

Identifying & embedding good practice in Process Safety including the role of Executive Leadership; how to achieve engagement and common practice; Learning lessons from past incidents

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‘When we think about Process Safety, we immediately default to the technology and engineering aspect of our architecture, contemplating and analysing, have we designed a safe and operable system and/or, process? In past times, it wasn’t until an incident had been reviewed or investigated that any systematic errors would be identified, and this has in recent years resulted in a sometimes reactive culture within industry itself. Good practice in Process Safety always starts with Leadership and the culture built around such roles, identifying with Industry experts and best practices such as dynamic assessments, honest reviews, and finally an open environment to learn from our own internal lessons or mistakes. The purpose of this paper will be to highlight the key role that Safety Culture plays in both preventing and contributing to an accident/incident, and/or hazardous environment(s), along with identifying what key areas an organisation can focus on to meet their own internal Process Safety goals. Industry Case studies of accidents will be reviewed and discussed, with emphasis placed on how critical Safety Culture and the role of Leadership can be, in maintaining Process Safety within our industries, and continuously staying ahead of the hazard curve.’

Introduction

When conducting the accident analysis of any incident, typically the focus in the past has been on the accident itself, the *immediate causes*, and the *basic causes* etc. It was not until more recent times that the *underlying causes* of an accident, and the role of safety culture itself came in to play.

The investigative techniques of the past typically focused on hunting down *who* was responsible for ‘*causing*’ the accident, and making sure they were punished or removed from the operational process altogether. Since the emergence of how critical a role, culture (in particular Safety culture) can play and impact process safety at our sites and throughout our organisations, the hunt for ‘*the person responsible*’ for an accident, is no longer enough meat for the proverbial justice sandwich, we must dive deeper to understand the *how* and the *why* this sacrificial scape-goat of yester-year, was indeed motivated to make such a critical decision that led to disaster, what the human factors were which led to the enabling conditions of such a disaster/incident, and indeed finally *why* was one of our colleagues in such a situation in the first place?

If we can identify the *Underlying causes* of accidents (safety culture etc.), understand the decision making process of the individual(s) involved, and analyse the Human Factors around the incident, people, organisation, etc., we can indeed start to identify (honestly), where our gaps lie with regard to our operational processes and procedures, how our current culture influences our people on the ground, and finally then start to implement our *Lessons learned strategy*, rolling out these lessons not only to our sister sites and organisations, but to the industry as a whole.

Let us start by looking a little more closely at the ‘*role of Executive Leadership*’, and how critical this position can be when implementing things like change management with relation to Safety culture, and the various other challenges associated with this critical role.

The role of Executive Leadership

The role of Executive leadership comes with responsibility that at times, the person in that position may not realise the extent of.

Finding the balance between developing and maintaining the organisational culture, whilst also remaining aware and focused on the Human Factor(s) with regard to decision making, and above all, identifying and embedding good practice in Process safety.

How well an Executive Leader nurtures and develops the internal Human Factors within the team(s) and organisation as a whole, and merges those with the internal and external Organisational factors themselves, is ultimately what defines the culture of the Organisation.

See below some key factors we should look to build our foundations on when responsible for Process Safety as Executive Leaders, but also hallmarks to remember when actively pursuing those targets and goals:

- Organisational factors:

Internal processes, culture, and external markets (productivity/financial/sectors). What organisational factors are driving the decision making of an Executive Leader? How does this impact on our team(s) and/or achievement of our goals?

- **Human Factors:**
Individual and group decision making (analytical, directive, conceptual, behavioural). Conscious and unconscious biases, and what they might be with relation to each individual and group within our organisation or team(s). Fast and slow thinking with respect to each individual's (or group's) decision making model, is key to understand also. We need to remember as Leaders within the organisation or group/team, that if we do not understand how our team or people are making decisions on the ground, and what motivates them to make certain decisions at key safety critical junctures within our safety eco-system at site, then we cannot hope to influence those behaviours successfully, or achieve or process safety goals.
- **Strategy:**
How much influence does the Executive leader have with regard to the overall strategy? Are there Organisational influences? As Leaders responsible for the safety of our process and people, it is critical to have a solid strategy that can be communicated effectively to our people, and organisational stake-holders. Define the strategy early on, get input from all stake-holders within the group (end-user and operational also), and provide a clear picture as to where the current status is, where the team or organisation wants to go, and how this will be achieved.
- **Leadership:**
Influencing behaviours and outcomes within ourselves and others, to achieve our goal(s). Knowing our own and others decision making style(s) and model(s), is key to firstly establishing a common communication and universal dialogue with our teams, but also it can allow insight in to how a group or team may perceive certain leadership styles.
This allows for a stronger engagement level when we understand our team's innate leadership models (how they perceive the message we are delivering, and how they make their decisions).
- **Governance:**
Compliance and management with processes. Ensuring smooth transition into new processes. This is typically the biggest challenge an organisation faces, as innately most site personnel find this part of the change management process the biggest challenge (moving to a new way of doing things). Continuous assessment of process execution and understanding, at a higher frequency in the early and initial periods, just to offer guidance and alignment, can yield positive results, and achieve governance.

How to achieve Engagement and Common Practice:

There are several ways for us to achieve engagement as Leaders within our organisations, and again they are centred around our people and supported by our processes.

When we speak of *Engagement*, we typically look to define ways in which we can reach all levels of our site teams, so as to inspire and develop the desired traits and cultures we look for when chasing our process safety targets and goals.

In this space there are 3 main components that are key areas of focus within this process safety eco-system, and they are as follows when defining *Engagement*:

- **Communication:**
What is the message we are trying to deliver? How is it being delivered? Is it being understood? Are we engaging our teams for dynamic feedback?
The key to communication when delivering the message, is to understand the personality types and professional backgrounds of the group, team, or site personnel we are dealing with.
We must be aware of how this message is being delivered firstly (virtually, in person, etc.), the environmental factors (is this at site and are their other work related or time related responsibilities/constraints distracting our personnel at the time?), and do we have a reference point that all parties in the meeting can relate to? Reference points are key baselines to work from when looking for engagement, and unfortunately in the past, these may have been incidents in which a hazardous event has occurred, possibly resulting in injury or fatality, but are extremely useful for galvanizing engagement amongst the group.
- **Credibility:**
Who is delivering the message? Does the message stand up to peer scrutiny? Are the sources of our message credible, for example, do we have credible people delivering our message? (i.e. Is it an ex-operational management/leader(s) delivering the message to operational personnel?)
The key to credibility when speaking of *engagement*, is to share a common experience with the audience we are looking to engage. If we have leaders from a different background and experience, attempting to engage an audience of a completely different background and experience, this allows for doubt to creep in amongst the group, and the engagement focus could be lost.
- **Concept:**
What are we trying to deliver? How are we going to achieve this, and why it is a worthwhile investment?

The key to achieving conceptual success, is in how clear and achievable our message is when we engage with our team or stakeholders. If the audience can engage with the concept, see how this concept can benefit their personal and group ethic and experience on a daily basis, typically this allows for better buy-in and in turn, successful engagement.

This is usually achieved by strategic engagement with the team/personnel to be affected by the concept, and to get *their* input on the concept design/deliverable, which enables and validates the group. This also allows the group to know their thoughts and feedback were incorporated in to the concept from the very beginning and amplifies the engagement firstly, but more importantly allows for an evolution to take place from an ‘*observer*’ level, to a ‘*participant*’ level within our group, as all parties now have an interest in achieving the ultimate process safety goal(s). This has yielded many successful results in the past within industry, specifically around change management, safety culture, and continues to do so to this day.

Finally, when we speak of engagement, one last critical factor that is imperative to the success of that dialogue, is the ‘*closed loop feedback*’ of the people on the ground and continuous dynamic assessment.

We as leaders must listen to the feedback of the operational personnel and/or our teams responsible for executing the work, as this is where the hidden curriculum lies. The learning and culture that is not in the training courses, the information that is out there amongst the site/teams/people, that is critical to attain if we are to affect real change in our culture, and achieve our process safety goals.

We must also look to provide an appropriate audience and platform for our site team(s) and personnel (indeed all levels of personnel and stakeholders), to channel and report their feedback and thoughts with regard to process safety performance, along with a mechanism for implementing any lessons learned from previous engagements/incidents, and how these results feed in to our Leading & Lagging indicators we have previously defined, indeed our Process Safety KPI’s.

Some great starting examples or pathways to support successful *Engagement* are as follows:

- Attending International Industry conferences and sharing of knowledge and experience amongst the organisation and teams.
- Engaging with a trusted source for industry fact(s) and best practices, especially with relation to International Standard(s) and Guideline(s) compliance.
- Engage a 3rd party industry thought leader, and propose to all internal departments (within the organisation), for engagement on *why* and *how* process safety affects their particular aspect of their internal safety eco-system(s).

When we speak of *Common Practice* (having achieved engagement), we are now centering our goals around the more systematic area, and the focus is on how we can get everybody within our group/organisation to ultimately be aiming and shooting for the same goal, but more importantly, using the same tools to get there.

Alignment here is key and once we have gotten ‘*buy-in*’ from the relevant stakeholders, we now need to be able to define the path for our teams and provide them with the tools to complete the journey.

In this particular space, we are again looking at 3 main areas of focus, that will help us define and achieve *Common practice*:

- People:
Training of our people. Ensuring competency has been defined and is being maintained and assessed correctly. Confirming whether Human Factors Analysis and Assessments are being carried out to ensure the people, environments, culture, etc., are all within the boundaries we have defined for our process safety eco-system(s), and our organisational goals/targets.
With regard to common practice, it is paramount that we have commitment from our people to the goal of achieving process safety.
- Processes:
Have we defined our procedures? Have we built a strong foundation with reliable processes and procedures within a Safety Management System, which allows all stakeholders within a team and/or organisation, to execute their respective tasks following a well-defined process, and up to date standardised procedures.
- Planning:
How will we achieve our goals and have we laid out the roadmap? How are we going to monitor our progress along the way (Leading/Lagging indicators)? Have we defined Single Point Accountable parties to carry out each specific duty with regard to the frequency of audit(s), tracking of KPI’s and metrics etc.? Have we defined the normative standards we will be following to achieve standardization and common practice across our people and assets.

Finally when we speak of *Common Practice*, it is ultimately the people that will determine the success or failure of our mission with regard to process safety goals. The people driving the message, the people tracking our defined KPI’s, the people executing their tasks in the hazardous environment, and so on.

If those people do not believe in the message and target of process safety for all, then the doubt can spread like a virus throughout the team(s), site(s), or the organisation itself, and this will destroy any chance of safety culture, leading to the consequences that we will discuss in the next section.

This is why it is imperative that *Normalization of Deviance* is to be treated with the utmost of concern and caution. The people within our organisations must be empowered to identify such deviance, know the process around reporting it, and know the correct steps to address it.

If we have strong global and regional standardisation compliance, for example to Standards such as IEC 61508 and IEC 61511 (for the Process Industry in particular), we move a lot closer to our goal of *Common practice*, and fulfilling process safety for our people and organisations.

Learning Lessons from Past incidents: Piper Alpha disaster

“Accidents such as the Piper Alpha disaster illustrate that the performance of a highly complex socio-technical system depends on the interaction of technical, human, social, organisational, managerial and environmental factors and that these factors can be important co-contributors that could potentially lead to a catastrophic event.”

(source: R.P.E. Gordon (1998) The contribution of human factors to accidents in the offshore oil industry. Reliability Engineering & System Safety 61, 95-108.)



(source: wordpress.com – google images)



(source: daily telegraph – google images)

Piper Alpha was a tragedy that rocked not only the Oil & Gas Industry across the globe, but the world itself. We still reference it and attempt to use it as an example of how far the industry has progressed with regard to Process safety, and whilst this may be true in a lot of senses, we still appear to meet challenges when it comes to *Organisational Maturity*, and *Process safety culture* throughout the various industries across the world.

The below is a quick snapshot of a recently carried out Human Reliability Analysis, based on the Piper Alpha disaster reports (e.g., Macleod and Richardson, 2018; Cullen, 1990), executed by this author as part of an academic study report within the University of Aberdeen.

The main focus below (for the purposes of this paper), has been placed on the *Underlying causes* section with regard to the original accident analysis carried out, and the recommendations that followed post analysis.

Let's review and see if we can identify commonalities with regard to process safety goals, and organisational safety culture.

Underlying Causes – Piper Alpha disaster, with regards to Safety Culture:

Safety Culture (Organisational & Site)

- From an organisational perspective, the culture seemed to have been prioritising production output over safety. This was evident from the decision to continue operations whilst carrying out an array of simultaneous tasks and operations on site. (i.e. safety critical maintenance activities, diving activities, etc.)
- On site, there was more evidence of suspect safety culture with the removal of a safety system, to allow diving operations to continue. The removal from service of the platform fire-fighting system, hampered any chance of trying to subdue or fight the raging blaze that had initiated after the first and second explosions. This was a common-place event on the Platform according to witness accounts (removal of fire pumps from service).
- The reluctance to seek out and find the appropriate Night-shift supervision/operational personnel to inform them of the compromised safety system(s), incomplete maintenance tasks, and associated process deviation(s) before finishing shift (safety valve removed/non-secured blind flange in-place), speaks to the safety culture within the operational and maintenance teams and to the overall site culture itself. Behaviour of individuals can sometimes be isolated but are often times indicators of the safety culture within site/organisation.

- An earlier incident in which a person visiting the site for contract work (ending with loss of life), was an indicator and warning to the Organisation that the culture was not right from a Systematic and Human factors perspective at the Piper Alpha site. The possible reluctance to investigate these root causes and rectify to resolution, was another contributing factor to the disaster, but also an indicator of where the safety culture may have been at the time.
- The lack of a common system for control of work, and similarly to report on daily activities for Maintenance and Operations alike, also led to a poor safety culture when critical task information was not being documented accurately. Oncoming shift personnel were not aware of safety critical status of the Plant and equipment, with regards to Process safety.
- The lack of any Maintenance/Ops personnel carrying out initial equipment checks across the plant at start of shift in Piper Alpha, also spoke to the potential safety culture at the site.

Lack of Training & Competency (Knowledge & Understanding)

- When disaster struck on Piper Alpha, it was found both at an Operator level and a Platform Management level, that the personnel with responsibility to take appropriate action to initiate a safe state/evacuation, did not perform under such conditions. This asks the question of competency within these ranks, and how it was being measured, tested, and confirmed. Had appropriate training and simulated conditions been created for full confidence to be attained with respect to these Operators and Platform managers, when assessing competency?
- With regard to the competency of the OIM's on the adjacent offshore platforms (Tartan, Claymore), why did they continue to pump to Piper Alpha (fuelling the blaze), or essentially, not shut-down production? This again called into question the competency and experience of the personnel in these positions, with further questions arising around the strength of procedures, and training available to such personnel in emergency response situations. Furthermore, the decision making cognitive bias of key individuals when faced with such high pressure scenarios (external organisational/commercial pressures or influence), leads directly to Human Factors concerns.

Normalization of Deviance/Patterns of behaviour

- The continued removal of safety services like the fire-fighting system during diving operations, allowed for a normalisation of deviance, and ultimately left the personnel on the platform without protection when it mattered.
- The decision to just leave a permit in a box without speaking to the oncoming responsible party along with any responsible operational personnel, was again normalisation of deviance, as is attested by accounts from visitors to the platform, that this behaviour was a common practice.
- Suspended permits were just signed off and left in the Safety office or Control room. This led to a normalisation of deviance from the organisational procedure requirements for operations and maintenance to discuss the suspended permit at the worksite, and sign off the suspended permit together.

The Cullen report itself issued 106 recommendations, all of which were mainly adopted by the industry as a whole, beginning in the United Kingdom.

Having personally spent over a decade in the oil and gas industry around the world, this author has seen, read, and experienced the dangers of not treating the Human Factors aspect of a process, and indeed the Human Reliability Factor of a specific task, with appropriate respect and caution.

Given the amount of time that has elapsed since Piper Alpha, and also the progression of the industry with regards to processes, procedures, and overall responsibility for Safety in general, some of the recommendations that would be relevant immediately after the Piper Alpha disaster, have already been implemented.

However, based on the above Underlying causes and Human errors coming directly out of the incident report(s), and the subsequent Human Reliability Analysis carried out by the author, the below are the recommendations that followed:

Recommendations to Industry – Underlying causes/Safety Culture:

- For a global regulator to be active and present in the verification of Process safety within each sovereign state, plant, and industrial operations. This would allow for unbiased assessment of Safety Management procedures, Emergency response procedures, Competency within each site, and overall Maturity level of the organisation responsible for the various sites inspected.

- Recommendation for continuous assessment of competency within the organisational and site frameworks, with emphasis put on emergency response scenario testing and procedures around same.
- Recommendation for all sites (globally), to submit their safety case to the regulatory body applicable (regional or global), detailing and outlining how they have documented the appropriate hazards at their site, and the mitigations around same. (already present in some sectors and regions)
- Recommendation for a Human Factors Lifecycle to be implemented into the organisational structure for verification of critical gateways throughout a process lifecycle. Especially in regard to Human Reliability and the dynamic assessment of same throughout the Plant life, (at different moments in time).
- Recommendation for a document to be available on site with the definition of each role and responsibility within an emergency response procedure, and also any safety management documentation. Details around who is the single point accountable person (SPA), for each sub-task within the overall safety management scenario, and also what their responsibilities are in these cases, with regard to the process safety eco-system at site.
- Recommendation for a Human Reliability Analysis (HRA) to be carried out for each safety critical task executed at site (as per mentioned above), and for the Human Error Probability (HEP) to be calculated for said task(s), so as to enable mitigation to take place in each case.
- Recommendation for Safety Leadership training (validated externally), to be available for the members of supervision and management within the organisation that are responsible for safety on site, but more importantly, for the members of management that are responsible for operations and production. The Safety Culture should be a multi-pronged team effort with stakeholders from all levels and departments, involved and informed through education, awareness, and training, respective to their position and role within the safety framework for that organisation.
- Recommendation for all lessons learned from incident/accident investigation(s) globally and across industry, to be shared amongst the wider international industry community, but more importantly to liaise with the Global Regulatory body(s) responsible for validating said safety compliance, for full implementation of lessons learned within all applicable sites etc. International committee could be created to manage same.
- Recommendation for global training centres to be established with simulation training available to mimic emergency situations for operational personnel, supervision personnel, and management level personnel around decision making in safety critical environments and situations, with strict level of competency requirements around same. To be managed by a 3rd party or the industry/global regulator for that particular sector.
- Recommendation for all leading and lagging indicators for process safety measured at site (and any associated deviations), to be reported to the Global and Regional regulator(s), and for organisation and site to provide evidence of root cause analysis carried out after any recordable incident, and full engineering investigation/process carried out through to rectification. Documentation of same and presentation to the regulator. (this not to be a reactive event, rather a proactive event). (note: regulator must be independent)

Conclusion

To conclude, we can ask ourselves the real question, what does the success of process safety really rely on? What are the key components within that process safety eco-system at each individual site (and indeed throughout the organisation), that are the corner stones to our success?

The answer is our people....

It is our people that identify good (or poor) practice in process safety, and indeed execute it. It is our people that help embed good practice in process safety, and define our safety culture. It is our people who give life to our processes, and ensure we are attaining common practice.

Without engagement from our people at all levels within our organisation, ‘*the goal of identifying and embedding good practice in Process safety*’, will always be out of reach.

To quote a well-known figure in the Industry, Dr. Trevor Kletz during an interview with the Chemical Safety Board (CSB) some years ago;

“There’s an old saying that if you think safety is expensive, try an accident!”

“Accidents cost a lot of money. And, not only in damage to plant and in claims for injury, but also in the loss of the company's reputation.”

(source – Chemical Safety Board Safety message – you-tube)

We can take a lot from this statement by Dr. Kletz, and hopefully use it to motivate us all within industry. Dr. Kletz was indeed referring to some Organisation's reluctance to invest initially from a commercial point of view, in safety system design, etc., and how they may have ultimately paid the price in the long run.

Dr. Kletz is correct when we look back over the figures that tell us a major process safety accident can be the end of some organisations. This has been in the past, simply due to not paying attention to the *leading & lagging* indicators, and refusing to implement a strategy around process safety, which can yes, inevitably lead to some initial financial cost, but can be drastically dwarfed in comparison to the cost of a process safety accident!

Such investment could be in the form of a Safety Instrumented System (SIS) for example, adaptation of Functional Safety Standards like IEC 61511 for the Process safety industry, and placing a laser focus on both accurate and honest accident investigations, where the *real* causes of a near miss (or accident/incident), are identified and engineered out of the process, so as to safe-guard against the same initiating event(s) repeating and happening again at a later date.

To quote Dr. Kletz again;

“For a long time, people were saying that most accidents were due to human error, and this is true in a sense but it's not very helpful. It's a bit like saying that falls are due to gravity.”

(source – Chemical Safety Board Safety message – you-tube)

Once again a lot can be taken from Dr. Kletz's experience in industry, and especially around this quote.

“Human error” is not enough to put on an accident report, and certainly removing said person from the process or organisation, is most times not the answer when looking to remove the threat to our process safety integrity. We must first understand the *why* and the *how* when it comes to decoding the root and underlying causes for the accident itself, and look to remove the opportunity for the error, rather than the player within the role.

Why did our colleague make such a decision in that critical moment leading up to an initiating event, and prior to the accident itself, and *how* was it possible for them to initiate said hazardous event, from within their own unique process safety eco-system?

When we look to answer these questions, we are starting to identify with good practice in process safety, and only then, can we look to define our strategy around embedding such good practice in the journey to overall safety culture success.

Some great starting examples or pathways to supporting and maintaining successful Process safety goals, are as follows:

- Adaptation of Global Industry standards (i.e. IEC 61511)
- Engagement with Industry experts and Organisations with regard to Process safety and Industry requirements alignment (Regulator compliance, etc.)
- Benchmark studies against Industry Standards and best practices.
- Gap analysis of current practices against afore-mentioned Standards (IEC 61511, etc.)
- Human Factors/Reliability Analysis of current site(s), teams, and processes.
- Competency & Training with regard to specific roles and responsibilities within our process safety eco-system(s) at site.
- Continuous and dynamic assessment of our systems performance and execution, with regard to achieving and more importantly, *maintaining* process safety targets (i.e. Safety Integrity Level, Functional Safety Assessments, etc.)

Finally, let us look one last time to history as our teacher, when deciding if process safety, and the challenges it entails, are a worthwhile investment, both at initial outset on the journey, and also throughout the life of our plant and organisations.

In this vein, we can once again draw on the words of Dr. Kletz, and hope to engrave them in the memory of all involved with a stake in process safety, at every level of our organisation.

In our quest to embed good practice within our team/group, and indeed embed it, we must always remember where our lessons in process safety inevitably come from. Yes, we can achieve a great deal through “*Executive Leadership*”, “*Engagement*” and “*Common practice*”, etc., but there is inevitably one golden fountain of all knowledge when it comes to keeping our people and plants safe, the one sometimes forgotten ally in this journey.

And that is the role of history itself....

The lessons learned from past incidents, near misses, accident investigations, and so forth, be-it specific to our plant or relative to our industry partners.... will forever be our guide and teacher if we can only learn to pay attention to the signs.

If you think Safety is expensive, try an accident!