

**Lessons from National Academies Report:  
“Evaluating the Effectiveness of Offshore Safety and Environmental Management Systems”**

**By**

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On June 19, 2012 the National Academies at the request of the US Bureau of Safety and Environmental Enforcement (BSEE) published a report entitled “Evaluating the Effectiveness of Offshore Safety and Environmental Management Systems (SEMS).” [http://www.nap.edu/catalog.php?record\\_id=13434](http://www.nap.edu/catalog.php?record_id=13434) As chair of that report I was asked to comment on what the Committee learned about process safety performance indicators (KPIs) for major accident prevention.

The report makes the following comments on KPIs:

“Specific KPIs associated with SEMS effectiveness are difficult to define and need further study and evaluation by both the industry and BSEE. Common safety and environmental metrics such as the number of injuries per year or the volume of spills per year provide only a part of the effectiveness picture. Other metrics need to be identified as lagging or leading indicators in relation to process safety. Once identified, such metrics can be used to monitor and direct the improvement of SEMS.

**“BSEE can collect and evaluate data from operations within and across installations to identify specific problems and trends in operations at a particular facility and across the industry.** This information is needed to evaluate the SEMS audit approach and to identify opportunities for improvement. While the benefits from such a data exchange are obvious and important, implementation is far from trivial. An open data-collection and data-sharing protocol requires agreements across all parties to ensure that confidentiality and legal concerns are satisfied. **BSEE should distribute information in a timely manner to the industry on trends and methods for improving the SEMS process and overall safety, as well as lessons learned, by means of publications, workshops, seminars, and other methods.**

“Offshore safety organizations abroad that have programs similar to SEMS, such as PSA Norway and the UK HSE, have access to a considerable amount of data. Because many of the safety and environmental issues associated with offshore oil and gas operations are common worldwide, a data set compiled from all of these organizations would be invaluable. **BSEE should create a task force with the industry, Petroleum Safety Authority Norway, the United Kingdom Health and Safety Executive, and other similar regulatory bodies worldwide to identify KPIs.** Creation of such a task force will help BSEE ensure that it is collecting the proper SEMS-relevant data and analyzing it appropriately to direct the agency’s effort to measure the effectiveness of SEMS.”

Although the Committee did not identify any specific KPIs for predicting the probability of major accidents, it did make a series of recommendations to BSEE for a holistic approach to evaluating the effectiveness of SEMS in a particular operation, and by extension reducing the probability of occurrence

of a major accident. I would like to propose that such a comprehensive method for evaluating the effectiveness of SEMS on a given installation can be considered a performance indicator for major accidents.

Let me explain:

### **1. The Problem:**

Common KPIs, such as the number and size of oil spills, lost time incidents, doctor cases and fatal injury rates, etc., seem to correlate with “occupational” or “personal” safety, but do not seem to correlate to the occurrence of major accidents or what the report calls “process” or “system” safety. One good example of this is that both BP and Transocean had excellent records on the KPIs being collected at the time of the Macondo incident. Indeed the very day the accident occurred there was a celebration on the rig of its safety record according to the then available safety KPIs. At the end of the year Transocean top management was eligible for bonuses based on the “safety record”, determined by existing KPIs, in spite of the Macondo accident.

The Committee could not identify any objective hard data that would have predicted that a major blowout with disastrous results was imminent or more likely to occur on the Macondo well than in any other operations.

Both the President’s Commission report and the National Academy report on the Macondo incident point to a need for industry to develop a better “culture of Safety”. Neither report defines what is meant by an appropriate “culture of safety” or how to measure that that such a culture exists.

If we accept the premise that the degree to which a culture of safety exists in an operation is a performance indicator for major accident prevention, the problem becomes, “How can we determine that an appropriate culture of safety exists?”

### **2. Defining a Culture of Safety:**

Decisions are often required to be made under the stress of time and other pressures, with competing goals and with inadequate, insufficient or uncertain information and consequences. A “culture” is a set of shared values and beliefs that interact with an organization’s structures and control systems to produce behavioral norms. A “culture of safety” can then be thought of as a culture which allows factors influencing critical decisions to be made in such a way as to reduce the risk that competing goals and inadequate knowledge compromise safety.

To build a culture of safety requires both MECHANISMS to be in place and ACTIONS at all levels of the organization to reinforce the use of these mechanisms.

Looking at it from an ORGANIZATIONAL perspective there must be:

- MECHANISMS that establish structure and control by specifying what is needed for safe operation and providing for checking to see that these specifications are being followed (SEMS’ organizational element), and

- ACTIONS that establish safety norms by encouraging people to act properly even when no one is looking, when it is not in their immediate best interest, when under stress, or in the face of inadequate, insufficient or uncertain information.

Looking at it from an INDIVIDUAL'S perspective there must be:

- MECHANISMS that build competency by developing individual knowledge and skill (SEMS' requirements for training, operating procedures, and safe work practices), and
- ACTIONS that show the motivation to act in accordance with behavioral norms when under stress and in dynamically evolving conditions.

Thus, an organization's culture is created by having the correct mechanisms in place and by thousands of individual actions by staff at all levels. The culture must be established by the top leadership, but must be owned by middle managers and line workers, because "[n]o matter what regulatory system is used, safe operations ultimately depend on the commitment to systems safety by the people involved at all levels within the organization" (NAE-NRC 2011, p. 116)."

### 3. Relation of SEMS to Safety Culture:

A properly functioning SEMS addresses the "mechanism" elements necessary to create a culture of safety:

From an Organization perspective, SEMS requires a structure and system of controls

From an Individual perspective SEMS requires providing for training and competency

However, SEMS does not address the "action" elements necessary to create a culture of safety:

From an Organization perspective actions are needed to establish behavioral norms

From an Individual perspective actions are needed to enable the individual to strike the correct balance between competing goals and to recognize inadequate, insufficient or uncertain information and consequences.

Thus, SEMS is a "necessary" but not "sufficient" element in creating a culture of safety. By itself the mere existence of a SEMS program does not assure that the action items are creating the correct norms.

The problem can now be restated, "Can we evaluate the effectiveness of a specific SEMS program in such a way as to measure both the "mechanism" and the "action" aspects of a culture of safety in a specific operation?"

### 4. Compliance Evaluation:

Evaluating whether a SEMS program is in compliance with a prescriptive regulation is possible with a pass-fail assessment.

It is possible to objectively evaluate with a pass-fail analysis whether a SEMS program exists on paper, does it cover all required elements and does it cover the elements in sufficient detail. Such an evaluation only determines the existence of the mechanisms aspects (structure, control, and competency) for a culture of safety are in place. But it cannot evaluate how well these mechanisms are actually used in practice. This requires an evaluation of the action aspects (norms, motivation, and behavior).

Compliance by itself cannot be used to measure the degree to which an adequate culture of safety exists in a specific operation.

## **5. Evaluating the Action Aspects:**

Evaluating the action aspects requires evaluating the degree to which SEMS is understood by all, and is actually utilized as designed. That is, do the norms and motivations of an adequate culture of safety actually exist in everyday practice?

Such an evaluation requires time, onsite observations and subjective judgment. A good evaluation requires a team which is familiar with both the technology and the operating environment. Implementation of numerous and complex human actions over time is never perfect and can always be improved. An evaluation that does not find something which can be improved concerning human implementation of a safety management system is probably not a good evaluation.

Thus evaluation of the action items needed for an adequate culture of safety cannot be measured by a pass-fail system. Things are never going to be perfect and there is always room for improvement. When it comes to this type of safety audit, no news is not good news. It may merely mean the audit was incomplete. Some type of grading system is needed and there needs to be a feedback to management on areas for improvement.

## **6. A Holistic Approach to Regulation:**

The Committee recommended the following holistic approach to determining the effectiveness of SEMS:

- Inspect for compliance to prescriptive regulations and to mechanisms of SEMS
- Require both internal and regulator initiated audits which focus on a grading system based on:
  - Interviews with a sampling of workers and first level supervisors
  - Grading each of the elements of SEMS
  - Reviewing and discussing results with leadership
  - Repeating periodically to find trends
  - Publicly reporting results to provide both a carrot and a stick
- Establish Whistleblower Program
- Coordinated international search for a suite of KPIs where possible
- Gather, analyze and disseminate learnings across operators from inspections, audits and incidents

## **7. Conclusion:**

The Committee did not find or recommend a specific set of performance indicators for evaluating the effectiveness of SEMs. Rather, it recommended a holistic approach to evaluating the effectiveness of SEMs for a specific installation including inspections for compliance, both operator internal audits and regulator initiated audits, a whistleblower program and a coordinated international effort to identify performance indicators for major accidents.

By implementing this holistic approach to evaluating the effectiveness of SEMs, it is possible to have an understanding of the culture of safety which exists in a given installation. This understanding taken as a whole could serve as a performance indicator for major accidents.