

# SEMS, Safety Case and Risk Assessment: What do they have to do with Culture of Safety ?

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# SEMS

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## Management Principles

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## Elements

Planning

Employee Participation  
Process Safety Information (PSI)  
Process Hazards Analysis (PHA)  
Pre-Startup Safety Review  
Emergency Planning and Response

Organizing

Operating Procedures  
Safety Work Practices  
Training

Implementing

Contractor Safety  
Mechanical Integrity  
Management of Change

Evaluating

Incident Investigation  
Compliance Audits



# SEMS

- ▶ Prescriptive in the sense that it tells what elements must be covered in the SEMS
- ▶ Non-prescriptive in the sense that it does not specifically describe how to achieve the elements
- ▶ Hazard Analysis tends to focus on process systems and preventing incidents
  - Built into a Hazard Analysis is some form of qualitative risk assessment
- ▶ Mitigation, evacuation and escape are covered under Emergency Response and Control
  - Historically not much attention to formal risk assessment
- ▶ Continuous improvement is covered under Investigation of Incidents and Audit



# Safety Case

- ▶ Non-prescriptive in that a goal of level of safety is set and operator must make the case that it is met.
- ▶ Document how goal is reached in
  - System Design, Fabrication and Construction
  - Operation
  - Maintenance
- ▶ Still need to perform Hazard Analysis and provide for Emergency Response and Control
  - A formal quantitative or qualitative risk assessment is required
- ▶ The other elements of SEMS must still be addressed to document that the goal is reached. For example, can the risk analysis be valid without assuring Training? Mechanical Integrity?
- ▶ Does that make this in reality as prescriptive as SEMS? And SEMS as non-prescriptive as Safety Case?
  - Are we tied up in definition distinctions without a real



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# Risk Assessment

- ▶ A formal assessment, either quantitatively or qualitatively, of probability and consequence
- ▶ Required by both SEMS and Safety Cases
- ▶ Is a risk assessment needed to prove the advisability of following established engineering practice for well known designs?
  - API 14J says what is needed is a check to make sure established engineering practice was followed
- ▶ A risk assessment **is needed** to justify deviation from established practice or for new situations where good engineering practice is yet to be established
- ▶ Is a risk assessment needed to demonstrate Emergency Response and Control?
  - Probably “Yes” for large complex rigs and facilities
  - Probably “No” for simple production facilities and well established drilling activities



# Benefits of Risk Assessment

- ▶ Causes designers, operators and maintenance personnel to think through potential disaster scenarios
  - Must be done by the actual designers, operators and maintenance personnel and not by specialized risk assessors
- ▶ Can point the way to improvements in design that were not uncovered by the normal Hazard Analysis
- ▶ Can point the way to improvements in operations and maintenance that would not be uncovered by adherence to standard SEMS practices

Can document that under the assumptions used an acceptable level of individual risk rate is



# Detriments of Risk Assessment

- ▶ Can focus the attention on documentation rather than analysis and understanding between designers, operators and maintenance personnel
  - This is especially true for quantified risk assessments
- ▶ Can lead to a false sense of security
- ▶ Risk assessment is a good tool if used carefully and not believed too closely
  - Better at understanding differences between defined alternatives in design
  - Not so good at determining individual risk rates
  - Not too useful in determining whether a “Culture of Safety” exists



# “Culture of Safety”

- ▶ A culture is a set of “shared values and beliefs that interact with an organization’s structures and control systems to produce behavioral norms.” B. Uttal
- ▶ To accomplish a culture of safety from an organizational perspective there must be:
  - **Mechanisms** Establishing Structure and Control – to specify what is needed to operate safely and check that it is being done
  - **Actions** Establishing Safety Norms – encourage people to act properly even when no one is looking or it is not in their immediate best interest
- ▶ From an individual perspective there must be:
  - **Mechanisms** Establishing Competency – knowledge and ability of the structure, control and behavioral norms
  - **Actions** Establishing Motivation – so a totally selfish person would act in accordance with behavioral norms



# Does SEMS (Safety Case) Assure a Culture of Safety?

- ▶ A properly functioning SEMS addresses the “**mechanism**” elements necessary to create a culture of safety
  - Organization – a structure and system of controls
  - Individual – training and competency
- ▶ SEMS does not address the “**action**” elements
  - Organization – actions establishing behavioral norms
  - Individual – actions establishing motivation
- ▶ SEMS is a “necessary” but not “sufficient” element in creating a culture of safety



# Does Risk Analysis Assure a Culture of Safety?

- ▶ Probably not
  - Most quantified risk analysis tend to focus on things whose failure rates can be measured
  - Most quality risk analysis assume SEMS soft elements (training, work practices, job analysis, MOC, etc.) are in place and operating effectively
- ▶ The cause of major accidents or the cause of incident escalation to major accidents almost always has a human component
  - “80% of all accidents are caused by human failure
- ▶ Risk analysis is NOT an end in itself
  - It is a tool to be used in developing SEMS



Risk analysis is necessary but not sufficient

# Assessing a Culture of Safety with PINCs and Checklists

- ▶ **Assessing Compliance** is possible with a PINC (pass-fail) assessment
  - Does it exist on paper
  - Does it cover all required elements
  - Does it cover the elements in sufficient detail
- ▶ Compliance assesses the **mechanisms** aspects but not the **action** aspects necessary for a Culture of Safety



# Assessing the Action Aspects of a Culture of Safety (norms and motivation)

- ▶ Assessing Action Aspects requires understanding
  - **the degree to which** SEMS is understood by all, and is utilized as designed, and
  - determining if the correct norms and motivations actually exist
- ▶ These are never absolute and can always be improved
- ▶ An audit of the actual operations is required
- ▶ Requires onsite observations and **subjective judgment**



It cannot be pass-fail

# Government's Role in Influencing Norms and Individual Motivation

- ▶ Issuing INCs before the fact leads to attitude of “compliance equals safety” and does **NOT** influence behavior
  - INCs correlate to “**personal**” safety but not to “**process**” safety
- ▶ Issuing INCs after the fact for inappropriate behavior (“The Stick”) does not often influence behavior
  - Fear of punishment has proven to work to provide a minimum level of expected behavior
  - Fear of punishment does not normally affect basic attitudes



So what is the role Government could play?

Check for compliance of the mechanisms (SEMS)

Grade and Counsel before the fact to help management

# Benefits of Grading and Counseling

- ▶ Help corporate leadership better understand how to strengthen the actual structure, controls and competency that exists in their operations
- ▶ Help corporate leadership understand how to improve the actual state of behavioral norms and motivation in their operations
- ▶ Develop 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
- ▶ Changing from an INC mentality (punishment) to a cooperative mentality (consultation and advice)



# Conclusions

- ▶ From a practical standpoint both the SEMS and Safety Case approaches are a mixture of prescriptive and goal setting regulations
- ▶ There is no practical difference between the two approaches (other than in terminology) except perhaps in the emphasis on Emergency Response and Control
- ▶ Both require risk analysis be done
  - The degree of documentation and quantification varies by regulatory body
  - Greater documentation and quantification probably does not contribute to developing a better Culture of Safety
- ▶ A Culture of Safety requires documentation AND actions
- ▶ A Culture of Safety cannot be measured by a pass–fail compliance based regulatory regime
- ▶ Government can encourage or discourage the development of a Culture of Safety

