



WITH YOU ALWAYS

RE-Konnect

Risk Engineering Bulletin

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In Focus:

Management of Change



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Preface

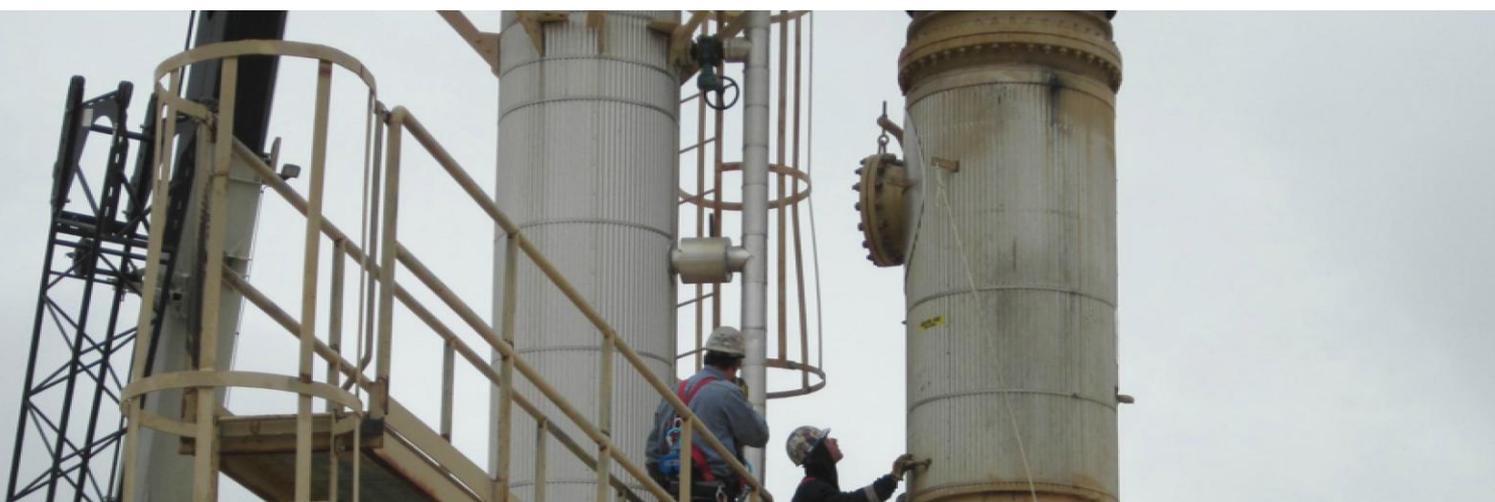
Changes are a daily reality in the process industry. These could be changes to the physical hardware of the plant, the control systems, the business processes used, or to the organisation running the plant. It is well-documented that poor control of plant changes has contributed significantly to losses in industry. The need to avoid such incidents and maintain good process safety management is the reason why all sites operating process plant need a robust Management of Change (MOC) process, sometimes also referred as Change Management. Management of change is a part of safety management, however, changes are often complex and usually involve both technical and organizational aspects.

Many of the catastrophic accidents over the past few decades can be traced, in large part to a MOC system that was not in place or was not functional.

In this issue of RE-Konnect, we present you a brief overview on management of change and related aspects.

Did You Know?

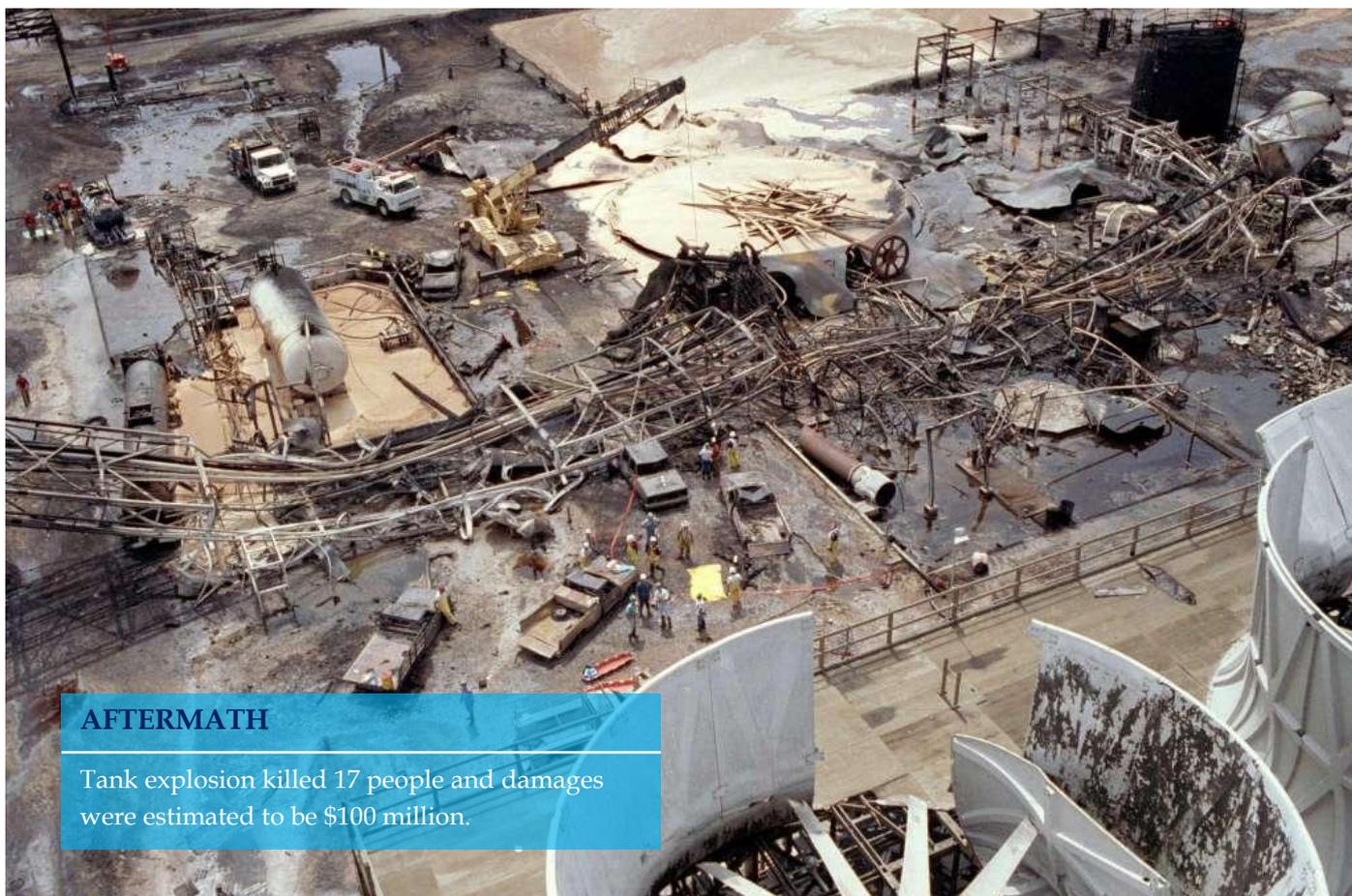
- Management of Change (MOC) was known as Configuration Management in early 1960s.
- More than 80% of large losses are related to change; where management of change is not present or not followed.
- Lack of MOC procedure was the major contributing factor for the 1987 Grangemouth Refinery explosion which lead to significant plant damage and was heard offsite 30 km away.
- A study shows that 22% of reliability problems are caused by uncontrolled changes.
- Of all of the uncontrolled changes that occur, “temporary” changes are the most pernicious and the most frequent cause of accidents and incidents.



Disaster

Explosion at ARCO Chemical Plant

On July 5, 1990, a waste water tank at the ARCO chemical plant in Channelview, Texas, exploded during the restart of compressor. The nitrogen purge had been significantly reduced during maintenance and temporary oxygen analyzer failed to detect the building of a flammable atmosphere in the tank. When the compressor was restarted, flammable vapors were sucked into the compressor and ignited. The flashback of the flame into the headspace of the tank caused explosion that killed 17 people. Damage were estimate to be \$100 million.



AFTERMATH

Tank explosion killed 17 people and damages were estimated to be \$100 million.

The waste water tank was not considered part of the operating plant. Hence, the management and workers did not understand that a chemical reaction was taking place in the tank, generating oxygen. The lack of understanding enabled a series of poor decisions, such as discontinuing the nitrogen purge, poor design and location of temporary oxygen probe, No Management of Change (MOC) review of the these decision and pre-startup review.

LESSONS LEARNED

- Proper MOC procedures should be followed before any Maintenance work is performed.
- Chemicals that enter wastewater tank are still prone to reaction.
- Workers were not aware of the process hazard and did not know that oxygen build-up was taking place in the tank.



Bhopal Gas Tragedy – December 1984, Union Carbide India Ltd. Methyl Isocyanate leak exposed more than 500,000 people to toxic gas and killed 8000 people. The Lack of MOC was one of important underlying cause of incident.

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Flixborough Disaster, 1974, UK. Cyclohexane vapour cloud explosion resulted in 28 fatalities, destroyed local process plants and caused significant off-site damage. It is understood that no formal or structured MOC process was conducted for the installation of the reactor bypass.

MOC Definition and Overview

The definition of management of change as per OSHA, Occupational Safety and Health Administration, as defined in standard 1910.119 is – The employer shall establish and implement written procedures to manage changes (except “replacement in kind”) to process chemicals, technology, equipment, and procedures and changes to facilities that affect a covered process. Here ‘replacement in kind’ is defined as: 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 function or safety of the item or associated items.

OSHA believes that one of the most important and a necessary aspect of a process safety management program is appropriately managing changes to the process. MOC helps ensure that changes to a process do not inadvertently introduce new hazards or unknowingly increase risk of existing hazards. This element includes a review and authorization process for evaluating proposed adjustments to facility design, operations, organization, or activities prior to implementation to make certain that no unforeseen new hazards are introduced and that the risk of existing hazards to employees, the public, or the environment is not unknowingly increased. It also includes steps to help ensure that potentially affected personnel are notified of the change and those pertinent documents, such as procedures, process safety knowledge, and so forth, are kept up to date.

To carry out and MOC typically an individual originates a change request. Qualified personnel, normally independent of the MOC originator, review the request to determine if any potentially adverse risk impacts could result from the change, and may suggest additional measures to manage risk. Based on the review, the change is either authorized for execution, amended, or rejected. Often, final approval for implementing the change comes from another designated individual, independent of the review team. A wide variety of personnel are normally involved in making the change, notifying or training potentially affected employees, and updating documents affected by the change.

Most Medium-sized and large chemical & petrochemical corporations have or should implement flexible procedures for several layers of process safety review for capital projects as major modification and expansions. Different organizations provide various names to process safety review teams such as: Safety operations committee, Hazards review committee, Technical support team and Facility & operations change review committee or chemical process safety review team. The committee can be lead by a Technical Manager, Engineering Superintendent, Manager of process safety, or others who are not directly affected by the budgetary constraints or the startup deadlines. In certain cases, such as changes created by a significant expansion, it is better to have a small group of specialist first identify the potential hazards and seek out inherently safer design prior to any type of committee review.

Periodic compliance questionnaires should be sent to the operating unit to review the progress on those recommendations that were made to reduce risk, but were not required to be completed before startup. These items should be resubmitted to the process safety committee for reevaluation.

MOC Procedure

Most MOC systems are different at each corporation, and somewhat different at each location. Each facility must adopt or develop a procedure tailored to fit the specific hazards, the available technical resources, the culture of organization and required governmental regulations. MOC must be practicable and workable without undue delays.

Essential elements of an effective management of change policy are:

1. MOC Initiation

A written summary of the proposed change should be procedure of review and initial approval and authorization by one of the MOC approvers on site.

2. Production of a Design

Suitable design prepared by competent person forms the basis of the risk assessment processes that are performed. Design should satisfy the fundamental requirements of the MOC & Consulting with all appropriate disciplines.

3. Risk Assessment Process

The risk assessment element is central to the whole MOC process. It ensures that all of the consequences of the change are fully understood, with all risks appropriately managed. It is normal that different levels or types of risk assessment processes can be used within the MOC procedure, appropriate to the size and / or significance of the change being made.

4. Engineering Design, Construction, and Installation

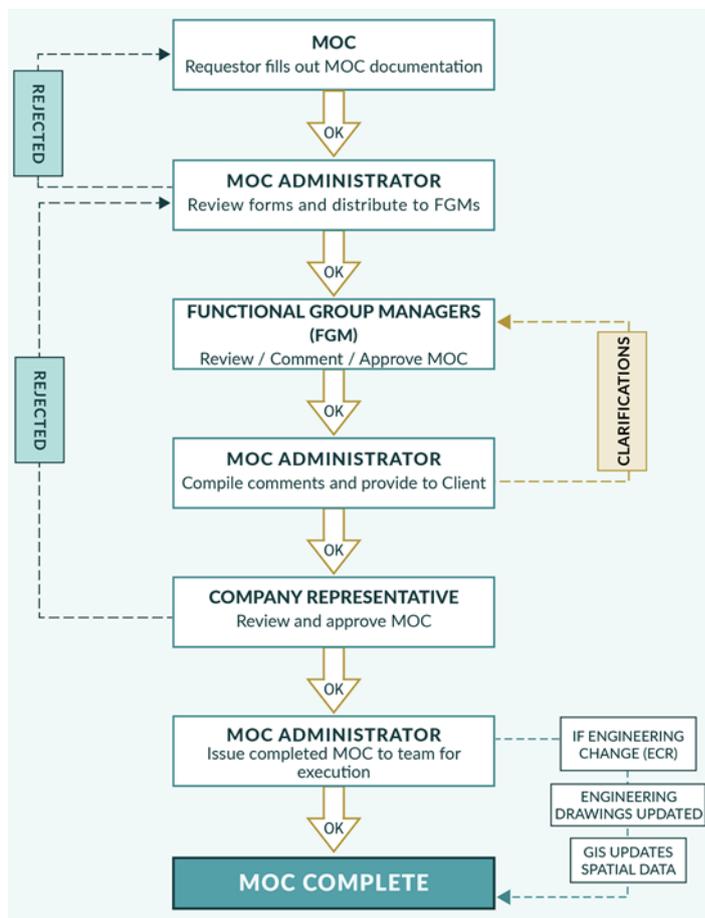
The site should have access to the appropriate capability to design the modification to the relevant codes and standards, either through its own organization or the use of third parties.

5. Pre Commissioning

Prior to the commissioning of the change, a number of check steps must be performed. Together these are often called a PSSR or pre startup safety review. The PSSR could consist of a number of different elements depending on the nature and complexity of the change.

6. Final Approval and Commissioning

Typically the designated MOC approver performs a review of all of the MOC steps and checks that



the process has been followed and the correct individuals involved. This person then approves or rejects the change as suitable for commissioning. Once commissioned, the MOC documentation should be signed as such to confirm its status. This often constitutes a formal handover of the change to the operations team.

7. Close-Out

The close-out part of the process involves ensuring that all of the follow-up actions after commissioning of the change are completed. The MOC Owner should retain formal ownership of the change, and the MOC documentation should remain at "open" status within the tracking system until all of the close-out processes are completed.

Guidelines

Following guidelines and standards can be referred for further reading:

- **OHSA 1910.119(I):** Process safety management of highly hazardous chemicals - Management of Change
- **GAP.1.0.2:** GAPS Guidelines for Management of Change
- **AIChE/CCPS:** Guidelines for Management of Change for Process Safety, 2008

Engage

Answer the following question and win Amazon coupons worth Rs 500 each. Send the answer to editor.bulletin@tataaig.com . Five winners for this quiz will be announced in the next issue.

Q1. The explosion in ARCO Chemical plant happened in which process area?

- | | |
|--------------------|-------------------------|
| a) Cooling Tower | b) Cogeneration Plant |
| c) Process Reactor | d) Waste Water Facility |

Q2. MOC procedure involves which of the following steps?

- | | |
|--------------------------------|------------------------------|
| a) Risk Assessment | b) Pre Startup Safety Review |
| c) Design Document Preparation | d) All of the Above |

Q3. Change of which of the following types do not require a MOC procedure?

- | | |
|-----------------------------|-------------------------|
| a) Change in Procedure | b) Replacement in Kind |
| c) Equipment Related Change | d) Change in Technology |

Winners of the previous issue are as follows:

- **Pradeep Jain** – Petronet LNG
- **Vishal Rana** – Munich Re, India Branch
- **Tulsi Reddy** – J B Boda Brokers
- **Kishor Kumar Kapoor** – Sridhar Insurance Broker, New Delhi
- **Girish G** – GIC of India, Mumbai

Answers to previous questions: 1. 1887

2. All of the above

3. Rotor blades

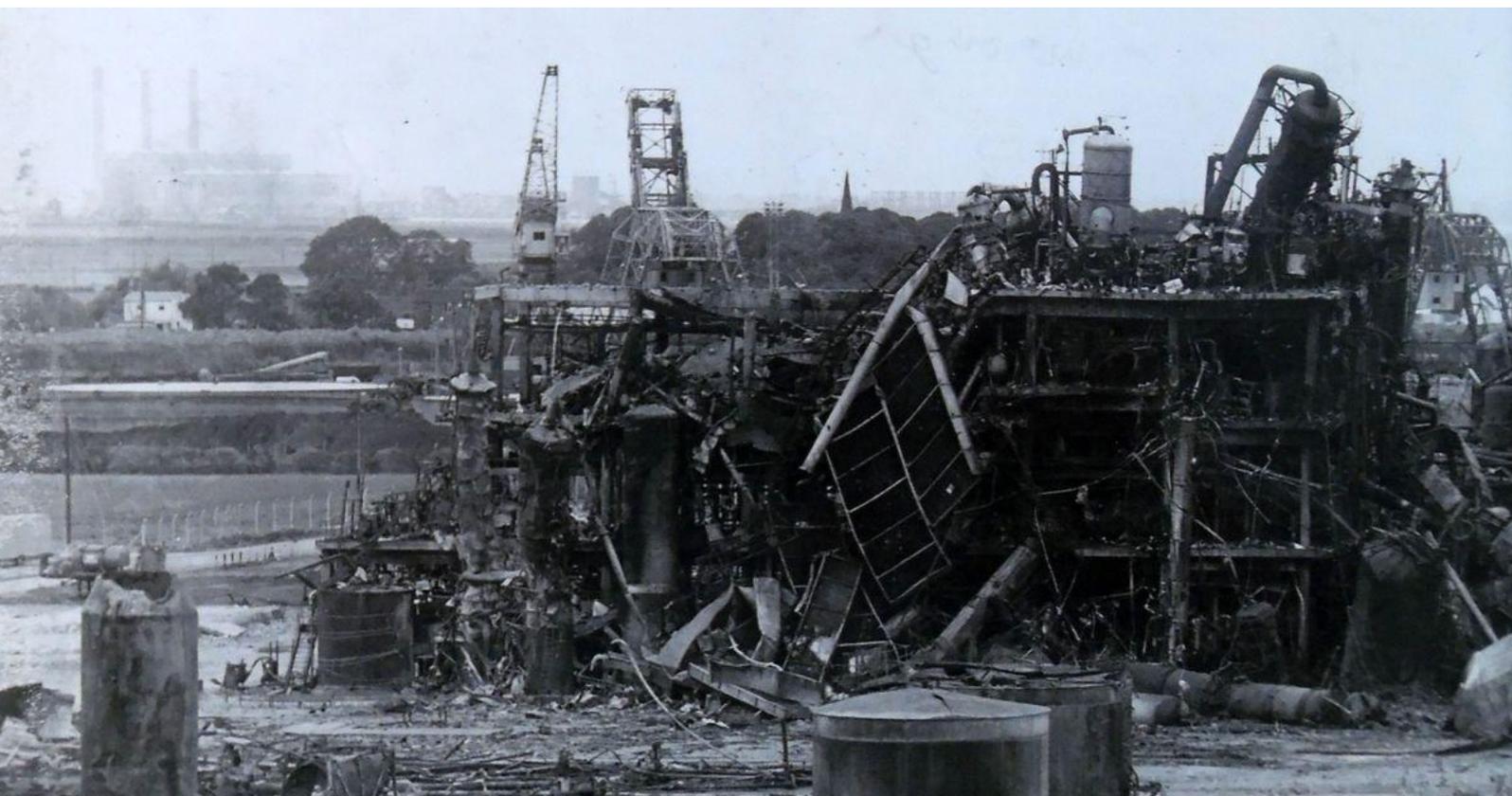
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Aftermath of Flixborough Disaster

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