Longford Royal Commission into the Explosion and Fire on 25 September 1998 at the Esso Gas Processing Plant

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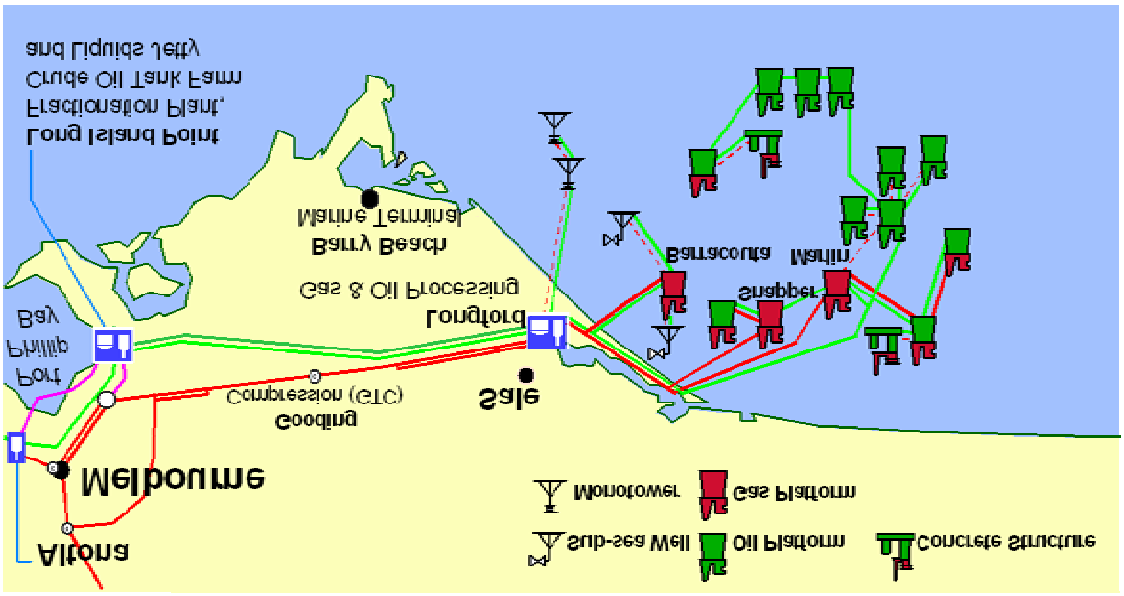
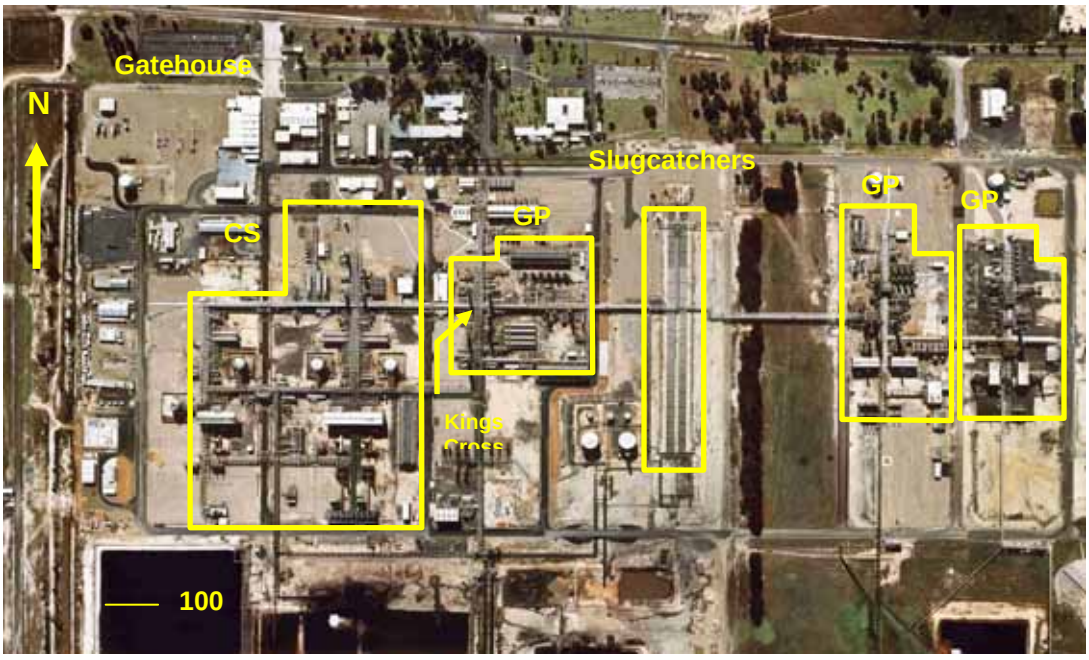
As the full Royal Commission report is readily available it is not proposed to reproduce all the information here.

The technical investigation team included people from many different organisations and many countries. Universities, safety experts and process experts all contributed.

•The Site





Operating environment:

Five shift teams working 12hour shifts with oe supervisor per shift. Engineering support was available from Melbourne. In 1992 engineers moved to Melbourne. During 1993-97 operations and maintenance roles changed where operators became troubleshooters and supervisor numbers were reduced, supported by competency-based training.

Safety Management System:

Operations Integrity Management System (OIMS)

"... a quality management process that is aimed specifically at lowering the risk of incidents, and provides a means by which continuous improvement can be achieved."

The Eleven Elements

- Management Leadership
- Risk Assessment
- Design & Construction
- Information & Documentation
- Personnel & Training
- Operations & Maintenance
- Management of Change
- Third Party Services
- Incident Investigation
- Communication Awareness & Emergency Response
- Operations Integrity Assessment & Improvement

Some of the Major Manuals & Documents that Comprise OIMS:

- OIMS System
- Risk Assessment & Management
- Safety Management
- Work Management
- Project Management
- Operating Procedures
- Maintenance Management & Procedures
- Emergency Response
- Training

In total some 140 manuals and documents comprised OIMS

Esso planned to HAZOP existing plants. GP2,3 & CSP had been Hazoped. GP1 Hazop postponed several times. Two Periodic Risk Assessments had been carried out. Condensate transfer mod HAZOPed in 1992. Near-miss reporting system in place but process upsets generally not reported as incidents eg. cold temperature incident one month previously.

•The Accident

On morning of accident it was school holidays. Senior operations people were away. The most senior site person was maintenance supt.

GP1201 trip (8:19 am)
– Not able to be restarted
– Plant not closed down
– Continued flow of condensate through plant
–Temperature decreased to -48°C by 9:30 am

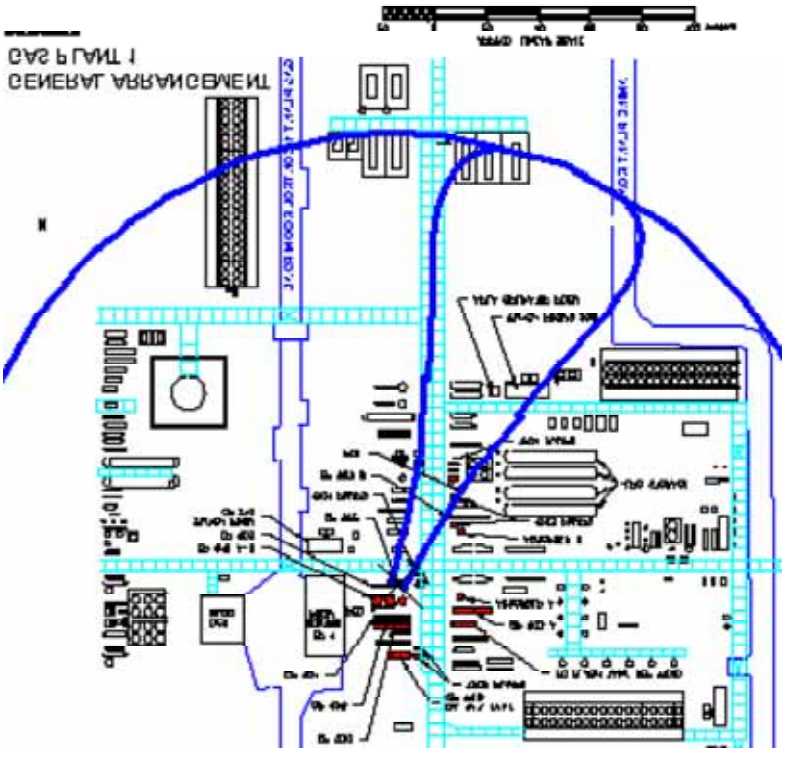
•GP922 Leaked (8:30 am)
– Temperature differential
– Maintenance people came to fix it
– Step back 5 x 5 safety review
– Shutdown of GP1
– Reintroduction of hot oil

GP905 Ruptured - Cold catastrophic failure

Explosion

Flash Fire

- ~10 tonnes released in 1-2 minutes
- Ignited by fired heaters 170 m away after 30-60 seconds
- Critically injured Heath Brew



Escalation
– Fire impinged on pipe rack of Kings Cross
– HCl from burning insulation entered control room
– After 10 minutes initial ruptures of pipes
– After 30 minutes major ruptures of pipes
– 53 hours to extinguish
– No gas for 9 days

The Royal Commission

Appointed by the Victorian Premier 3 weeks after the accident
Very focused terms of reference:
- lWhat were the causes?
- Did certain specific factors contribute?
- What steps should be taken by Esso and BHP to avoid a repetition?

Commissioners:
- Sir Daryl Dawson ex High Court Judge
- Mr Brian Brooks ex GM Operations, Santos

Reviewed in detail previous Royal Commissions.
- Piper Alpha
- Kings Cross
- Flixborough
- Moura Mine
- Westray Canada
- Hillsborough Football Stadium

- 80% of commissions time spent determining the technical cause
- 80% of findings related to management systems failure, as distinct from equipment failure
- All commissions led to changes in legislation

Findings

The Royal Commission found that the accident was caused by:
- failure to isolate cold flow when pumps could not be restarted because...
  - the dangers were not recognised because...
    - operators were not trained in these hazards, and
    - had no current operating procedures

The Royal Commission found the following contributing factors:
- failure to carry out a HAZOP of GP1
- inappropriate supervision of operating practices
- inappropriate design of absorber temperature overrides
- ineffective ESD and isolation

Maintenance was NOT a contributor.

Further comments:

The incident reporting system was ineffective:
- Incidents, such as those in June & August 1998 were either ignored or analysed for potential 'production' upset.(Hydrate Incident & Cold Temperature Incident)

OIMS in particular was criticised:
- There were shortcomings in the implementation of its (Esso) OIMS system.
- The system had become a end in itself, improving OIMS was taken as meaning improving safety.
- It was contended that effort in creating the OIMS detracted from other more obvious safety measures and controls**.**

Knowledge:

- Operators lacked basic knowledge pertaining to the process and hazards:
  Whilst a previous plant manager contended that Loss of Lean Oil was a hazard known to operators this was not borne out by either operators statements or their actions on 25th September 1999.

Inadequate Supervision (pg 198)

- No attention to alarms
- No reporting of process upsets
- No checking before altering process parameters
- No effective handover at shift change
- These were all common practices

•Lessons

- Develop procedures for forseeable failures with significant consequences and train operators in these procedures
- Hazard identification and detailed study of failure types essential
- Safety Management Systems must be implemented and audited effectively
- Design alarm systems so that the number of alarms is appropriate (stop crying wolf)
- Control of escalation

Legislative Impact

- "National Standard for Control of Major Hazard Facilities" to be used as model for legislation
- New legislation in Victoria
  Regulated by a new Major Hazards Unit
  Consistent with the National Standard
- Stricter regulation in New South Wales and Queensland foreshadowed
- Mandatory now in Western Australia
  Does not require demonstration of ALARP for on-site risks

Conclusions:

- Training and Current Operating Procedures
- Hazard Identification, Assessment and Mitigation
- Supervision of operating practices
- Design of ESD and isolation systems
- Safety Cases & National Standard for Control of Major Hazard Facilities will raise the standard for demonstration of adequate plant safety.

General lessons

- Large sources of energy have large potential for disaster
- Management disassociated (not in the same place, don't think the same way, not knowledgeable of actual situation) from risk become complacent
- Training is required to ensure competence
- Supervision is a key safety control

Safety Management System Lessons

- Plants (processes, places, contractors?) with limited accidents become considered safe
- Extensive evidence contradicting ‘normal’ condition of safety ignored and or marginalised
- Limited evidence supporting ‘normalcy’ of safe operation is promoted
- Documented systems not effective without rigorous audit, effective reporting and corrective action
- Reduction in LTIFR is not intrinsically linked to reduction in serious accidents / disasters.