

Management of Change and its Role in Maintenance Shutdowns

In the lifecycle of any facility with machine assets, maintenance shutdown is inevitable as these activities are paramount in improving the efficiency and safe function of the plant. A comprehensive shutdown concept is usually incorporated to take into account the movement of different components as well as the safe coordination of maintenance and shutdown related activities across the site. While the shutdown might be relatively easy for plant that operates for 8 hours a day – 5 days a week, it becomes more complex in industries that operate 24 hours a day – seven days a week. Such shutdowns require maximum amount of preparation which leave little room for surprises. It is for this reason that a Management of Change program should be at the very core of any maintenance related activities.

Management of Change is a tool to enhance process safety. According to OSHA 1910, the requirements for Management of Change (MOC) are: *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.* A well applied MOC program or procedure perfectly complements other loss elimination processes. Simply put, MOC is a process for preventing or mitigating business losses including degradation of safety, health or environment as the result of changes made to how you construct, operate, manage, or repair your facility or your processes. It involves identifying potential hazards that a change can introduce, assessing the risks associated with these hazards and dealing with them.

It is interesting to note that many of the worst industrial accidents in recent history have had failure of the MOC process as a root cause. Some sources indicate that as many as 80% of the serious major accidents in industry are related to uncontrolled change. Additionally, as much as 22% of reliability problems faced in manufacturing are caused by uncontrolled changes. This is majorly attributed to failing to thoroughly evaluate the total operating context and environment of the proposed activities. An example is the Flixborough Accident (1974) in Nypro, UK where 28 employees were killed and 87 people were injured including people off site. A plant modification occurred without a full assessment of the potential consequences. There were only limited calculations undertaken on the integrity of the bypass line and there was also no drawing of the proposed modification produced. Other major incidents that have occurred as a result of failure to effectively manage change are Grangemouth – BP Oil incident in 1987 and Longford – Esso, Australia incident in 1998.

While most process industry facilities have a MOC program for 'permanent' changes like addition of new process equipment and modifications to equipment and systems, it is the seemingly temporary changes that, if not subjected to the MOC process, ultimately cause accidents and incidents. An example of 'temporary' change is the bypassing of an interlock to carry out periodic maintenance on an equipment. The MOC procedure should ensure that the equipment and procedures are returned to their original conditions at the end of any temporary change.



Moreover, in most facilities, the change mostly identified deal with plant, processes and products. A key addition to changes that may necessitate the management of the change is People. In some cases, job shifts are made without considering the role holder's function as being safety critical. There could also be loss of someone with specific expertise required for some processes. Another key factor is the number of personnel. Where a task normally requires a specific number of personnel, any deviations from the set number should be subject to a MOC.

MOC is important because uncontrolled changes can directly lead to catastrophic events as well as degrade the quality of the facility's operations. The key elements to an effective MOC program include: request for change, impact analysis, approval/denial, change implementation and review/reporting. These steps can be further broken down as follows:

1. **Identifying and quantifying changes.** The originator of the change request should be clear, concise and complete so that the evaluation team can properly evaluate the proposed change.
2. **Evaluate the risks and rewards from proposed changes.** This is where risks and rewards to proposed changes are evaluated against desired outcomes.
3. **Identify and select the MOC evaluation team.** The team to objectively review the particular change needs to be multi-disciplinary and should ideally consist of more technical personnel. This is because the requirement at this stage is more inclined on knowledge rather than approval authority of an individual.
4. **Develop risk mitigation actions.** The evaluating team reviews identified risks, make appropriate recommendations and come up with actions to mitigate against foreseeable risks. These mitigation actions should then be put in place before the change is put into effect.
5. **Identify approvers and those to be informed.** Sometimes, those evaluating the change request do not have the approval authority. It is at this point that the change request is run by the approvers, who in most cases are departmental managers. It is paramount to keep in mind that every MOC does not have the same approvers. The best approvers are those who are most competent to perform the specific risk analysis and understand what that approval implies.
6. **Approve and communicate – documentation.** This step is pretty much straight forward. It involves change request approval through processes already identified in the particular facility. It can either be done by paper, shared document or on databases. Where the identified approver is absent, there should be proxy who shall act as a specified designated approval authority.

7. **Organisations should then effectively communicate the proposed changes to all affected persons.** This means that the affected parties should be identified and a robust communication method used. The output from this particular exercise may include a sign off to affirm that they have received and understood the communication.
8. **Execute the changes and mitigation.** Pre-implementation and post –implementation mitigation measures need to be effected within identified timelines. Without exception, all of these tasks must be completed before the MOC can be closed out. Every omission here is an opportunity for a failure or an incident to occur for the life of the change that was made.
9. **Confirm effectiveness.** This seemingly easy step involves verifying that the change worked as intended. Not all changes give the intended results. And many, despite the best planning, result in unintended and often undesirable consequences. If the change is not going as planned, the options are simple: restore the system to the original configuration, which includes all of the necessary follow up actions and communications necessitated by the change. Or execute a new MOC to address another option. What you must not do is keep on changing the change until it is outside of its original approved scope, hoping to get it right without a repeat of the previous steps. This defeats the purpose of the original MOC.
10. **Confirm mitigation and follow up.** Every last mitigation item that was identified as a condition for approving the MOC must be completed and completed on time. Confirmation of the same should be done before close out on the MOC can be done.
11. **Close change activity.** When the change has been confirmed to be effective, and all of the MOC action items have been confirmed to have been completed, then and only then, may the MOC be confirmed closed and records updated accordingly.
12. **Audit process compliance.** Measurements and audits are necessary. Leading measurements such as number of MOC opened and closed, number of action items generated, percent of late action items and late MOC closures tell you if people are conforming to the process. Lagging measures such as a summary of the benefits realized by the changes, and net resources expended, give a picture of the activity level and effectiveness of the MOC process. Auditing the MOC program will give input into these indicators which will give insight into the level of compliance to the program and any additional improvements that may be required.

The advantages of implementing a systematic MOC process include accident prevention, ensures traceability of changes, increases and/or sustains asset reliability and it ensures the proper evaluation of alternatives.

In conclusion, when having a maintenance shutdown, facilities should recognize that there is change, use the right hazard analysis technique, authorize change at the level appropriate; considering hazards and risks, communicate the new operating procedures in writing including the hazards and safe operating limits, and provide appropriate training. This way, the robust MOC program will greatly minimize negative eventualities from the shutdowns.