Small Site MOC: Big Company Challenges without Big Company Resources

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Gateway Consulting Group, Inc.
8610 Transit Road, Suite 100, East Amherst, NY 14051
Ph: 800.668.2334, www.gatewaygroup.com

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Abstract

Many have argued that the PSM regulations impact small sites particularly hard. While small sites must comply with the same regulations as much larger sites, small sites are hamstrung by a lack of resources. This is particularly true for Management of Change due to the inherent complexity of MOC.

This paper focuses on the challenges of improving the MOC business process at small sites. An MOC improvement initiative generally involves improving the MOC business process, and then assisting with some form of technological automation.

The authors interviewed representatives from small sites to obtain their first-hand lived experiences, in order to properly ground the study.

Introduction

Managing change effectively has always been important at chemical plants and refineries. Lack of a proper MOC program the prime cause in a number of well-known accidents, including the Flixborough explosion [1], and a contributing factor in other well-known accidents [2, 3]. Certainly small sites are not immune to accidents where improper MOC was a factor.

Since the promulgation of OSHA 1910.119 [4]—the Process Safety Management regulations—proper Management of Change is a regulatory requirement, for Covered Processes (as defined in the regulation).

The Process Safety Management regulations cover 14 elements, much more than just Management of Change. As a result, when the regulations were first promulgated in 1992, substantial effort was needed to bring most plants into compliance. In this environment, with deadlines and potential penalties, Management of Change business processes were either hastily created, if they did not previously exist at the site, or quickly reworked and formalized from an existing business process.

Poorly or inadequately applied MOC processes have contributed to many incidents [2, 5] , and have been identified as issues in Refinery National Emphasis Program [6] and Chemical Plant National Emphasis Programs [7]. Based on the authors' experience, personnel who are required to use the MOC process, the "users", often have a negative view of the MOC process. User dissatisfaction may be due to a poorly-designed or poorly-implemented process.

Herber [8] notes that 85% of the Chemical Safety Board investigations occur at small companies, implying that small companies are disproportionally impacted by PSM issues, including MOC. Both Herber [8] and Goddard [9] elaborate on the reasons why small sites find PSM compliance so challenging.

Many small sites, whether triggered by an incident or simply a desire for enhanced process safety, attempt to improve their MOC systems. Improving MOC normally requires improving the MOC business process itself (the policies, procedures, forms, engineering aids, etc.). Efficiency improvements, and often better compliance, can be achieved by using electronic technology to implement MOC.

This paper summarizes the results of a survey of 64 sites who have attempted to improve their MOC processes. Some were independent small sites, while others belonged to a larger corporate entity.

This paper does not attempt to define MOC best practice, since that is well-covered by other authors [10-17]. This paper focuses on the effort, challenges and enablers that allow a small site to move on the path to best practice.

MOC Overview

A high-level model of MOC, referred to as a "lifecycle" model, is shown in Figure 1. The diagram depicts a permanent, non-emergency MOC process. A lifecycle is composed of "states": Initiation, Scoping, Change Design, etc. While the MOC is active, it could be considered to be "in" a state: e.g. the MOC is in the Approvals state.

Further details of lifecycle models can be found in the references [10].

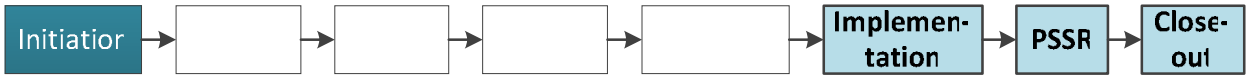

Figure 1. Typical permanent, non-emergency MOC lifecycle.

Characterizing Small Sites

What is a Small Site?

There are various metrics which can be used to characterize the size of a site:

- number of units or processes
- number of employees
- physical size
- proximity of coworkers
- revenue

At a small site, there may only be a few or a dozen units or processes, unlike a large refinery, where there may be up to 100 units.

A small site often has fewer than 100 people on site (without regard to whether these are employees or contractors).

Also, a site may be physically small so that it is convenient to walk, say, from the administration building to the control room(s); in a large site, it may be more practical to drive.

At a small site, technical resources are usually in the same building or even the same room. In contrast, a large site is bigger and has more formal communications, often respecting organizational boundaries and hierarchies.

How Do Small Sites Behave?

The small size engenders a number of behaviors, which promote efficiency:

- informal communication
- rapid decision-making
- easier consensus-building

Communication tends to be less formal at a small site, since coworkers see each other on a routine basis.

Decision-making is rapid, because the people that need to be involved, are close at hand.

Consensus-building is often easier, since it's often based on personal relationships, which may be stronger in a smaller organization.

On the other hand, a small site has:

- fewer total resources
- fewer opportunities for specialization

With fewer individuals, a given person may have many roles and responsibilities, so it is more difficult to become an expert in one domain—staff at small sites are required to be generalists [9].

The Best/Worst of Both Worlds: Small Sites as Part of a Larger Corporate Entity

The prior discussion contains an implicit assumption, being that the small site is completely independent of any other site or corporate entity. There are comparatively few small sites that enjoy that level of independence. More common is for a small site to be part of a larger corporate entity. This provides opportunities for collaborating with other sites and leveraging corporate resources, but also has a concomitant obligation to conform to corporate policies, procedures and technology standards.

The position of a site as an independent entity versus part of a larger corporation has an important impact on site autonomy and how the site may proceed in any MOC improvement initiative.

Research Methodology

Small sites may not have the same opportunity to improve their MOC systems as large sites have, due to resource constraints. This paper reports the results of a qualitative research study with input from a variety of sites.

A total of 64 sites were surveyed for this research. However, the sample was not random. The sample was biased in favor of companies and sites that had expressed an interest in improving their MOC systems. Consequently, 0% of the survey participants believed that their MOC systems were best practice, and 100% believed that improvements were possible and desirable.

Small, independent sites were surveyed as well as small sites that belong to a larger corporate entity, the latter being more prevalent.

The results presented in the following chapters, are be ordered by the feedback that was most prevalent: that is, the most common issues are stated first, the second most common next, and so on. Since this is a non-randomized, qualitative study, presenting quantitative results (e.g. x% of respondents had characteristic Y), is not statistically valid. As is common for qualitative research, the results could be used to identify relevant questions for a future quantitative study.

MOC Business Process Improvement

MOC improvement initiatives are generally conducted in two phases:

1. MOC Business Process Improvement: This is where the MOC process itself (policies, procedures, guidelines, forms, engineering aids, etc.) are updated.
2. MOC Technology Improvement: This is where the MOC process is implemented (or updated) using some form of technology.

Independent Site MOC Business Process Improvement Challenges

Based on the survey results the most common challenges for small independent sites are:

1. Uncertainty over who "owns" the business process
2. Lack of user engagement at the proper time.
3. Lack of compliance with existing MOC process

There is often overlap between the Quality organization and the Process Safety organization at a site. Both the ISO9000 quality systems program [18] and OSHA1910.119 process safety management regulations [4] govern how procedures are modified, approved and released. This creates situations where both organizations (rare) claim ownership of the MOC process, or neither organization (more common) claims ownership of the MOC process. While there may be a perceived need for MOC improvements, no one organization feels that it has the mandate to advance this kind of initiative.

An MOC Improvement Team ("Team") may work diligently at improving the MOC process. This team will no doubt solicit input from interested parties at the site, in an attempt to sincerely address MOC requirements contributed by several disciplines. Often, the site response is lackluster, and meaningful feedback isn't received until after the Team has completed its work, has updated the MOC procedure, and is now syndicating the new process throughout the facility. Of course, at that point, it is too late to incorporate the feedback without redoing much of the Team's work.

Sometimes site personnel do not execute MOCs in accordance with their existing MOC procedures: checklists are ignored, forms are not completed, and signatures are overlooked. User reactions while being trained in the new MOC process may be that it is "a lot more complicated". In fact, the new process may be much simpler than the former process, but if the former process was ignored, then the mistaken perception is one of increased complexity.

3.2 Independent Site MOC Business Process Improvement Enablers

Based on the survey results the most common success enablers for small independent sites are:

1. MOC redesign can be funded from local (often engineering) budgets
2. Someone is willing to "champion" the initiative
3. A streamlined process, without unnecessary steps, leads to higher compliance

MOC process improvement initiatives are often done with a combination of local resources and outside expertise. For a small site MOC redesign, the cost of the outside resources is normally within the approval limits of local site management. Funds are often available in budgets for engineering studies.

Good leadership of an MOC improvement initiative is important. A project champion, like a good project manager, is likely to keep the initiative moving, and is able to overcome obstacles.

Needlessly complex processes discourage compliance. Even a well-intentioned person may find it difficult or impossible to comply with a confusing process or one with unnecessary steps. A simpler process, streamlined to the essentials should encourage better compliance with MOC requirements.

3.3 Corporate Site MOC Business Process Improvement Challenges

This covers the case where a small site desires or is required to participate in an MOC process improvement initiative in conjunction with other sites or in compliance with a corporate initiative. Based on the survey results the most common challenges for small sites that are part of a larger corporation are:

1. Lack of a regulatory mandate
2. Difficulty in arriving at a consensus on the path forward
3. Impacts of acquisitions and divestitures

Some companies have dozens of sites, but only some of them have any PSM-covered processes. Nonetheless, the corporation mandates that business processes will be consistent across the organization, and therefore the non-PSM sites must implement an MOC process. A non-PSM site has less impetus for deploying MOC than a regulated site, so the effort and cooperation are necessarily less at the non-PSM sites.

Many companies pride themselves on their adoption of consensus management. Consensus management normally implies that most or all parties must agree to a new initiative or approach. This becomes problematic when a consistent MOC process is sought to address multiple sites whose needs are inconsistent. Sites with simpler requirements require considerable coaxing to accept approaches that address the needs of other, more complex, sites.

The current business climate is very dynamic with acquisitions and divestitures of assets (e.g. entire plants or facilities) being quite common. Unfortunately these may not be rapid events, but multi-year processes as a site is made available for sale, groomed for the sale (by cutting all expenses beyond the bare essentials), becomes the subject of bidding and speculation, and is finally sold. Once a potential sale is announced, MOC improvement initiatives stop almost immediately, since the participants await direction from the new owners.

3.4 Corporate Site MOC Business Process Improvement Enablers

Based on the survey results the most common success enablers for small sites, which are part of a larger corporate entity, are:

1. Effective championing
2. Effective facilitation
3. Effective buy-in

As mentioned in §3.2, having a person willing to champion the MOC process improvement initiative is a big contributor to its overall success.

One of the difficulties of redesigning the MOC process, on a corporate or multi-site basis, is that none of the participants may be experts in business process design, and each of them may simply understand his/her local process and not fully appreciate the processes at other sites. A facilitator, experienced with business process redesign and having MOC experience, is a vital member of the MOC Redesign Team. Without effective facilitation, the Team may degenerate into cycles of the form: first “A” is seen as the solution, then “B”, then “C”, then back to “A”, etc. The facilitator should avoid that.

An improved MOC process, with enthusiastic multi-site support, will experience better compliance than if such support were lacking.

4. MOC Technology Improvement

The second phase of MOC improvement initiatives is often to realize business process efficiencies by deploying an electronic MOC system.

Often, the MOC technology improvement is performed concurrently with the MOC business process improvement. That is a reasonable approach, since the available technology options put constraints on what is possible or practical during the redesign.

4.1 Independent Site MOC Technology Improvement Challenges

Based on the survey results the most common technology challenges for small independent sites are:

1. Budget limits
2. Positioning of MOC as a "tag-along" to another initiative
3. Lack of leadership

There are very real budgetary limits on what a small site can spend on a technology solution for what is perceived as an administrative process (in contrast with process control systems which are viewed differently). If the proposed technology fits into the site's spending limits, then the project can often proceed. If the project is more costly, then the justification process is so onerous, that site personnel either don't have the time or desire to pursue it.

There may be other technology upgrade initiatives taking place at the site, and the participants feel that they may be able to take advantage of economies of scale if MOC were upgraded at the same time. Often, there is a team with a mandate to implement better incident investigation and tracking; that team may be well-resourced. The person(s) responsible for MOC is invited to participate in the technology evaluation, again, with the hopes of obtaining a lower unit cost. The difficulty with this is that incident investigation (when measured by the number of tasks) is a much less complex process than MOC. So, the evaluation effort is actually inverted, whereby the simple process (incidents) receives a lot of attention, and the complex process (MOC) "tags along" and receives comparatively little attention. This will usually result in a sub-optimal MOC deployment, even if the technology selected is acceptable.

Similarly, there may be a team investigating electronic document management ("EDM") with the goal of managing process safety information and other important facility documents and drawings. Again, the person(s) responsible for MOC is invited to participate in the technology evaluation, again, with the hopes of obtaining a lower unit cost. This arrangement has a different problem. From a project management perspective, MOC is well-bounded. MOC lends itself to fixed-price, short-duration implementation because the MOC process requirements are similar from site-to-site—only the details differ. EDM, in contrast, is comparatively open-ended with many opportunities to expand the scope of the initiative by simply addressing more document types (PSI, environmental, maintenance, inspection, …). An EDM initiative is not typically fixed-price, and has a longer implementation duration than MOC. Combining MOC and EDM can be done. But the participants must understand that these different kinds of projects.

Lack of leadership is an oft-cited issue when implementing improved MOC technology at small sites. The difficulty lies in the fact that there are many people who want a better MOC solution—PSM Managers, MOC Coordinators, environmental representatives, the user community—but there may be no one who feels qualified to lead what is seen as an "IT project".

4.2 Independent Site MOC Technology Improvement Enablers

Based on the survey results the most common success enablers for small independent sites, undertaking an MOC technology improvement initiative, are:

1. Experienced partners
2. Effective championing
3. Supportive IT resource

Specifying and implementing an electronic MOC solution requires a number of specialized skills. It is unlikely that these skills exist at a small site, nor is it cost-effective to develop those skills. A technology partner with the requisite skills and MOC experience is an invaluable asset.

As stated previously, a project champion is a significant asset to an MOC technology improvement initiative. Technology changes often bring unexpected results, and the change the way people are accustomed to working. A champion is needed to reassure the doubters by explaining the merits of the "new" approach.

A small site electronic MOC implementation does not require much (measured in man-hours) support from IT. But it is usually difficult to accomplish with no IT resources. So a supportive IT person can significant streamline the implementation process.

4.3 Corporate Site MOC Technology Improvement Challenges

This covers the case where a small site desires or is required to participate in an MOC technology improvement initiative in conjunction with other sites or in compliance with a corporate initiative. The end-user survey had far more responses in this section than any of the others. Based on the survey results the most common challenges for small sites that are part of a larger corporation are:

1. An IT organization that wants to create a home-grown solution
2. An IT organization that wants to leverage existing vendor relationships, even when the existing vendor has little to offer
3. An IT organization that views MOC as an extension of the work order process
4. An IT organization that refuses to accept any solution a Team proposes, but offers no solution of its own

Many IT organizations have a mandate to provide technological solutions. IT may conduct "make versus buy" decisions, and decide that MOC is an application that can be accomplished in-house. Sometimes the decision is driven by the existence of programming resources that don't have any current assignments, so it appears that these resources are "free". The success rate of in-house MOC initiatives is poor. Oftentimes, the development team grossly underestimates the complexity of the MOC process and delivers solutions that are inadequate (by trimming the requirements to fit the budget) or consuming far more resources than planned (actual resource consumption of 10 times the planned resource consumption, is not uncommon). In-house development creates other forms of end-user dissatisfaction: as time goes on, the original developers move on to other projects, and the support for the in-house software wanes.

A common IT organization goal is to minimize the "technology footprint". In one sense, this can be restated as reducing the number of major application vendors that IT deals with. This is a reasonable goal, since each new vendor relationship has an associated cost. The problem arises when IT attempts to engage existing vendors that have no MOC solution or an MOC solution in name only (that is, something called "MOC", but lacking important functionality). The end-user community is quickly frustrated by this, because they see themselves teaching the vendor about

MOC, when the expectation is that the vendor should already be proficient in this area, and, in fact, be able to share experiences and best practices with the end users.

Almost all sites have an electronic mechanism for generating work orders. Some even believe that MOC could be an offshoot of the work order system, illustrated at the top of Figure 2, and evidenced by checkboxes on the work orders entitled "MOC Needed ? ☑". The creates a situation where MOC is a reactive process. By the time the work order exists, the *final* solution has already been accepted and is ready for implementation. Even if an MOC is triggered at this point, it causes all the essential MOC tasks— risk ranking, task scoping, design proposal, impact analysis, and approvals—to be conducted in a hurried manner, after the fact. These are really the activities that minimize risk and ensure that the MOC has been safety designed, so these are not the tasks that should be rushed. In contrast, the MOC best practice begins with a *proposed* solution, and the MOC concept is developed and risk mitigated throughout its lifecycle. The latter approach, illustrated at the bottom of Figure 2, is the recommended approach. Work order systems are used to implement the MOC activities in the physical plant—so work order systems are important to the overall process. But a work order system on its own is too little, too late, to be a viable automation tool for MOC.

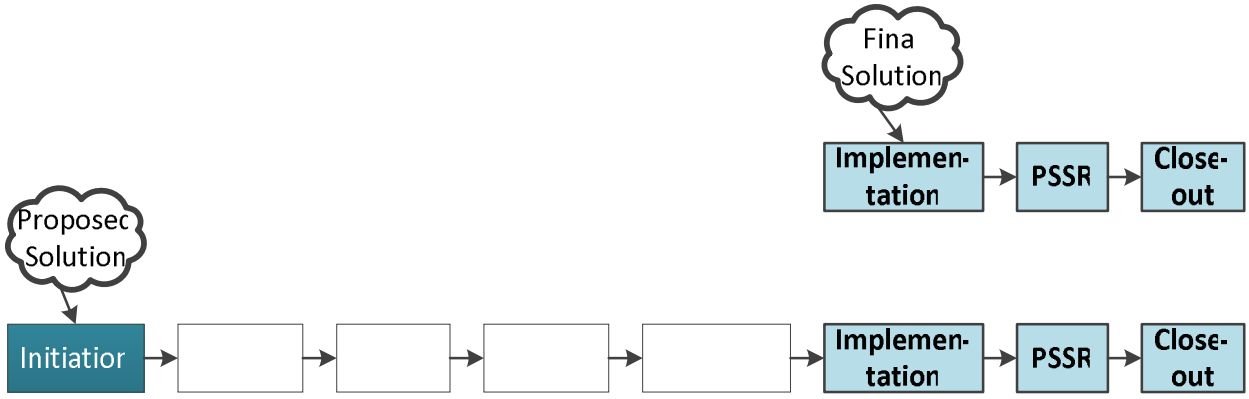

Figure 2. MOCs triggered by work orders (top) versus MOCs independently triggered by a need for change (bottom).

Finally, some IT organizations simply refuse to assist with an MOC improvement initiative. They are unwilling to accept the technology recommendations from the MOC Improvement Team, yet are unwilling to recommend an alternate solution. There may be legitimate reasons—manpower, budget, other priorities—but these reasons are often not exposed to the MOC Team.

4.4 Corporate Site MOC Business Process Improvement Enablers

Based on the survey results the most common success enablers for small sites, which are part of a larger corporate entity, are:

1. Supportive IT organization
2. Experienced partners who have experience with enterprise MOC rollouts
3. Executive commitment

Section 4.3 identified 4 barriers to success of an initiative to improve MOC technology, on a corporate basis. All of the barriers dealt with IT issues. The counterpart to that, and one mentioned by all the successful MOC Team, was the support of a capable IT organization. Much of the work is performed by third-party vendors, so the work load on IT is minimal, but the support of this organization must still be there.

Corporate MOC deployments are complex. Not only is the MOC process itself complex, but there are legitimate variations between business units (usually because the processes or hazards are different). An experienced partner will understand and highlight the trade-offs of various levels of standardization and site-specific deployment.

In previous sections, the importance of having someone champion the initiative was stressed. That is no less important for a corporate MOC technology initiative. But also, due to the cost of these larger initiatives and the impact on the organization, it is necessary to have executive support as well.

5. Conclusions

Independent smaller sites have some advantages over larger sites, since communication is easier and decision-making more rapid. They also have some disadvantage due to a lack of specialized resources and resources in general. Small sites that are part of a larger corporate entity may be able to leverage corporate resources, but may also be constrained by corporate policies.

An MOC improvement initiative generally has two phases: a business process improvement phase and a technology improvement phase. The two phases may be concurrent.

A survey of 64 companies identified a number of challenges experienced during MOC process improvement initiatives, primarily:

- uncertainty over who "owns" the MOC process
- lack of a regulatory mandate (at some sites).

The success enablers experienced during MOC process improvement initiatives were primarily:

- redesign efforts are comparatively inexpensive and can be funded from local engineering budgets
- effective championing of the effort

The challenges experienced during MOC technology improvement initiatives are, primarily:

- budget limits
- IT organizations who want to create their own MOC solutions, but may not be able to complete this project successfully

The success enablers experienced during MOC technology improvement initiatives are, primarily:

- experienced partners
- supportive IT organizations

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Gateway Consulting Group

For the past twenty years Gateway's consultants have provided services over a wide range of activities, including: IT architecture, IT strategy, requirements gathering, vendor selection, system design, system implementation, system deployment, system upgrades, system validation for regulatory agencies, and production system support.

Gateway has been engaged by over 200 past clients in industries ranging from discrete manufacturing, life sciences, and process/petrochemical. Gateway has a wide range of experience in managing technical information and optimizing business processes for engineering and manufacturing.

Gateway's consultants develop information management strategies to improve the safety and efficiency of business processes in these highly regulated environments. Gateway also maintains a team of experienced project managers and information management professionals to implement the recommended process improvements.

Gateway views Management of Change "MOC" as the key business process to examine in order to drive down operating costs, improve plant safety, environmental protection and reliability.

Gateway's Management of Change solution represents years of research and hands-on experience led by Dr. Rainer Hoff, President and Senior Principal Consultant, Gateway Consulting Group, Inc. Dr. Hoff is the editor of the MOC Best Practices Newsletter and the instructor for MOC Best Practices Seminars.