High Reliability Organisations

• UKHSE chose this as a serious subject for assessment and improvement following the Buncefield accident.

• The event revealed almost everything that could possibly go wrong ...........

• Did go wrong!
Hertfordshire Oil Storage was a joint venture between TOTAL and Texaco
Fed by 3 pipelines from around the U.K.
— Servo level — Access hatch for dipping — Independent level switch
— Indicator (ATG) —
— Measure —
— and alarm —
— (ATG) —
— Funnel for dip —
— Vented ullage —
— Containment —
— Gasoline —
— LSHH 912 —
— atmos. Vents —
— Containment —
— Case 1 Large Storage tank —
— Flow —
— In/out —
— Floating —
— Roof
Reminder!

- Tanks were managed by allowing them to fill until the high level alarm sounded
- The Tank Level transmitter being used to manage tank 912 level had failed 14 times in previous 4 months
- No corrective actions by management
- Control of transfers was by sender (not receiver)
- Communications between shifts is confusing
- Maintenance crew did not understand how the High-High level automatic trip worked and left it disabled
- Shift patterns (12 hours) and overtime control not applied
- No proper risk assessment of the overflow case
- The first people to notice the vapour cloud were tanker drivers and members of the public (look at this) MAN WITH HANDS IN POCKETS!
- Inadequate emergency plans (inappropriate site response)
- Emergency stop button on panel – not wired up
Surprises

• Buncefield was included as a ‘Seveso’ site only because of the environmental criteria! *(environment)*

• Many people (including the regulator) did not realise that a large explosion was possible *(note: 7 events earlier in 20th C)*

• Apparently the establishment met all the Seveso 2 requirements as top tier

• The fuel storage industry believed that the API standard for fuel storage tanks (SIMPLE LEVEL ALARM) was enough to guarantee safety. Claimed to be ‘best practice’

• The standards operated at Buncefield were common in the fuels business throughout Europe *(my observation)*.

• Senior inspectors in the UKHSE commented that the degree of control in this industry is not as good as in the Chemical Sector – I replied that I was not sure of that
Large leaks of gasoline leading to a Vapour Cloud Explosion had occurred at least 7 times during the last 50 years:

- Houston Tx 1962
- Baytown Tx 1977
- Newark NJ 1983
- Napoli 1985 (It)
- St Herblain (Fr)
- Jacksonville (Fl) 1993 (check google)
- Laem Chabang (Thai) 1999 (check google)
What was EPSC involvement?

- 2008 UKHSE (regulator) published the first ‘final’ report
- Report included risk assessment examples (layer of Protection Analysis) carried out by one of the Major Incident Investigation Board.
- Examples flawed and likely to lead to wrong results
- R. Gowland challenged report findings and was asked to lead a group to produce the guidance which was published late 2009.
Aftermath: What do the authorities expect for High Reliability Organisations?

- **TOPICS**
  - Culture:
  - Leadership by Example
  - Systems
  - Workforce
Identified 19 items

• Leadership and Safety Culture
• Process Safety
  – Process Safety Management
  – Hazard Identification and layers of Protection
  – Organisational Issues
PHA

  - Bow tie diagrams
  - Layer of protection analysis
  - fault./event trees
  - Tabular records of the hierarchy of control measures
Safe Staffing levels

- Shift organisation
- Shift handover
Competence

• HSE Industry review in 2003 revealed wide variation in standards of competence and its means of evaluation

• Response from Industry has been mediocre _ Hopefully EPSC will help improve
MOC

• An essential element which may be improving
Planning for the hazardous operations

• power source of ignition when there is reported a large un-ignited vapour cloud covering the site?
Information and system interfaces for front line staff

- Guidance on alarm systems
- In Buncefield, the alarms were being used for the wrong purpose
Availability of documents for periodic review

• Are your P&IDs up to date?
• Safety Report
  – What is its purpose?
Performance Indicators

• Public and in company metrics. HSE commented to me in 2012 ”If your industry will not publish individual performance data, eventually we will”.

• API 754 already cited (2009)
It goes on…

• Emergency Planning – the only people to come out of this with reputation intact were the Fire Brigade.

• Emergency response: Does it make sense to start the fire pumps when:
  – A) no ignition yet
  – B) the vapour cloud was so large that it covered the fire pump house

• Investigation of incidents and near misses
• Audit and Review
déjà vu?

• Where have I heard all this before?

• In fact it is no more than Responsible Care ® published in 1990s
Responsible Care® code for Process Safety

- Leadership by senior management
- Clear accountability for performance
- Measurement of performance
- Investigation and reporting, corrective action
- Sharing safety knowledge – lessons learned
- Community Awareness Emergency Plan
- Complete documentation of the process design, operating parameters etc.
- Periodic assessment
- MOC
- Mitigation of the impact of normal operations and expansions
- Facility design using best practice
- Safety reviews of all new and modified facilities during projects
Responsible Care® code for Process Safety (cont)

- Documented maintenance and inspection
- Sufficient layers of protection through technology...
- Provision of facilities for control during an emergency
- Identification of skills necessary for each job
- Safe Maintenance procedures
- Training to required competency level
- Demonstration of proficiency
- Programs to ensure fitness of workforce to carry out duties safely
- Contractor safety
Responsible Care®

- CEFIC is the coordinator of Responsible Care® programme in Europe
- Process Safety Code not fully implemented in Europe
- I believe that CEFIC needs help to meet the aims of the programme