this a change to the design of the cosmopolitan management system? <input type="checkbox"/>			


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Hazard Risk Ranking

- Don't manage all changes with same rigor (serious)
- Must explain changes
 - small
 - medium
 - large
- Hazard analysis method and level of approval dependent on type of change.

RISK ASSESSMENT MATRIX				
SEVERITY \ PROBABILITY	Catastrophic (1)	Critical (2)	Marginal (3)	Negligible (4)
Frequent (A)	High	High	Serious	Medium
Probable (B)	High	High	Serious	Medium
Occasional (C)	High	Serious	Medium	Low
Rarely (D)	Serious	Medium	Medium	Low
Improbable (E)	Medium	Medium	Medium	Low
Eliminated (F)	Eliminated			




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Determining Potential Severity

- Could the change take the process outside the safe operating envelope?
- Does the change significantly alter the heat and material balance?




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The Risk Level Determines the Type of Safety Review Needed

Risk Level Degree of Hazard	Type of Safety Review	Authorization
Low	Simple Checklist	Shift Supervisor
Medium	What-if Checklist	Unit Supervisor
High	FMEA or HazOp	Area Supervisor
Serious	HazOP or CCA	Plant Manager



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A successful MOC program is dependent on ...

- Leadership Support
- Stakeholder Involvement
- Communication
- Simplicity

“A modest MOC system that is regularly used and works is much better than an elaborate, sophisticated system with an impeccable paper trail that is occasionally winked at, bypassed, or sometimes totally ignored.”

– Roy E. Sanders



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Do's and Don'ts of MOC

DO!

- Apply to all process units, not just those containing flammable or toxic substances. ((eg. utility boilers))
- Make sure there is easy access to documentation. (safety review)
- Save all records - both approved and disapproved.
- Make sure EVERYONE is aware of MOC program.
- Address both types of risk - short term and long term.

DON'T!

- Don't focus solely on modifications procedures (eg. changes in operating procedures, staffing levels, and maintenance procedures)..
- Don't have unnecessarily tight equipment specifications. (been necessary had more thought gone into the original operating procedures and mechanical specifications
- eg. using only catalog replacements instead of having functional descriptions of spare parts.)



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Conclusion

- Improper plant modifications have been a major cause of chemical plant accidents.
- MOC is a formal method to deal with change will prevent future accidents from occurring.
- Change is unavoidable in industry
- All organizations should have a MOC program.



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