Managing Change in a Chemicals Supply Chain

In memory of Marc Twisk † 26-7-2016

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1.   Introduction

Investigation of some of the major incidents in the Chemical Industry identified the lack of proper Management of Change (MOC) as one of the root causes of those incidents. Classic examples are:

- At Flixborough (UK) a temporary bypass to the reactor failed and the explosion of 30 tons of flammable cyclohexane killed 28 workers and injured 89 people. The investigation learned that due to a change in plant management no engineering resource was available to review the bypass.
- In Castleford (UK) a fire killed 5 employees during cleaning a vessel containing potentially instable sludge. It appeared that because of a recent company restructuring, the cleaning task had been organized by inexperienced team leaders reporting to an overworked area manager.

These incidents are not unique. Incident analysis shows that a significant share of all incidents in industry can be attributed to failures in Management of Change. The following three incidents show that there is no reason to assume that the situation is different for incidents in the logistics chain of chemicals:

- Type A gasket is a frequently used gasket for a corrosive product and is recognized by the driver because of its green color. A purchase manager had the opportunity to buy "green" gaskets that were offered for the same application for a cheaper price.
  These gaskets, without a clear indication of the name Type A, but with the same dimensions and in (a slightly different) green color were bought and used without further checking of the properties of the material as if it was the original gasket. A driver used this "green" gasket during a corrosive product unloading operation. During this activity the valve started to leak, resulting in loss of product and (minor) burns as a consequence.

  An incident related to changing material without proper management of the material specification.

- An unloading site replaced their sulphuric acid tank. A new and fully equipped tank with one "minor" not discovered default: a tube connected to the pressure relief valve of the tank releases its vapors just above the tank truck connection. During the first unloading (on a hot summer day) the operator who was assisting the driver, got fumes in his neck and suffered from severe burns.

  The change in the design of the tank did insufficiently take care of the site lay-out.

- A transport company had to deliver LPG urgently to a client. No driver was available to load and deliver. Although the planner was qualified to do this, he had

been in an office function for a year. After consultation with his superiors, the planner decided to do the transport himself. He arrived at the loading site and because the loading was "self-service", he requested help from the operator. The truck had two connections, one slightly smaller than the other. The loading arm was connected to the smaller connection. Immediately after the valves were opened and the connection pressurized, the arm disconnected violently from the truck and a vapor cloud developed around both persons. The operator succeeded in closing the valve on the truck and pressing the emergency stop on the loading arm. Fortunately nobody was injured.

The competencies required for safe loading were not sufficiently addressed in selecting the planner as the driver.

When investigating incidents, a lack of Management of Change is indeed a frequently reoccurring cause. Providing guidance on how Change can be managed safely is therefore a key enabler in striving for "Zero transport incident/accidents" by the Industry.

The need for a Management of Change process is well established in the Chemical Industry[1]. But although various guidance documents for such a process are publicly available in a manufacturing environment, there is hardly any guidance published for the logistics component in the supply chains of the Chemical Industry, from Shipper to Logistic Service Provider to the final Consignee. This joint Cefic & ECTA Guidance document attempts to fill that gap.

Obviously, many changes are taking place and one cannot run the Management of Change process each time to address these changes, e.g. delivery of a product to a new customer. As shown in Figure 1 changes that occur frequently should be addressed by specific company procedures. Others may be in fact routine and low risk (e.g. change in delivery date of a product) and staff should be trained such that they can do these changes as part of their normal job. It is for each company to define when to use which type of approach to manage their changes. For example, a company involved in transporting packed goods might see the onboarding of a new driver as a low risk and perhaps routine type of change. However a company involved in the transport of bulk liquid Ethylene Oxide (EO), a high risk chemicals product, would have a full set of procedures ready for selecting and onboarding a new driver. If a company that transports EO has a very stable driver population and new drivers rarely enter the EO driver pool, it might be considered to use a MOC procedure to ensure that no significant changes have occurred to regulatory, competence and customer requirements since the previous

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[1] Throughout legislative and industry documents the 'Management of Change' subject is addressed, examples of which are:
- Directive 2012/18/EU (Seveso III), Annex III, item (b), sub (iv), http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012L0018
- 2015 Revisions of management system standards, e.g. ISO 9001:2015, ISO 14001:2015, Chapter 6.3
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onboarding. Further guidance on what ~~a~~ change is, in terms of the MOC process, and what not, is provided in Chapter 3.
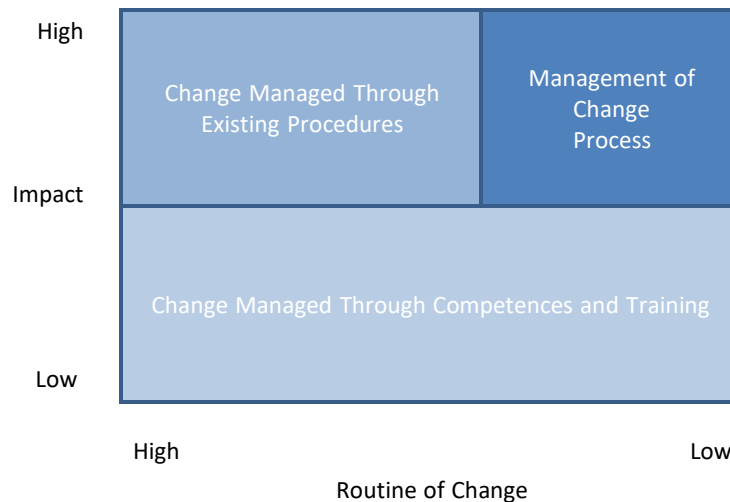
__Figure 1.__ Type of approach to Managem of Change depending on how often the change happens and the impact it might have.

A key feature of the MOC process is that the change is planned. Therefore, reactive (unplanned) changes due to circumstances encountered in the field, e.g. unloading in 2 tanks instead of one tank, are not in scope of this guideline.

In the case of reactive change, a safety review of the unplanned change should always be performed, associated with an authorization requirement to do such a change.

The MOC process described in this Guideline builds on well recognized Management of Change components such as

1. Identifying and describing the Change (including proposal and justification)
2. Authorization for the development (including identification of the MOC Team)
3. Scope development and risk assessment
4. Review and authorization for implementation
5. Implementation (including design, development, communication) and handover
6. Final approval

In addition, guidance on processes and templates will be provided for changes associated with technical, people/organizational and process matters.

Although this Guideline focuses on the HSE aspects of Management of Change, the underlying concepts and processes are applicable in general to ensure that other risk areas of change like accountabilities and responsibilities, financials, timing and

resources, legal, social responsibility are managed as well. Getting the HSE performance right leads to an efficient and effective organization.

2.   Scope and objectives

This Guideline, which is based on best practices in the contributing companies, describes procedures and tools to manage changes safely in chemical land logistics operations and organizations, both on- and off-site, including transport, intermediate storage, loading/unloading operations and cleaning, related to all modes of European land transport including intermodal transportation.

This Guideline and the tools included should provide a framework for companies active in the Chemicals supply chain to better manage changes associated with equipment, materials, products, people, organization, procedures and in doing so reduce the number of incidents and the associated harm to people and the environment.

3.   What is a change

Before one can manage a change it must be clear what change is and whether it needs a structured process to manage it.

3.1   Defining Change

A change is any change, permanent or temporary, that confronts people with a new situation not handled routinely. In principle every change requires a Management of Change to be implemented. There are 2 notable exceptions:

- A process/procedure already exists to deal with this change. This process/procedure needs to capture all aspects of the change as described further on in this document but doesn't require the initiation step (See Figure 2).
- The change is the direct result of an emergency situation/unplanned event. In this case existing emergency procedures need to be used. Once the situation is under control and there is a need to perform a subsequent change to prevent reoccurrence, the MOC-process needs to be initiated.

Table 1 lists potential change-categories. This list is not exhaustive and serves as a starting point for the thought process on whether an MOC is required.

Table 1. *Overview of potential change categories and examples of what does and does not belong in that category*

This type of change …	Includes changes to such things as …	Does not include …
Changes to any type of technology, equipment or physical asset	Equipment modifications or installations, including changing packaging materials, mode of transport, materials of construction, building or structural modifications to loading/unloading equipment.	Approved substitutions that serve the same purpose and operate in the same way.
Changes to operating discipline (procedures, policies, standards, Safety & Loss Prevention, Most Effective Technology (MET), etc.)	Loading and unloading procedures, plant policies, site or business rules or requirements, global standards, transportation regulations etc.	Updates in syntax.
Changes to a work process	Work process steps or step descriptions, roles and responsibilities, tools, etc. A change in the way something is done.	Switching from main to back-up systems if the operating procedure already covers this.
Changes to people's roles or responsibilities	Job or role change such as a new driver or loading/unloading operator	If a process/procedure for new employee introduction already exists and is followed.

3.2.   Deciding whether a change needs the Management of Change process

It is not always easy to identify when an action actually constitutes a change. Whenever there is doubt, it is advisable to consider that it is a change and follow the MOC-process. The below flow-sheet assists in this decision.
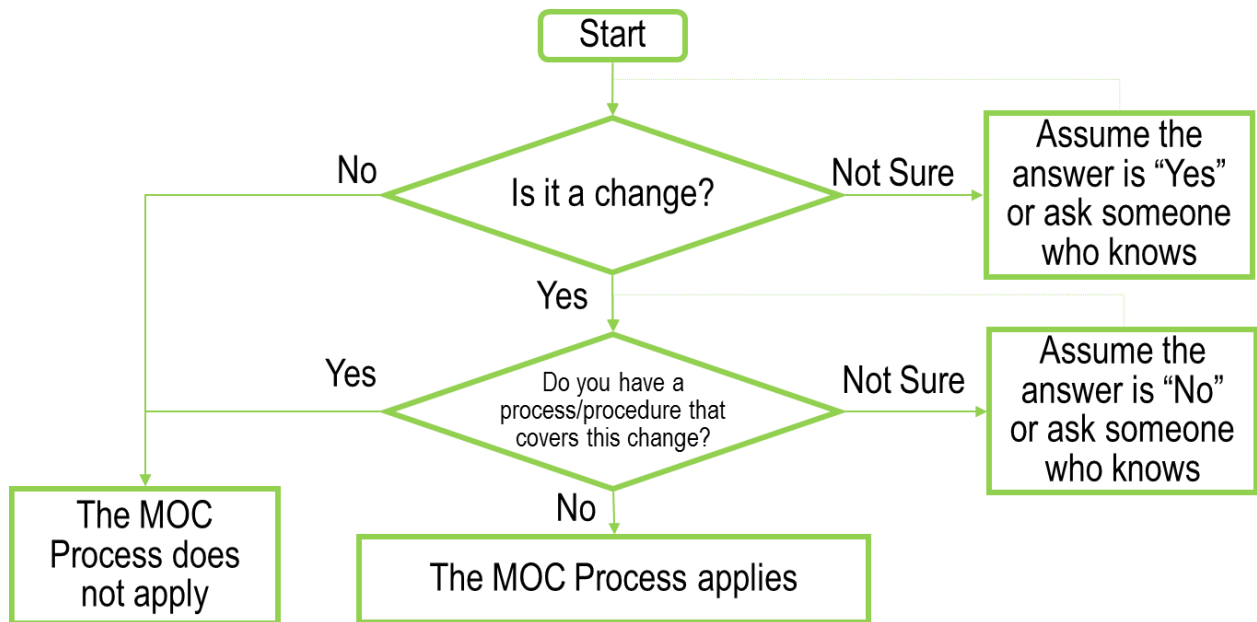
Figure 2. *The MOC process.*

4. The Management of Change process

The "Management of Change (MOC)" process can be identified by the following steps:

1. Identify and describe the Change, including a "Proposal and Justification"
2. Sponsorship/authorisation for scope development of the proposed "Change", including an identification of MOC team
3. Scope development (including Risk assessment and other implications)
4. Review and approval for implementation
5. Implementation and handover
6. Final completion (technical and operations acceptance)

These stages are defined in more detail below in terms of what needs to be done and what are the Roles & Responsibilities which differ from phase to phase.

4.1. Identify the Change – Description, Proposal and Justification

Responsible Person: Initiator

The proposed change should be identified and described by the person who wishes to initiate the change. This should be presented in the form of a basic scope description. The Initiator should identify the basic scope of the change and a justification for proposing that change.

The justification could be related to topics like:

- (Change in) Regulations
- Health & Safety & Environmental (HSE) improvements
- Technical improvements (new installations, machinery)
- Cost
- Efficiency
- Quality
- Organisational and people change

The initiator should provide enough information to allow the responsible authorising person to understand the proposal and the impact of authorising the development of the change e.g. estimated cost/size of the task, whether it will require significant resource/funds.
The initiator should also identify if it is a Permanent or Temporary change. Temporary changes should have a review date defined by which the change should be reversed.

4.2. Authorisation for Development (project sponsor) - Identification of MOC team

Responsible person: MOC Sponsor

This is the commitment and authorisation step to proceed with the more detailed and technical development of the scope. The MOC sponsor should be someone with the authority to approve the development time and resources (note: this person will mostly also be the Final Approver, see section 4.6).

The Sponsor should also nominate an overall Project Leader and project team with the required skills and competency to develop the scope of work.

The Project Leader should also consider if there are any specific "subject matter experts" required for the team. This may include internal or external resources.

Note – It is important that any management of change is subject to at least a second pair of competent eyes. When the Sponsor and the Project Leader is the same person an extra pair of eyes is needed for approval.

4.3. Scope development (including risk assessment and other implications)

Responsible persons: MOC Scope Development Team

This is the detailed definition and design stage of the proposed scope. The team should have the competency to recognise and define the potential risks, mitigating factors and design requirements.

Consideration should be given by the project team to:

- Any significant risks associated with the proposed change. This may include HSE, financial, product quality, customer impact etc.
- Risk assessment
- Where there are HSE implications, the team should ensure the core aspects of the process, as described in Table 2, are executed.
- Detailed design and costs.
- Define specification of any equipment, material, product, organization, complete drawings etc.
- Approval of "Fit for Purpose"
- Implementation planning
- Training requirements/procedural changes
- Identification of resource for installation and/or implementation
- Impact outside the own organisation
- Time plans – Windows of opportunity
- Pre-start-up safety review.

Table 2 *Key questions to manage the (HSE) aspects of a Change*

	Phase	MOC Core Question	MOC Assurance
1	Identify	What are the (HSE) risks of the proposed change	Have all the risks been identified?
2	Design	What needs to be done or which barriers needs to be put in place to address those risks	Are the corrective actions / barriers sufficient to manage the risk to As low As Reasonable Possible.
3	Check	Have all the corrective actions / barriers been put in place	Has it been checked that all actions have been taken.
	Who	Initiator, MOC Owner, SMEs	Subject Experts and Final Approver

For more minor changes the scope definition may be less complex.

Checklists and prompts can often be used as an "Aide Memoire" or prompting tool to ensure that the most common factors have all been considered (See Chapter 5. Tools). It is however also important that any such tools do not detract from the team's consideration of all the potential risks (i.e. the team must ensure it does not become a "tick box exercise").

4.4. Review and approval for scope implementation (including costs)

Responsible person: MOC Sponsor / Approver

Once the detailed design and scope definition including the resources (cost, time and effort) is completed, it should be approved. The authorization for implementation of the change is the responsibility of the MOC approver.

The MOC Approver should be the person in the organization who:

a) Is accountable for the change process and for ensuring that the technical aspects of the scope development has been completed.
b) Has the authorization to approve the costs and resources.
c) Has a knowledge and understanding of the consequences of the change, and the potential impacts to operations and business.

In general it is the same person as the MOC Sponsor.

4.5. Implementation and handover of scope of work (including detailing of any outstanding actions)

Responsible person: Project Leader

After receiving the approval, the agreed Scope needs to be implemented and properly handed over.

The Project Leader (see also 4.2) is responsible for

- Co-ordinating the implementation of change and monitors progress to completion.
- Reviewing if the work scope has been completed satisfactorily.
- Ensuring that there is operational acceptance of the change.
- Consider if any open items or deficiencies identified during or after implementation need to be addressed. These items should be identified as a list of action items.
- Ensure impacted employees, contractors and agency staff whose job tasks are impacted by the change, are informed and appropriately trained prior to implementation.

4.6. Final Approval

Responsible person: MOC Sponsor

In the final approval, the MOC Sponsor formally:

- Approves that the key risk and assurance questions as described in Table 2 have been addressed in the MOC-process.
- Acknowledges the completion of the "Management of Change" process.
- Approves that the defined scope has been completed and implemented, and is now part of "Normal Operations".
- Ensures that a proper archiving of the MOC documentation takes place.

5. Tools

To help the MOC Scope Development Team to recognise and define the potential risks, mitigating factors and design requirements, the attached Tool with checklists has been developed.

The purpose is to ensure the most important aspects have been considered when dealing with a change.

These checklists should be used to complement the key questions that should be asked to manage the (HSE) aspects of a Change (see table 2 of § 4.3).

Each type of change has its own set of questions made of a succession of open questions followed by two close questions. A "no" answer to a close question implies an action with the designation of a responsible person and a due date for the realization.

Please note that these checklists are far from being exhaustive and can be adapted to the change to be analysed.

To facilitate managing the progress of the MOC, in line with the process described in section 4, a tracking tool on the checklists is part of the Tool.

MOC TOOL

CEFIC - ECTA Supply
Chain MOC Tool.xlsm

A printable version of the full tool can be found in the following attached PDF. Printing on A3 will enhance the readability.

Printable version of
CEFIC - ECTA Supply

6. Examples

Below two examples that demonstrate how the MOC Tool can be used to manage a change. Please note the examples should not be considered to be an extensive overview of the actions to be taken. In contrast, they only sample a small part of the changes and actions that should be considered if such a case would indeed be encountered. Moreover as with all changes the MOC will heavily depend on the local situation.

6.1. Example 1

A transport company is considering becoming active in the transportation of HF (Hydrogen Fluoride), an extremely corrosive acid. HF is a product unknown to the Logistics Service Provider and needs to be transported from Antwerp to Rotterdam.

MOC_tool- Example HF.xlsm

6.2. Example 2

A warehousing company has received the information that, due to REACH regulations, one of the products stored was re-assessed and found to require classification as toxic or CMR substance. The product had been unclassified before.

MOC_Tool Example Warehouse.xlsm

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