Shell in the North Sea

Progress With Safety?

1999 - 2006

This presentation looks at the actual safety performance of Shell compared with the propaganda in their external press releases and internal communications within the Company - the presentation is in sections covering the following

Section One: Introduction
Section Two: The situation in 1999
Section Three: From Cullen to Chaos
Section Four: Evidence of degradation of critical safety systems
Section Five: Sustenance of a negative safety culture from 1999
Section Six: Comparative Analysis between 1999 and 2003
Section Seven: Failing to learn from the past - corporate amnesia
Section Eight: After the fatalities, is the future brighter?

Progress With Safety?
1999 - 2006

Section One
Introduction - setting the scene

Viewgraphs 3 through 5

Shell publicly claim significant progress with safety since 1999!

In a communiqué in 2006 to the Shell EP World-wide population Shell states in reply to Upstream articles of June that year, that:

- You may be aware that the Upstream trade magazine has today (16 June 2006) published an article making a number of very serious allegations against Shell in its operation of the Brent field and some very personal, and completely unjustified, attacks on current and former members of Shell's staff and management. Shell strongly refutes these allegations.
  An audit in 2000 confirmed significant progress had been made on asset integrity and management systems. This progress has contributed to the continual improvement in Shell's safety performance since 1999 in the North Sea. Further Shell absolutely refute allegations that it operated its installations at high risk levels and that safety critical equipment maintenance records had been falsified. Safety is, and always will be our first priority Shell reiterated

The inconvenience of the Truth!

But within Shell a decision had been taken by the CEO and the Executive Director to subvert their internal investigation report, in behaviour similar to the reserves cover-up just 24 months earlier, because the truth was that

- There was no evidence that the immediate actions in 1999 to reduce risks had ever been undertaken and critically important longer term action plans to correct the bad behaviour witnessed in 1999 had been truncated by end 2000 with 80% of actions outstanding
- The recommendation of the SIEP Lead Auditor in 1999 to suspend from Duty the Asset Manager and his deputy, and the General Manager because of their wilful negligence was ignored - instead the Lead Auditor was removed from the team - no explanation was given at the time by the MD for this action
- This allowed the negative safety culture to persist with the implication that the residual risks offshore, specifically on Brent Bravo, remained dangerously high contributing, directly to the deaths of the two men four years later

Why would Shell cover all this up - 1999, it's such a long time ago!

The reserves scandal rocked the Company, three board members were sacked. Over a three year period Shell had knowingly deceived shareholders, internal audit reports highlighting this were buried out of sight, the current CEO had his reputation tarnished, but survived

The current Executive Director was put forward as a safe pair of hands, to lead Shell out of the valley of despair, a modern day knight in shining armour. But that was all smoke and mirror's, in a leak-proof enhanced Expro in 1999, there was a culture of under reporting, e.g. false reports were sent to The Hague on financial defalcation, the PSMR story was under reported, by the Shell Expro MD, now the Shell EP Executive Director

After the deaths in 2003 interest focussed on the PSMR audit from 1999, for this had been a opportunity for Directors to take action to reverse the bad behaviour witnessed. If their failure to take appropriate action could be linked to the deaths four years later, then the Shell EP Executive Director would be, as they say, in deep water. The truth, had suddenly become very inconvenient, the only way to survive, was to lie, and lie again

Progress With Safety?
1999 - 2006

Section Two
The situation in 1999

Viewgraphs 7 through 17

Shell in the North Sea
The start of the journey - 1999

This section looks at the conditions prevailing in September/October 1999 from the verified results of a major audit. This audit called the Platform Management Safety Review was the largest ever undertaken in the then Shell Expro organisation. The findings were based on interviews with circa 260 people offshore and onshore and included visits to complete audits on 7 offshore installations. 1999 is an important stating point. It's a reference point at which the risks offshore, specifically on the Brent facilities, were considered by the Audit team to be in all probability in the threshold region, or in other words, at levels considered unacceptable to Society

Why was the 1999 Audit considered necessary?

- During 1998/9 Shell Expro experienced a number of high potential incidents on North Cormorant and Cormorant Alpha - concurrent with that internal audits were witness to a significant rise in serious findings across the organisation, many of these findings being HSE related
- There was a prevailing culture of denial evident in the Company, Auditee's refused to accept actions, many months of wordsmithing ensued until final acceptance, during which identified risks persisted
- As a result of these concerns Shell commissioned a major audit (PSMR) covering 7 offshore installations which was completed in 1999. The Auditor who at the time was employed by SIEP was requested by Shell Expro to lead the audit on their behalf
- The objectives of the audit was to assess whether safety was being managed effectively offshore - were the high potential incidents a statistical anomaly, or was there something fundamentally wrong with day to day management of health and safety issues?

What was the principal finding from the 1999 Audit?

- That there were significant weaknesses in essential supervisory and management controls caused by inappropriate attitudes and behaviour resulting in non-compliance and deviation - not to comply had become a normal way of doing things
- Perhaps the most important statement by the auditors was that they believed that it was the key business drivers and messages **from corporate level** that were fostering the undesirable behaviour in the organisation
- At corporate level, implied the Directors of the Company and specifically the Oil Director and the Managing Director - in other words, supervisors, and technicians offshore were non-compliant - but Audit opinion was that the culpability rested with the regime they had to work under

How was health and safety being managed offshore?

- The unanimous opinion of the audit team reached through consensus and as presented to Shell Expro on 22nd October 1999, was that safety was not being managed effectively - **in Brent specifically** production **and, to a degree cost, very much** took precedent over health and safety
- There was no problem with procedures, standards, codes, and in general offshore staff competency levels
- Witnessed behaviour however, at all levels in the organisation, indicated that violation from codes of practice and unapproved deviation from operating and design standards was common
- Throughout the offshore organisation there was an unhealthy level of cynicism with respect to their onshore management's commitment to safety - managers knew all the right words, used all the appropriate catch-phrases, but beyond the words there was little substance

Operating with high levels of residual risk Offshore

- Particular concerns was expressed with regards to Brent Bravo which was operating with high levels of risk - no immediate actions were taken by Shell Expro to reduce these risks at the time and the actions to correct undesirable behaviour were truncated in 2001 when only 20 % complete
- With regards to Brent Bravo although the audit findings claimed the risks to workforce on that installation were at threshold levels, they were not informed - and subsequently never have been
- This failure to inform the workforce of unacceptable risk levels in 1999 was continued in 2003 when a post fatality technical integrity review highlighted chronic weaknesses on the 18 offshore installations (17 excluding Brent Bravo) covered by the Review - this is in breach of the Offshore Safety Case Regulations - these Regulations also stipulate that the audit and review reports should have been copied to the respective installations for the attention of the safety representatives on those installations - this was never done

Shell claim that safety is, and always will be our first priority, but on Brent Bravo in Sept, 1999 with 156 POB this was observed

Operation of test separator in violation of design codes

Many gas detectors were inhibited - outputs isolated and overrides not logged in in Central Control Room therefore not approved and unmanageable

Unauthorised temporary repairs on hydrocarbon and utility lines

Skid deck covered by heavy equipment - explosion venting of utility shaft impaired by this - casual control over same

PTW violations and deviation observed

In Control Room Log quote Standby Firepump 'only one run left on pump', 'only use in anger' unquote

Firemain being used to supply cooling water to drilling, seawater discharge valve to sea jammed open - this meant that firewater volumes would be seriously restricted in an emergency

Two gas leaks - valve stems on XCV downstream of test separator (not reported)

Emergency Generator questionable reliability (air in lube oil) - from Logbook

Low levels of safety critical maintenance compliance (14%) against falsely reported 96%

NB: OIM had no overview of of the above and many other dispensations and deviations

Findings as presented to the Oil and Gas Director - 22nd October 1999

Shell Expro should take immediate action to reduce the risks of operation on Brent Bravo specifically and the Brent Field in general - Risks on Brent Bravo at present - as witnessed during recent visit - are intolerable - we are aware of no remedial action being taken to reduce these risks since the visit to this installation.

Weakness and deficiency is apparent in the

continued operation of plant and equipment outside design envelope

unauthorised changes to plant and operating parameters

unsafe recording of performance data during the testing of safeguarding and other SCE * (it was established that false records were entered into databases for oil riser ESD Valve)

changes of performance criteria for SCE with no thought to the implications of such change - the goal widening approach

chronic deviation from safety critical equipment routines with no prior approval or risk assessment

*** SCE - Safety Critical Equipment**

Findings as presented to the Oil and Gas Director - 22nd October 1999

Shell Expro should take immediate action to reduce the risks of operation on Brent Bravo specifically and the Brent Field in general

Weakness and deficiency is apparent in the

- **lack of controls in the inhibition/overriding of safeguarding systems**
- **failure of the independent external and Shell internal verification process to pick up the weaknesses highlighted by this audit**
- **failure to ensure that only competent staff who are assessed as such perform safety critical roles**
- **Failure to notify and otherwise inform workforce on BB specifically of intolerable risk levels and what is causing same**
- **failure to notify HSE (Regulator) of the true circumstances surrounding recent press and media coverage e.g. lack of compliance with SCE maintenance raised by OILC et al - so called Touch Fuck all**
- **(what OILC was claiming and newspapers/TV were reporting was factual, in fact situation was much worse, but recent Shell Press release statements indicate all is well, not to worry etc. This will be a huge REPUTATION issue, if the these audit findings leak onto the streets)**
- **Other business not related to BB - Failure to correct injustice to CA technicians disciplined in process now known to have been flawed**

SIEP Lead Auditor Additional Recommendation

Because of the severity and span of the findings, specifically on Brent Bravo, the Asset Manager, his Deputy, and the General Manager should be suspended pending an inquiry into their conduct. The justification for this was given by the author as -

> From early September the concerns re the audit findings were raised with these Managers but despite this the platform Brent Bravo continued to operate with no actions taken to reduce risk, this included knowingly operating process plant whilst it was in a dangerous condition to augment production (e.g. test separator)
>
> The Asset Manager and his Deputy had admitted under interview to the falsification of maintenance records, and the falsification also of the test records of safety critical equipment (e.g. ESD valves)
>
> An independent external DNV inspector reported he was bullied into signing of a whole tranche of test results as satisfactory only to find 12 months later that this equipment had been unserviceable and isolated from use during that period (e.g. Brent D oil mist detectors)
>
> The Asset Manager regularly approved changes to equipment design and altered the performance standards of safety critical equipment all of which he were not authorised to do (e.g. the firewater main changes, temporary repairs on pipe-work)
>
> There has been no attempt to communicate the audit results in 1999 to the workforce or the HSE in breach of Safety Case Regulations

What happened to these recommendations?

An internal investigation team reported to the CEO of Shell in July 2005 that they could find no evidence that -

The immediate recommendations to reduce risk on Brent Bravo were ever undertaken and that the longer term actions to correct the negative safety culture were truncated in late 2000 when only 20% complete

The Oil Director who heard these findings in 1999 stated that he reluctantly has accepted the PSMR audit findings only to prevent an ongoing dispute between the Audit team and the Brent Management team. He has never explained why he did not correct his false and misleading statements to the media and the HSE with reference to Touch Fuck All and its true effects on technical integrity offshore

The MD, who dismissed the Shell International Lead Auditor after the presentation on 22nd October, stated to the investigation team that he had considered the replacement of the Asset Manager in 1999 but decided against this because of the undesirable effect this may have on that Managers mental health - the investigation team reported this decision as astonishing and inexplicable

Brent Bravo - not the only problem area in 1999

On Dunlin Alpha (since 1995) bursting discs on the water side of gas coolers vessels were isolated - this was expected to remain the condition until Q4 2000

> This was a causal factor in a major incident in 1991 when gas, entering the service water cooling system from the heat exchanger of a gas vessel migrated via an unknown connection into the toilet flushing system within the Fulmar Alpha Living Quarters and was ignited by a cigarette

On Brent Delta the HVAC in the drilling modules had been non-compliant since early 1999. There was no evidence of an effective response. There were seized firemain valves and overridden Oil Mist Detectors in the process modules.

> In August 1999 the Brent Delta Fire and Gas detection systems had 98 overrides applied - many of which were not approved

Lord Cullen in his recommendations placed great stress on the competence of the OIM. Cormorant A had a major incident in its M3E module, an investigation found the Emergency Response was inadequate, morale on the platform was unhealthily low, empowerment was in vogue and vertical relieving of OIM position was in place for 80 days in 1998. Despite all this, an OIM was retained on seat despite onshore management stating in writing that they had no confidence in him

Progress With Safety?
1999 - 2006

Section Three
From Cullen to Chaos - the failure of the offshore safety regime to force Shell to improve

Viewgraphs 19 through 32

Progress With Safety?
1999 - 2006: From Cullen to chaos

Shell EP press releases and internal communiqué in June 2006 robustly challenge my allegation that the 1999 audit findings were not handled appropriately. They say the audit follow up was vigorous and an audit carried out in 2000 substantiated marked improvements and that these improvements were continual from 1999 onwards. This assertion is challenged in the next set of viewgraphs

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The importance of these viewgraphs is that the data is independent coming from the HSE, the industry Regulator or 'enforcing authority' under the terms of the UK Health and Safety at Work Act.

The data illustrates significant decline in standards offshore which commenced when the ink on the submitted Safety Case's was barely dry right through until the start of this year 2007 - hence the title from Lord 'Cullen to chaos'

Progress With Safety?
1999 - 2006

- In contradiction to the Shell press releases the safety performance has been **appallingly bad** with respect to inability of the Company to comply with mandatory legislation in its North Sea operations
- The continued degradation of hardware and undesirable behaviour contributed to a double fatality in 2003
- The authors opinion is that much of the enforcement actions to correct breaches of offshore legislation may not have been adequately reported internally in the Health, Safety and Environmental (HSE) governance assurance letters sent in January each year from the Shell MD in Aberdeen to corporate headquarters in The Hague.

Shell North Sea progress with safety?

Statistical comparison with some other Operators *

Period 2002 till end of 2006

Enforcement Notices

- **Shell served with 42**
- **BP (comparable in size and complexity) served with 25 or 60% , circa half the number served on Shell**
- **Amerada Hess served with 2 and Talisman were served with 4**
- **Total Oil Marine served with 4 and Chevron served with 1**
- **KCA Deutag (Drilling Operations only) served with 3**

Prosecutions

- **Shell prosecuted on 5 occasions - 3 of which related to the Brent B fatalities**
- **BP prosecuted on 4 occasions**
- **Amerada Hess prosecuted on 6 occasions**
- **Talisman, Total Oil Marine, KCA and Chevron have had no prosecutions**

* For offshore Operations only - this data courtesy of the HSE on http://www.hse.gov.uk/ go to A-Z directory, click on E for Enforcement and enter name of recipient - data only available for all other Operators on web-site from 2002

Historic Decline

A loss of organisational checks and balances

- During the early 90's under the stewardship of Brian Ward and Keith Allan great efforts were put into improving standards offshore to ensure operational and technical integrity - the author is not aware of any enforcement notice being served on Shell North Sea operations, particularly in Northern waters, during this period
- By the mid 90's on the departure of Ward and Allan significant organisational changes took place to create 'enhanced Expro' organisation
- Enhanced Expro discarded the traditional checks and balances between the line and the technical function - the latter was replaced by a commercially driven technical services consultancy, the use of which by the line was not compulsory
- Many more changes took place, a transition risk plan to minimise the risks during this period of exposure was ostensibly ignored
- The increasing audit findings and Regulator intervention, as discussed in the following data, are symptomatic of an organisation that had increasing weaknesses in essential controls related to health and safety of its employees

1999 - 2006 From Cullen to Chaos

- A story of the constant decline in technical integrity -

- Between last quarter 1999 and end 2006 the Company has been served **50 enforcement notices,** an average of 7 per year, or over an 87 month period an average of one every 7 weeks
- **38** were Improvement Notices
- **12** were Prohibition Notices
- All this discounts the fact that in 2003 the HSE were informed of the results of the post fatality integrity review by Shell but served no enforcement notices on the 17 offshore installations - notices were served on Brent Bravo only as the limited HSE resources were tied by in the fatal accident investigation
- In addition there was 5 prosecutions for serious breaches of offshore Regulations, 3 related to a double fatality - To all of which Shell pled guilty

The Enforcement Notices were served to reduce the unacceptable risks to persons employed offshore

- As a result of Government Inspections by an enforcing authority, as required under the UK Health and Safety at Work Act, the HSE inspectors serve enforcement notices when they consider that -
- There has been a serious breach of legislation and, the risks to persons on the installation are unacceptable due to this breach
- Completion of an improvement notice is mandatory and the actions to improve must be completed within a specified timeframe
- A prohibition Notice takes immediate effect to take out of use any system of work, process, hardware and can be used to halt production - the immediacy of taking action is because the risks are assessed by the enforcing authority as being dangerously high
- Until the enforcement action is complete the Company remains in breach of legislation - over the period 1999-2006 Shell have been in breach of legislation almost continually due to the absolute number, and overlap, of the 50 enforcement notices - more importantly as long as the notice remains outstanding the residual risks are above ALARP

An early warning to Shell Directors from the industry Regulator goes unheeded

27th October 2001

- The HSE write to Shell Expro complaining that progress on Improvement Notices issued related to the the verification schemes on Cormorant A and Dunlin A in 1999 and 2000 and the North Sea generally, are significantly overdue - the Company has been in continual breach of these Regulations for over 18 months
- They request that to give this the attention and priority it deserves that their letter be discussed at corporate level in the organisation - the seeds fell on stony ground, for after the letter was received a further nine Improvement and two Prohibition notices are served prior to the fatal accident in Sept. 2003

Chronology of Improvement Notices served from 1999 to 2006

Years served	
1999 - 2001	Six
2002	Nine
2004	Nine
2005	Six
2006	Eight
Total	38

Faced with resources constraints to investigate the fatal accident HSE imposed no improvement notices on the 17 other offshore installations shown in the 2003 data - all these installations had serious problems with ESDV and Fire and Gas system verification, unauthorised temporary repairs, and the common problems of violation and deviation. HSE have been heavily criticised by trade unions for this failure, if 17 additional notices had been served the grand total would have been 55 Improvement Notices between 1999 - 2006

Chronology of Prohibition Notices served from 1999 to 2006

Years served	
1999 - 2001	Two
2003	Three
2004	Four
2005	Two
2006	One
Total	12

Faced with resources constraints to investigate the fatal accident HSE imposed no prohibition notices on the 17 other offshore installations shown in the 2003 data - all these installations had serious problems with ESDV and Fire and Gas system verification, unauthorised temporary repairs, and the common problems of violation and deviation. HSE have been heavily criticised by trade unions for this failure.

Before the fatalities on 11th September, 2003

- Before the 11th September 2003 there were 15 Improvement Notices served and 2 Prohibition Notices - a rate of enforcement notices over this 48 month period of 1 per quarter
- As a result of the fatal accident on 11th September 2003 there was a further 3 Prohibition Notices served
- Before the 11th September there had been one prosecution in 2000 at which Shell pled guilty

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- At Stonehaven Sheriff Court in April 2005 there were 3 separate prosecutions for unlawful killing related to the fatal accident event to which Shell pled guilty

After the fatalities

Did Shell learn lessons from the unlawful killing of two young men ?

- After the fatalities there has been 23 Improvement Notices served and 10 Prohibition Notices served, three of which related to the double fatality event - over this 39 month period a rate of enforcement notices of approaching 3 per quarter
- Excluding those three gives a rate of issue of Prohibition Notices of two per year which represents a 300% increase over the situation prior to the fatalities
- The Company was prosecuted for serious breaches of legislation in 2004 for which it pled guilty

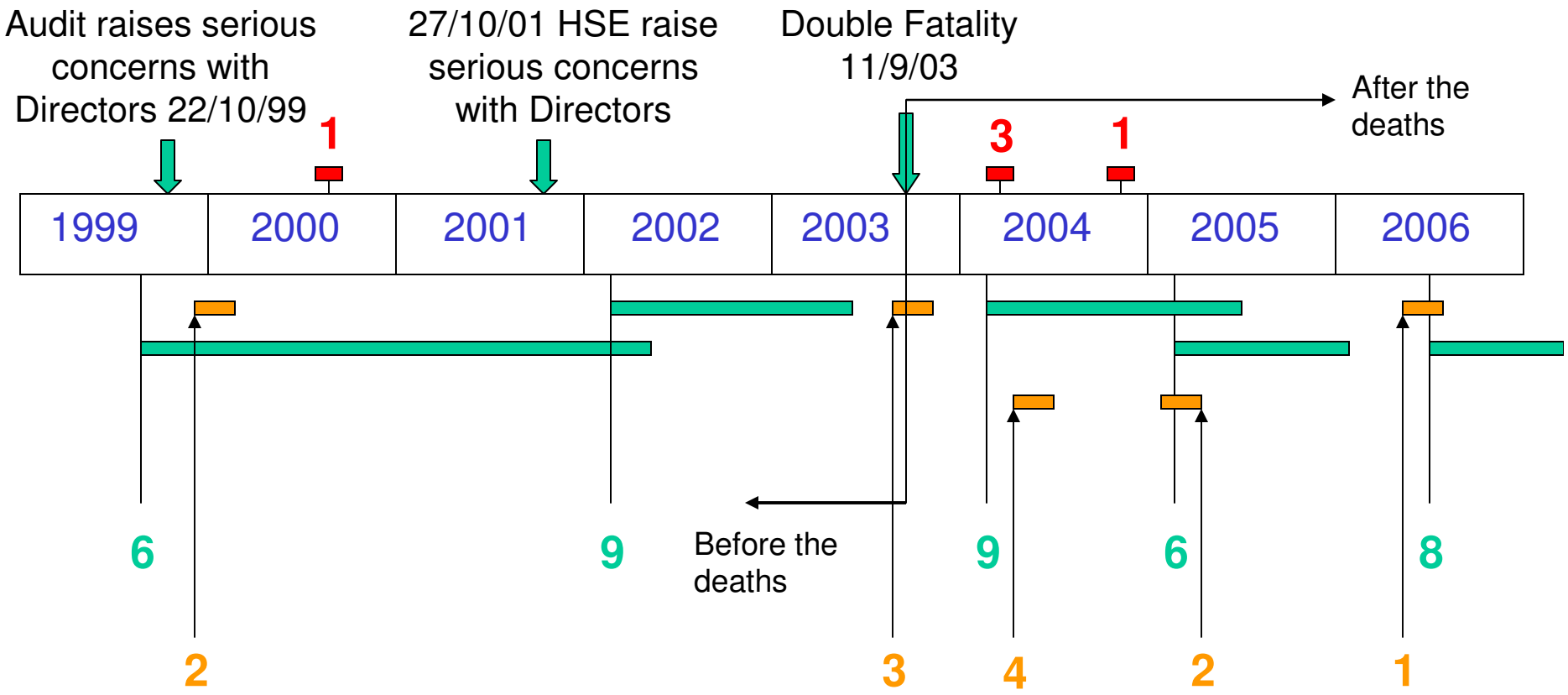
The bottom line is enforcement actions have significantly increased - which means there is evidence that the residual risks levels have increased, not reduced, as would have been expected - so it appears Shell have not learnt from its bitter experience

Chronology of Improvement and Prohibition Notices along with Prosecutions served from 1999 to 2006

Span of Improvement Notices

Initiation of Prohibition Notices

Pled guilty at prosecutions for breaches of legislation



The number and severity of the Enforcement Notices served on Shell in the North Sea

- Whilst a number of Improvement and Prohibition Notices are to treat or terminate the risk of a single fatality, for example to replace or improve guarding on machinery, many were issued to reduce the risks to the integrity of the installation per se and are to prevent major accidents, or potential multiple fatality events occurring, or if they did occur, to prevent these events escalating out of control
- For example many of the Improvement Notices related to safety critical equipment performance verification schemes - chronic weaknesses in these schemes are likely to have raised residual risk levels to threshold values - or values unacceptable to Society - 7 such Notices were served in 2002 alone!
- Of the 38 Improvement Notices served between late 1999 and end of 2006 - 25 or 66% were to reduce risks with the potential of causing a multiple fatalities. Of the 12 Prohibition Notices 6 - or 50%, were to reduce immediately risks that had the potential of causing multiple fatalities

The Number and Severity of Enforcement Notices served both before and after Fatalities

Improvement Notices - (15)	
To remove risk of multiple fatality	11
To remove risk of single fatality	4

Prohibition Notices - (2)	
To remove risk of single fatality	2

Before the fatalities

Improvement Notices - (23)	
To remove risk of multiple fatality	14
To remove risk of single fatality	9

Prohibition Notices - (10) includes 3 due to fatalities	
To remove risk of multiple fatality	6
To remove risk of single fatality	4

After the fatalities - significant increase indicating further decline!

Progress With Safety?
1999 - 2006

Section Four
Evidence of degradation of critical safety systems from September 1999 to September 2003

Viewgraphs 34 through 58

1999 c.f. 2003
Hardware degradation symptomatic of bad behaviour

As evidence that there was no improvement in Safety performance between 1999 and 2003 the next set of viewgraphs compare the status of critical safety systems, the hardware, as they were on Sept 1999, and as they were immediately after the fatalities in Sept. 2003

It is the contention of the author that the root cause of the deaths on Sept. 2003 was a direct consequence of the normalised behaviour of the offshore crews, and their onshore managers, not to comply with their own internal standards and Codes of Practice with regard to the maintenance and safe operation of the hardware

This persisted over a prolonged period - a conditioning process. In 1999 the Oil Director and the Managing Director were given an opportunity to intervene effectively to turnaround this culture, but they patently failed to do so by their own behaviour of self denial

- 2000 and 2001-
Platform Evacuations of non-essential personnel as other evidence of serious technical integrity problems in North Sea operations!

- In September 2000 a fire developed in the fire-pump room on Leman. The deluge system failed to protect the pump and maintenance, which should have been carried out in 1999, **had been neglected**
- In September 2000 some 93 persons from Brent D were evacuated after **prolonged loss of all life support systems**
- In November 2000 the newly commissioned Shearwater platform which handles extremely high pressure, high temperature hydrocarbons, was evacuated after **higher than normal pressures were recorded at the wellheads**
- In February 2001 the Kittiwake platform was evacuated after **the loss of control on an oil well**

Sept. 1999

An early warning that Fire and Gas detection systems are failing goes unheeded

- Following the major audit in 1999 Directors of Shell Expro were informed of serious concerns related to safety critical fire and gas detection systems on Brent Facilities offshore, namely that
  - **they were not being tested in line with mandatory maintenance routines under the undesirable influence of the touch fuck all instructions**
  - **When they were tested after a prolonged period between tests there was a high failure rate**
  - **acceptable tests were being recorded when in fact to get the devices to operate pre-conditioning and cleaning was being carried out prior to test - this is an example of the false reporting of safety critical equipment performance**
  - **devices were isolated for prolonged periods of time with no appropriate authorisation or risk assessment**
  - **Such isolation were not recorded appropriately in the central control room logbooks**
  - **Technical Integrity key performance data in monthly reports had incorrect numbers (under-reporting) of inhibited fire and gas sensors - this is an example of the false reporting of safety critical equipment performance**

Sept. 2003

Fire and Gas detection system performance - Data from post Fatality Integrity Review -

- The Shell EP executive Directors publicly claim that the 1999 audit findings were vigorously pursued and as a result continual improvements to technical integrity has been assured
- The following data from a review carried out after the fatal accident in 2003 does not support these public claims, the review covered the systems shown below with only dangerous failures targeted
  - Flammable gas detection
  - Toxic gas detection
  - Oil Mist detection
  - Flame detection
  - Smoke detection
  - GPA or General Platform Alarms

At Sept. 2003: Fire and Gas Systems Performance

Platform		Comments
BA		Gas heads calibration regime not as per EA/081 and currently changing to CoP regime, given as amber as an interim measure.
BB		Only Utilities leg reviewed.
BC		**Some inadequate SAP histories, or preconditioning such as cleaning reported before carrying out tests.** **Detectors inhibited for lengthy periods of time before corrective actions**. Gas heads calibration regime not fully as per CoP EA/081.
BD		**Some inadequate SAP histories, or preconditioning such as cleaning reported before carrying out tests.** **Detectors inhibited for lengthy periods of time before corrective actions**. Gas heads calibration regime not fully as per CoP EA/081. No deviation.
CA		Some inadequate SAP histories for flammable gas detectors.
DA		Gas heads calibration regime not fully as per CoP EA/081. No deviation.
TA		ZG30 barrier faults that is not fail safe giving faults on GPA functions. Asset are aware of this fault. Gas heads calibration regime not fully as per CoP EA/081. No deviation.
EA		A single detector WO corrective work RAMed out. Gas heads calibration regime not fully as per CoP EA/081. No deviation.
NC		
AA		**No or inadequate SAP histories, or preconditioning such as cleaning reported before carrying out tests**. Gas heads calibration regime not fully as per CoP EA/081. No deviation.
AN		**No or inadequate SAP histories, or preconditioning such as cleaning reported before carrying out tests**. Gas heads calibration regime not fully as per CoP EA/081. No deviation.
FA		**No or inadequate SAP histories, or preconditioning such as cleaning reported before carrying out tests.** **Detection inhibited for lengthy periods of time (e.g. flame).** Gas heads calibration regime not fully as per CoP EA/081. No deviation.
GA		**No or inadequate SAP histories, or preconditioning such as cleaning reported before carrying out tests**. Gas heads calibration regime not fully as per CoP EA/081. No deviation.
SW		**No or inadequate SAP histories, or preconditioning such as cleaning reported before carrying out tests.** **Some detectors appear not to have been successfully tested for over 2 years.**
Nelson		No SAP records for calibration tests for flammable gas detectors. Gas heads calibration regime not fully as per CoP EA/081. No deviation.

Fire and Gas Detection Systems Performance

Sept. 2003: Systems that failed to danger

Expro - Northern and Central North Sea

Devices reviewed

Device	BA	BB	BC	BD	CA	DA	TA	EA	NC	AA	AN	FA	GA	SW	Nelson
Flammable gas	19	21	24	27	39	34	76	65	71	116	11	76	126	46	27
Toxic	0	2	6	4	3	2	0	0	0	0	0	0	0	14	0
Oil Mist	0	3	3	2	0	0	0	0	0	14	1	0	0	4	0
Flame	12	17	13	12	44	22	4	8	19	8	9	75	24	41	0
Smoke	10	13	9	29	18	97	5	32	50	70	4	48	6	16	8
GPA / MAC	4	6	3	4	11	12	83	0	19	83	3	46	6	3	7

Failed to danger INCLUDE where data not available in SAP **or when cleaning / preconditioning carried out**

Device	BA	BB	BC	BD	CA	DA	TA	EA	NC	AA	AN	FA	GA	SW	Nelson
Flammable gas	20	14	6	15	6	1	11	1	0	**237**	26	**156**	**293**	12	27
Toxic	0	0	14	12	0	0	0	0	0	0	0	0	0	5	0
Oil Mist	0	2	5	6	0	0	0	0	0	10	1	0	0	7	0
Flame	0	0	5	0	2	0	0	2	0	14	33	**150**	**24**	13	0
Smoke	0	0	0	1	2	5	0	0	0	2	0	**36**	0	0	0
GPA / MAC	0	0	0	1	0	0	7	0	0	2	0	**92**	0	0	0
			Note 1	Note 1						Note 1	Note 1	Note 1	Note 1	Note 1	Note 1

Note 1: Most of the recorded "Failed" numbers are from "No or inadequate histories" or "cleaned" before testing or "not tested".

Fire and Gas Detection System Performance

Sept. 2003: What was found!

- Old Northern platforms (including Brents) have reasonable as-found calibration histories for gas detectors (flammable and toxic), **for the rest of Expro this history is effectively non existent**
- There would appear to be detectors that have a history of **out of service for long periods**, as they appear in consecutive Work Orders without evidence of successful tests
- Test methods carried out by testers frequently **are incorrect** (e.g. oil mist) in that they clean / pre-condition before carrying out the tests, thus unable to determine if the as-found would have performed the function required
- The actual failure rates for Toxic, Oil mist and General Platform Alarms (GPA) are magnitudes worse than the values used within the IPF process
- Oil mist detectors generally a problem across the North Sea installations
- SAP maintenance history data quality is generally poor, thus difficulty in identifying dangerous failures

Sept. 1999: Emergency Shutdown Valves Performance

What was verified by the Audit!

The current Shell EP Executive Directors publicly claim that the 1999 audit findings were vigorously pursued and as a result continual improvements to technical integrity has been assured. Following a major audit in 1999 Directors of Shell Expro were informed of serious concerns related to principal oil and gas riser Emergency Shutdown Valves, namely that

- **they were not being tested in line with mandatory maintenance routines as driven by the touch fuck all instructions**
- **When they were tested after a prolonged period between tests there was a high failure rate, namely leak-off criteria exceeded Shell Expro performance standard**
- **If a valve failed its leak-off test criteria the Brent Asset Manager simply authorised an increase in the leak-off criteria, the upper limit he authorised was 20 scm/m or 2000%above the standard applied in the rest of Expro**
- **evidence was provided where ESDV valves had failed but continued in operation, when risk assessments were produced some 8 weeks later these assessments were that the risks were unacceptable but still no action had been taken**
- **Frequently, when an ESDV had failed, the maintenance records recorded 'NO FAULT FOUND' - this is an example of the false reporting of safety critical equipment performance**

At Sept. 1999

If the Safety Critical Equipment didn't function, well lets just change the standard! - how ESD valves and deluge systems were altered by the Asset Manager with no reference to a technical authority or pre - assessment of the increased risks

Safety & Reputation RISK

Original UK industry, and Shell standard

GAS PIPELINE RISER ESDV Leak Off Test Criteria	Above 1 cm/min take immediate action to replace	Above 4 cm/min put action to replace into Asset Reference Plan	Above 20 cm/min replace at next planned shutdown
DELUGE RESPONSE CRITERIA	20 seconds	60 seconds	100 seconds

Brent SCE ended up with performance standards significantly worse that the industry norm and the rest of Shell Expro - and all to save shutting down or spending on OPEX

Emergency Shutdown Valves Performance

Sept. 2003: What was found!

Platform		Comments
BA		**BA-XEV-970 leak at 25bar in 5min in 2001, WO for correctives cancelled as has the routine to LOT valve. Other gas riser closure and LOT tests have also been cancelled.**
BB		**WO signed off as OK when test not carried out. WOs signed off as Ok when using wrong test method and known fault on system. WOs cancelled for corrective with faults still present (e.g. valves).** Riser ESDV measure leak accepted for average value not the maximum value which is the criteria, if maximum used valve fails test.
BC		Some inadequate SAP histories. **Histories for gas riser valve do not show that the valves meet the leak off criteria. HP sep EZVs slow to close, no follow up actions, other valve failures not corrected when identified.**
BD		Riser ESDV closure time greater than criteria. Gas valve LOT and seal failure. **Failed valve not being tested properly but reported as OK for WO closure. Corrective WOs cancelled.**
CA		Some inadequate SAP histories. Sticking valves identified during ESD test in 2002, **corrective WO raised but not released for remedial actions.**
DA		**F&G inputs to ESD not tested as there are no input inhibits at ESD system, but routines being signed off or cancelled. Tests signed off as successful even when failures noted.**
TA		ZG30 barrier faults that is not fail safe giving drift on ESD functions. Asset are aware of this fault. **Hudson overpressure protection ESD valve not meeting required performance, known to Asset.**
EA		Last LOT on riser ESDV is a good model for history as give pressures temperature, etc.
NC		Fixed format not used for ESD-2/2S test results.
AA		Some WOs that were completed months ago are still awaiting history.
AN		**Repeated valve failures.** **Valve recorded as frigged before test, not tested and left in frigged state after test.**
FA		Some inadequate SAP histories. Riser ESDV closure and LOT results not always in SAP. **Failed valves (?) with no follow up identified.**
GA		**Riser ESDV closure and LOT results not in SAP. Repeated valve failure**
SW		Some inadequate SAP histories. **Riser ESDV performance changed from 2001 with closure time doubled.**
Nelson		**Riser ESDV closure and LOT results not in SAP.**

Emergency Shutdown Valves Performance - this borders on Criminal Neglect

Sept. 2003: What was found!

- The Data overleaf shows serious problems with the testing and performance of the principal ESD valves on **12** of the 15 offshore installations
- For Brent Bravo the work order signed off as OK when test not carried out, further Work Order to rectify faults cancelled when these faults known to be still present on valves - evidence of false reporting
- For Brent Delta and Dunlin Alpha we see a similar story - these are but three examples of falsification of the performance records
- For Brent Alpha, Brent Charlie & Cormorant Alpha we see examples of valves failing to meet the mandatory leak-off performance criteria but the installations continue to operate and the corrective work orders to rectify the defects are cancelled
- For Anasuria note the **repeated valve failures** and that the ESD valve is recorded as frigged before test, not tested but left in frigged state after test
  - frigged is offshore terminology for purposefully inhibited from use

ESD Valves on Brent Bravo

With reference to the fatalities - What did the Sheriff say in his Report?

- During the annual maintenance shutdown in August 2003 ESD valve EZV 4415 on the outlet of the HP Flare KO Vessel failed to close during routine testing
- During the same shutdown some 14 other valves failed to operate within specification
- The OIM considered the failure of ESD valve EZV 4415 did not prevent the start up of the platform on 22nd of August - it should be note that under the Shell technical change control procedure the OIM did not have the authority to take that decision
- The total amount of hydrocarbon vapour cloud released into the shaft via the leaking temporary patch was estimated at 6280 cubic metres
- A significant factor which contributed to the extent of the vapour cloud was the failure of ESD valve EZV 4415 to close in the emergency

ESD Valve EZV 4415

With reference to the fatalities - what did the Sheriff say in his Report?

The deaths might reasonably have been prevented, if a robust risk assessment of the possible consequences of starting up the platform in the knowledge that this ESD valve had failed to operate within specification when tested during the shutdown, had been carried out

Sept. 1999: **Temporary Repairs on Pipes**
What was Found!

- The current Shell EP Executive Directors publicly claim that the 1999 audit findings were vigorously pursued and as a result continual improvements to technical integrity has been assured. Following a major audit in 1999 Directors of Shell Expro were informed of serious concerns related to the management of temporary repairs on Brent Bravo and North Cormorant, the installations subject to audit at that time, namely that -
  - **the repairs were being applied** without the prior and formal approval of a design authority in violation of Shell Expro technical change control policy
  - **There was no register of these changes such that the OIM's on both the installations** had no knowledge of the number and range of these temporary repairs and patches
  - **It was verified that repairs and patches were applied and stayed in situ** well beyond the original designated temporary period assigned for their use

What Directors were told about temporary repair and patches on 22nd October 1999, by their Audit team

- Another warning that went unheeded -

Extract from a viewgraph used at the management presentation of the Audit findings to the Shell Expro Leadership Team including the Oil and Gas Director at Tullos on 22nd October 1999

In our ageing assets there is increasing use of temporary clamps, due to pipe-work reaching minimum allowable wall thickness

Our corrosion management data is out of date, so who has overall responsibility for this within our business?

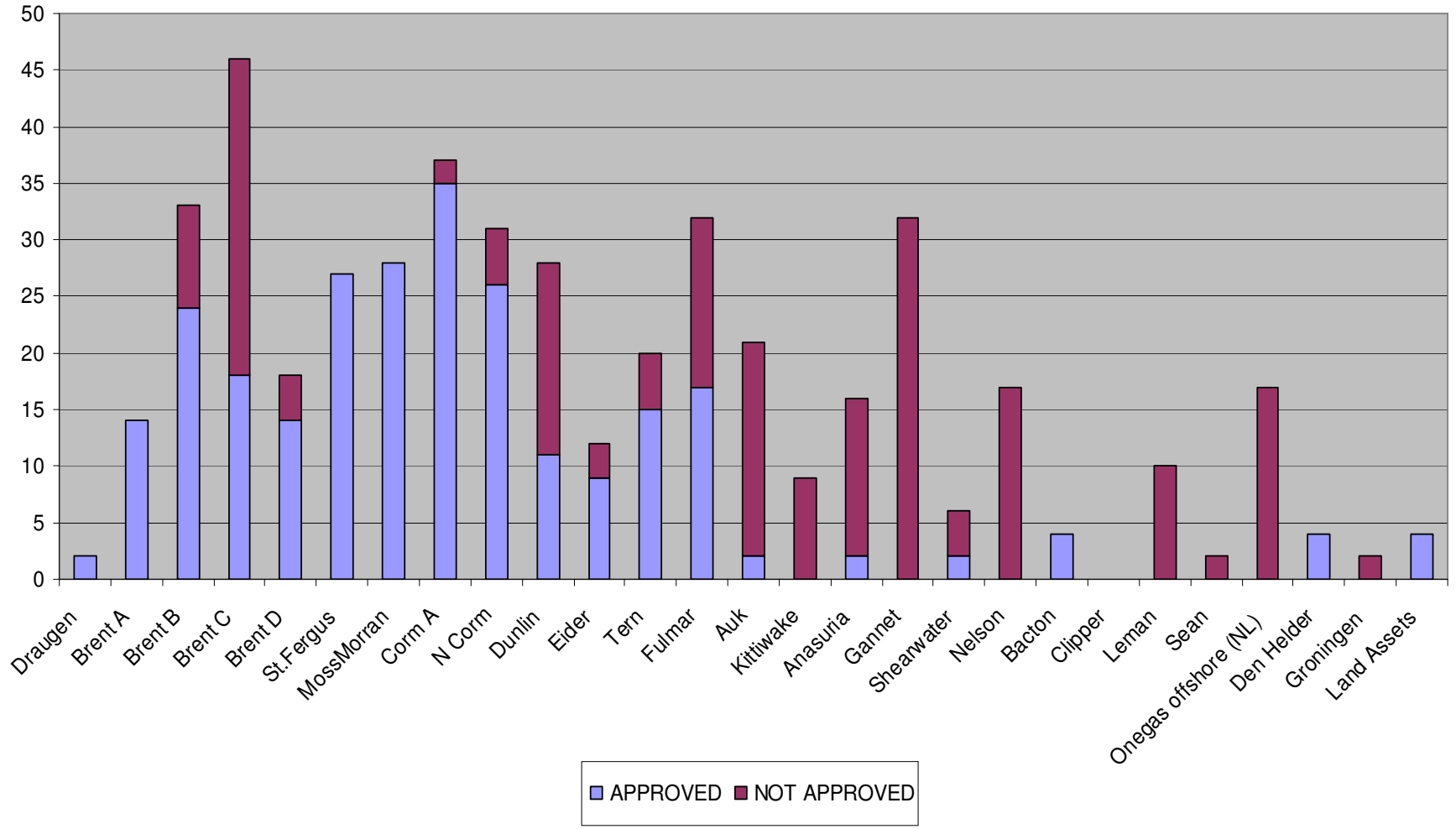
What Directors were told in a strictly confidential note from the Internal Audit Manager to the Oil and Gas Director on 20th October, 1999

- Another warning that went unheeded -

page 7 of 10 of the Note

Quote - No person at any level in the organisation appears to have a concise overview of the technical integrity status of any specific offshore installation, for example, the collective picture of loss of containment risks due to clamps, thin wall pipework, at any moment in time - Unquote

Post fatality Review Findings as presented to the Shell Production Director in September 2003 - approved and unapproved repairs



After the Fatalities the Shell Production Director so 'shocked and horrified' by his Review Findings asks for operators to check, and check again, by walking every line

Shell Aberdeen Production Director Note of 18/9/2003 in relation to the findings of his internal review into the status of temporary repairs (extract)

Quote from Production Directors e-mail……..

- In light of these findings, I am requesting you to complete the following actions. It is my expectation that these have been done in the ordinary course of business. However we need to ensure that all procedures have been properly carried out, and hence this request:

  - Re-check all temporary pipe-work repairs. This means that you must satisfy yourself that all "lines have been walked" to identify all temporary repairs on pipe-work. For each of those repairs I expect you to record the location, type of service, and the integrity of the patch;

  - For each repair, also indicate approval status by the appropriate internal authority, the expiry date of the approval, compliance with the inspection program, and your plans to effect a permanent repair;

Sept. 2003: What was reported to the Production Director by his post fatality Review team that so 'horrified'* him?

The exercise identified a total of **472** temporary repairs of which

- 205 were Hydrocarbon service
- only 258 were 'approved'
- 214 were 'not approved' of which 73 or 30% were in hydrocarbon service
- * On 31st of August 2006 at a meeting with the Head of the OSD (HSE) in Aberdeen, and the OILC, the author was informed that the Shell Production Director had presented the results of his post fatality review to them in October 2003. They quoted him as saying at the time that he was 'shocked and horrified' when first presented with these findings by his post fatality Technical Integrity Review team in Aberdeen

Witness an a further exponential rise in temporary repairs and patches

Sept. 2003: More and more repairs!

- The initial exercise triggered another bow wave of deviation requests in the former Expro Assets to secure technical approval

205 such requests processed from 12-30 Sept of which

- 162 were 'new' approved
- 35 were extensions to existing approvals where expiry was imminent
- 8 were rejected by the Technical Authorities as being not acceptable

Lowlights from Temporary Repairs Review

Sept. 2003: What was found!

For a number of assets, there were significant gaps in the overview of temporary repairs in place, and consequently in the overall view of risk, for example

- **On Gannet of the 32 temporary repairs found** none were approved
- None of the temporary repairs **on Leman, Kittiwake and Nelson were approved**
- **Brent Charlie alone had 46 temporary repairs of which** 32 were not approved
- **Of the 16 temporary repairs on the Anasuria FPSO** only two were approved

Temporary repairs in relation to the Fatalities - what did the Sheriff say in his Report!

- The temporary repair was carried out on a safety critical line whose failure could cause, or substantially contribute to, a major accident
- Approval from a technical authority **was not obtained** prior to carrying out the repair - to do this had become a normal way of doing things
- Approval would not in any case have been given for the repair by the technical authority as it was not in compliance with Shell engineering standards

Temporary repairs in relation to the Fatalities - what did the Sheriff say!

You need to question how can the Shell CEO claim a vigorous and effective response to the 1999 Audit when the cause of the deaths was due to a generic deficiency of unapproved repairs highlighted to Directors 4 years earlier?

- The leaking temporary patch which caused the accident was first observed to leak on 17th August 2003. The leak caused a gas sensor to go into alarm at low level, so the operators were aware at that time that the leak from the De-Gasser rundown line was volatile
- On 21st August, 2003 the operation supervisor's written hand-over noted that the temporary patch in question has failed and is leaking badly and he was trying to locate a replacement spool
- A highest ranking of 1 was given to the matter - it had to replaced urgently by a replacement spool within one month but this was not accomplished
- As a direct result of this two men died on 11th Sept 2003, when they attempted to effect a repair on this patch releasing significant hydrocarbon vapour into the shaft

Summary of 2003 Technical Integrity Findings

These are statistics of shame from a Company that states that Safety is, and always will be, our First Priority

OFFSHORE INSTALLATION	Status of Principal oil and gas Riser ESD Valves	No of Unapproved Temporary Repairs	Number of Safety Critical Fire and Gas sensors in failed to danger condition
Brent Alpha	Riser ESD valves fail leak-off tests but corrective WO cancelled	9	20
Brent Bravo	WO signed off as OK when test not carried out	16	16
Brent Charlie	Gas riser ESDV does not meet leak-off criteria	30	30
Brent Delta	Failed ESD valves not being tested properly but reported as OK for WO closure	41	41
North Cormorant		5	nil
Dunlin Alpha	ESD valve tests signed off as OK even after failures noted	6	6
Cormorant Alpha	Sticking ESD valves identified, WO raised but never issued	10	10
Tern	Hudson Overpressure ESD valve does not meet performance criteria	18	18
Eider		3	3
Gannet	Repeated ESD valve failures with no follow-up identified	32	317
Auk		19	265
Fulmar	Failed ESD Valves but no follow-up identified	15	434
Shearwater	ESD closure time doubled with no reference to a technical authority	4	37
Nelson	ESD valve historical performance data not in SAP computer	17	27
Kittiwake		9	
Anasuria FPSO	Repeated ESD Valve failures, valves left Frigged after testing carried out	18	60
Leman		10	
Sean		2	

Is it surprising that the Shell Director was 'horrified' with what his team told him in September 2003?

- Despite Gannet having repeated ESD Valve failures with no follow-up identified, of having 32 temp repairs, none of which were approved, and of having 317 safety critical sensors in fail to danger state the platform continued to operate
- Despite Fulmar having failed ESD Valves but with no follow-up identified, of having 15 unapproved temp repairs, and of having 434 safety critical sensors in fail to danger state the platform continued to operate
- Despite Anasuria having repeated ESD Valve failures, with valves left in frigged state (purposefully inhibited) after tests carried out, of having 18 unapproved temp repairs, and of having 60 safety critical sensors in fail to danger state the platform continued to operate
- Despite Brent Delta having failed ESD valves not tested properly but reported as A - OK so that Work Order could be closed out, of having 41 unapproved temp repairs, and of having 41 safety critical sensors in fail to danger state the platform continued to operate

Despite all this and more, as shown on the previous viewgraph, all these installations continued to operate, no assessment of the risks were carried out, the workforce were not informed and most surprising of all, the HSE, apparently with their resources tied up with the Brent B investigation, issued no enforcement notices on any of the offshore installations other than Brent Bravo

Progress With Safety?
1999 - 2006

Section Five
Evidence of development of negative safety culture in 1999 and the maintenance and sustenance of that culture over a prolonged period of time

Viewgraphs 60 through 65

- 1999 c.f. 2003 -
Witnessed Behaviour

As evidence that there was no improvement in Safety performance between 1999 and 2003 the next set of viewgraphs compare the attitudes and the behaviours witnessed in Sept 1999, and as they were immediately after the fatalities in Sept. 2003

It is the contention of the author that the root cause of the deaths on Sept. 2003 was a direct consequence of the normalised behaviour of the offshore crews, and their onshore managers, not to comply with their own internal standards and Codes of Practice with regard to the maintenance and safe operation of the hardware

This comparison of witnessed behaviors at Sept. 1999 and Sept. 2003 indicates remarkable similarities - as evidence of a culture of non-compliance persisting and being sustained over the prolonged period of time preceding the fatal accident event

Sept 1999
Witnessed Behaviors from 1999 Audit

Some Behavior examples

Violation from procedures

Review of shift hand-over Notes indicate violation is common. Many such violations are apparent in the general workforce. People offshore are coping with the pressures being placed upon them from the beach, and to cope sometimes means to violate. Violations often stem from direct instructions from Asset Managers, for example the touch fuck all instruction has led to chronic under-compliance with critical maintenance & inspection

Operating plant when it was in a dangerous condition

The operation of the test separator in a dangerous condition, the illegal use of the fire-pumps continually to supply drilling were all operating parameters approved by the autonomous Brent Asset Manager allowed freedom to do what he liked by a disinterested and technically incompetent General Manager

Unapproved design and operating envelope changes

In Seafield House, the home of the Brent Management team anarchy reigned. The Asset Manager approved modifications, changes and variance to design or operating parameters, completely ignoring the Company business processes - this was known about and supported by his boss, the General Manager

Sept 1999
Witnessed Behaviors from 1999 Audit

Some Behavior examples

Bullying and Harassment

There was evidence of bullying and harassment emanating from the Asset Manager, an example was the coercion of an external inspector to sign-off a large tranche of safety critical systems only to find 12 months later on a visit offshore that these were still isolated as unserviceable. The 1999 audit gave evidence of the improper disciplining of a technician on Cormorant A and a Supervisor on Brent B, Shell were asked to look at these actions as they were seriously flawed

Purposeful falsification of maintenance records

There was many examples of false and misleading reporting of the performance under test of safety critical equipment.

Denial

One of the most worrying aspects of the 1999 audit was the inability of the General Manager and the Oil and Managing Director to accept the findings. Their internal audit findings from 1997 and 1998 highlighted that denial was endemic in the organization but when challenged themselves to face up to their own inadequacies, denial reigned

- After the Fatalities -
Findings from 1999 Audit on
Witnessed Behaviors and Resources

The following viewgraphs were prepared by the post fatality Technical Integrity Review team and presented to the Shell Production Director in September 2003 shortly after the event. The behaviours witnessed are remarkably similar to those witnessed in 1999 so that any reasonable person might adduce that the behaviours witnessed in 2003 were similar to those in 1999 because they had not changed over that prolonged period

After the Fatalities - Brent Bravo Technical Integrity Review on witnessed behaviors etc

Some Behavior examples

Violation from procedures

Why are crewmembers/staff willing to continue to operate with systems in potentially dangerous condition, unwilling to accept accountability or to effectively challenge when they see things happening that are not acceptable

With regards to the PTW, a carryover from 1999 was the execution of work under the operations umbrella instead of via the permit to work system, this had become custom and practice

Bullying and Harassment

Have the leaders and managers **conditioned** our crewmembers and staff not to challenge? - there was evidence of bullying and harassment

Why are offshore crewmembers **afraid** to "FLAG" problems they have with the hardware on our installations

Operating plant when it was in a dangerous condition

Operation of the HP Flare KO Drum when its ESD valve was in a failed state, the operation of the Drains De-gasser Vessel when its LCV could not maintain liquid level, both circumstances that contributed to the massive volume of gas escaping into the utility shaft

After the fatalities

Brent Bravo Technical Integrity Review comment on lack of competent staff in the organization both onshore and offshore

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Incompetence

There is a **shortage of competent resources** both onshore and offshore

There is a **lack of ability** of staff in key positions to take technical overview of systems

Progress With Safety?
1999 - 2006

Section Six
A comparative analysis of the common mode failures evident in 1999 which persisted, and contributed directly to the deaths in 2003

Viewgraphs 67 through 88

The following viewgraphs look in more detail at the causal factors apparent in the deaths of the two men in 2003 and looks for common threads between those deaths and the situation that developed over a prolonged period from 1999 to ask the question - were there similarities, and could the events of 2003 have been reasonable foreseen and prevented? - this is important to establish because the deficiencies in 1999 and 2003 were not minor, but so serious as to cause major accident events with multiple loss of life?

11th September 2003
The fatal failures in essential controls

The last sections showed the general decline in the standards of hardware which were symptomatic of continuance from 1999 to 2003 of a negative safety culture.

In the following viewgraphs we have a detailed look at the specific failures causing the deaths in 2003 and make the case that these common failures were also apparent in 1999

Eradication of any one of these common failures in the intervening period between 1999 and 2003 could have prevented the fatal accident - Directors were made aware of these common failures in Sept. 1999 but took no effective action to rectify the situation

11th September 2003
The fatal failures in essential management controls

Both in Sept. 1999 and Sept.2003, the following common failures in essential controls were witnessed. It was inevitable, that if these latent failures witnessed in 1999 persisted that it was only a matter of time until the undesirable consequences would accrue - as they finally and unfortunately did on the 11th Sept 2003

- **(1) that plant and machinery was being operated purposefully in a dangerous condition due to maintenance neglect**
- **(2) that unauthorised (therefore potentially unsafe) design changes were being made**
- **(3) that violations and deviations from the permit to work and other operating and control procedures had become custom and practice, and**
- **(4) that ESD valves were not functioning as required**

Brent Bravo
Common failures evident in 1999 and 2003 - the evidence the Sheriff did not hear

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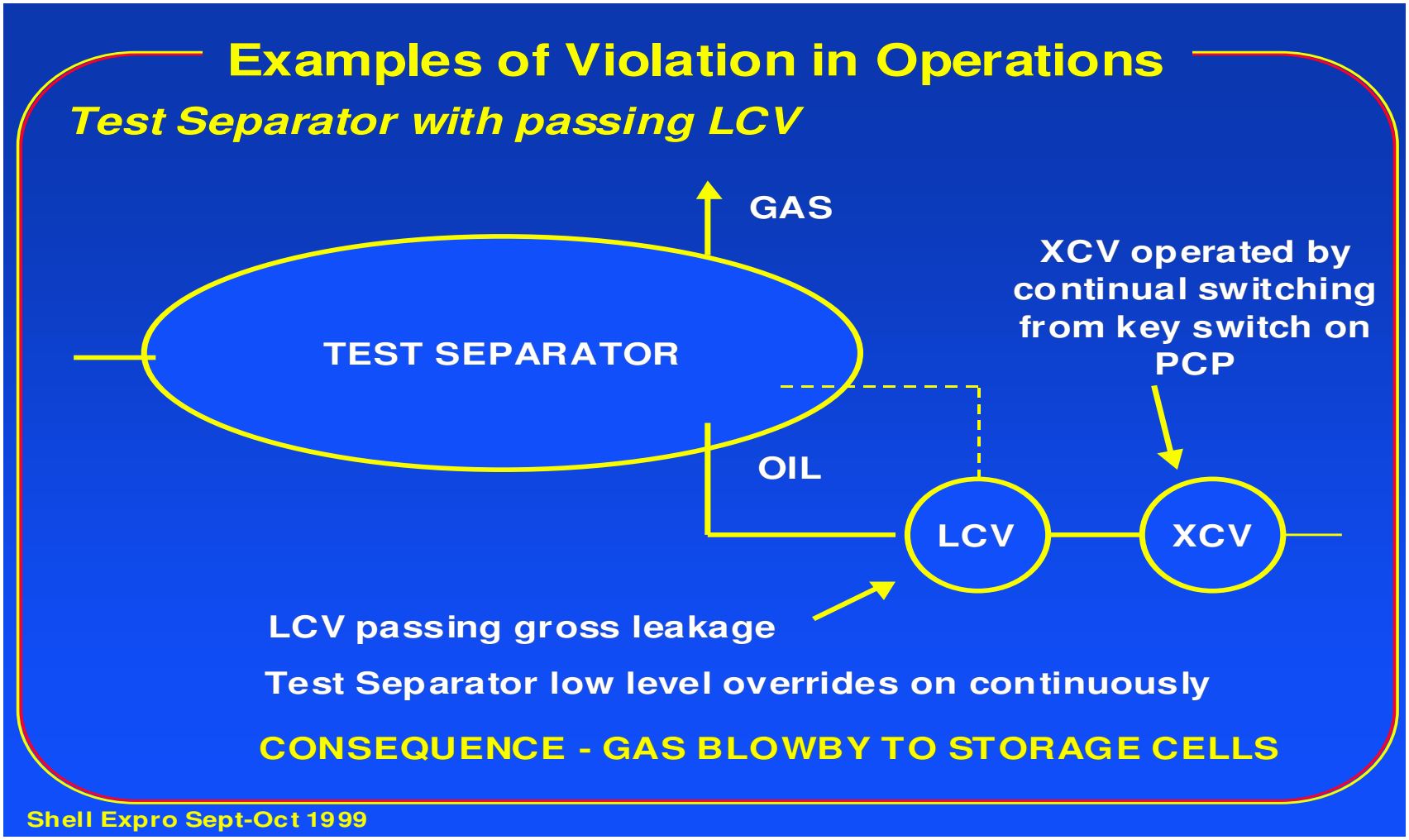
(1) What evidence was there that plant and machinery was being purposefully operated in a dangerous condition both in September 1999 and at September 2003

Sept. 1999 : Knowingly operating process equipment when it was in a dangerous condition to augment oil production

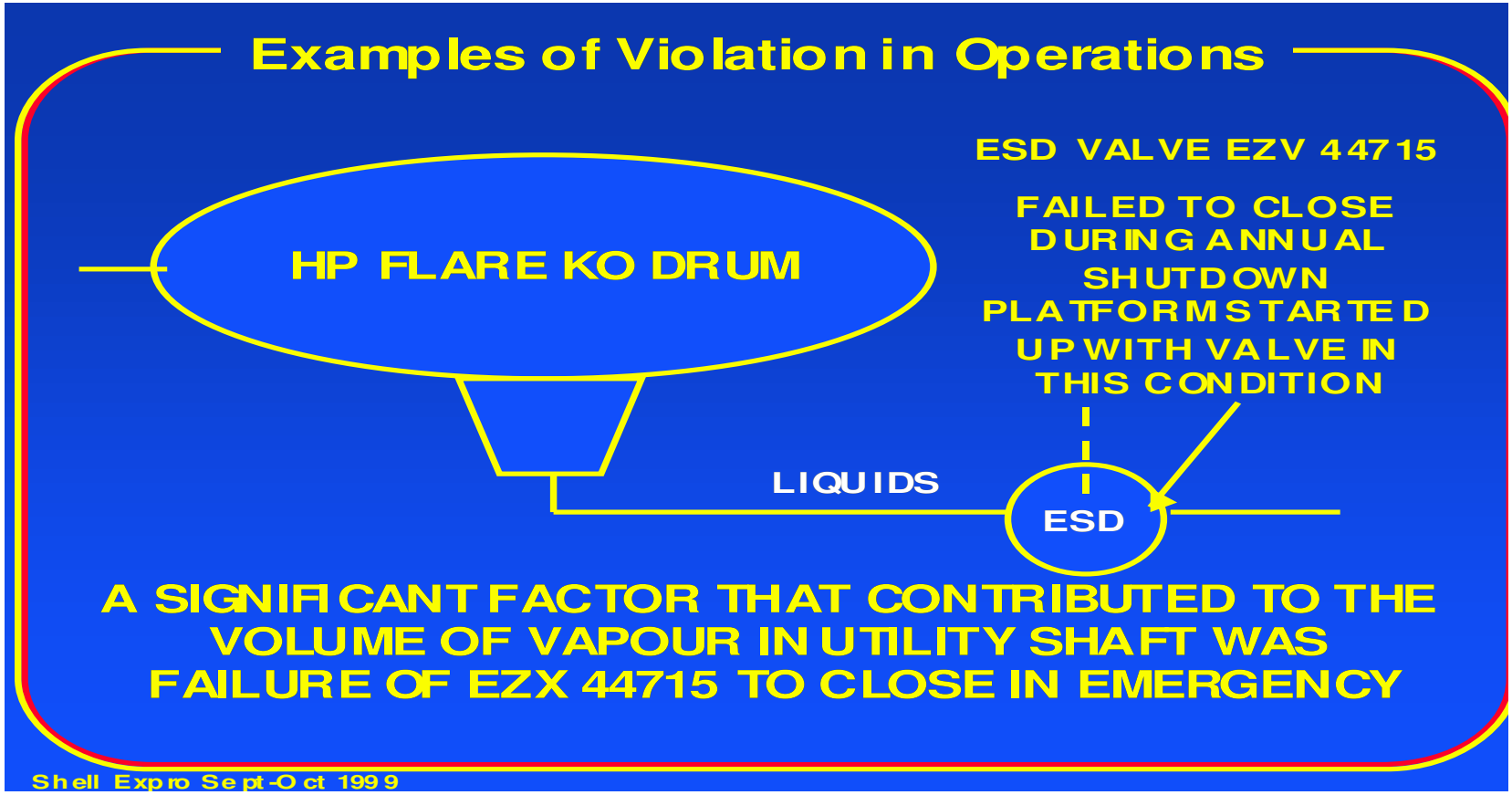


Sept 1999 - The Story of the Brent Bravo Test Separator - the acceptance of the unacceptable from technician to Director

There was a problem with the Separator LCV, it was passing with such volume that it could not automatically control the separator level and the Low Level alarm and LL level executive action were permanently disabled. The Control Room Operator (CRO) 'needed to control the level by throttling the XCV downstream of the Separator'. This had been ongoing for some time. 'It was thought that sand breakthrough – this had occurred on a number of occasions – had caused internal erosion of the valve. On Brent Bravo it had become normal operating practice 'to use the separator to augment production in addition to its specified role of testing the performance of individual wells as required'. This in itself was not a problem, it was the fact that in so doing the vessel was operated outside its design envelope. Disabling the logic associated with the LCV inhibited the automatic action that would normally be taken on LL level in closing the process ESD valve upstream of the separator and the XCV (to prevent gas blow-by to the downstream process). The CRO stated he was working under instruction and the manual operations carried out with him were known about and accepted**.** On visit to the separation module it was observed that the manual switching of the XCV was causing chattering, associated vibration, contributing to regular seepage/leakage of oil and associated gas from the valve. If this modus operandi continued it would not take long for the internals of the XCV to be eroded also giving a direct path for gas to blow-by to downstream. The CRO knew he was operating in violation of the Shell Codes of Practice but that he was instructed to do so by his Supervisor, who in turn said he was authorised to operate like this by the OIM. The OIM 'head in his hands' stated that if he did not operate like this then the Asset Manager would simply get someone who would. Over the following weeks this situation was accepted up the line to the Oil Director, and despite that Director being informed on the 5th October and again on the 22nd October that this situation was not acceptable, he was in violation of his own mandatory Codes of Practice, the test separator continued with no remedial action being taken or indeed contemplated. The 2005 Shell internal investigation found no evidence that this situation had ever been rectified over the interim period

Sept. 2003: Knowingly operating process equipment in a dangerous condition contributing to the fatal accident

Process equipment was being operated in a dangerous condition in 1999 and the the same behaviour of operating such equipment in violation of Codes of Practice was apparently normal practice in 2003. Shell say there was a vigorous follow up to the 1999 audit but the normalised behaviour of operating like this had not changed. In addition to above, and also a contribution to the volume of vapour released into shaft, LCV6600 on the Process Drains Degasser Vessel could not maintain its liquid level, this was known about prior to the fatal accident



Brent Bravo Comparative Analysis 1999 c.f.2003 Knowingly operating plant when it was in a dangerous condition - a summary

September 1999	September 2003
Activity Oil test separator being run in violation of design codes to augment production, LCV unable to maintain liquid level due to gross leakage past the valve, control room operator intervening manually to maintain liquid level by throttling in and out the downstream XCV Consequence If the control room operator is distracted and liquid level falls below a critical level then gas will break through into the downstream pipe-work with the potential for loss of containment of gas into the atmosphere in an enclosed space such as the utility shaft or into the oil storage cells	Activity HP Flare KO Vessel operating in violation of design codes. ESD valve downstream of vessel was known to be passing. In addition to above, and also a contribution to the volume of vapour released into shaft, the LCV on the Process Drains De-gasser Vessel could not maintain its liquid level. The platform started up in this condition after the shutdown in August 2003 Consequence When the leak commenced from the unapproved temporary repair both these conditions above contributed to the significant volumes of gas which entered the utility shaft axphisiating the men who had been attempting to repair the leak

Brent Bravo
Common failures evident in 1999 and 2003 - the evidence the Sheriff did not hear

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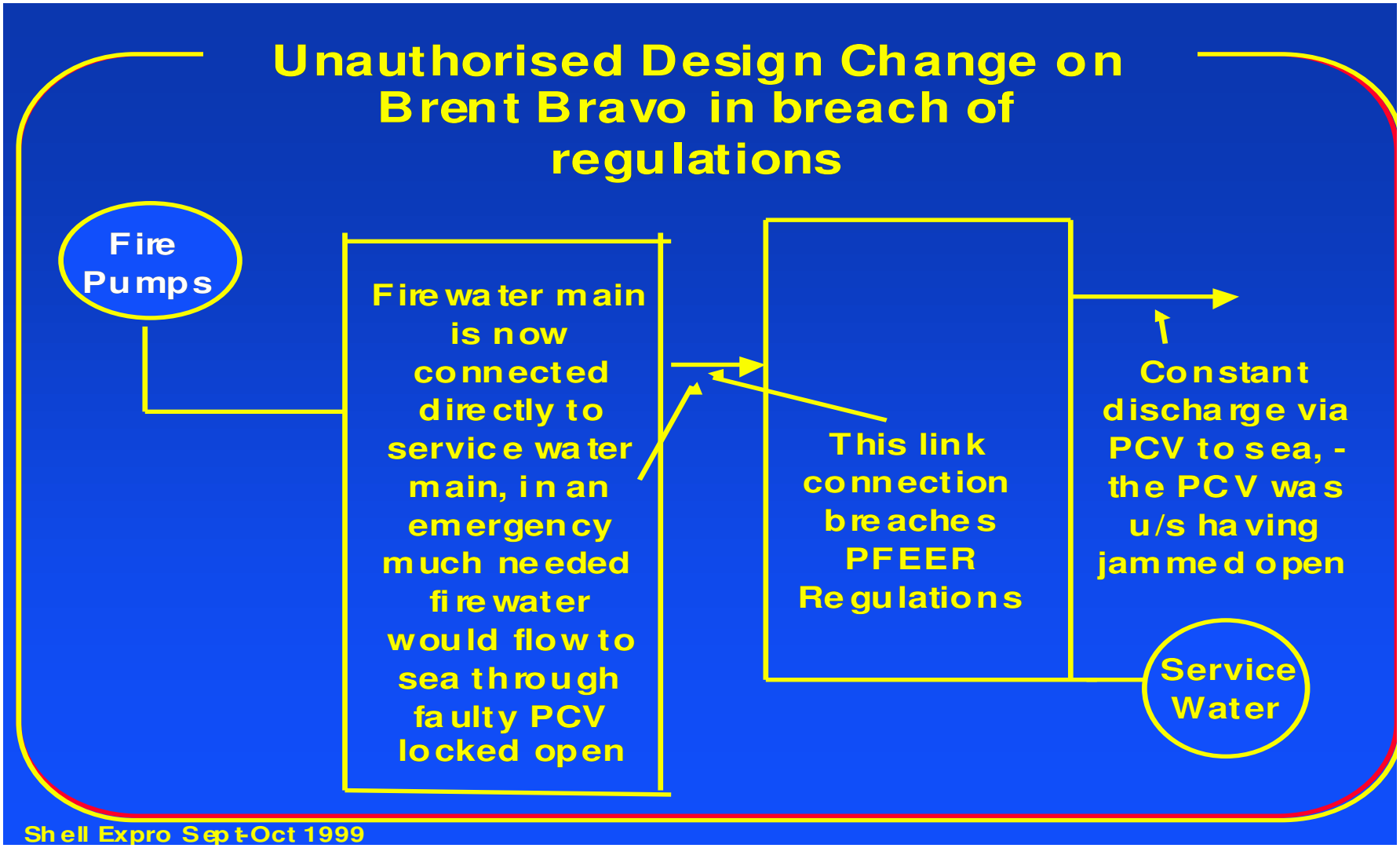
(2) What evidence was there that unauthorised (therefore potentially unsafe) design changes were being made in September 1999 and also at September 2003

Sept. 1999: Unauthorised design change seriously impairing functionality of firepumps



Sept 1999 - The Story of the Brent Bravo Fire-pumps - the acceptance of the unacceptable from technician to Director

Brent Bravo had lost into the sea (corroded caisson) a seawater pump dedicated to supply cooling water to the Drilling process. In order to save money in purchasing a new pump, a decision was made to utilise firewater to augment the service water system, the drilling modules would know be a branch connection off the latter. Consequentially, a full-bore connection was now constantly open between the firewater main and the service water main. As a result of this change the modus operandi was that one 100% duty fire-pump was running continuously into the service water system. This was having an undesirable effect on the pumps due to wear and tear from constant use. This had already influenced the condition of the second 100% duty fire-pump. The Control room logbook stated 'standby fire-pump about goosed, only run in anger'. In the same logbook the Pressure Control Valve (PCV) on the service water main overboard connection to the sea was noted to be 'jammed open' and this situation had persisted for many months. The OIM accepted that operating like this was in violation of his Codes of Practice and also in breach of legislation but as with the test separator he was clearly working under instructions from his Asset Manager. The Asset Manager had authorised the changes to the service water/fire main bypassing the technical authority. He said he had no choice in the matter. There were very serious consequences in this modus operandi not fully appreciated on the platform. On coincidental gas detection from two or more sensors AC generation is tripped, in turn, the large Service Water pumps are tripped. The gas ignites and we have a major conflagration. We need our Fire-pumps and sure enough one is already running but the firewater is discharging directly to sea via the jammed open PCV with inadequate volumes flowing into the firewater ring-main to meet the cooling and extinguishing needs in the emergency. As was the case on Piper A, just when we need the pumps, they are not available. Over the following weeks this situation was accepted up the line to the Oil Director, and despite that Director being informed that this situation was not acceptable, he was in violation of his own mandatory Codes of Practice, and the Law, the fire-pumps continued in this mode with no remedial action being taken or indeed contemplated. The 2005 Shell internal investigation found no evidence that this situation had ever been rectified

Brent Bravo Comparative Analysis 1999 c.f.2003
Unauthorised design changes - a summary

September 1999	September 2003
Activity - Firewater Pumps Unauthorised design changes by the Asset Manager to reduce capital expenditure meant that firewater pumps (which by Law should be immediately available and on stand-by) were being run continually. Because the PCV to sea on the service water was jammed open the firepump were essentially running to make up for these losses - to shutdown and repair the PCV would have ceased production Activity - Temporary Repairs Unauthorised repairs were being carried out on pipe-work. A number of these temporary repairs were in place long after the original time set for them, there was no temp repairs register, or system of effectively managing these repairs Consequence Potential dangerous conditions being created by unauthorised design changes	Activity - Temporary Repairs At the time of the incident there were 33 temp repairs on Brent Bravo of which 9 were not approved including the repair that leaked. Of the 9 non-approved repairs a number were found not acceptable when eventually subjected to review by a competent technical authority. In the North Sea operations at the time of the incident per se there were circa 500 temporary repairs approximately half of which were not approved by a competent technical authority Consequence Temporary repairs are initiated when the pipes visibly leak or wall thinning had occurred such that the wall thickness was below the minimum allowable according to that pipe specification - unapproved repairs increase the potential for loss of hydrocarbon containment which when it happens can result in very undesirable consequences as witnessed on Brent B

Brent Bravo
Common failures evident in 1999 and 2003 - the evidence the Sheriff did not hear

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(3) What evidence was there that violations and deviations from the permit to work and other operating and control procedures was custom and practice in September 1999 and in September 2003

Brent Bravo Comparative Analysis 1999 c.f.2003 Known failures in the Permit System - a summary

September 1999	September 2003
Activity - Permit to Work System Violation and deviation from the permit system was common. Examples included not visiting the work-site and issuing a number of permits simultaneously to one work-site supervisor Offshore staff across the North Sea had markedly different interpretations of what could, or could not, be done within the PTW system. On Brent B a lot of work was being doe under operations rules to avoid raising a permit - permits were often knocked back in the prevailing Touch Fuck all climate Consequence Compliance with the PTW system offshore is an absolute prerogative - remember it was a failure of this system that was the initiating event in the Piper Alpha disaster	Activity - Permit to Work and other mandatory procedures A significant failure in the management controls offshore was that the men involved in the fatal accident did not have a permit to carry out the repairs planned on the leaking pipe. It had become custom and practice to carry out such work under the operations umbrella. The men also entered the confined space of the utility shaft without application of the rigorous leg entry procedures put in place after a previous fatal accident in the utility shaft (fire) in 1982 Consequence The Sheriff in his determinations from the Fatal Accident Inquiry listed these factors as contributing to the deaths through failure by Shell to provide a safe system of work

Brent Bravo
Common failures evident in 1999 and 2003 - the evidence the Sheriff did not hear

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(4) **What evidence was there that ESD valves were not working functioning as required both in September 1999 and September 2003**

Brent Bravo Comparative Analysis 1999 c.f.2003
Known failures of ESD Valves - a summary

September 1999	September 2003
Activity - ESD valve functionality ESD valves were not being tested in line with mandatory maintenance routines as driven by the touch fuck all instructions. When they were tested after a prolonged period between tests there was a high failure rate, namely leak-off criteria exceeded the performance standard. If a valve failed its leak-off test criteria the Brent Asset Manager simply authorised an increase in the leak-off criteria. Evidence was provided where ESDV valves had failed but continued in operation, when risk assessments were produced some 8 weeks later. These assessments were that the risks were unacceptable but no action was taken and the platform continued to operate. On a number of occasions when an ESD valve had failed, the maintenance records recorded were logged as 'No fault found'	Activity - ESD valve functionality The main riser ESD valves failed their leak-off tests but a Work Order to correct same had been cancelled During the annual maintenance shutdown in August 2003 ESD valve EZV 4415 on the outlet of the HP Flare KO Vessel failed to close during routine testing. During the same shutdown some 14 other valves failed to operate within specification Consequence In relation to EZV 4415 the total amount of hydrocarbon vapour cloud released into the shaft via the leaking temporary patch was estimated at 6280 cubic metres. A significant factor which contributed to the extent of the vapour cloud was the failure of ESD valve EZV 4415 to close in the emergency.

Brent Bravo Comparative Analysis 1999 c.f 2003

Where is the evidence of a significant improvement over the four year period?

On 4th September 1999	On 11th September 2003
ESD Valves not meeting performance criteria Operation of test separator in violation of design codes to augment oil production Many gas detectors were inhibited - unauthorised Unauthorised temporary repairs Skid deck covered by heavy equipment - explosion venting of utility shaft impaired PTW violations and deviation observed Standby Fire-pump 'only one run left on pump' Fire-main being used to supply cooling water to drilling, Seawater discharge valve to sea jammed open Two minor gas leaks - valve stems (not reported) Emergency Generator questionable reliability Low levels of safety critical maintenance compliance (14%) against falsely reported 96%	A Failed ESD Valves on the HP KO Drum contributed to deaths. The main Riser ESD valves had failed their leak-off tests but the Work Order for same was cancelled Operation of the Drains De-gasser Vessel test separator in violation of design contributed to deaths The post fatality Review found a number of fire and gas detectors (16) failed to danger There was at the time 33 temporary repairs on pipes of which 9, including the leaking temp repair that contributed to deaths, were not authorised PTW and leg entry procedures deviation contributed to the deaths Maintenance was being neglected, the Emergency Generator known to be of questionable reliability failed to start automatically and the UPS system failed when most required

The story of the contribution of the common failures to the fatal accident event

The temporary repair had been leaking again. The rundown line had leaked badly during the shutdown in August and had been repaired on a temporary basis . This repair was not approved **(2)** and would never have been approved by a technical authority as it did not comply with Shell standards for such a repair **(1).** Pigging operations were planned later that week and potential gross leakage from this temporary repair, was highlighted as a risk to that operation, at a pre-work planning meeting. To remove this risk instructions were given to repair the leak. On the afternoon of the 11th September two men entered the utility shaft for the purpose of repairing the leak. They did not follow the leg entry procedures fully **(3)** and commenced work on the leaking patch without a permit to work **(3).** The leaking patch must have parted completely and gross inflow of liquids into the shaft resulted. The liquids were volatile and rich gas vapour in considerable volume (6280 m^3) started accumulating in the shaft. The Level Control Valve on the Process Drains De-gasser Vessel could not maintain its liquid level, a situation that was known about **(1)** and that fact in combination with the ESD valve downstream of the HP Flare Knock Out Vessel failing to close **(4)** contributed to the deaths of the men by asphyxiation. The Emergency Generator failed to start automatically, and took 15 minutes to start manually, the uninterruptable power supplies (UPS) failed, both these systems known to be a problematic **(1)** prior to the incident. The UPS failure affected the hand held radios causing loss of communication at this vital time delaying the emergency response

The Brent Bravo Comparative Analysis

Has it been accepted by others?

There is external and independent support for the contention that things in 2003 had just not happened overnight, but that in line with the comparative analysis thinking, problems had developed over a prolonged period of time.

So say the Crown Prosecution Service in the shape of the Solicitor General

And so say the enforcing authority, in the shape of the HSE, read on

Solicitor General comments on technical integrity status before Sept. 2003

- As an indication that things were not at all healthy before the 11th September 2003 the Solicitor General for Scotland in a written reply to a member of the Scottish Executive writes:

quote

I would wish to reassure Mr Campbell that there was evidence led at the Brent Bravo Fatal Accident Inquiry to suggest that the deaths had occurred as a result of many failures over a prolonged period of time - not failures which had risen just prior to the deaths

unquote

HSE comments on the technical integrity status of Shell North Sea Assets

before and after Sept. 2003*

27th May, 2005

quote - The Focussed Asset Integrity reviews recently undertaken by Shell has shown up similar safety related issues, if not more so, than those shown up by the audit in 1999, i.e. not much has physically changed - unquote

31st May, 2005

quote - I would like to raise the issue of the significant high levels and apparent increase (certainly not reduction) of maintenance backlog (out of compliance) on most Shell Mature Assets (North) installations - unquote

* information obtained from HSE under the Freedom of Information Act

HSE comments on technical integrity status before and after Sept. 2003*

9th August 2006 in a Note from the Head of the Offshore Safety Division (OSD) of the HSE to the author

quote - The comparative analysis provided by you was , as I understand it, for the purpose of demonstrating linkage between the issues identified by the your Audit team in 1999 and similar types of failures contributing to the Brent B double fatality. The Offshore Safety Division view was, and still is, that there were undoubtedly similarities in the types of issues identified and in the nature of the generic problems. This confirmed our own findings, which were covered in the prosecution, that Shell were not at the time managing key aspects of plant maintenance and integrity - unquote

* information obtained from HSE under the Freedom of Information Act

Progress With Safety?
1999 - 2006

- Section Seven -
Could the events of September 11th 2003 have been reasonably foreseen, did Shell fail to learn from past experience? - this section is a case study in corporate amnesia

Viewgraphs 90 through 93

The Fatal Accident
Could it have been reasonably foreseen?

Public Inquiry into major accident events and industrial disasters highlight almost universally that for a significant period of time before the accident the conditions that were causal in that event had persisted within the organisation, examples would be

- Piper Alpha
- Herald of Free Enterprise
- BP Texas City refinery explosion

In general terms the evidence seen so far in the decline as measured by the continual enforcement actions, the comparative analysis showing equipment degradation and the prevailing negative safety culture, meant operating for prolonged periods prior to the fatal accident with high risk levels - so not only was a major accident foreseeable, but it was also inevitable as the exposure time increased.

But there were other warning signs, but Shell Expro was a Company with a short memory, and it apparently failed to learn from bitter experiences in the past, what I call corporate amnesia

A Case study in corporate amnesia - the intrinsic dangers in column shafts!

A number of North Sea offshore installations are concrete gravity structures and have their topsides supported by concrete columns, a number of which require to be entered by the crew during normal operations - these enclosed spaces are very difficult to gain safe egress from in an emergency particularly if full breathing apparatus has to be donned - the fatal accident on Brent Bravo in 2003 occurred in the utility shaft.

In 1983 a multiple fatality occurred in the Brent Bravo utility shaft. During a shutdown, hot-work was ongoing which caused debris at the shaft bottom to ignite. The workers did not have breathing apparatus and died. As a consequence a rigorous set of procedures were instigated controlling access into these enclosed spaces. The number of persons entering the shaft would be restricted, persons could not enter the shaft unless they reached a certain competency level making them familiar with all aspects of the shaft, breathing apparatus and other safety equipment would be strategically located at various shaft levels etc etc. These procedures were rigorous and fit for purpose. These shaft entry procedures put in place as a result of a multiple fatality event in 1983 on Brent Bravo were unfortunately not complied with on the 11th September 2003

A Case study in corporate amnesia - the intrinsic dangers in column shafts!

In 1989 an explosion occurred in shaft C4 on Cormorant Alpha, nobody was killed but the platform was shutdown for many months with repairs costing 20 million pounds. Safety Case studies had shown that the cellar deck areas, (where the topsides mate to the concrete support columns of the installation) could not potentially withstand the explosive pressure as calculated by Shell Thornton Research scientists. At the time of the explosion in 1989 Cormorant A had 240 persons on board. Catastrophe was prevented because the explosion vent arrangement (a bit like the cork on the champagne bottle) lifted, relieving the instantaneous pressure. If this had not happened it was highly unlikely that the platform remaining three columns would have supported the 25, 000 tonnes topside and it may have collapsed onto its 1 million barrel storage cells within a few seconds - Piper Alpha would have been minor league compared to this event.

However, in 1999 on Brent Bravo, the pressure relief vents would have been prevented from lifting by two (double stacked) containers holding Drilling equipment sitting atop the vent cover. Brent Bravo had at the time 156 souls on board.

NB: the Author was the topside facilities design engineer for Cormorant Alpha in the early 1980's, so can speak on this subject with some authority and credibility

- A Case study in corporate amnesia - on how an organization fails to learn from past experiences

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In October 2000 the Dunlin Alpha platform had to be evacuated after build up of hydrocarbons in its utility shaft

In January 2002 - 100 non essential crew were evacuated from Brent Charlie after a leak of Hydrogen Sulphide into its utility shaft

Note that the deaths on Brent Bravo in September 2003 were caused by influx of hydrocarbon vapour into its utility shaft

Progress With Safety?
1999 - 2006

- Section Eight -
After the fatalities, are things improving, has Shell learnt the lessons from the unlawful deaths of the two young men?

Viewgraphs 95 through 105

Progress with Safety
2003 - 2006

After the fatalities - having learnt from bitter experience the future must be brighter, surely?

Lets re-look at the health and safety statistics since September 2003

After the fatalities

Have Shell learnt the lessons from 2003? - it would seem not as enforcement actions have significantly increased

- After the fatalities there has been 23 Improvement Notices served, a rate of circa 7 per year - this represents a significant increase in the rate of issue
- After the fatalities there have been 10 Prohibition Notices served, three of which related to the double fatality event,
- Excluding those three gives a rate of issue of Prohibition Notices of two per year which represents a 300% increase over the situation prior to the fatalities
- The Company was prosecuted for serious breaches of legislation in 2004 for which it pleaded guilty

The Number and Severity of Enforcement Notices served after the Fatalities
Not much sign of reversal of a negative safety culture here?

Improvement Notices - (23)	
To remove risk of multiple fatality	14
To remove risk of single fatality	9

Prohibition Notices - (10) includes 3 due to fatalities	
To remove risk of multiple fatality	6
To remove risk of single fatality	4

In 2004: Are behaviors really improving - are we learning from bitter experience - more problems in the column shafts after the fatalities!

In my recent discussions with Shell they have made great play about improvements and greater focus on compliance. The bad behaviors from 1999 and 2003 have been eliminated and all is well with the world they say. This has been re-enforced by the issue of the simple to understand 3 golden rules worldwide, the first of which is to comply with the law, there is also a new section on compliance in the amended Shell Group General Business Principles.

However in respect to the above and given that the fatalities in 2003 were in the enclosed area of the utility shaft then here would be one area where improvement would be noticeable, would be clearly demonstrable - wouldn't it?
but:

On 26th November, 2004, just over a year from the fatal accident another Improvement Notice is served on Brent Bravo. Shell it stated, failed to provide information, instructions and training as was necessary to ensure the health and safety of their employees whilst undertaking work at the 101 m level of the utility shaft - almost the exact location (86 m level) where the two men died on 11th September 2003, And

On 8th December 2004, another Improvement Notice was served on Dunlin Alpha for having inadequate Breathing Apparatus self-rescue sets in the enclosed space shafts

In July 2006: Are behaviors really improving - are we learning from bitter experience - more problems in the column shafts after the fatalities!

In my recent discussions with Shell they have made great play about improvements and greater focus on compliance. The bad behaviors from 1999 and 2003 have been eliminated and all is well with the world they say. This has been re-enforced by the issue of the simple to understand 3 golden rules, the first of which is to comply with the law, there is also a new section on compliance in the amended shell Group General Business Principles.

However in respect to the above and given that the fatalities in 2003 were in the enclosed area of the utility shaft then here would be one area where improvement would be noticeable, would be clearly demonstrable - wouldn't it?

but:

Workers in the Brent Bravo utility shaft completing remedial work on corroded oil cell fill lines are allowed to use access stairs that are so corroded they had been condemned as unfit for use in an inspection report in February, 2006. This report fails to surface for some months until its contents are leaked to the workforce after they have raised concerns about observed movement of the stairs under load. The HSE get involved and impose yet another enforcement notice on Shell on the 26th July, 2006. Without the workforce involvement would the stairs still be in use?

In May and June 2006:

Double trouble for Shell's Bravo - and you guessed it, another temporary repair!

Upstream, 9th June 2006

'Shell UK has suffered two gas leaks in three weeks on its much troubled Brent Bravo platform'. On 15th May a pinhole leak was found on the Brent Alpha oil import line. On the 5th of June there was a release of gas and around 20 - 60 litres of oil were spilled during pigging operations. The platform was shutdown whilst the module was safely isolated'

Upstream, 16th June 2006

' Shell has suffered another safety headache on its much troubled Brent Bravo platform. It had to stop work in the utility shaft after an alert caused by a seep from a pipeline bringing seawater into the platform. The area will be allowed to dry out and a temporary repair will then be fitted'

The role of the HSE? - have they learnt from their inability to enforce improvement on Shell since 1999

It's to the eternal credit of the HSE that they are not in the same mode of denial as Shell and the HSE has issued a get-tough warning to operators

The new head of the HSE offshore division has established more open communications with workforce representatives and more formal contacts with the independent agencies responsible for verification of the performance of safety critical equipment offshore

A revision of the Offshore Safety Case Regulations (2005) has re-enforced legislation related to verification

It has established new strategies for dealing with non-compliant Operators such as Shell, its KP3 project has goals of significantly improving installation integrity

Shell has lost its right to run its own internal independent verification process because this has patently failed over a prolonged period

All this can be demonstrably witnessed by the significant rise in enforcement actions on Shell post the fatal accident, by the HSE

In Conclusion

It is the authors contention that the data shown on enforcement and the comparative analysis reasonably demonstrates that it was the combination of failure to maintain plant and equipment in a safe condition, then knowingly operating this plant and equipment, which in a number of occasions had been changed or modified in an unapproved fashion, and violating and deviating from essential control procedures over a prolonged period of time that conspired together on 11th September 2003 to cause the deaths. The intervention by Directors, Managers and Supervisors to remove any one of these common failure modes, at any time from September 1999, may have prevented the accident.

Although the consequences were severe in the deaths of two young men, it could have been much worse. Ignition, of the most explosive mixture of the rich hydrocarbons, a mixture of pentane, butane, propane, ethane and methane etc may have caused the partial or complete collapse of the support column. This might have been particularly so, if the explosion venting device at the top of the utility shaft had been impaired by stacked drill equipment containers (as it was in September 1999) with no subsequent evidence that this system had been rectified in the interim period

In Conclusion

The Shell press statement that between 1999 - 2006 there has been Progress with Safety in the operation of its North Sea assets is clearly a work of fiction.

Instead of significant progress, and continual improvement the statistics indicate a worsening situation. It would appear that many installations have operated for prolonged periods with risk levels significantly above those values agreed as ALARP in the safety cases submitted to the Regulator - there is no quick and easy solution to this

When the Shell CEO writes to the Shell EP population about a one billion dollar improvement programme in North Sea operations in terms of something Shell can take pride in, we enter the world of spin. The improvements are to clear up the long list of enforcement actions, and to clear the maintenance backlog, and to replace the hundreds of temporary repairs, etc and to return the installations from a state of degradation and high residual risk, to the conditions as specified in the Safety Case, and back to where risks are once again ALARP. To a state where Shell are in compliance once again with the Law of the land

Is the future brighter?

Perhaps the most worrying aspect from all you have just read is that three years after the fatalities, we have instead of marked improvement in health and safety, evidence that suggests a continuance of degradation of hardware and the sustenance of a negative safety culture.

How long will it be therefore before the next major accident event? If history tells us anything it is that if we fail to learn from our past, then the prognosis for the future is not good!

The biggest concern is the exponential rise in temporary repairs as piping leaks due to corrosion or internal erosion - the hundred's of temporary repairs implies hundreds of leaks, or potential leaks, where the pipe wall is below the minimum allowable wall thickness. Surface corrosion of carbon steel is pernicious once it takes hold, in the authors opinion the evidence suggests the situation may not be retrievable without prolonged summer outage's to try and get back on the front foot

Is the future brighter?

Anecdotal evidence from North Sea insiders indicate that at least some of the $ 1billion earmarked for integrity improvements is already leaking out to drill more wells made economically viable in this high oil price era. These first generation installations are already 5 years or so over their original 25 year design life and may have another 15 years or so to go. The current 'band-aid' strategy of temporary repairs, followed by more temporary repairs is frankly not sustainable over this period

Shell Expro are bleeding experience as the post war baby boomers, the guys who did 5 year apprenticeships with NCB, British Steel, ICI etc are retiring. The younger best of the rest are attracted to major CAPEX projects such as the civil engineering for London Olympics where craftsmen can command wages commensurate with working offshore

Although the Regulator has become more proactive Shell specifically still seems in denial mode which doesn't auger well for the future

In the authors opinion, as an accepted industry specialist, if Shell continue like this then it's just a matter of time before the next major accident event, and Shell may have less of that commodity than it thinks. That, as they say in the oil industry, is the bottom line on this story