

Criminal neglect of maintenance of ESDV and Fire and Gas Detection Systems on Shell offshore installations in the period 1999 – 2003

The operation of Emergency Shutdown Valves (ESDV) immediately when required is essential to limit the consequences of the loss of containment of hydrocarbons and to protect process equipment. If ESDV are in a failed state, or not functioning to their required performance standard, then uncontrolled escalation of hydrocarbon events can result. It was the lack of an ESDV on the Piper Alpha riser that allowed gas to flow uninterrupted causing the eventual destruction of the installation with significant loss of life. To restrict the heat energy (hydrocarbon fires can reach temperatures in excess of 1000 degrees Celsius), and prior to the issue of Safety Cases in the UK post Piper Alpha, ESDV were to be located on all oil and gas risers.

The ESDV were to meet statutory standards re closing times and the acceptable leak rate past the valve internals should the valve not fully seal off the flow. But even if the ESDV was fully functioning, if its actuator, the device which operates the valve so it fails safe in the fully closed position, does not receive a signal to close directly from the fire and gas system, as required by design, or from the central control room, or any other place specified in the installation Safety Case, then it will simply sit there, undisturbed, in the fully open position. The data presented to HSE officials in 2003 immediately it became available to Shell, the duty holder, not only covered ESDV either in an inoperable condition or where the ESDV was not functioning to the required standard **in addition over a thousand fire and gas detection systems throughout the oilfield were of suspect reliability, in that they may not have operated immediately to sent the signal to the ESDV actuator. Here are compounded two risks, the risk that ESDV could fail itself and the risk also that the signal for the ESDV to close, may not be available immediately in an emergency due to fire and gas detection systems being not in good repair.** The legal implications of this are discussed at the end of this introduction.

So concerned was the Sheriff about the neglect of maintenance of 15 ESDV, some of which contributed towards the deaths that at the Brent Bravo, that at the inquiry in 2006 he raised concerns over the role played by ESDV. He considered that on this point alone a more general public inquiry into this matter may be necessary. No such inquiry took place and no explanation as to why is forthcoming from the Scottish government.

In 2003 the 15 ESDV in question on Brent Bravo were secondary valves placed strategically around the hydrocarbon process to protect equipment. It was the failure of the ESDV on the outlet of the De-Gassifier vessel, known to be defective by the operators, but production allowed to continue, which allowed

massive quantities of gas to enter an enclosed space causing the deaths due to lack of oxygen.

In addition to the 15 valves of concern to the Sheriff an ESDV on the riser at Brent Bravo had its performance test falsified in 1999. This was a finding of the 1999 Audit and was one of a number of serious concerns raised at the time with the responsible Director UED, Chris Finlayson. Refer to Doc (1). In 2003 this principal ESDV on the main riser also was in exactly the same condition as witnessed four years earlier. This information was withheld from the public inquiry.

Doc 1: Briefing Note to Directors in 1999 from Internal Audit Manager

The importance of this Note with reference to culpability was that clearly, and it a Note whose authenticity is not questioned, Shell Directors were pre-warned of all the following but failed to act appropriately

Doc 2: ESDV were failing in 1999

In October 1999 the Shell Expro internal auditors found that ESDV were failing to meet their performance criteria and to avoid shutting down with loss of production the performance test records were being falsified. This document also provides evidence that when safety critical equipment including ESDV did not meet the required standard this standard was simply altered and the equipment was then recorded in maintenance records as being satisfactory. In one case the leakage rate past principal ESDV were accepted as being satisfactory to continue operations when verified to be 20 times the rate given in the guidance notes issued by HSE.

Doc 3: A brutal regime even forced outsiders to break the rules

Independent external inspectors (DnV) were being pressurised to sign off the maintenance records of fire and gas detection systems examined under the Prevention of Fire and Explosion etc Regulations as satisfactory when the equipment was either in a failed state or had its performance standard altered and then recorded as being satisfactorily tested.

Doc 4: Shell accepts falsification of maintenance records took place in 1999

Prior to the BBC programme the Human Price of Oil aired on 14th June 2006, the Shell Production Director Greg Hill freely admits to the BBC Producer and Director of the programme that falsification of maintenance records took place. In Doc (3A), despite Greg Hill admitting to the BBC that falsification of maintenance records of safety critical equipment took place, Shell threaten to take legal action against the BBC

Control Valve (LCV) because its internals were eroded by sand. An Oil separator was operating in exactly the same condition in 1999. The actions that were raised in 1999 to prevent operation of process plant and equipment when it was known to be in a dangerous condition were clearly never implemented.

Their deaths were tragic enough, but if the explosive gas air mixture had ignited, the consequences may have been catastrophic resulting in significant structural damage to the facility and more deaths.

Doc 9: Need for a more general Inquiry

The Sheriff considers need for more general public Inquiry into consequences of the operational condition of ESDV on Brent Bravo. This request was ignored by the Scottish government despite public outcry and many concerns from Trade Unions at the time over the perceived inadequacy of the public Inquiry that had made no recommendations.

Doc 10: Legislation related to Pipelines and associated ESDV (The Pipeline Safety Regulations 1996)

As a result of Piper Alpha, an early indication was given to Duty Holders that on all pipelines above a certain diameter Emergency Shutdown Valves (ESDV) would require to be fitted. The installation of these valves was underway on many installations by the early 90's and formalised in legislation by 1996. **These requirements were prescriptive.** For purposes of all the foregoing your attention is drawn to Schedule 3 and specifically to the part 6 in **that an ESDV shall be maintained in an efficient state, in efficient working order and in good repair. Not to do so would be an offence in Law.**

If we start with the platform where the fatalities occurred - in the 1999 Audit, (refer to Bundle A) the audit findings were that Riser ESDV's had failed to meet their performance standards and these failures were not corrected but the maintenance records indicated that for these valves there was no fault found.

But in 2003 nothing had changed. The main riser ESDV on Brent Bravo, where the fatalities occurred, had a falsified maintenance record; *the work order (WO) was signed off as test completed OK* when in fact no test had been carried out at all.

Doc 6 is simply a summary of the information provided to HSE by Shell on the state of ESDV post the fatalities in 2003 only weeks after the accident. This shows that on 10 installations principal riser ESDV were either in a failed state or with degraded functionality and some had had their performance test results falsified.

Doc 5: In a desperate effort to cover-up the Shell CEO gets involved

The Royal Dutch Shell CEO Jeroen van der Veer lies to the Times and other broadsheets to cover up that ESDV maintenance records were falsified. He also writes to me on this subject also. He does this despite the evidence of his own internal audit process that Directors were informed in 1999 that ESDV records were falsified, they accepted this finding and its rectification was put into an action plan along with all the other findings from the 1999 audit.

Doc 6: In 2003 ESDV were failing all over the place

This evidence on ESDV performance was from the post fatalities Review carried out by Shell and presented to HSE only days after the fatalities by Greg Hill the Aberdeen based Production Director. That Shell presented this data to HSE is not contentious being verified in writing by them.

Doc 7: In 2003 Fire and Gas Detections systems were in a poor state of repair

This evidence re the performance of Fire and Gas Detection Systems was from the post fatalities Review carried out by Shell and presented to HSE only days after the fatalities by Greg Hill the Aberdeen based Production Director. That Shell presented this data to HSE is not contentious being verified in writing by them.

Doc 8: What did the public Inquiry determine?

The Sheriff determined that the fatalities might reasonably have been prevented if the ESDV involved had operated as per design. When the platform started up 15 ESDV around the production process were known to be in a failed state including the ESDV involved in the incident. The main riser ESDV which had its performance test falsified in 1999 was reported to be in the same condition in 2003. Clearly, if the Shell Expro Directors Finlayson and Brinded had acted responsibly on the actions from the 1999 Audit to improve the essential management controls re the proper maintenance and testing of ESDV the deaths may have been avoided.

The Shell internal investigation into the conduct of Malcolm Brinded in 1999 found when it reported in July 2005 to the Shell CEO no evidence that the immediate actions raised in 1999 to reduce the unacceptable levels of risks associated with falsification of the test records for ESDV were undertaken. This can not come as a surprise to the reader given the data provided to HSE in November 2003, refer to Bundle B1 and B2.

The failure of the De-gassifier vessel ESDV allowed an estimated 6280 m³ of gas to enter the enclosed area where the two men were working. The gas came out of the liquid outlets of the De-Gassifier vessel when gas passed through the Level

Despite this criminal neglect, and the intolerable risk levels as a consequence, these installations were allowed to continue in operation by Shell in collusion with the HSE. No Prohibition Notices were served to cease production, persons on board were not informed of the risks, and no prosecutions followed these **ten serious breaches of The Pipeline Safety Regulations.**

Doc 11: Legislation related to Fire and Gas Detection Systems (Prevention of Fire, Explosion and Emergency Response Regulations 1995)

In summary the Duty Holder needs to ensure the suitability and condition of systems to detect fire and accumulations of flammable gas which are required by Law to be maintained in an efficient state, in efficient working order, and in good repair. It is an offence not to do so. The provisions of this legislation are so important to health and safety offshore that the verification of all this was to be carried out by competent and independent persons, normally a certifying authority such as Lloyds or DnV.

Despite HSE being informed by Shell in November 2003 that on 14 offshore installations there was **1278** fire and gas detections systems not in a good state of repair these installations continued in operation. No Prohibition Notices or Improvement Notices were served to cease production, persons on board were not informed of the risks, and no prosecutions followed these **1278 serious breaches of The Prevention of Fire and Explosion etc Regulations.**

Doc 12: HSE Enforcement Policy

All the above can be compared with the HSE Policy. By any comparison HSE officials were in breach of their own policy tantamount to Misconduct whilst in Public Office. Without going into detail, this policy, well written and unambiguous, is available on the HSE website. **In summary HSE are accountable to the public to ensure that duty holders take action to deal immediately with serious risks, the oil and gas industry is a high risk venture, enforcement per se is by HSE policy to be proportionate to risk, the higher the risk the more justified enforcement action becomes.** There also is the matter of transparency. This is important. The public generally and specifically the employees at risk from neglectful employers can be made aware of the risks because if Notices are issued they are placed on Notice Boards offshore and on the HSE public website. This did not happen so employees offshore were in the main blissfully unaware of the risks they were exposed to by simply being on the installation. Enforcement is to promote sustained compliance with the law, but the authentic, not disputed, Shell data for this section alone, records 1288 breaches of the Pipeline Safety and Prevention of Fire and Explosion Regulations. The Policy is meant to hold Directors and Managers accountable when they breach legislation but no formal enforcement actions, and no prosecutions were forthcoming, other than those related to Brent Bravo. With

the conditions covered in this section alone at the installations continued in operation with no cessation of production with the exception of Brent Bravo.

Doc 13: Gives examples to the public of where it has applied Enforcement

It is only in recent weeks that we commemorated the Piper Alpha. 25 years on from this holocaust, who can forget those horrible scenes, 167 workers, dead already thank God because of the high intake of Carbon Monoxide, were incinerated in the wooden box which was the then accommodation building. Lord Cullen understood that for this never to happen again safety critical systems, whose failure would lead to major accident events, because of the major hazards present if they failed, were to be maintained in good working order.

Hence, the introduction of two fundamental pieces of legislation, Pipeline Safety which includes the emergency valves, and Prevention of Fire and Explosion. This was to counteract the threat of escalating hydrocarbon events causing multiple fatalities and structural damage. The reader then has to draw a comparison between enforcement actions taken by HSE for slips trips and falls, guarding of machinery et al, all in the main single fatality risks, with no actions taken when ESDV were either not functioning, or where there functionality was impaired and where the fire and gas detection systems were considered by the duty holder to be unreliable.

This is beyond subjective opinion, and will not be contested by the HSE.

HSE officials allowing these installations to continue in full production with a callous disregard for the safety of hundreds of offshore workers to hide from public scrutiny their own failures.



Examples of enforcement

Below are real life examples of enforcement action taken by HSE. The examples demonstrate common breaches of health and safety legislation by duty holders and the resulting outcome following HSE involvement. The examples cover a variety of industry sectors, health and safety topic areas and sizes of business. Examples given are not exhaustive of the extent and type of enforcement action undertaken by HSE in the course of its work but aim to give an indication of the types of breaches and outcomes following non compliance by some duty holders. It is important to note that the resulting consequences of each breach is taken on a case by case basis and it is ultimately the Courts who decide what penalty to impose.

All actions were taken following either - an unannounced routine inspection; arranged audit or visit or investigation following an accident, incident or complaint.

Examples of enforcement

Priority health and safety topics

- [Working at height](#)^[1]
- [Transport](#)^[2]
- [Slips and trips](#)^[3]
- [Manual handling](#)^[4]
- [Asbestos](#)^[5]
- [Hand Arm Vibration](#)^[6]
- [Preventing contact dermatitis](#)^[7]

Enforcement in some other topic areas

- [Machinery](#)^[8]
- [Confined spaces](#)^[9]
- [Electrocution](#)^[10]

Enforcement in some specific sectors

The Health and Safety Executive's Policy Statement on Enforcement

The following is the full text of the statement:

The purpose and method of enforcement

1 The ultimate purpose of the enforcing authorities is to ensure that dutyholders manage and control risks effectively, thus preventing harm. The term 'enforcement' has a wide meaning and applies to all dealings between enforcing authorities and those on whom the law places duties (employers, the self-employed, employees and others).

2 The purpose of enforcement is to:

- ensure that dutyholders take action to deal immediately with serious risks;
- promote and achieve sustained compliance with the law;
- ensure that dutyholders who breach health and safety requirements, and directors or managers who fail in their responsibilities, may be held to account, which may include bringing alleged offenders before the courts in England and Wales, or recommending prosecution in Scotland, in the circumstances set out later in this policy.

Enforcement is distinct from civil claims for compensation and is not undertaken in all circumstances where civil claims may be pursued, nor to assist such claims.

3 The enforcing authorities have a range of tools at their disposal in seeking to secure compliance with the law and to ensure a proportionate response to criminal offences. Inspectors may offer dutyholders information, and advice, both face to face and in writing. This may include warning a dutyholder that in the opinion of the inspector, they are failing to comply with the law. Where appropriate, inspectors may also serve improvement and prohibition notices, withdraw approvals, vary licence conditions or exemptions, issue simple cautions* (England and Wales only), and they may prosecute (or report to the Procurator Fiscal with a view to prosecution in Scotland).

4 Giving information and advice, issuing improvement or prohibition notices, and withdrawal or variation of licences or other authorisations are the main means which inspectors use to achieve the broad aim of dealing with serious risks, securing compliance with health and safety law and preventing harm. A prohibition notice stops work in order to prevent serious personal injury. Information on improvement and prohibition notices should be made publicly available.

5 Every improvement notice contains a statement that in the opinion of an inspector an offence has been committed. Improvement and prohibition notices, and written advice, may be used in court proceedings.

* A simple caution is a statement by an inspector, that is accepted in writing by the dutyholder, that the dutyholder has committed an offence for which there is a realistic prospect of conviction. A simple caution may only be used where a prosecution could be properly brought. 'Simple cautions' are entirely distinct from a caution given under the Police and Criminal Evidence Act 1984 by an inspector before questioning a suspect about an alleged offence. Enforcing authorities should take account of current

DATA PRESENTED BY GREG HILL OF SHELL TO HSE CIRCA 5th NOVEMBER 2003 BUT WITHHELD PURPOSEFULLY FROM PROCURATOR FISCAL WITH THE EXCEPTION OF DATA FROM BRENT BRAVO WHERE THE FATALITIES OCCURRED

Unreliable Fire and Gas Detection systems

Data shows that on **14** offshore installations including Brent Bravo the Post Fatalities Review Team found **1278** fire and gas sensors that were in a fail to danger condition. In other words, could not have been relied upon to operate when required in an emergency.

This reflects **an appalling state of affairs** and yet all these installations with the exception of Brent Bravo continued in operation although the risks of doing so were unacceptable. No Enforcement Notices were issued other than on Brent Bravo and no prosecutions were sought other than on Brent Bravo.

Installation	Number of Fire and Gas Sensors found during the post fatalities Review to be in a Fail to danger Condition, that is their operation immediately in an Emergency could not be assured
Brent A	20
Brent B	16
Brent C	30
Brent D	35
Dunlin A	6
Cormorant A	10
Tern	18
Eider	3
Gannet	317
Auk	265
Fulmar	434
Shearwater	37
Nelson	27
Anasuria FPSO	60
14 in Total	1278

DATA PRESENTED BY GREG HILL OF SHELL TO HSE CIRCA 5th NOVEMBER 2003 BUT WITHHELD PURPOSEFULLY FROM PROCURATOR FISCAL WITH THE EXCEPTION OF DATA FROM BRENT BRAVO WHERE THE FATALITIES OCCURRED

Failed or Inhibited Emergency Shutdown Valves (ESDV)

What the Sheriff found was that during the annual maintenance shutdown on Brent Bravo in August 2003 an ESD valve on the outlet of the HP Flare KO Vessel failed to close during routine testing. According to the Sheriff during the same shutdown some **14** other ESDV failed to operate within specification on Brent B. The Sheriff determined that a significant factor contributing to the extent of the vapour cloud entering the enclosed space was the failure of the ESDV on the Flare KO Vessel outlet to close in the emergency.

Below is the Data from 10 Offshore Installations, found to be operating with ESD valves in failed condition, or with falsified test results. All these installations with exception of Brent Bravo continued in operation although the risks of doing so were unacceptable. The riser ESDV on Brent Bravo was in the same condition as verified by Audit 4 years earlier, not functioning but recorded as no fault found.

Offshore Installation	Evidence obtained during Review - Data in tables shows ESDV in failed condition or where the functionality of the ESDV was degraded but the results of the test had been falsified
Anasuria FPSO	Repeated ESD valve failures. ESD valves recorded as friggged before test, not tested and left in friggged state after test (friggged means purposefully inhibited from operating)
Brent Alpha	Brent Alpha ESDV fails its leak-off test (LOT) but Work Order (WO) for correctives maintenance cancelled as has the routine to further LOT on the valve. Other gas riser closure and LOT tests on ESDV's have also been cancelled
Brent Bravo	WO's signed off as Ok when using wrong test method and known fault on system. WO's cancelled for corrective with faults still present (e.g. valves). Maintenance Word Order (WO) signed off as OK when test not carried out
Brent Charlie	Histories for gas riser valve do not show that the valves meet the leak-off criteria. ESDV on High Pressure separators on hydrocarbon process slow to close, no follow up actions, other valve failures not corrected when identified
Brent Delta	Failed ESD valve not being tested properly but reported as OK for WO closure. Corrective WO's cancelled
Tern	Hudson overpressure protection ESD valve not meeting required performance, known to Asset Manager
Cormorant Alpha	Some inadequate maintenance histories in database of SAP computer. Sticking valves identified during ESD test in 2002, corrective maintenance WO raised but not released for remedial actions
Dunlin Alpha	Fire and Gas signal inputs to ESD valves 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
Fulmar	Failed ESD valves with no follow up identified
Gannet	Riser ESDV closure and LOT results not in SAP computer. Repeated valve failures

WO is a maintenance Work Order

1.0 EXAMPLES OF FALSIFIED TEST RESULTS SHOWN IN BLUE

2.0 EXAMPLES OF VALVES KNOWN TO BE IN A FAILED CONDITION SHOWN IN RED

The Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995

1995 No. 743 Regulation 19

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Status: This is the original version (as it was originally made). This item of legislation is currently only available in its original format.

Suitability and condition of plant

19.—(1) The duty holder shall ensure that all plant on the installation provided in compliance with these Regulations (other than aircraft, or equipment to which regulation 18 applies)—

- (a) is so constructed or adapted as to be suitable for the purpose for which it is used or provided; and
- (b) is maintained in an efficient state, in efficient working order and in good repair.

(2) Without prejudice to the generality of paragraph (1) and subject to paragraph (3), the duty holder shall ensure that there is prepared and operated a suitable written scheme for the systematic examination, by a competent and independent person, of plant (other than aircraft, or equipment to which regulation 18 applies), provided—

- (a) in compliance with regulations 11(1)(a), 13, 15 and 16;
- (b) as means required to be provided by regulation 10—
 - (i) for detecting fire; and
 - (ii) for detecting and recording accumulations of flammable gases, and
- (c) pursuant to the measures required by regulation 12 to combat fire and explosion, and for recording results thereof.

(3) A scheme prepared pursuant to paragraph (2) shall—

- (a) specify the nature and frequency of examination;
- (b) provide for an examination to be carried out, where appropriate, before plant is—
 - (i) first used on the installation; and
 - (ii) first used on the installation after modification or repairs (other than running repairs);and it may make different provision for different plant or categories of plant.

(4) In this regulation, reference to examination is reference to careful and critical scrutiny of plant, in or out of service as appropriate, using suitable techniques, including testing where appropriate—

- (a) to assess its suitability for the purpose for which it is used or provided;
- (b) to assess its actual condition; and
- (c) to determine any remedial measures that should be taken.

(5) Subject to paragraph (6), reference in paragraph (2) to the suitability of the scheme is reference to its suitability for the purpose of discharging the duties specified in paragraph (1).

(6) The scheme referred to in paragraph (2) need not provide for the examination, while a Certificate of Fitness is in force in relation to the installation, of any equipment, which was attached to or formed part of the installation at the time of a survey, if—

- (a) the equipment was included in the survey;
- (b) the survey found that the installation complied with Schedule 2 of the 1974 Regulations; and
- (c) a declaration of such survey was considered before the Certificate of Fitness was issued.

(7) For the purpose of paragraph (2) a person is independent where, even though he may be employed by the duty holder, he is sufficiently independent of any other persons accountable to the duty holder for the discharge of his duties under these Regulations in respect of the installation to ensure that the discharge of his duty under the scheme will not be prejudiced.

(8) In paragraph (6) "Certificate of Fitness", "equipment" and "survey" have the same meaning as in regulation 2(1) of the 1974 Regulations.

Detection of incidents

10. The duty holder shall take appropriate measures—

- (a) with a view to detecting fire and other events which may require emergency response, including the provision of means for—
 - (i) detecting and recording accumulations of flammable or toxic gases; and
 - (ii) identifying leakages of flammable liquids; and
- (b) with a view to enabling information regarding such incidents to be conveyed forthwith to places from which control action can be instigated.

The Pipelines Safety Regulations 1996

1996 No. 825 PART III Regulation 19

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Emergency shut-down valves

19.—(1) The operator of a major accident hazard pipeline which—

- (a) is connected to an offshore installation; and
- (b) has an internal diameter of 40 millimetres or more,

shall ensure that the requirements contained in Schedule 3 are complied with in relation to the pipeline.

(2) The duty holder in relation to an offshore installation to which a pipeline described in paragraph (1) is connected shall afford, or cause to be afforded, to the operator of the pipeline such facilities as he may reasonably require for the purpose of securing that the requirements contained in Schedule 3 are complied with in relation to the pipeline.

(3) In this regulation—

"duty holder", in relation to an offshore installation, means the person who is the duty holder as defined by regulation 2(1) of the 1995 Regulations in relation to that installation;

"the 1995 Regulations" means the Offshore Installations and Pipeline Works (Management and Administration) Regulations 1995(1).

(1) S.I. 1995/738.

SCHEDULE 3 REQUIREMENTS FOR EMERGENCY SHUT-DOWN VALVES ON CERTAIN MAJOR ACCIDENT HAZARD PIPELINES CONNECTED TO OFFSHORE INSTALLATIONS

1. An emergency shut-down valve shall be incorporated in the riser of a pipeline—

- (a) in a position in which it can be safely inspected, maintained and tested; and
- (b) so far as this is consistent with sub-paragraph (a), as far down the riser as is reasonably practicable,

and such valve shall comply with the remaining paragraphs of this Schedule.

2. An emergency shut-down valve shall be held open by an electrical, hydraulic or other signal to the mechanism for actuating the valve on the failure of which signal the valve shall automatically close.

3. An emergency shut-down valve shall also be capable of being closed—

- (a) by a person positioned by it; and
- (b) automatically by the operation of the emergency shut-down system of the offshore installation to which the pipeline is connected,

or, while relevant work of examination or maintenance is being carried out, by one of those means

4. If the pipeline is designed to allow for the passage of equipment for inspecting, maintaining or testing the pipeline, the emergency shut-down valve shall also be designed to allow for such passage.

5. An emergency shut-down valve and its actuating mechanism shall so far as is reasonably practicable be protected from damage arising from fire, explosion or impact.

6. An emergency shut-down valve shall be maintained in an efficient state, in efficient working order and in good repair.

7. After an emergency shut-down valve has operated so as to block the flow of fluid within the pipeline it shall not be re-opened so as to permit the flow of fluid until steps have been taken to ensure that it is safe to do so.

8. In this Schedule "emergency shut-down system" means the system comprising mechanical, electrical, electronic, pneumatic, hydraulic or other arrangements by which the plant on an offshore installation is automatically shut down in the event of an emergency

(i)..... a failure to clearly set out the limits which applied to the work which could be carried out, in the utility shaft, under the operations umbrella, and a failure to ensure that personnel on board the Brent Bravo offshore platform clearly understood those limits;

(ii)..... a failure to carry out a robust risk assessment of the possible consequences of starting up the platform on 22 August, 2003 in the knowledge that emergency shutdown valve EZV 44715 had failed to operate within specification when tested during the annual platform shutdown.

ESD VALVES

Subj: **Email of 21 July to Mr. Van der Veer**
Date: 03/08/2006 12:15:27 GMT Daylight Time
From: I.Mohsen@shell.com
To: Cambell1944@aol.com

Dear Mr Campbell,

Thank you for your email of 21 July, to which Mr. Van der Veer has asked me to reply.

I do not feel it appropriate to respond to all the specific points you have raised, but I would like to stress that I do not believe that we have given false or misleading information about this matter.

With regard to your specific concern about falsification, this was thoroughly examined at the time and during our investigation in 2005 . The investigation team looked at the falsification allegation but were unable to find any definitive evidence to support it. We therefore do not accept there was deliberate falsification of records.

Let me assure you that safety is Shell's foremost priority at all times and we absolutely reject any suggestion that we would compromise safety offshore.

Best Regards,

Imad

Imad Mohsen

P.A. to J. van der Veer, Chief Executive Royal Dutch Shell plc
Shell International B.V.
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associated with the specific activities (and the summation of these activities) to be fully assessed by those required to subsequently manage the risks.

Procedures

Under interview, recognition and acknowledgement of violation of procedures by people is variable. However review of handover notes indicates that violation is common. Many such violations are apparent to the general workforce. This would be a serious reputation issue after a major event. People are coping, and to cope sometimes means to violate. Violations observed varied in severity from procedural non-compliance to operating plant outwith its design and operating limit. In one specific case involving operation of an oil separator, the violation was known about and accepted up to the level of a Senior Manager. There was evidence of misleading information in maintenance records for safety critical equipment, for example the Brent Bravo ESDV which failed its leak-off test in April 1998 was recorded as 'NO FAULT FOUND'.

Permit-to-work

PTW violations are common, examples include not visiting the work-site, and issuing a number of permits simultaneously to one work-site supervisor. There has been a dilution of the corporate PTW system custodian role in Expro and in some instances, Asset Teams are applying differing interpretations on what can or cannot be done within the PTW system.

Implementation and Performance Monitoring

PFEER Examination and DCR Verification Schemes

The general level of understanding of these schemes throughout the organisation is poor and even encompasses the limited knowledge of some people who work the process on a day to day basis. A significant concern is the effectiveness of the PFEER process. This is a statutory scheme ensuring that PFEER safety critical elements on an offshore installation are examined and tested in accordance with the Duty Holders' published performance standards. A number of offshore systems can not currently meet their published performance standards. These standards in turn are being relaxed with no demonstration of a robust assessment of the risks involved. There is also divergence in standards being applied pan Expro e.g. leak-off testing for riser ESDV's. Where cited in the Duty Holder's written scheme, the 2nd Party Verifier (UESE/6) should validate and approve any changes to these performance standards but this does not always happen.

Concerns expressed to the review team by an independent PFEER examiner included pressure being exerted to sign off non-compliances. Evidence was obtained of a report being signed off prior to remedial actions being undertaken.

Maintenance Non-compliance

BEHAVIOUR

Subj: RE: Help
Date: 20/11/2006 20:17:35 GMT Standard Time
From: ANDREW.MCFADYEN@ITN.CO.UK
To: Cambell1944@aol.com
Bill,

The Editor of Frontline Scotland, Dorothy Parker, and myself met with Greg Hill at Broadcasting House, Glasgow, on April 24th, 2006. I kept a short-hand note of the meeting and the account that follows is based on my original notes.

Hill confirmed that the PSMR had taken place in 1999 and said that it had resulted in 40 separate actions. The first broad area related to asset integrity and management systems, the second to behaviour. He said there was significant leadership and management training.

Towards the end of 2000 a follow-up audit was conducted. He said it found great progress on a lot of fronts, but there was a recognition that "the behavioural journey was a long one". When pressed on whether Shell had responded adequately to the findings of the PSMR, Hill told us:

"There were 40 separate actions as a result of PSMR. The review in 2000 found significant progress but with hindsight it did not go far enough or deep enough. The safety journey is about learning and improving."

At another point in the conversation, he also admitted that "with the benefit of hindsight the recommendations of PSMR could have gone deeper". (At the time I interpreted this as a comment on Shell's response to the PSMR, but my notes suggest he was actually saying the report itself could have gone further.)

In relation to falsified maintenance records, Hill accepted that it had gone on. His explanation was that Shell employs five thousand people and some individuals occasionally "do things we don't want them to." He continued, "where that happens we take disciplinary action, but it can be difficult to prove."

Hill denied absolutely that falsification of maintenance records – or any other breaches of safety regulations – were implicitly tolerated by Shell's senior management. He said that Shell had implemented a process of "deep learning" after 2003. Since then, much had changed and he personally would not operate an unsafe platform.

This meeting was conducted on the basis of "background" – this means that we could use the information to inform our report but we weren't allowed to identify the source or quote anything directly. It would therefore be helpful if you didn't forward this e-mail to any third parties.

It is worth noting that Shell's official statement for use in the programme flatly contradicted much of what Greg Hill told us.

Let me know if there are any points that need clarification or further explanation.

Kind regards

Andrew



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associated with the specific activities (and the summation of these activities) to be fully assessed by those required to subsequently manage the risks.

Procedures

Under interview, recognition and acknowledgement of violation of procedures by people is variable. However review of handover notes indicates that violation is common. Many such violations are apparent to the general workforce. This would be a serious reputation issue after a major event. People are coping, and to cope sometimes means to violate. Violations observed varied in severity from procedural non-compliance to operating plant outwith its design and operating limit. In one specific case involving operation of an oil separator, the violation was known about and accepted up to the level of a Senior Manager. There was evidence of misleading information in maintenance records for safety critical equipment, for example the Brent Bravo ESDV which failed its leak-off test in April 1998 was recorded as 'NO FAULT FOUND'.

Permit-to-work

PTW violations are common, examples include not visiting the work-site, and issuing a number of permits simultaneously to one work-site supervisor. There has been a dilution of the corporate PTW system custodian role in Expro and in some instances, Asset Teams are applying differing interpretations on what can or cannot be done within the PTW system.

Implementation and Performance Monitoring

PFEER Examination and DCR Verification Schemes

The general level of understanding of these schemes throughout the organisation is poor and even encompasses the limited knowledge of some people who work the process on a day to day basis. A significant concern is the effectiveness of the PFEER process. This is a statutory scheme ensuring that PFEER safety critical elements on an offshore installation are examined and tested in accordance with the Duty Holders' published performance standards. A number of offshore systems can not currently meet their published performance standards. These standards in turn are being relaxed with no demonstration of a robust assessment of the risks involved. There is also divergence in standards being applied pan Expro e.g. leak-off testing for riser ESDV's. Where cited in the Duty Holder's written scheme, the 2nd Party Verifier (UESE/6) should validate and approve any changes to these performance standards but this does not always happen.

Concerns expressed to the review team by an independent PFEER examiner included pressure being exerted to sign off non-compliances. Evidence was obtained of a report being signed off prior to remedial actions being undertaken.

Maintenance Non-compliance

BEHAVIOUR

Extract from Brent Bravo Fatal Accident Inquiry where Sheriff Colin Harris indicates need for a more General Inquiry – he uses example of ESDV – this was not acted upon despite concerns raised at the time by politicians and Trade Unions dissatisfied in general with the FAI and its findings and further that there were no recommendations made

Emergency Shutdown Valves (ESDV)

The scope of a fatal accident inquiry in Scotland is defined by the terms of section 6 of the 1976 Act, which requires the Sheriff to amongst other things should determine the reasonable precautions, if any, whereby the death and any accident resulting in the death might have been avoided. The defects, if any, in a system of working which contributed to the death or any accident resulting in the death, and any other facts which are relevant to the circumstances of the death.

During the Inquiry the Sheriff determined that the total amount of hydrocarbon fluid released into the utility shaft during the period between the surface process shutdown and the introduction of service water into the closed drain system was about 6280m³.

He stressed that a significant factor contributing to the extent of the vapour cloud in the utility shaft was the failure of emergency shutdown valve EZV 44715 to close. In addition, during the August shutdown prior to the fatalities he was made aware that some fifteen valves, including emergency shutdown valve EZV 44715, failed to operate within specification.

ESDV EZ 44715 had a history of failures for a prolonged period of time prior to the fatalities (three years). During the annual maintenance shutdown in August, 2003 valve EZV 44715, together with a number of other valves, failed to close during routine testing

During the course of the inquiry it became apparent that evidence relating to the condition of certain valves on the platform might be relevant to the cause of the deaths of the two men, or have contributed to the incident which resulted in their deaths.

Sheriff suggests need for another Inquiry – see extract from his report

However certain evidence, such as the possible consequences to the structure of the platform, and its crew, of the ignition of the vapour within the utility shaft, while of concern to some of the parties and no doubt of importance to the offshore oil industry and those who work in it, was, in my opinion, beyond the scope of the 1976 Act and more appropriate for consideration at an Inquiry of a more general nature.

What the Sheriff was not told

Main Riser ESDV was in same condition as found in 1999 – Piper Alpha revisited

The 1999 Audit found that the Brent Bravo riser ESDV was falsely reported as having no fault found when in fact the valve had failed its performance test. This can be observed in the earlier documents containing audit findings. **But in 2003 the valves were in the same condition, nobody told the Sheriff this.**

The Sheriff's concerns re the need for a more general inquiry were well founded. If the considerable volume of gas had ignited in the enclosed space the instantaneous pressure may have caused the structure where the jacket mates to the columns to collapse partially or totally. In these circumstances it would have been essential that these ESDV operated in line with their design requirements to prevent an escalating hydrocarbon event.

But when the post fatalities review looked at ESDV maintenance records for Brent Bravo they found that the valve maintenance work order (WO) had been signed off as OK when the test had not actually been carried out. This is the same behaviour as witnessed 4 years earlier.

They also found maintenance WO's were signed off as OK when using the wrong test method and with a known fault on the system.

Rather than making good the situation the WO' s were for correcting the situation were cancelled with faults still present on the valves.

When carrying out the mandatory leak test they had used average value not the maximum value which is the criteria, if maximum used the valve fails test

**Shell Expro
Platform Safety Management Review (PSMR)
A Briefing Note (20/10/99)**

To: UED/UEG
From: UEFA

Purpose of this Briefing Note

To highlight immediate concerns arising from the PSMR in advance of the final Level 1 Review Report. The subsequent Level 1 report will provide more detail and also highlight observed areas of best practice.

Interim Opinion / rationale

There are significant weaknesses in essential controls, which require senior management attention.

Resources and Standards

Following the transition to Enhanced Expro (post technical function) there is a strong reliance on the corporate 'glue' being provided by Process Owners Forums (POFs), supported by service providers in UESC and UESE to set and review standards. However POFs have varying effectiveness - in some cases they actively review and set standards whereas in others the role is largely passive. POFs will offer advice when requested however the Asset Manager can reject such advice if they so wish. Most notably, in the context of this review, there was evidence of the Maintenance POF having raised **serious concerns** within the organisation but these concerns remain. In addition, the effectiveness of the POFs in proactive skill-pool management remains an area of weakness.

Safety Case Management and Risk Assessment

Under the Safety Case legislation Duty Holders are expected to demonstrate in their day to day operations that the risks on their offshore installations are ALARP. On Brent Bravo for example, with a POB of 156 there were high activity levels, combined with equipment operating outside its design envelope, a significant number of overrides and other weaknesses in direct controls including inappropriately authorised changes to safety critical equipment. However the Asset Management team could not clearly demonstrate a holistic approach to the management of risk on the installation. Our concern is that other platforms may be operating at risk levels above ALARP, and the possibility is that these risks could be exceeding threshold values.

There were also concerns on the rigour of the decision making process around approval of design changes. In some instances persons approving such changes (including operating outside the design and operations envelope) may not be sufficiently experienced or adequately informed to take such decisions.

People within the organisation are taking decisions in isolation which may not appear unreasonable, but after the event could have severe implications e.g. changing ESDV leak-off test criteria from 1 scm/m to 4 scm/m to 20 scm/m. Also, where equipment fails to meet its performance criteria, simply relaxing the standard seems to have become a normal response. No evidence was found of cases where hardware modifications are made to enable equipment to subsequently meet its original standard.

Procedures

Under interview, recognition and acknowledgement of violation of procedures by people is variable. **However review of hand-over notes indicates that violation is common.** Many such violations are apparent to the general workforce. This would be a serious reputation issue after a major event. People are coping, and to cope sometimes means to violate. Violations observed varied in severity from procedural non-compliance (**Permit System**) to operating plant outwith its design and operating limit. In one specific case

involving operation of an oil separator, the violation was known about and accepted up to the level of a Senior Manager. There was evidence of false and misleading information in maintenance records for safety critical equipment, for example the Brent Bravo ESDV which failed its leak-off test in April 1998 was recorded as 'NO FAULT FOUND'.

Implementation and Performance Monitoring

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The general level of understanding of these schemes throughout the organisation is poor and even encompasses the limited knowledge of some people who work the process on a day to day basis. A significant concern is the effectiveness of the PFEER process. This is a statutory scheme ensuring that PFEER safety critical elements on an offshore installation are examined and tested in accordance with the Duty Holders' published performance standards. A number of offshore systems can not currently meet their published performance standards. These standards in turn are being relaxed with no demonstration of a robust assessment of the risks involved. There is also divergence in standards being applied pan Expro e.g. leak-off testing for riser ESDV's. Where cited in the Duty Holder's written scheme, the 2nd Party Verifier (UESE/6) should validate and approve any changes to these performance standards but this does not always happen. Concerns expressed to the review team by an independent PFEER examiner included pressure being exerted to sign off non-compliance's. Evidence was obtained of a report being signed off prior to remedial actions being undertaken.

Maintenance Non-compliance

Sampling revealed many examples of non-compliance with safety critical and other routine maintenance. Much of this non-compliance appears driven by the requirement to prevent production deferment. As an example, the process for authorising deferments in NBU had significant weaknesses (now being revised). Changes in reporting parameters resulting from the introduction of SAP-PM have served to highlight the non-compliance issue (in the sense that 'true compliance' is now monitored and reported). However the general prevalence of non-compliance is not directly attributable to SAP.

Technical Integrity Reporting and Overview

Based on fieldwork in the Northern Business Unit, Technical Integrity information given to Managers is fundamentally flawed. There is no data validation at source by the people compiling the NBU report. Key performance indicators lack clear definition (e.g. gas release) and acceptable control limits have not been established (e.g. number of overrides on a specific installation). No person at any level in the organisation appears to have a concise overview of the technical integrity status of a specific offshore installation, (e.g. collective picture of loss of containment risks due to clamps, thin wall pipework, etc at any moment in time.)

Note – circulation of the Briefing Note

UED and UEG are the Oil and Gas Director, Chris Finlayson and Tom Botts respectively

UEFA is the Internal Audit Manager

Extract from Auditors Notes giving details to the Briefing Note above

Line of sight gas detectors

All the hydrocarbon module line of sight gas detectors had their executive actions inhibited. There was no valid justification for this. These detectors from time to time operate spuriously for a variety of reasons and they were therefore only isolated to prevent a process shutdown – a part of TFA policy. The inhibition of these systems was logged in the CCR. No QRA or other qualitative analysis had been completed to justify the inhibition of this crucial equipment, and no authorisation via change control process had been raised with a technical authority

As an example of false reporting the NBU monthly report section on Technical Integrity had a KPI related to number of safety systems isolated, the reports for July, August and September 1999 made no reference to these isolations

Control of Overrides on Safeguarding Systems

There were 29 overrides logged in the CCR logbook. These overrides were on process control and safeguarding instrument functions – again as with the LOS detectors no justification of the risks had been produced and no change control procedure authorising the overrides had been raised. The only justification forthcoming was with the overrides in place it reduced the probability of spurious trip of the process – TFA policy

As an example of false reporting the NBU monthly report section on Technical Integrity had a KPI related to number of overrides and inhibits on safeguarding systems. The reports for July, August and September 1999 made reported override levels for BD and BB below the actual level confirmed offshore

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Failure to comply with essential Maintenance

Compliance with safety critical maintenance and inspection was as low as 14%. Almost all of this deviation from the target figure of 100% was part of the TFA policy. It was noted that some systems such as water deluge were overdue their test period by 12 months. It was also noted from historic records that a number of systems which were overdue had failed when eventually tested, so their was a known and accepted high failure rate for safety critical systems designed to mitigate against the escalating hydrocarbon or other top events. A number of these systems had 'hidden failure modes',

that is the Operator would not be aware the system had failed until it was called upon to operate.

On checking on the beach, of a sample of 75 systems, which had not been examined and/or tested in August, only 5 approved deviations for the non-testing of these systems had been raised. It should be noted that all the SCE on Brent Bravo had their periodicity set following Failure Mode Effects and Consequence Analysis (FMECA) as part of a huge investment around 1992/3 in Reliability Centred Maintenance. In short if the SCE is not examined and/or tested within the scheduled period then the risks of the SCE failing on demand rises as time expires. This is why 100% compliance with the examination and testing of SCE is essential and mandatory as the Shell policy standard. Not to comply at 100% is accepting residual risk levels significantly above ALARP levels.

As an example of false reporting the NBU monthly report section on Technical Integrity had a KPI related to compliance with safety critical maintenance, the required standard was 100 % compliance in any calendar month

Safety Critical Equipment performance under test – a goal ‘widening’ regime

Records indicated that on Brent Bravo when SCE failed its performance criteria during test, the criteria simply changed, and the records changed to show ‘test results acceptable’. For example seawater deluge operation within 20 seconds changed to 120 seconds. ESDV leak of test criteria increased by 4 times then to 20 times the original mandatory level. . No example could be found of any SCE equipment, which had failed its performance test that was corrected at the time until it met the Company standard performance criteria. Before changing any of the Company performance criteria the Asset Manager should have sought approval from Expro internal verification department, but he did not. Also the technical authority responsible for change and variance control under mandatory Expro codes of practice should also have been in the loop but he was not.

Interviews with the department responsible for the internal verification scheme UESE/4 highlighted that they were aware of what was happening in Brent but accepted that they were unable to do anything about it, they appeared passive. The external verifier DnV was interviewed at Veritas House. He was also aware that performance criteria were being widened. He raised many concerns and complained that he could not get reasonable access to the Asset Manager to discuss his concerns. He stated in one example that he had been coerced into signing of documentation that the oil mist detector system on BD was in order. He did this in the promise from Shell that they would rectify faults in this system and put it into effect with some immediacy. When he then visited BD some 13 months later he found the oil mist detection system had been permanently isolated. When challenged if he had raised these concerns with his own Management he said that he had but that they were not entirely supportive of him. The implication was that the contract with Shell was significant in terms of their overall portfolio and that he shouldn’t rock the boat. One of the most alarming aspects was his answer to the question ‘what are the limits of goal widening’. For example, if to get ludicrous Brent set a response time for deluge systems at 2 hours 30 minutes what would be his response. His position was quite clear. He would verify the response time against the standard he was given. At that juncture we lost entirely any confidence in the efficacy of the external verification scheme – if it wasn’t so serious it would be funny.

As an example of false reporting as the equipment failed to meet the required standard but was recorded as satisfactory because the standard was reset. Examples were verified of deluge operation within 60 seconds became 120 seconds, leak off volumes passing closed ESD valves were raised by up to 20 times. For Brent facilities the Auditors found no examples of corrective or breakdown maintenance being carried out on safety critical equipment which failed to meet its performance standard, in all the examples witnessed the performance goal was widened. The audit also verified that these performance changes were not approved by the designated technical authority in breach of Shell Expro Codes of Practice

Falsification of Test Results on Principal ESD valves

One of the worst cases of relaxation of performance criteria was a gas riser ESD valve. Although this finding is restricted here to BB it should be noted that evidence of this existed on the beach for all Brent riser ESD valves. ESD Valves, which had failed the leak-off criteria of 1scm/minute, were marked in the maintenance records as 'test results acceptable, No Fault Found'. This included the BB gas riser valves at 2 scm/minute. To cope with these performance failures the Asset Manager had set his new performance standard for all his Brent field installations at up to 20scm/m - twenty times higher than the oil industry recognised standard and twenty times higher than ESDV installed on Central and Southern installations. Even when a valve failed at this level the strategy had been changed such that the ESDV could stay in location, and the platform operate normally, until the next planned shutdown.

With no reference to an authorised technical authority the autonomous Asset Manager was setting his own standard – all this was done to prevent the installations from having to shutdown. The internal and external independent verifiers knew about these changes of standard but they effectively took no action to redress the situation.

Under formal interview on 15th October, and in presence of General Manager, the deputy Asset Manager accepted that ESD test records had been falsified. Before continuing to operate with an ESDV valve that had failed its LOT the Asset Manager should have referred the matter to a technical authority and a risk assessment should have been undertaken. This was a field problem, on BD a gas riser ESDV had a leak-off rate of 4 scm/m. A risk assessment was completed but only some 8 weeks after the valve had failed its LOT. This assessment, discussed in detail with the Asset Manager under interview, indicated that the risks of operation at the new levels on BD were unacceptable.