Shell’s Experience Implementing a Manual of Permitted Operations

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ABSTRACT

Shell Exploration & Production Co. (SEPCo) and Shell Canada Ltd. (SCAN) have developed and implemented a comprehensive risk management tool to provide standardized and consistent direction and guidance for their onshore and offshore operations personnel. This tool is called the Manual of Permitted Operations (MOPO) and can be applied when faced with conditions or conflicts in activities or operations that could threaten safe operations. The MOPO includes a set of matrix charts which uses a “traffic-light” coded approach to indicate when activities can proceed unrestricted, can proceed with caution, or are prohibited. These activities and operations include wells, production, transportation, and maintenance and construction. The MOPO covers concurrent operations, external influences, and impaired Safety Critical Elements. Guidance is provided for each matrix to assist the user with understanding the threats associated with the activity, and what additional controls may need to be implemented to proceed with caution.

Users include maintenance planners, project engineers, supervisors, technicians, operators, and line managers. The tool is routinely used during work planning, approval, and during the work when conditions change, and does not add significantly to the time for completing those activities. MOPO is also used as a communication and training tool.

The MOPO is constructed from existing documents and processes including HSE Cases, bowties, maintenance procedures, operating procedures, HSE standards and regulations. Teams consisting of experienced senior technical and operations personnel are engaged to conduct validation of the matrices and provide guidance for incorporation in the tool. Asset leadership provides support of the implementation through providing resources for the validation and nominating site personnel as Focal Points for the roll-out training.

Sustainability is achieved through ownership of the tool by the Operations Safety Managers coupled with a robust competency assurance and document update feedback system.
1 INTRODUCTION

I did an internet search the other day. Judging from the number of consultants offering to assist with developing a Manual of Permitted Operations (MOPO) and the number of job openings for someone that has the skills to implement one, the subject shouldn’t be unfamiliar to most operations and maintenance personnel working offshore. Familiarity doesn’t always mean everyone working with the MOPO has the same view of it or that it is even considered as accomplishing the same objectives.

Shell has had a requirement to have a MOPO for many years in the upstream business. One part of the MOPO, what we call Simultaneous Operations (SIMOPS) has been around for years. SIMOPS was mostly about drilling and completing wells while producing on offshore platforms. Work planners and supervisors reviewing work permits offshore found the SIMOPS to be a valuable tool in providing a means to assist with consistently applying risk management controls to the various activities occurring on a daily basis. I can’t count the number of times I sat in a work permit approval meeting and heard the OIM (Offshore Installation Manager) ask: “What else is going on at the same time and what does the SIMOPS chart show?” Not that they didn’t already know, but they wanted to make sure the work planner had looked at it first.

Starting in June 2007, Shell Exploration and Production Co. chartered a team to implement the MOPO. Aided by the startup planning for the Perdido platform in the Gulf of Mexico, the MOPO team was able to convene workshops to build the MOPO starting with a clean sheet with the exception of the existing SIMOPS that was decided to be minimally revised only to remove duplications. Using the architecture commonly known for a MOPO, the team went about developing and implementing the procedure. Once the word of the perceived value in the full tool came to the attention of the Asset Managers the team was directed to accelerate the implementation and roll out of the tool in the shortest reasonable time. The team completed the training for Asset Focal Points, and in July 2009 the procedure was published for use in the Gulf of Mexico production assets. Custodianship of the procedure now resides with SEPCo Deepwater Operational Safety.

Based on the success in the offshore business, it was decided to follow that process for development of the MOPO for the onshore business. The onshore production business consists of field production facilities, gas plants and insitu oil production in Canada and USA. The rollout of the MOPO tool for Onshore production was substantially complete in December 2010. But what was thought to be easy the second time around quickly changed when the development and rollout ran into challenges from leaner assets. The result brought about an evolutionary change in the approach to using the tool with the advent of the Combined MOPO that only indicated prohibited situations; leaving the original tool available for use as guidance or for training.

What follows are the details.
2 WHAT IT IS

No, it’s not just SIMOPS. When we initially engaged any new group of potential users of the MOPO there was invariably a broad spectrum of knowledge about what the tool actually consisted of, when and how it was to be used, and then there was the big question: What is it going to do for me?

There can be very complex set of activities that can occur at a production facility, and many can be occurring at any one time. What field staff and supervision needs to know is which activities may be in conflict with any other activity, environmental influence, or which may invoke an unplanned event that would result in the need to activate some type of safety equipment to mitigate the impact. This is provided by the MOPO.

MOPO is a visual tool that brings together a collection of activities and situations in one place to provide information on when certain combinations can occur that can threaten safe operations. The MOPO is in the form of traffic-light charts to indicate when activities should not proceed (red), proceed with caution (yellow), or proceed unrestricted (green). The MOPO tool consists of the following 4 charts which are discussed in detail below:

- Concurrent Operations (SIMOPS),
- External Influences,
- Impaired Barriers (some are considered Safety Critical Elements),
- Combined MOPO (chart is only implemented in Onshore business).

For those from the drilling industry the MOPO should sound familiar as it is basically the same as the Summary of Operational Boundaries (SOOB) referred to in the International Association of Drilling Contractors document on guidelines of HSE Cases for Land Drilling Units published in 2009.

A. Concurrent Operations

This is what most people are familiar with; SIMOPS. The conflict between two activities occurring concurrently has been the most commonly addressed concern. This matrix chart has the same activities/operations listed on both axes. The real key is deciding which activity takes priority. That decision will be left to the facility supervisors to work in real time.

If you want to know how many activities can safely occur concurrently – in other words when to say “enough is enough”, SIMOPS won’t give you the answer. During our on-site rollout, we got a lot of questions about multiple activities being a concern. Like many decisions, this one must be made based on experience of the supervision and personnel conducting the work. The distance between concurrent activities also impacts what can be done safely. For most onshore assets that are large, it is entirely possible that concurrent operations may not have an impact if done at widely separated locations. This is not to say that SIMOPS won’t indicate when multiple activities conflict with only one activity, and in the Onshore Production SIMOPS, there is one in particular that stands out: Remote Isolated Work. The reason for the high number of prohibited activities for lone workers is primarily based on the need for some activities to have more than one person (e.g. hot work and confined space entry require a person to watch). Figure 1 shows how the SIMOPS chart appears.
B. External Influences
The environment we work in impacts what we try to do in many ways. Although mostly weather related, External Influences also include man-made conflicts such as Visitors to the site, Third-Party Equipment, Lack of Resources (equipment and people), Loss of Utilities, Restricted Site Access, etc. Figure 2 shows the External Influences matrix.
C. Impaired Barriers (Safety Critical Elements)

As we get better and better with understanding threats imposed by safety equipment that fails in service, it has become apparent that there is a second dimension; what activities or operations should be curtailed when a safety related system is off-line or malfunctioning. Shell has established a series of eight Safety Critical Element (SCE) groups. Each group consists of several specific items of hardware and each has a performance standard that must be periodically tested to verify it is operating within the specified limits. The MOPO provides direction as to what corrective action must be taken and what activities or operations must be curtailed or are prohibited when a safety barrier or SCE is impaired.

The Impaired Barriers charts are unique for each asset type. As one would expect there is a substantial difference between the SCEs for an offshore tension-leg platform (TLP) and those for an onshore gas production field. For example TLPs have hulls, mooring systems, fire and gas detection, fire suppression systems, etc. Onshore field production sites typically have few if any full-time staff and rely on routine inspection and maintenance with a limited amount of safety interlocks. If size matters; this is the largest of the MOPO charts. Figure 3 shows the Impaired Barriers chart.
D. A Combined MOPO of prohibited activities

One quick look is all it takes to see the show stoppers. It has been decided that the use of this chart is mandatory while the other three charts are considered to be for information purposes.

The Combined MOPO chart is a compilation of the prohibited activities from all three of the primary MOPO parts. This chart shows only those matrix intersections that are prohibited by law, Shell policy or procedure, and a few limited decisions by the team that validated the tool. For simplicity, this chart is constructed using only red cells on a grey background.

For those that need to know why, there is a legend that provides the regulation citation reference, the Shell procedure, or if the prohibition has been established by the business supervision. Figure 4 below shows the Combined MOPO for Field Production.
E. Other Vital Parts
The construction of the MOPO changed from what the developers originally envisioned almost immediately after work started on it. The generally accepted architecture basically consisted of a set of the three matrix charts set up using a “traffic light” approach. Microsoft Excel® was selected to build the tool since it fits the need of being able to build matrix tables in color and was part of the company standard software suite. The capability to use hypertext links was found to be an added benefit.

The development was a learning experience not only for the facilitators, but the contributors as well. The activities and operations were identified that needed to be included. Not a simple task, but required input from several disciplines. Once that was completed the task of assigning traffic-light colors started. It then became apparent that some of the “proceed with caution” activities needed some explanation as to reasons to be cautious. So some notes were entered in the spreadsheet cell on the chart. Can you imagine an “eye chart” within an “eye chart?” Well that seemed to work okay for SIMOPS, then External Influences, but when it came to the Impaired Barriers chart notes in the spreadsheet cell wasn’t going to work.
The resulting tool is a spreadsheet with multiple tabs. It is intended to be used electronically or visually in the form of hard-copy wall charts.

F. Supporting Guidance and Documentation

As the needed explanations came rolling out from the team of subject matter experts (SME) it also became apparent that a place to capture their wisdom and experience needed to be included. With the capability to use internal and external hypertext links it turns out that Microsoft Excel® was the right choice. Tabs were added to the workbook to incorporate the guidance for each matrix. In the electronic version, Hypertext links were used to guide the user to a table where the activity or operation guidance was placed. A tab for a table of Activity/Operation definitions was included, and a tab for user instructions, and the all important “General Rules” of logic in applying the tool correctly. Within each matrix, a set of references for the operation or activity, External Influence, or Impaired Barriers was also included that would take the user to the Shell standard for that subject. Figure 5 shows an area of the SIMOPS chart that shows references.

Figure 5: Section of SIMOPS showing reference links

3 THE PURPOSE OF THE MOPO

Okay, so now you know what it is, but still want to hear what it’s for? It is pretty straight forward. The purpose of the MOPO is to facilitate risk management by eliminating or reducing activities that could compromise safe operation and to do so consistently across all operations and facilities. This is done using the mechanisms described as follows.
A. Provides guidance for decision-making
   When situations could arise that could compromise safe operation, MOPO uses the traffic light color yellow to indicate that one should proceed with caution. When the matrices were constructed, if the response to the question of proceeding with operations under a given circumstance was: “well, it depends”, the cell would be color-coded yellow. In this situation, the tool provides guidance by way of the documented rationale.

B. Provides a process to assess if additional controls are needed
   For Shell, the MOPO chart for Impaired Barriers is tied to a series of documented Technical Integrity Performance Standards (TIPS). Each of the TIPS has a section on MOPO, and it provides direction on what steps must be taken when an SCE or Safety Barrier is impaired. Some require only a notification to implement repairs, others to notify the Superintendent, and others disallow certain activities in the area of impairment up to and including production. For some impaired SCEs, alternative controls may be used on a temporary basis to allow work to continue. The Impaired Barriers chart gives operation personnel a quick assessment if the activity/operation can proceed, proceed with caution or is prohibited without first digging into the related documents.

C. Provides a comprehensive set of references
   Since the MOPO is mostly based on existing safety procedures and standards the tool includes these as hypertext links to the internal documents. There are reference links associated with Activities/Operations on the SIMOPs chart, the External Influences, and the Impaired Barriers. External regulations are not included as links, and are only referenced on the Combined MOPO used for Onshore. It was thought to be redundant if the internal procedures and standards referenced a regulation that would be adequate, thus not needed to be included on the MOPO. This also avoided the administrative burden of maintaining external hypertext links.

D. Enables consistent and accessible guidance across all assets of the same type
   Shell is working very hard to simplify and standardize as many processes as possible across its asset base. MOPO was designed to do this by tailoring the MOPOs to be consistent across similar asset types. Rather than have a unique MOPO for each asset (e.g. fixed-leg platform, tension-leg platform, gas plant, etc.) it was decided that there were so many more similar features than differences that the MOPOs should be the same for “types” of assets. In all, there are six MOPOs for SEPCO and SCAN assets; three for offshore (spars, tension-leg platforms, fixed-leg platforms), and three for onshore (field production, gas plant complexes, insitu oil production complexes).

E. Documents experience and lessons learned
   As is the case in many oil and gas companies - and Shell is no exception - when we look at the staff profile there is an obvious concern about succession. One way to maintain knowledge is to document it. The rationale tabs added to the tool provide guidance from the experience of the senior level field and technical leaders on how to manage specific and unusual circumstances. This is one of the rare times in the MOPO when an activity/operation may be shown as prohibited without having a regulatory or documented procedure to support the direction. It is intended that this information be retained for future reference once those senior people have gone and are no longer in a position to bring their experience directly to bear.
F. **The MOPO is for permitted operations and not for prohibited operations**
One of the basic foundation philosophies of the MOPO is that people know and follow the rules. Thus the MOPO is for normal and routine work activities and operations conducted as they should be, and not to provide justification to proceed with something that should not be allowed. This may seem like a fundamental basis for most activities, but the MOPO is not all inclusive; there may be changes, temporary or permanent that could bring rise to activities or conditions not listed. Just because something isn’t on the MOPO does not mean it is automatically allowed.

A good example of this concept is the unlikely operation a pressure vessel above its maximum allowable working pressure. You won’t find this activity/operation on the MOPO; so don’t interpret this to mean it must be okay to do so. It should be obvious it is not an acceptable practice.

G. **Who uses it and when**
Now that we know what the MOPO is to be used for, what is in it, the next part of the process is to learn who uses it and when they use it.

Below shows a list of people who use the MOPO and when they are using the tool. The MOPO can be consulted by a number of different people (disciplines) doing different things at different times during their work related tasks. This is not always the case, and many users find that they have been doing what the MOPO is designed for in their normal routines and have been for years.

1. **Planners**
The maintenance planner will be one of the primary users of the MOPO during work planning. Planners use it when scheduling maintenance activities. How often they consult will depend on what other activities/operations may be occurring when the work they are planning needs to occur. The closer to the scheduled work the more consultation is needed. Considerations include not only other concurrent activities, but also the weather and if there are impaired SCEs that could impact the work and vice versa.

2. **Supervisors**
Supervisors will use it when reviewing or approving work activities in advance of the work. This includes activities governed by work authorization processes that require “permits” or the new term for this “Work Control Certificates”, but also for work governed by procedure that does not require a permit.

3. **Project Leads**
Project Leads use it during planning for small projects to be implemented during operations. This use is similar to that of Planners. There are many variables and first use could be months before the work is scheduled. Consideration of weather and impaired barriers would be done closer to the work start date.

4. **Construction and maintenance supervisors**
The line management with the “big-picture view” will use it during the work planning and conducting the work in the field. Since this supervisory level staffs are expected to be most knowledgeable regarding the overall construction and maintenance activities, the expectation is that they should know what is planned and what could be compromised during the work. This
also includes knowing when “enough is enough” and to defer certain activities that are not essential at that time.

5. **Field personnel**
Changes in the work environment can be cause of concern for the safety of the workers and the facilities. Changes can occur in the weather, concurrent work activities that may be in conflict, or a piece of safety critical equipment becomes impaired during the work. Even with all the planning being done as good as we can do it, there are times when people doing or supervising the work need to use the MOPO in the field when conditions change. In most cases, changes in the work environment create some form of reaction from the work crew. The MOPO provides a tool that can be consulted to reinforce what the people in the field probably sense anyway. They usually know when to stop work because of safety concerns. The MOPO can assist in cases where the work can proceed, and help workers understand better what threats to consider and, if present, eliminate them to make the job safer.

Although there are a number of users, there are really just a few who will need to use it routinely. How often these people consult the MOPO depends on the complexity of the activity being considered, the number and complexity of other activities, and the size and complexity of the facility. Figure 6 shows a graphic of the work flow process of using the Combined MOPO.

**Figure 6: Using the Combined MOPO**

6. **Non-work activity related uses**
The way the MOPO was developed provides a wealth of knowledge that goes beyond what it was originally envisioned to be used for. With the addition of the rationale and reference links, the tool has become an asset that can be handy in many ways.

a. **Reference and Consultation**
We have already mentioned the tool can be used to look up rationale during planning. There is a feeling that something “just isn’t right” intervenes. The various hypertext links to internal procedures and TIPS, and the rationale tabs for the SIMOPS, External Influences, and Impaired SCEs provide an easily accessible tool for users to work from related to the activities they are
interested in. The Combined MOPO for Onshore also cites regulations applicable to activities that at times may be prohibited due to certain conditions or impaired safety equipment.

b. Communication
If you want to know what the special of the day at the diner is, just look at the chalk board. It’s hard to imagine a way to communicate certain information that could be easier. Okay, just take your white board marker and put a note or marking on the MOPO wall charts. They’re laminated in plastic so when you want to remove the note, just rub it off. So when the planner is trying to get a job set up and he sees a certain SCE is impaired or offline for testing that would impact the work they’re planning, it’s a no-brainer; just reschedule once they find out when the SCE will be back on line. Supervisors can also see conflicts when reviewing WCCs for approval. Likewise field crews can also see conflicts the very day of the work when the morning meeting goes through changes that have occurred overnight; they just mark up the wall charts when they’re going through their meeting, and there it is, right there for everyone to see it.

c. Training
We’ve already mentioned “the big shift change” that’s coming. We know there will be new people coming into the company, coming into new positions, coming into different work environments, coming in to work in a field where they may have worked before, but not for Shell. When are these new people most vulnerable to errors or omissions? Here’s where the MOPO can provide a quick one-stop shop overview of activities and operations and key information right at the start. How? The traffic light approach is simple and easy to understand. And, as mentioned above, the references and rationale are easily accessible.

4 HOW IT IS USED
Now we get to the direct application of the MOPO. There is a defined process, a series of steps, that will result in the user getting to the answer they need whether it’s okay to proceed without restrictions, or there is a need to consider other controls, or stop and rethink how to get the task done. This is not a new concept nor is it a new activity. People planning work, authorizing work, and doing the work have been doing this for years. Rather than having a tool, they have been doing it mentally using their knowledge and experience to guide them. The difference is that now there is a collection of knowledge and experience developed from teams of several senior people that logic would tell us is better yet.

A. Determine the activities/operations required to perform the job
The most important step is to understand what the job entails. There can be several activities, or a few. Either way, the scope of work and activities/operations impacted needs to be determined. It is also just as important to consider what external influences may be impacting the work environment, and if there are impaired SCEs that affect the work. Once these are determined it’s time to consult the tool.

1. Combined MOPO
For Onshore Production, go to the Combined MOPO chart first. The chart is printed on tabloid size paper so it’s easy to carry or put on the desk top for reference. The use of the Combined MOPO is mandatory. The sequence of steps provides the solution:

1. If the activity is not listed, it is not prohibited.
2. For each activity/operation identified that is listed, read across the chart to see where the red cells are present.
   a. During job planning or approval, consult the references to determine the reason for the prohibited activities. Determine if the prohibition if driven by regulation or Shell requirement. For Shell requirements, it may be possible to obtain a formal deviation. For regulatory requirements, an alternative approach must be taken. Evaluate what changes, if any, can be made to the job plans to allow the work to be done. Do this for each red cell associated with the activity
   b. During work; STOP the work, then re-plan to avoid the conflict.
3. If the activity is not prohibited in the first step, the user can consult the other three charts for information as described below.

2. Using the Three Basic MOPO Matrices
   So things don’t seem quite right and you want to check on potential pitfalls. The use of the standard three MOPO charts is similar to the Combined MOPO with one exception. There are traffic lights on the charts, not just red cells. The sequence can be in any order. What’s important is that one needs to consider all of the charts to see if there is a conflict on more than one chart. The activities/operations on the vertical axis is the same on all of the charts to make finding them easier.

The MOPO charts when printed turn out to be large and are intended to be posted on the wall of the room where permits are reviewed. Since these are large and not easily portable, the electronic version can be downloaded for use on a laptop. Figure 7 shows the flow of logic for using the basic three matrices.

Figure 7: Using the three basic MOPO matrices

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Is the planned operation affected by...

   Concurrent Operations
      Yes → Comply with SIMOPs matrix
      No

   Adverse External Influences
      Yes → Comply with External Influences matrix
      No

   Impaired Safety Critical Elements
      Yes → Comply with Impaired Barriers matrix
      No

Proceed per activity-specific documentation
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Use the screening questions below to select the appropriate matrix. If uncertain, assume "yes".

- Does the situation involve simultaneous operations (e.g., drilling while producing or welding while venting, etc.)? Then go to the SIMOPS matrix.
- Does the situation involve external influences (e.g., high winds, lightning, extreme temperatures, site visitors, etc.)? Then go to the External Influences Matrix.
- Does the situation involve impaired or non-functional Safety Critical Systems or barriers (e.g., malfunctioning or unavailable communications system, fire and gas detection system, or firefighting equipment, etc.)? Then go to the Impaired Barriers matrix.

If the answer to all screening questions is "no", work may proceed per documented requirements for the activity.

Once the chart(s) have been determined:

1. Locate the operation/activity of interest along the Y-axis of the matrix.
2. Follow across the row to the potential conflict (concurrent operation, external influence, or impaired barrier).
   a. If the cell at the intersection is green, the desired operation may proceed. NOTE: Operations personnel may still choose not to proceed with the activity until the conflict has been eliminated (other activity is completed, external influence is no longer present, or barrier is no longer impaired).
   b. If the cell at the intersection is yellow, contingency actions are required before the desired operation may proceed. See step 3.
   c. If the cell at the intersection is red, the desired operation may not proceed until the impairment no longer exists or until a variance/deviation is approved by the appropriate authority (e.g., Operations Manager).
   d. If the cell at the intersection is gray, the operation, external influence, or impaired barrier was considered to be not applicable at the asset.
3. Yellow indicates there are potential situations that may need additional controls. The rationale for the assigned color for a given cell and recommended contingency actions may be found in the Rationale worksheets that are part of the MOPO, in the MOPO section of the technical integrity performance standard for the relevant Impaired Barrier or SCE(s), or in other relevant standards and procedures. The user can activate the hypertext link to the Rationale worksheet and it will take them directly to that operation/activity, External Influence or Impaired Barrier. Additionally, there are links to reference procedures or TIPS that can be activated. Note that the user must be on line and have active access for the hyperlinks to documents outside of the MOPO tool to work.

B. Important points to remember
There is always something else that we need to remember. One key principle in all of our operations is that:

Everyone has the obligation and authority to stop work if they feel it is unsafe!

Other ground rules and assumptions:
- The MOPO does not address everything.
• There are other complementary procedures such as Integrated Safe System of Work (ISSOW), Risk Assessment, JSA, MOC, etc. that need to be done along side of MOPO; it does not take their place.

• The guidance provided for Impaired Barriers assumes the operation/activity is in the vicinity of (within the area affected by) the Impaired Barrier (e.g., if the portable fire extinguishers in one area are not functional, hotwork is not permitted in that area.)

• The guidance provided for External Influences assumes the operation/activity would be within the area affected by the External Influence. With production facilities spread out over a large geographic area something such as lighting may affect only a part of the area and thus only impact work in that area.

• Consider impact of External Influences on personnel and operability of equipment. For example, if excessively cold, could that make performing the task more difficult/dangerous for worker and could it impact the ability of equipment to function per design?

• Asset Leadership shall be immediately notified whenever impairment of safety critical systems/elements is detected (e.g., Complex Technical Team Leader, Complex Manager, Field Supervisor, and/or Maintenance Supervisor).

• Cells coded yellow indicate that the operations/activities can be continued, with conditions. In some cases, the specific operation/activity is not directly impacted by the barrier that is impaired, but consideration should be given to deferring non-essential work that could increase risk exposure.

• In the event of a major incident, the Incident Command Structure (ICS) or Emergency Response Plan program takes over the management of the operations.

5 HOW TO CONSTRUCT A MOPO
How many times have you heard “The Devil is in the details”? Now that we know what it is what it’s for, and how to use it, here’s how to make a MOPO. This is really the challenge for the custodian. Although it is tedious, it’s not all that difficult. Simply take things one step at a time.

First it is necessary to establish who is going to do the work of building it and facilitating workshops that we will call the “developer”, and who will be the “owner” of the document. These are essential roles that are typically assigned either by the nature of the organizational structure or on an ad hoc basis by senior leadership. Once these roles are assigned, the process can begin.

A. Determine the scope
Is the MOPO for a specific asset or set of similar assets? If your organization has HSE Cases for its assets, use it as the basis and the starting point for information. The HSE Case should have sections that include a description of the Scope of the Asset, the Facility, the Hazards and Effects Management Process. It also includes a list of Safety Critical Equipment.

If there are several similar assets, be sure to gather the data from all of the assets and compare them to avoid omitting important considerations.
B. Build a “strawman” set of matrices

Build something that others can work from to get the job started. The MOPO developer has a specific role at the start of the process that will save a lot of time. A “strawman” can provide a picture of what the outcome should look like, and by building it, avoids taking valuable time from the experienced operations and maintenance staff to build it from scratch. In some instances this may be the only way to get a MOPO into use.

The strawman should contain everything the MOPO needs, and be as reasonably correct as possible.

1. Identify Activities/Operations

The scope of the HSE Case should provide the best input to this list. What is done at the asset? Is there road haulage in or out? How about rail? Is there a gas fractionation process or just separation and sales? Is there sulfur loading? The Hazard Register should also provide important facts. Is aviation transport a hazard?

Identify the threats and escalation factors that can compromise safe operating limits. The bow ties are a key source for this information.

Just as SAP has information not in the HSE Case, there should be a set of local operation instructions for various activities and equipment specific to the asset. These local procedures provide a view of the tasks that are performed on a routine basis or may be infrequent but of such a high risk that a procedure was developed and documented.

2. Identify External Influences

The geographic location is a primary consideration in determining what external influences might be a concern. Is the asset in the Gulf of Mexico? Is the facility in the Rocky Mountains? There is a list of external influences that stays pretty constant for offshore versus onshore assets depending on the latitude. A third dimension for this matrix is that of human intervention. It’s not just about natural phenomenon, but people can be an important external influence. Consider site visitors, outside the fence public, people as resource, etc. each will have a different effect on some activities.

3. Identify the Safety Critical Elements

In addition to the HSE Case, the list of “Functional Locations” from SAP PM (the plant maintenance program) also provides valuable information. The Functional Locations includes the items in SAP that are inspected and maintained on a periodic basis. It is often the case that the list of items in SAP is longer than that in the HSE Case since many items are not on bow-ties, but are still in the PM program.

The Global list of Safety Critical Elements can also be a source to consider making sure important items are not overlooked.

C. Validate the MOPO

Now that the strawman looks like it’s ready it’s time to put it to the test. Assemble a team of subject matter experts, experienced operations and maintenance personnel, and conduct a “Validation” workshop. The length of time for the workshop will vary depending on the complexity of the asset and types of operation/activities done there. A typical offshore platform...
should take almost a full week to be done in adequate detail, whereas an onshore production field
could be done in two or three days. The real trick to it is getting just the right amount of input
from the right people. Too many people will drive more interaction; too few will result in an
incomplete tool, and not enough “shared ownership.” Be sure to include the appropriate
stakeholders. It should be obvious that people from supervisory level should be sought from
operations, maintenance, constructions, logistics, projects, and any groups that may be
conducting concurrent activities like drilling and completions. Don’t forget to invite the
designated in-house experts (in Shell they are referred to as “Technical Authorities”) for the
session on Impaired Barriers. A broad horizontal cross section is much more important than
getting a broad vertical spread.

1. There is only one place to start
Collectively review the Activities/Operations along with their definitions. Add, modify, or delete
as appropriate. Be as clear as possible and make sure you’ve got the quiet participants to speak
up. If the field users don’t know what you mean by an operation or activity, then they can’t use
the tool correctly. What is important here is to make the definitions fit the activity as the users
know it. Forget the dictionary.

2. Review each matrix in turn
It is typical practice to start with the SIMOPS matrix. Probably because it’s the most commonly
known from experience, and it’s less likely to be controversial. Since the team has agreed on the
operations/activities, go ahead with reviewing each of the traffic light choices. What will happen
several times is that the team will come up with an answer of “well it depends….” Guess what?
That’s a yellow cell. Go to the Rationale tab for that operation or activity and make some notes
on what issues to consider when a choice needs to be made to proceed or defer that activity.

Proceed with the External Influences matrix. Collectively review the External Influences,
references, and their definitions. Once the External Influences are clearly established, the team
can go through the traffic lights. As with the SIMOPS matrix, document the rationale when it
would be helpful for users to understand what other considerations should influence the decision
to proceed or defer the work.

One observation that usually occurs when reviewing the External Influences is that well defined
limits do not exist for most activities. The team will be faced with many decisions. Take care not
to make a cell red if there are times when work can proceed. Because of the need for an approved
Variance in order to proceed, it will unnecessarily delay the work or worse cause work to
proceed when there is a prohibition. Challenge red cells; they’re okay, but don’t use them
without due consideration.

It is recommended that the last matrix reviewed be the Impaired Barriers. This is usually the
largest, and best defined of the three. The work done internally to provide operating limits and
guidance when impaired barriers are found has been the focus of a great deal of work globally
within Shell in the past few years. Shell also has appointed Technical Authorities for various
disciplines that can assist with reviewing the matrix and providing Rationale documentation. In
their role, the Technical Authorities are also the owners of the Technical Integrity Performance
Standards.
There is a difference in the Rationale documentation between the Impaired Barriers matrix and the other two. Because of the need to understand just what impairment means, the definition has been added to the rationale tab along with considerations when decisions to proceed or defer are being made. For some Safety Barriers impairment is relatively straightforward, but not all. Actions to take when barriers are found to be impaired are usually straightforward, but not always. Some difficult questions arise for some of the more complex facilities and the rationale should provide information about who to contact for guidance in certain situations. An example of just such a situation is when a flare ignition system is offline. What if in this case production is prohibited? Should the platform be shut in and depressured? Where does the gas go? Right out the flare system that’s not working right. The result could be a large gas cloud that engulfs part of the platform if the wind conditions are blowing the wrong way. There needs to be a better answer so use the Rationale to provide the field with guidance on who to contact to resolve the actions to take.

6 HOW TO IMPLEMENT THE MOPO

Now that the MOPO has been built and validated it can finally be put into use. After all, the end user is really who needs this the most. One of the most important aspects of implementation is that it must be supported by the Asset Leadership. What we find is that there are often several other programs that are being rolled out simultaneously that compete for the time of the field staff. Thus the implementation must often be coordinated with these other programs being rolled out since parts of the MOPO may overlap with those programs (e.g. Asset Integrity programs that include inspection and maintenance of SCEs). With an understanding of the “big picture”, here’s how to do it:

A. The Documents

Ideally, taking the approach of preparing program documents and publishing them in the on-line system first is the best approach. This doesn’t always meet the timing needs since the group managing the documents also has a lot of work on their schedule. If you need to proceed with rolling out the tool before the documents are published, that’s possible but provisions are needed to distribute them to those people that need them.

The risk of having the documents online before a formal roll out is that the intended users can access them before they are properly trained. This should be considered a minimal risk for MOPO because most of the content is based on existing requirements that should be in practice anyway.

Since the procedure will be maintained as a controlled set of documents, we used the established procedure in place for the business. Although there were differences in the Offshore and Onshore document management processes these were easily dealt with by working through coordinators for these established systems.

The processes to develop the tool brought to light several important aspects of the documents that needed to be prepared that will allow sustainability. It’s important to remember that when developing a new procedure that includes, as part of it, the process to develop a new tool or product, that it must provide enough direction and guidance so that future users can accomplish their task. What we ended up with as key parts of the procedure are:
1. **Prepare training materials**

Now that the documents are complete, the training material should be prepared. Since the approach mandated by the operations leadership was to use Focal Points at the sites, two training packages were prepared. This included presentations for both Users and for Focal Points. Along with the presentations, training tools were made of the full-size MOPO charts, examples problems, and two sets of test questions were made, one for Users and one for Focal Points.

As part of our roll out process, we also included a feedback form so participants could provide us with their views on what went well and what we needed to change in our training approach.

One thing we discovered after conducting some of the on-site training was that other related groups or disciplines also needed to get an awareness of the MOPO. In response to this suggestion from the training feedback, we conducted awareness training sessions and found them well received.

2. **Arrange training sessions**

There are two ways to do the training in the field; try to train everyone that needs or wants it, and train a select group of Focal Points. Since we had the mandate to go with Focal Point training approach, all that was left was to set up and conduct the on-site training. The commitment of the Asset Managers again is critical in getting resources and participation in the training.

With the help of the Asset Managers who nominated the Focal Points and the local site training coordinator, we visited each facility and conducted the training during the course of about three months for all onshore assets. We limited the sessions to 1/2 –day in length to allow site personnel time to deal with early shift duties, and still attend the training. During the training we presented the presentations, went through example scenarios, administered the test including reviewing the answers with the class and collecting the names of company identification of each person, and asked for feedback on the forms.
The on-site training also provided the opportunity to show and use the MOPO charts. One set of the full ANSI D-size charts was posted at the training session so that the participants could see them. With the completion of the on-site training each site was then considered a “live” site.

B. Follow up activities
With the popularity of web-based surveys, we developed a survey for users to find out what was going on with MOPO about six months after the on-site training. We found this to be helpful in identifying gaps in the training from Offshore and applied it to the Onshore roll out. Further follow up is planned through internal HSE audits as a topic for the team to assess during their on-site visit.

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