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### ► To cite this version:

Jean-Christophe Le Coze. BP Texas city accident : weak signal or sheer power ?. 3. Resilience Engineering Symposium, Oct 2008, Antibes - Juan-les-Pins, France. pp.185-194. ineris-00976209

**HAL Id: ineris-00976209**

**<https://ineris.hal.science/ineris-00976209>**

Submitted on 9 Apr 2014

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## **BP Texas City accident: weak signals or sheer power?**

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**Abstract:** The aim of this paper is to discuss the interpretation of the BP Texas City accident. While bringing a lot of empirical data on a wide range of dimensions, the US Chemical Safety Board investigation did not import the normalisation of deviance concept for sensitising the data. It however clearly indicated a reference to the Columbia Accident Investigation Board where this concept was influential (i.e. chapter 8 of the Columbia report, 2003). The aim of this paper is to see nevertheless how valuable the concept could be for this case. The Baker Panel report (2007) will be used as a second source for this purpose. It will also be the opportunity to introduce the complex debate of the relationship between culture and power. Some, such as Perrow, have indeed criticised the cultural rationale of the normalisation of deviance, at the expense of power "*We miss a great deal when we substitute culture for power*". This paper is not a judgement of the reports used here as inputs but rather a way of interrogating the case with an alternative, and hopefully, complementary angle.

## **1 INTRODUCTION**

The CSB report on BP Texas City accident (CSB, 2007) provided a deep account of the organisational genesis of the disaster. Based on a similar framework of the accident investigation model of CAIB (Columbia Accident Investigation Board), several dimensions are covered, linking technology, human, organisational and environmental factors. The historical approach applied by the report allows a description of the events that shaped the situation prior to the events. Main outcomes of this investigation are linked with BP organisational way of dealing with process safety, through learning from experience (i.e. poor root causes analysis, poor completion of actions for identified deficiencies), management of change (i.e. budget cuts, organisational changes such a merger and leadership turnover). Other identified items were human factors (i.e. design of control rooms and interfaces, procedures updates, communication and fatigue issues), safe design and maintenance of barriers (i.e. blowdown system size, level transmitters failures), but also relationship with regulators (OSHA and lack of enforcement and inspections throughout the years).

One of the key finding (at the organisational level) and lengthy development in the

report ("BP Safety culture", p 149 to 174) concerns the way signals about risks were handled by the management of the plant and by corporate levels. Indeed, following the accident, as outsiders and readers of the report, messages such as these ones seemed quite clear: there was a risk, according to the HSSE business plan from March 15 (few days before the accident - 23<sup>rd</sup> of march) that the refinery "*kills someone in the 12-18 months*". There was also the following message from the Texas City plant HSSE manager "*I truly believe that we are on the verge of something bigger happening*" (from an email of February 20, 2005).

It is true that the state of the installations and safety management implementation appear as rather more than inadequate through the descriptions found in the report. When reading the findings of the report, one can not help wondering why was the plant maintained in this apparently degraded level of safety while information was available and opportunities for action obvious (for instance the replacement of the blowdown system by a flare system). But at the same time, some similar reports of investigations of past accidents, such as the presidential commission on the space shuttle Challenger, were revised by social scientists while introducing principle of retrospective fallacy, but also by stressing the associated systemic nature of these types of accidents.

## 2 INTERPRETATIVE PRINCIPLES OF ACCIDENTS

### 2.1 Retrospective fallacy (and normalisation of deviance)

The retrospective fallacy advocates that signals present in the past only appear quite clear in retrospect<sup>1</sup>. They are not as clear for the decision-makers at the time of the events as they are for investigators. "*This warning is the warning of the retrospective fallacy understanding organisational failure depends on systematic research that avoids the retrospective fallacy by going beyond secondary sources and summaries, relying instead on personal expertise based on original sources that reveal all the complexity, the culture, the culture of the task environment, and the meaning of actions to insiders at the time.*" (Vaughan, 1996). Thus, based on this retrospective fallacy argument, Vaughan's "*normalisation of deviance*" (1996) suggested to revise some of the challenger commission findings. A main principle of this model is that signals at the time were weak rather than strong, and that decision to launch was strongly biased by past experience of engineers regarding joints behaviour as well as biased by their socialisation. This pattern was created and maintained by the production of a culture, a culture of production and a structural secrecy.

*The production of a culture* occurs with the uncertainties of the technologies. Engineers introduced the technological uncertainties into qualitative and quantitative behavioural models, offering the ability to predict or to anticipate. Anomalies or signals about the gap between the anticipated behaviours and the observations were closely monitored. These signals triggered the need for new explanations or were rationalised so that they found their place in the worldview or paradigm developed by engineers. For Vaughan (1996), these signals could either be mixed signals, routine signals or weak ones. The production of a culture is thus the establishment of

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<sup>1</sup> This is also known as the « hindsight bias ».

a prevailing paradigm constraining the way engineers or scientists interpret phenomena and make sense of them.

**The culture of production** refers to the bureaucratic (daily importance of paper and procedures for dealing with subcontractors, with regulations etc) and political (imperative of cost and schedules) accountabilities of NASA. Culture of production was also based on the “can do” culture of NASA, anchored in the past successes of Apollo program and the ability of the organisation to be successfully meeting its purposes despite technological challenges.

**The structural secrecy** introduces the classical problems of organisations such as specialisation of functions, geographic distances and difficulty for control functions to ensure oversights due to problems of independence but also competence given the complexity of the technologies involved.

**Culture and power.** However, this model of normalisation of deviance, introducing a strong cultural perspective, was not favoured by other social scientists such as Perrow (1999). Perrow still saw in the Challenger accident an example of sheer power rather than a cultural manifestation « They were told to take off their engineering hats and put on their managerial hats and make a managerial and not engineering decision. To me, that is a case of sheer power, it is not the routinisation of deviance » (Perrow, 1999). Perrow's sentence introduces the question in social science of the relationship between culture and power.

It is interesting to notice that culture as a safety issue has been debated quite a lot, maybe at the expense of power which is however a key dimension in any debates on organisations, and more widely in any debate on society. Weick (2004) made a point on this issue, when commenting on Perrow's assertion regarding some interpretations of his 1984 normal accident book “*I would say that much of the work in the risk area today is systematically detoxing the power aspects of my book*”. Weick makes the following remark (2004) “*So we are all provoked to remember that power matters and that it matters differently depending on the plurality of the powerful organizational interests (p 385) and we are provoked to work out the mechanism by which this happens, something that has not been done well. We are also provoked to take a second look at organisational culture. “A focus upon a culture of reliability is a luxury in the world of risky systems” (p 360); “We miss a great deal when we substitute culture for power” (p 380). Perhaps we need another Snook-like tour de force to show us that culture and power are not opposed explanations, but rather that culture shapes the way for power, defines power, is shaped by power, masks power, embodies power. Culture is not just breezy social constructionist talk (my phrase, not Perrow's), it makes power possible and is made binding through acts of power*”. It was not the first time that Perrow illustrated his point of view on the relationship between power and culture. We find an earlier sentence from Perrow (1985), in Scott (2000) in which he disapproves “*this infatuation with cultural myths and symbols to the neglect of power and group interest*”. Normalisation of deviance introduces thus the interesting problem of the relationship between culture and power. It seems that a cultural perspective would favour normalisation of deviance as an explanatory principle whereas an emphasis on power would reject the rationale behind it (but this is a simplification).

## 2.2 Systemic dimension of accidents

The systemic nature of the accident refers to the fact that such events do not happen

in isolated organisations but in wider contexts including outside actors and forces. The open system perspective introduced is a powerful analogy for organisational studies (Scott, 2003). These actors and forces can be professions (i.e. engineering profession), nation states (i.e. regulation and control authorities) or also industries and associations (i.e. petrochemical industry). These external forces due to the open property of organisations permit for normalisation of deviance to occur and to be maintained, so the retrospective fallacy and the systemic nature of these accidents are closely linked as principles for interpreting accidents.

According to Vaughan (1996), some of these outside influences were missed in the Challenger commission report. The part played by the Congress in constraining the space agency was not identified whereas NASA depended on congress and had little freedom. The influence of the engineering culture, which can be considered as a societal influence through profession, was also not mentioned in the report however contributed to the normalisation of deviance pattern. *“Engineering as a craft and as a bureaucratic profession contributed to the work group’s normalization of technical deviation in official launch decision making venues by providing basic assumptions that were elaborated in the NASA organisation culture”* (Vaughan, 2002, 18).

Following the Columbia shuttle destruction and given the similarity of this accident with her analysis of Challenger, Vaughan insisted on these types of external forces constraining the possibility of avoiding repetitive negative pattern (Vaughan, 2005, 56). *“Cultures of production, whether production of police statistics, war, profits or timely shuttle launches, are a product of larger historical, cultural, political, ideological and economic institutions. Making organisational changes that contradict them is difficult to implement, but in the face of continuing and consistent institutional forces even more difficult as time passes. Attributing repeating negative patterns to declining attention and forgetting of lessons learned as a crisis recedes into history neglects the sustaining power of these institutionalised external forces. The extent to which an organisation can resist to this condition is likely to vary as its status and power vary”*. She found empirical and theoretical support in new institutionalism for such a position (Powell & DiMaggio, 1991, Scott, 2001). For Scott, *“I see the ascendance of institutional theory as simply a continuation and extension of the intellectual revolution begun during the mid 1960s, which introduced open systems conceptions into the study of organisations (...) Organisations were seen as more than production systems; there were social and cultural systems”* (Scott, 2001). Institutions constrain (but also enable, in a dual relationship) organisations in different manners with different mechanisms that Scott distinguishes between regulative, normative and cultural-cognitive. New institutionalism, by opposition to the old institutionalism (Di Maggio & Powell, 1991a), introduces the latter one, the culture-cognitive forces existing within specific fields, at macro levels with impact at micro levels, such as professions (i.e. engineering professions in Vaughan’s analysis). This approach is contemporary and influenced by theoretical developments in social sciences such as Garfinkel (1967), Berger and Luckmann, (1967), Bourdieu (1977) or Giddens (1984) introducing and stressing the cognitive dimensions of the relationship between individuals and society.

### 3 IMPORTING THE MODEL IN BP TEXAS CITY ACCIDENT

What is the situation of the BP Texas City refinery in regards with this type of model and debate that followed the Challenger investigation report (retrospective fallacy, systemic nature of accident)? How can an accident of this scale happen when “*The panel observes, however, that during the course of its review, it saw no information to suggest that anyone, from BP’s board members to its hourly workers acted in anything other than good faith*” (Baker panel, 2007, 15). How does it complement the CSB report that has not made much reference to this specific model of weak signals and normalisation of deviance? Can we apply these to the data and findings? In the next parts, some elements from the report will be extracted for this purpose. They will offer a partial perspective (hence the brackets in the headings “some elements of”) for each items in the scope of this paper. Elements showing how the company is opened to its environment have been also favoured, in order to stress some of the systemic dimensions shaping the accident.

#### 3.1 A normalisation of deviance (some elements of)?

One approach to answer to this question is to look for information that could fit in the rationale of normalisation of deviance, and then to look for data to fit the production of culture, culture of production and structural secrecy model. Do we find a normalisation of deviance in the BP Texas City accident?

It is indicated that the refinery is “*Considered one of the world’s most complex refineries, it includes 29 oil refining units and four chemical units, largest BP’s refineries worldwide (1800 BP employees, 6000 subcontractors)*” (Bake panel, 2007, 43). From the reports (especially part 9, “BP Safety culture”), it seems quite clear that many assessments of the state of the installations were performed throughout the years preceding the accident. Table 1 contains some extracts of the different studies carried out and some comments from the CSB.

**Table 1.** A number of assessments of the Texas City situation (from CSB report)

<b>Veba report (2002)</b>	<i>“There were serious concerns about the potential for a major site incident due to the large number of hydrocarbon releases (over 80 in the 2000-2001 period). The study also found that many inspections were overdue and that known reliability issues including instrumentation, needed to be addressed.”</i>
<b>Retrospective analysis (2002)</b>	<i>“The analysis concluded that the budget cuts did not consider the specific maintenance needs of the Texas City refinery” the prevailing culture at the Texas City refinery was to accept cost reductions without challenge and not to raise concerns when operational integrity was compromised”</i>
<b>Financial Crisis mode (2002)</b>	In October 2002, the BP group refining VP sent a communication saying that the financial condition of refining was much worse than expected,, and that from a financial perspective, refining was in a “crisis mode” (...) During this same period, Texas City managers decided not to eliminate atmospheric blowdown systems.
<b>GHSER audit (2003)</b>	<i>“the units and staff are actively managing infrastructure risks but the current condition of the infrastructure and assets is poor at the texas city refinery”</i>

<b>SHIFT program - 1000 days goal (2003)</b>	<i>" The 1000 days goal reflected the continued focus by site leadership on personal safety and cost-cutting rather than on process safety"</i>
<b>Repositioning project (2004)</b>	<i>The project team, led by BP personal outside the refinery, found that the refinery contributed only to 10 percent of the Global refining profits while consuming 18 percent of capital expenditure needed to meet environmental and safety compliance. The Texas City refinery faced additional challenges due to its unique complexity and interconnectedness. Management stated that the refinery was the most complex in the world by a factor of two.</i>
<b>Golden rules (2004)</b>	The golden rules addressed primarily personal safety issues related to work activities such as working at heights, lifting operations, and entering confined spaces. Although MOC (management of change) is one of the element of the golden rules, process safety was not specifically addressed.
<b>Safety Reality (November 2004)</b>	poor safety level, <i>wake up call</i> for plant supervisors
<b>Telos Survey end of 2004 january 2005</b>	<i>"They had never seen such a history of leadership changes and reorganisations over such a period that resulted in a lack of organisational stability "seeing the brutal facts so clearly was hard to digest, including the concern around the conflict between production and safety. the evidence was strong and clear and I accept my responsibility for the result" Business Unit leader, the 17<sup>th</sup> of march, 2005</i>
<b>2005 Budget cuts</b>	<i>"In late 2004, BP group refining leadership ordered a 25 percent budget reduction "challenge" for 2005. The Texas city business unit leader asked for more funds based on the conditions of the Texas city plant, but the group refining managers did not, at first, agree to his request".</i>
<b>2005 Key Risks</b>	The refinery would likely <i>"kill someone in the 12-18 months"</i>

This part of the CSB report reminds the reader of a pattern. Problems were identified; signals were strong (in retrospect) about the state of the installations, especially the warning from some whistle blowers and from the many official reports. These signals could be said strong because they were clearly acknowledged by management. *"Seeing the brutal facts so clearly was hard to digest, including the concern around the conflict between production and safety. The evidence was strong and clear and I accept my responsibility for the result"* (CSB report, 2007, 171). However, we also know that some were not communicated to higher levels. *"Serious safety failures were not communicated in the compiled reports. For example, the "2004 R&M segment risks and opportunities" report to the group chief executive states that there were "real advancements in improving segment wide HSSE performance in 2004", but failed to mention the three major incidents and three fatalities in Texas City that year"* (CSB report, 2007, 145).

A sign of normalization of deviance in the Challenger case was the fact that information about potential serious problems (cold temperature potential impact on joint behaviour) was not transmitted to higher decision making levels. Instead of revealing a decision-making problem pointing at individual faulty managers, it was indeed, for Vaughan (1996) a sign that insiders collectively constructed an inadequate level of risk. Were risks at Texas City in general therefore also normalized? Were they identified and treated through specific measures, each time establishing a new norm while stepping outside safe boundaries? Do we have the production of culture; a culture of production and a structural secrecy combining together to produce and maintain a slippery slope (Vaughan, 2005)?

### 3.2 The production of a culture (some elements of)

***Behavioural safety as a solution.*** The behavioural safety approach was also favoured as an answer to the technological problems “ The Texas City site’s response to the “control of work review”, which occurred after two major accidents in spring 2004, focused on ensuring compliance with safety rules. The response stated that the review findings support “our objective to change our culture to have zero tolerance for wilful non compliance to our safety policies and procedures. (...) the Texas city business unit leader announced that he was implementing an educational initiative and accelerated the use of punishment to create a “culture of discipline”(CSP report, 2007, 164).

***An institutional influence.*** The inadequacy of the answer to the problem faced by BP through a focus on behavioural compliance with rules could be the sign of one of these external forces contributing to create isomorphic pattern among companies such as put forward by new institutionalism (Di Maggio and Powell, 1991b, 70). “ *Models may be diffused unintentionally, indirectly through employees transfer or turnover, or explicitly by organisations such as consulting firms or industry trade associations. Even innovation can be accounted for by organisational modelling (...) organisations tend to model themselves after similar organisations in their field that they perceive to be more legitimate or successful*”.

This behavioural and disciplinary approach seems indeed to have become a norm in the industry for dealing with human factors in safety. This is clearly performed at the expense of other approaches targeting more cognitive and contextual approaches of work such as promoted by ergonomics or sociology (Le Coze and Dupré, 2008). We find confirmation of this prevailing way of thinking in BP with comments from employees regarding accident investigations within BP. “*A number of hourly employees at Texas City and Toledo, for example, expressed the belief that management is more interested in assigning blame than identifying the root cause of an incident*” (Baker Panel, 2007, p 201). But while in this particular case the accident reveals the inadequacy of response through behavioural compliance with rules to identified safety problems, this can’t be seen only as the BP company level but more widely as an industry level, at a systemic level, influencing BP’s practices.

### 3.3 A culture of production (some elements of)

***A “Making do” culture institutionalized.*** Do we now find elements regarding the presence of a culture of production? It certainly is something that is made explicit in the two reports. As it is obvious that the degraded state of the installations can be traced back to the budgets cuts throughout the preceding years of the accidents, the Baker Panel ask the following questions: *Did the refinery plant managers and their staff fail to see the need to spend more? Did they believe that they were more likely to be rewarded for meeting aggressive cost-cutting goals?(...) the panel is unable to answer to these questions*”. Short of answer to these questions, it nevertheless found some support from Browne, the CEO of BP, who suggest a “make do” mentality as an explanation for the poor state of the installations. “*Browne commented that for a number of years, BP had a “make do” mentality when times in the refinery business were tough and there was not much money to go around. Browne also commented that the otherside of “making do” is the fact that if a business gets used to not having something, it does not notice its absence. If the business makes do for a long*



*time, it begins to become blind of the risks that the business faced because the business just got used to them” (Baker panel, 2007, 84). As Vaughan analysed in a her case about production pressures that they “became institutionalised and thus taken-for-granted aspect of the worldview that all participant brought to NASA decision-making venues” (Vaughan, 1996, xiv)”. Similarly, BP Texas City culture of production through “making do” principle became institutionalised and created forces constraining practices of managers.*

***Unclear tradeoffs as a contributory factor.*** The fact that corporate levels created more pressure on the tradeoffs processes at refinery levels did not help to ensure a better use of the resources. As indicated in the Baker Panel report “*While initiative has been well intentioned, collectively they have overloaded refinery management and staff. BP’s corporate organisation has provided the refineries with little guidance on how to prioritise these many initiatives and the refineries do not receive additional funding to implement each initiative.*” (Baker Panel, 2007, p 86).

### **3.4 Structural secrecy (some elements of)**

***A gulf between actual performances and perception of it.*** BP is a huge company that “operates in more than 100 countries across six continents and employs more than 96000 people. BP’s corporate structure has been complex for many years” (Baker Panel, 2007, p27). The size and complexity of BP’s organisations participated in creating a deep gap between many of the objectives of the refineries and the current practices. “The information available to the panel indicates that a substantial gulf appears to have existed between the actual performance of BP’s process safety management system and BP’s perception of that performance. The gulf did not occur at any one particular point in time and did not exist only at particular point within the organisation. Instead, the information available to the Panel appears to indicate a more systemic breakdown occurring at multiple levels and in different line and functional positions.” (Baker panel, 2007, 228).

The Baker Panel report indeed dedicates two parts on corporate and board oversights. For the Panel “BP typically did not receive short term negative feedback on its reorganisations or job reductions, and as a result, BP apparently believed that the refinery operations continued to have the necessary capabilities in place” (Baker panel, 2007, 81). This is clearly the symptom of effect from structural secrecy, where relevant information to steer the organisation is not provided.

***Turnover in the industry as an institutional influence.*** An aggravating factor of structural secrecy at the refinery came from the frequent changes of leadership. “*The panel believes that the high turnover at the plant manager position has contributed to the process safety culture leadership weaknesses at those refineries. (...) Texas City interviewees also noted the differing personalities and priorities of the plant managers.* (Baker Panel, 2007, 73). But turnover in managerial position is a current practice in the industry. It is not specific to BP and could be traced back to an evolution of practices in the whole industry, a standard that has been pointed at and criticised after the BP Texas City accident for its impact on safety. « *Jeroen van der Veer, Shell’s chief executive, has imposed a job-tenure rule of four to six years for all but the most junior staff. Last week BP followed the Dutch company, signalling that the here-today, gone-tomorrow culture of the globe-hopping oil executive had to come to an end.(...) Shell now expects mid-career and senior executives to spend four to six years in a post, but when Mr van der Veer joined the company in 1971,*

*rapid job movement was the rule. In a recent interview with The Times, he said that the industry had changed over the past two decades and needed much greater professionalism.” (The Times, May 7, 2007)<sup>2</sup>.*

## 4 CONCLUSION

### 4.1 Preventing « data that should fit model »

Historical events such as industrial accidents are unique, they never repeat in the exact same ways. They happen at different time, within different technologies, with different people, etc. But it is also possible to think nevertheless that patterns repeat themselves. As Hughes wrote “*History does not repeat itself in detail, but drawing analogies between past and present allow us to see similarities*” (Hughes, 2004, p 2). The two positions are defensible. There will indeed probably be always enough similarities and differences between historical cases to maintain one or the other position. One important principle for accident investigation, and for both these positions, is to be sensitive to the “*data that should fit the model*” symptom (Le Coze, 2008). This principle warns observers not to attempt to force data to fit pre-existing models. Enough sensitivity should be therefore granted. It is clear that this applies to this paper and this interpretative exercise. There is always a risk to use a case from which the data have been collected without in mind the specific model one is trying to apply.

### 4.2 Strong signal or sheer power ?

Yet, treating the Texas City accident with the normalisation of deviance concept is also a useful exercise for the question raised between strong/weak signals and power, between culture and power. We found useful complementary data to the CSB report in the Baker Panel report (pressures from corporate levels to make tradeoffs without guidance, “making do” principle etc) to perform a very partial analogy. It is also an analogy at a macro level, considering risks from the plant perspective and not from a specific technology. It is not completely convincing though, given the limits pointed at through the “*data that should fit the model*” issue and because of the limited nature of the exercise. There is a bit of a twist in doing so especially when not working on primary sources (direct interviews and observations) but indirect ones (reports already organising their findings).

We could nevertheless say that it is interesting to try to look through the event with the production of a culture, a culture of production and structural secrecy in mind. But we could also see that this company was under abnormal and extreme production pressures. With this stated, is a focus upon a culture of reliability (with all the conceptual refinements of normalisation of deviance) as Perrow suggested then a luxury? Does this accident not explain itself simply by targeting misused power by elites, the power of few to enforce production pressures way out of known good practices? Is it the power of few, regardless of potential consequences (consequences of which they are not themselves exposed)? The power of high level

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<sup>2</sup> The two examples of institutional forces, behavioural approaches and high turnover of managers, are clearly detrimental to safety. They do not appear in retrospect to be very rational responses to process safety issues. But they are nevertheless implemented.

officials taking way too many risk, gambling, while managing complex and highly hazardous plants? We won't be able to definitely answer this question here but we also understand that personal opinion on human nature and society strongly influences the type of interpretation one would favour.

A sort middle position could be satisfying here. It is indeed rather difficult to analytically distinguish culture from power. Wouldn't it be indeed a reduction of the ase to summarise it as a result of power when it is an entire system which revealed its weaknesses? Accidents of this scale are complex events, with psycho, cognitive, social, economical, cultural and political dimensions (Le Coze, 2008). As Weick put it "*culture and power are not opposed explanations, but rather than culture shapes the way for power, defines power, is shaped by power, masks power, embodies power*". Resilience engineering as an applied field, would probably gain in trying to incorporate into its models the constant intertwined presence of power and culture as shapers of organisational behaviour.

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