

Addressing the Dissonance between Corporate and Individual Process Safety Drivers

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Conventional wisdom holds that the Process Safety Goals of the Organization and the Individual are roughly in tune: the Organization wants to keep PS incidents to a minimum so that its employees are kept safe and that their fixed and variable costs are kept down; the individuals who work for the Organization want to keep safe and keep being paid for doing their job. This paper will argue, however, that the drivers of the individual's Brain and the Organization are sufficiently incoherent so as to merit attention.

It will argue that, as the most complex organism in the known universe, the Brain is very energy hungry and has thus evolved to be extremely efficient. It drives relentlessly from conscious incompetence (very energy sapping) towards unconscious competence. However, the Organization would be better served by a group of consciously competent Brains, avoiding the perils of complacency and a tendency to violation.

Furthermore, Brains strive to maintain the status quo, which is the low fuel consumption option, while Organizations must constantly improve, feeding back the experience it gains, or risk begin overtaken.

So what to do. The paper will suggest that while Organization culture is very hard to rapidly change, modifying mindset is more effective. Moving from a fixed mindset which is reinforced by success praise, to a growth mindset, which is underpinned by effort praise. Organizations can also look for better ways to incentivize the Brain to engage with the hassle of change in order to generate safer working habits.

What drives Process Safety in Corporations? My 30 years as a Chemical Engineer working in diverse roles in the international Oil and Gas sector leads me to believe that corporate drivers for Process Safety are two-fold: Money and Reputation. Corporations are and should be driven to maximise a return to their shareholders. If corporations didn't do this, they may become uncompetitive and possibly perish. All the benefits that are attributed to them: useful products, employment, shareholder profit would be lost. Additionally, in some cultures they also have an obligation (financial and/or psychological) to their employees and other stakeholders.

Thus I believe, their approach to Process Safety (PS) should be underpinned by these tenets:

- to minimise PS incidents, which cost, on average, 10000+ times the cost of measures which would have prevented them
- to maximise their PS Return on Investment
- to maximise their uptime, which is negatively correlated with Lagging Indicators such as breaching the PS envelope (e.g. popping PSVs)

Consequently, they strive to align the PS related behaviour of their employees with these goals. The following table gives examples of Current/Recent Methods Employed by Corporations to promote PS within workforce:

Company	Method	Workforce Impact
A	Chronic Unease – workforce encouraged to be vigilant at all times	This is unsustainable and, on its own, can lead to increased levels of stress and higher risk of violation
B	Operator Care – workforce is empowered to tour the facility and be alert to anything out of the ordinary	The worker is acknowledged thus making it more likely that he/she will persevere with any behaviour change such that habits form
C	Safety Day - A day (or at least a significant part thereof) is devoted to considering and discussing an key element of Process Safety	If it is led sincerely and competently from the top, individuals will be impressed by the 'talk walking'.
BP (Texas City 2005)	Focus on Lagging Indicators (days without lost time incident) exacerbated by celebrating milestones	Workers able to maintain unconscious competence mode (avoiding trips, slips and falls) while generating psychological sunken costs ahead of a milestone (not reporting lost time incidents)

What drives Process Safety in People? On operating sites, the tenets are different from those of corporations. I would argue that they are complex, but would certainly include protecting self and colleagues.

Why is it that Individuals and a group of Individuals (a corporation) have different drivers? I believe that individuals generally respond to the drivers of their own brains. Human brains are among the most complex organisms in existence. They are very energy draining (25% of body's energy usage vs 2% weight). Consequently, they have evolved to be very energy efficient and will drive to minimise activities which are energy sapping:

- Conflict
- Uncertainty
- Conscious thought

They have also developed senses to protect us against atavistic threats such as attack by wild animals:



I think it is useful here to look at the Learning Paradigm: how we master a new skill. Firstly, we are not aware that we don't have (or need) the skill - for example a child doesn't know (or need to know) how to drive a car. This first phase is known as Unconscious Incompetence. In the Process Industry, a school leaver becoming a plant operator would be in this mode. The Risk for the corporation is Ignorance leading to Mistakes. The remedy is classroom and 'on the job' training.

Secondly, when we attempt to engage with a new skill, we are aware of our incompetence. We are Consciously Incompetence. Here the Risk for corporation is Nervousness leading to Lapses. The remedy is Buddying or Mentoring.

Thirdly, we start to become competent at the new skill. However, we are still aware of our execution actions. Here we are in the realm of Conscious Competence, which is ideal for corporations. Unfortunately, the brain will drive relentlessly to the final mode - Unconscious Competence, as this is the low energy consumption (ideal) state for the brain. Here again there are risks for the corporation Complacency leading to Violations. How are we to counter these?

Let's examine the key individual Process Safety related behavioural drivers. These are:

- Minimising conflict – risk of groupthink
- Minimising uncertainty – fear of change
- Minimising conscious thought – risk of human factor errors: lapses, mistakes, violations (normalisation of deviation)
- Use of senses (sight, hearing, smell, touch, taste) has evolved to protect us from atavistic threats. Less useful when having to manage PS incidents (when nothing happens for a long time)

How can we address these issues to drive alignment and improve process safety? The following table illustrates potential alignment tools:

Individual Driver	Impact	Alignment Tool
Minimising Conflict	Groupthink – unwillingness to report unsafe situations	Empower employees and lead by example. Encourage external perspective.
Minimising Uncertainty	Resistance to necessary change (especially in culture which rewards success)	Incentivise the hassle to develop new habit. Reward endeavour over success.
Minimising conscious thought	Increased risk of human factor errors: lapses, mistakes, violations (normalisation of deviation)	Consider use of 'safe surprises' e.g. carry out 'on the spot' site audits.
Use of senses (sight, hearing, smell, touch, taste) has evolved to protect us from atavistic threats	Less useful when having to manage PS incidents (when nothing happens for a long time)	Empower employees to tour the facility and be alert to anything out of the ordinary (applying their 6 th sense).

Groupthink is alive and well in our industry. Look no further than the BP Deepwater Horizon Disaster. The uncontrolled subsea blowout in the Gulf of Mexico in 2011 led to fire and explosion resulting in 11 deaths. It was the biggest US environmental disaster for 20 years. The cost to BP - \$50bn. It was partly caused by collective psychological issues including groupthink.

One BP operator reported that when one of the men carried a handful of rubber material to a superior concerned that the rubber seal down in the well had been damaged, he was told, "No, that can't be. We always get that kind of material coming up."

BP had already sunk millions of dollars into the oil rig's production. Changing direction at that point – in other words stopping production because the rubber seal might be broken - was out of the question. BP had become wilfully blind: the evidence of barrier transgression didn't fit with the collective view that the rig was safe and was therefore ignored.

So how can we best counter Groupthink:

1. Anticipate Groupthink in your Risk Plan. While it might sound like planning to fail, ignoring the potential for Groupthink is a failure to plan for a very real risk. And like any risk plan, there must be processes for monitoring and mitigating emerging Groupthink.
2. Size counts. Limit the typical team size to less than 10 and ensure that there are well-defined boundaries for inclusion. Porous team boundaries and widespread casual involvement on teams breeds dysfunction, including pressure towards consensus for the wrong reasons.
3. Invite external perspectives at various stages of the process. Of course, you've got to have the procedures in place to both protect external viewpoints and to find ways to incorporate them into the group's thinking and plans.
4. Lengthen the discussion phase. Use structured discussion to focus on vetting the issues.
5. Develop a second solution. Challenge your team to assume that management will reject their first solution. Develop an alternative and very different second solution and be prepared to defend it.
6. Invite the Devil's Advocate to the party. While a designated Devil's Advocate is a contrived role and everyone knows it, at least someone will be throwing rocks at the groups beautiful picture. Rules on respecting and vetting the DA's perspective are critical to benefitting from this approach.

How could we start addressing Resistance to Change? Change is uncomfortable and therefore instinctively avoided. We do start off well however. I remember encouraging the effort both my sons made when they started to walk as babies.



Unfortunately, at some point, we seem to segue to only praising skill. One of the consequences of this change is that, as we grow, we are more likely to develop a 'fixed mindset' (one that believes that ability is innate) rather than a 'growth mindset' (one that believes ability can be improved by practice). As Carol Dweck argues in her book 'Mindset', people with a fixed mindset are more likely to lie and normalise deviation to counter the discomfort they feel at the prospect of making mistakes.

Over half a century ago, Mick Jagger uttered the famous mantra 'I can't get no satisfaction' in the eponymous song. It seems to me the lyric encapsulates a key drive of human behaviour, where ever the end goal is on the Maslow Hierarchy of Needs. If the purpose of life is simply more life, then perhaps the goal of life should be individual satisfaction. For most of the key tenets of our lives, we know and target the scenarios which lead to consumption gratification.



And mostly that works fine. We buy and consume food and drink, we engage with other people for social and sexual benefit, we sleep when we are tired. All of which is likely to make us feel good if they are achieved. It seems our evolution has created rewards, often in the form of the hormones dopamine and oxytocin, which are released to encourage us to abandon the status quo and engage with the barriers between us and these tenets. Often the more significant the tenet and the higher the barrier, the greater the associated reward: for example, you may risk competition and rejection in pursuit of a mate.

However, in the arena of industrial hazards, this relationship becomes very tenuous. In terms of risk reduction, it benefits the group if near misses are reported and acted upon. Statistically, there are many times more near misses than the accidents they

may have become. And as the antecedents of both are often the same - for example, the cause of a dropped load leading to an injury or a 'lucky escape' - the learning will reduce the likelihood of the same or similar cause reoccurring. So, it would seem to make sense to encourage the reporting of near misses.

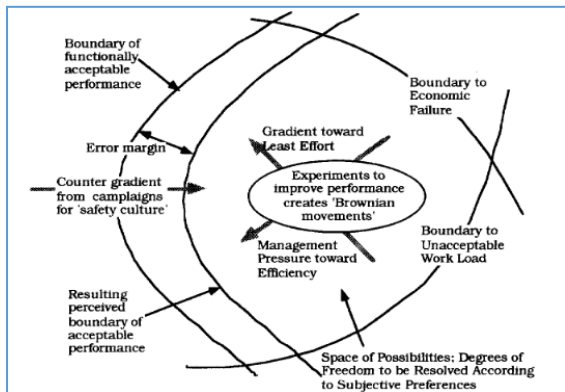
However, this is not always the case. Currently, many operating companies set milestones for lost time incidents. As the milestone is approached, who wants to be the one to report a minor injury which would scupper the celebrations? Also, many companies have incentive schemes which are aligned to productivity, which is superficially negatively correlated with downtime. Furthermore, in companies with a strong safety culture, where near miss reporting is encouraged and the corresponding reduction in incidents means that nothing untoward happens for increasing lengths of time - which is a good thing, but not a satisfying thing.

So what to do? How can we make the promulgation of less incidents be satisfying to the front line worker? One idea I have is take an idea that Hollywood has hijacked and re-imagine it. I don't think I'm alone in watching action movies where heroes prevent bad things happening. Tom, Arnie et al battling to prevent the explosion, toxic cloud, wild beast from doing their worst. We are experiencing the vicarious echo of the actual experience. Risk and Reward. Why not apply the same principle to rewarding front line workers when they report a near miss which could have led to an injury or fatality.

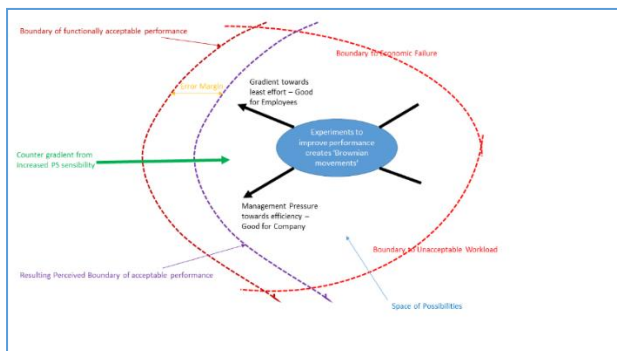
An example I heard recently from an operating company was a propane leak in the vicinity of the air intake for a compressor. 'There was no explosion but for luck and the quick reaction and reporting of the shift supervisor'. In this case the supervisor was thanked. How about enhancing this thanks with the reward of a simulation of the incident his (or her) quick and robust intervention prevented. I could be shown at an end of year event and a copy presented to the worker. You have just created a lasting psychological reward which will reap benefits long after any monetary offering has been forgotten.

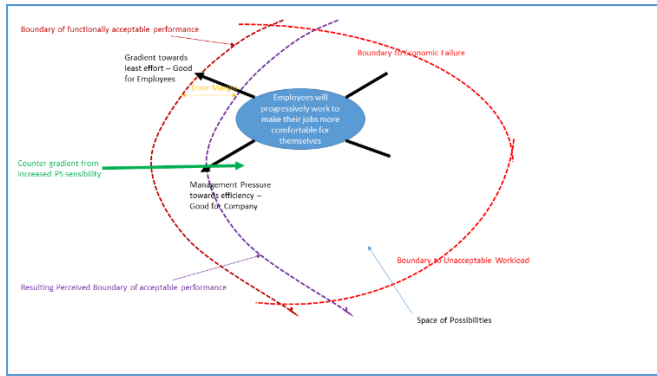
In an interview with Entrepreneur.com in 2012, James Dyson, the billionaire engineer and inventor, said 'we have to embrace failure and almost get a kick out of it.' Before successfully developing his eponymous bag-less vacuum cleaner, he had a large number of failures: 5216 to be precise. If he had become discouraged at, say prototype 3682, for example, he wouldn't have ultimately succeeded. How can we harness this spirit in our industry? By incentivising the hassle to develop new habit and rewarding endeavour over success.

What about the Normalisation of Deviation? In his 1997 paper, published in the Journal Safety Science, Jens Rasmussen argues that in the presence of strong cultural and psychological forces (Corporate, Safety, Individual) human behaviour are likely to migrate towards the boundary of acceptable performance.

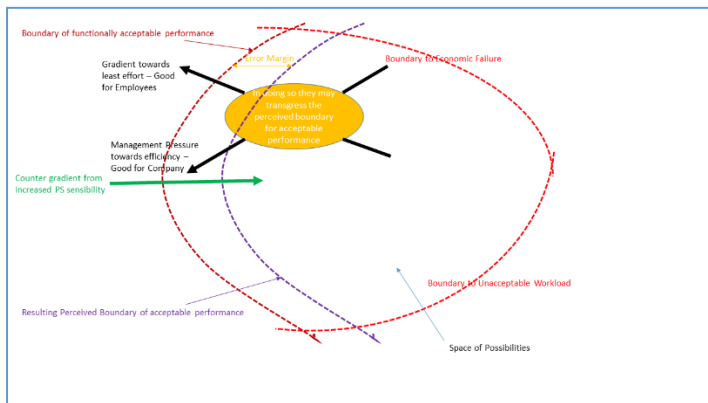


He argued that Experiments to improve performance creates 'Brownian movements' and that individual and corporate drivers will push the operations envelope towards the perceived boundaries of acceptable performance. If we take individual employees, they want to make their working lives as comfortable as possible, generating a gradient of least effort.

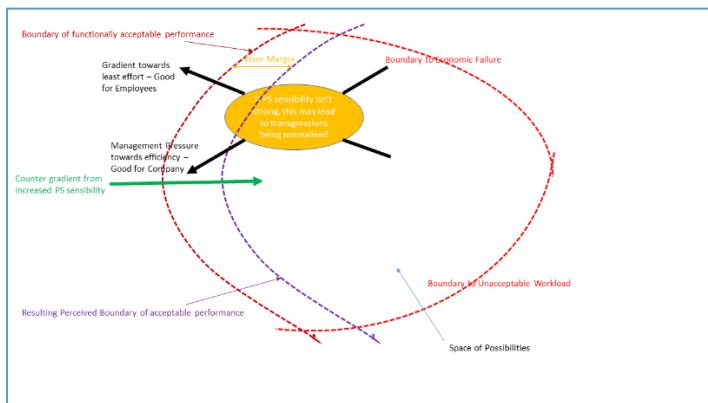




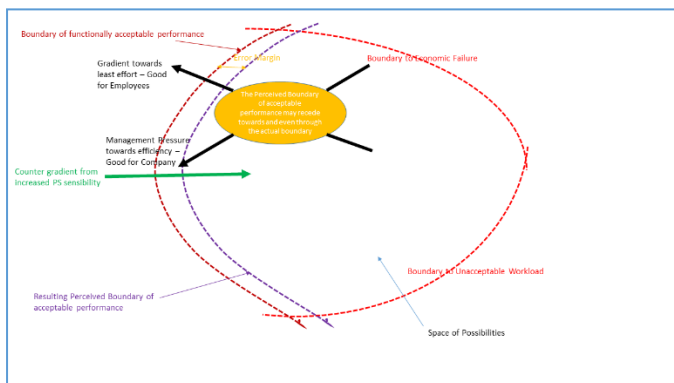
In doing so they may transgress the perceived boundary for acceptable performance.



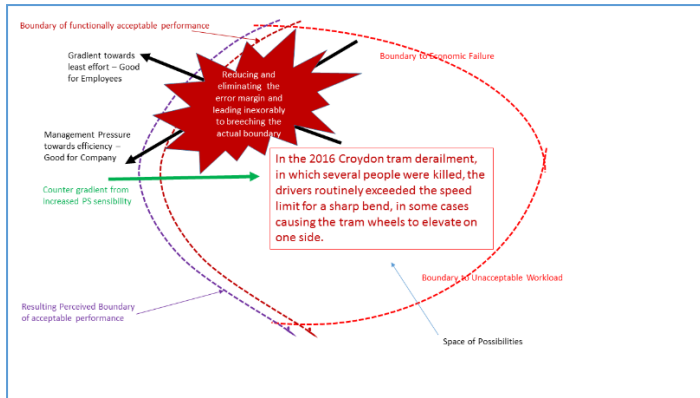
If PS sensibility isn't strong, this may lead to transgressions being normalised.



The Perceived Boundary of acceptable performance may recede towards and even through the actual boundary



Reducing and eliminating the error margin and leading inexorably to breaching the actual boundary:



In the 2016 Croydon tram derailment, in which several people were killed, the drivers routinely exceeded the speed limit for a sharp bend, in some cases causing the tram wheels to elevate on one side. The accident took place in the dark and during heavy rain, on a sharp left curve. The curve comes almost immediately after the line emerges from a tunnel. It has been described as a "sharp bend" and has a 20 km/h (12 mph) speed restriction. The tram entered the curve at a speed of 70 kilometres per hour (43 mph) and overturned onto its right side, falling outside the curve on which it was travelling and trapping several people inside. There were seven fatalities with 58 other people injured.

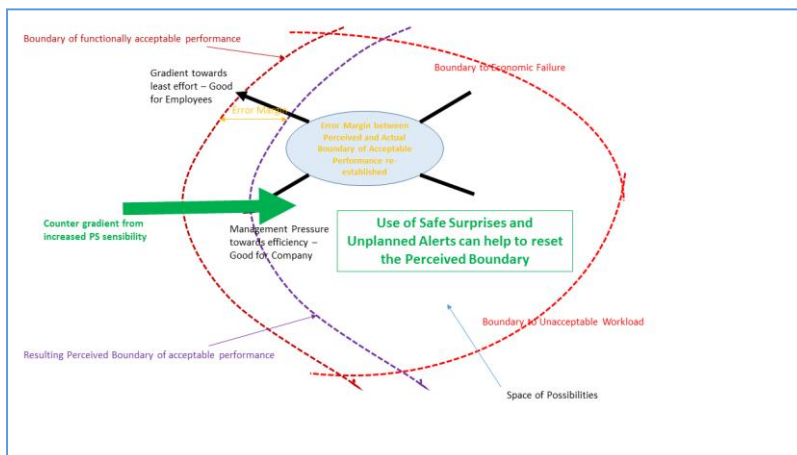


Images from the Aftermath:





However, if we make use of Safe Surprises and Unplanned Alerts, we can help to reset the Perceived Boundary. The Error Margin between Perceived and Actual Boundary of Acceptable Performance is thus re-established.



Finally, how can we augment the front line operator’s senses to improve PS outcomes? By Providing 6th Sense Tools such as ‘Google Glass’. We could upload Key Process Parameter and Condition Based Monitoring Data. The glasses would be able to sense dynamic plant conditions, such as temperature or pressure spikes. The software could then trigger triaged warnings:

- Red – immediate plant shutdown
- Orange – investigate and risk assess
- Yellow – Periodic monitoring



How can all this ideas be consolidated? I have a number of suggestions, which include:

- Generation of 'Digestible' PS Metrics to aid Management Decisions
- Set up a 'Near Miss' register with robust learning and feedback methodology
- Customised CBT to reflect plant specific issues and enable umbrella organisation coverage

Hopefully, this will lead to a Successful Outcome



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References

Carol Dwerck. Mindset: How You Can Fulfill Your Potential. ISBN1780332009. 2012.

Nadia Goodman. James Dyson on Using Failure to Drive Success. Entrepreneur.com. November the 5th 2012.

Jens Rasmussen. Risk Modelling in a Society: A Modelling Problem. Safety Science Vol 27No 2/3. Pp 183-213. 1997.