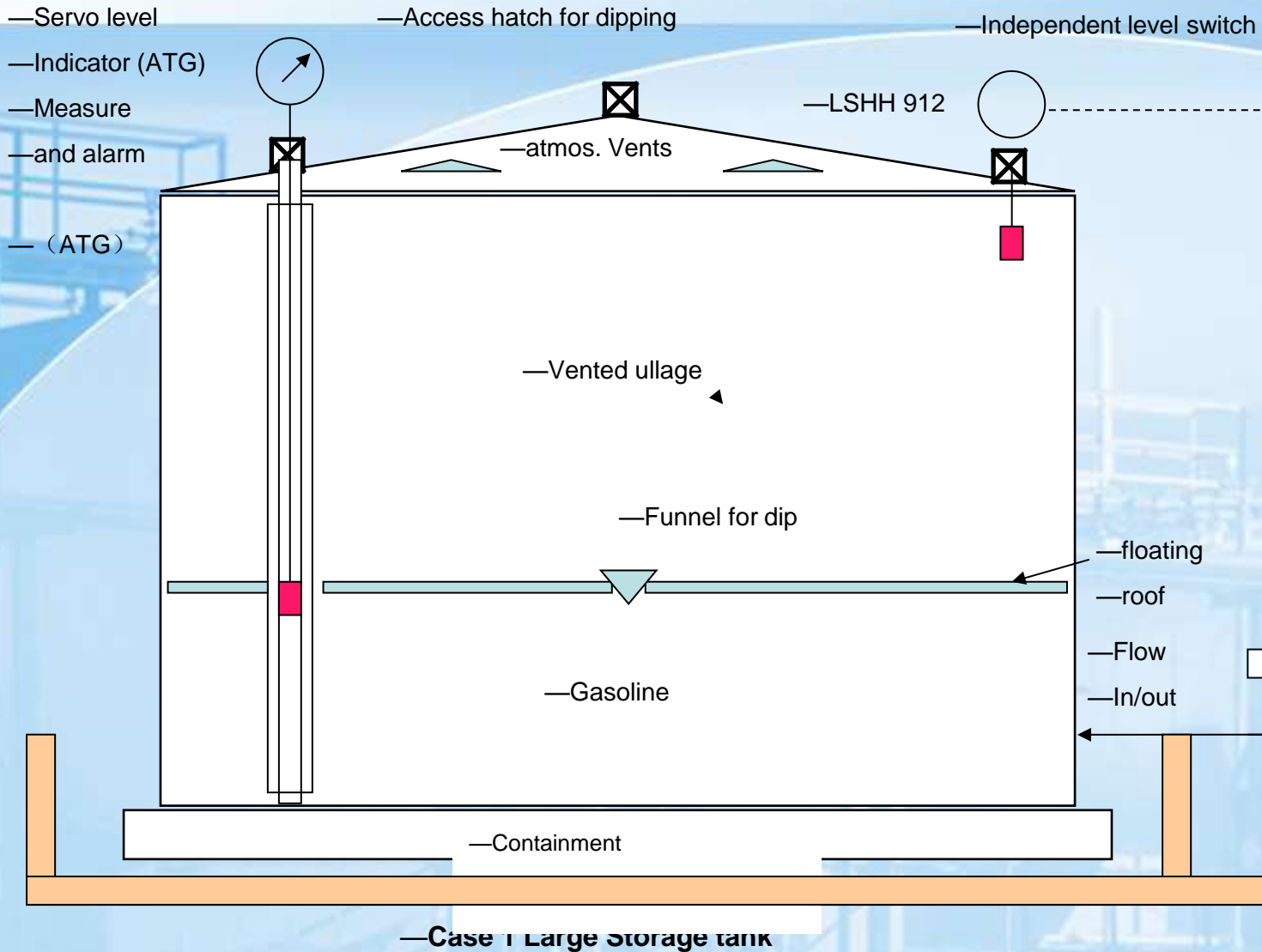


# High Reliability Organisations

- 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.





# 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 ([overflow](#))
- 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 20<sup>th</sup> 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

- Hazard Identification, Layers of Protection and assessment of their effectiveness.
  - 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 it 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