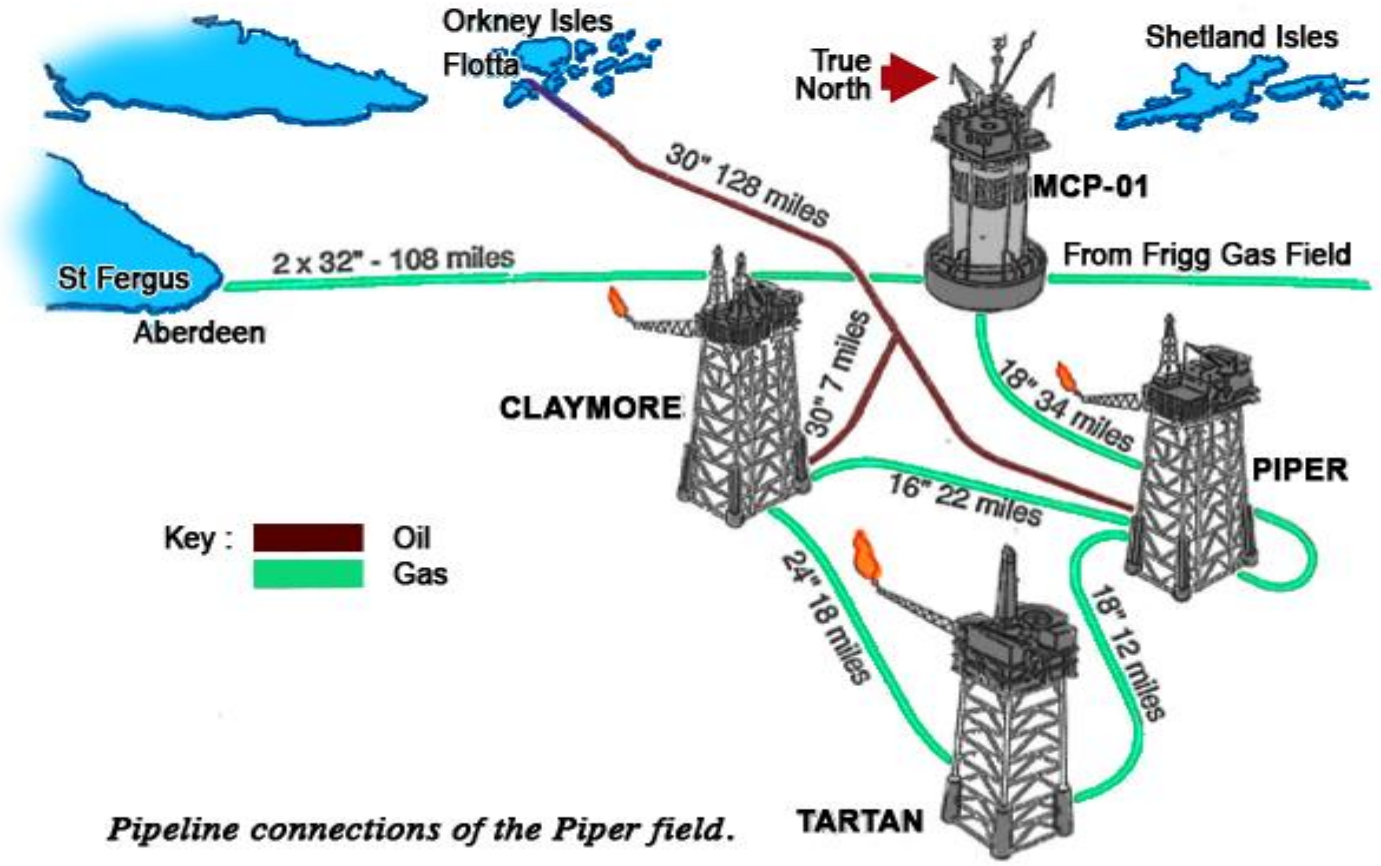
Piper Alpha Case Study: June 2008

Credited to ConocoPhillips Project Development

What was the Piper Alpha platform?

- Built in 1976
- A major Northern North Sea oil & gas drilling & production platform
- 226 people lived and worked on the platform
- Exported oil to Flotta, and gas to St. Fergus
- Acted as a hub for gas import and export
- Designed and built to the standards of the day
- Had recently been inspected and declared “safe”

Location of Piper Alpha



Pipeline connections of the Piper field.

What happened?

- At around 10pm on 6th July 1988 a series of events started which would destroy the platform completely
- 165 of 226 men on board were killed plus 2 crew members from a fast rescue craft which was trying to rescue people
- Only 61 survived, all of who decided to “go for it” and save themselves
  - 27 climbed down ropes to a lower deck and then to the sea
  - 1 by a stair to a low deck and then the sea
  - 7 by rope and then dropped into the sea
  - 5 jumped from 65’
  - 1 jumped from the derrick level
  - 15 jumped from the pipe deck at 133’
  - 5 jumped from the helideck at 175’
  - none who jumped knew what they were jumping into

What happened?

- 109 men died of smoke and gas inhalation
- 80 of those were in the accommodation unit

Events leading up to the initial explosion

- Activities in place: drilling, production, inspection & maintenance (some by divers)
- Platform had 2 condensate injection pumps, one was out of service for work on a pressure relief valve, the other was operational
- Work was being done under the PTW system
- The 2nd pump trips and the flare intensity increases, shut down is threatened

The initial explosion

- They did not want to shut down
- They did not know there was a missing PSV and a blank flange in its place
- First pump was started up
  - the blind flange leaks, ignites and causes an explosion in the gas compression module
  - this wipes out the control room (no blast walls)
  - initiates large oil fires from the topside inventory causing intense smoke and fires

Escalation

- The fire system does not start, it has been put on manual because there are divers in the water: 2 men go to try to start the pumps and are never seen again

Escalation

- The fires continue, smoke intensifies
- People are gathering in the accommodation, but there is no control
- Some start to escape on their own initiative
- It is only about 15 to 20 minutes from the initial explosion

The Tartan riser ruptures

- The Tartan platform has been continuing to pump gas to Piper Alpha, the intense heat and fires melt the riser and the riser ruptures (although the SDVs may have closed, there is a large section of the riser on the cellar deck, completely unprotected
- The bursting riser causes a huge fireball which engulfs the platform
- The tartan platform continues to pump gas to Piper as the OIM has no authority to shut it in (needs authority from shore based Management)
- The platform's fate is now sealed, destruction is inevitable
- It is 20 minutes from the initial explosion
- The only hope now is to escape

Evacuation and Escape?

- The helideck is engulfed in smoke and helicopters are too far away
- The lifeboats are similarly inaccessible
- Due to a design fault, the gangway of the safety vessel, “Tharos”, is too short to reach into the platform
- All control has broken down on the platform
- By this time the only option is to escape to the sea in whatever manner possible

The failures?

- Management:
  - Permit To Work System not used properly
  - Platform management did not have full authority to act (reluctant to shut-down)
  - Surrounding platform OIMs did not have authority to stop exporting
  - Command system failed in an emergency
  - Occidental's management were "too easily satisfied", since nobody was telling them there were issues, they assumed everything was OK
  - Passing a prescriptive safety inspection does not confirm a safe operation

The failures?

- Operations:
  - No proper handover between shifts
  - Not aware of or understanding the risks
  - Fire water system on manual, no proper way of starting it in an emergency

The failures?

- Design:
  - No recognition of the changed risks when gas production was started (no blast walls, for example)
  - Control room was unprotected and in an exposed location
  - No sensible segregation of hazardous areas from non-hazardous
  - Risers not protected, inappropriately sited SDVs
  - Inadequate refuge area
  - Inadequate escape systems

Legacy of Accident

- The Cullen Inquiry is set up in November 1988.
- It concluded that the initial condensate leak was the result of maintenance work being carried out simultaneously on a pump and related safety valve.
- Occidental (Piper Alpha's operator), which was found guilty of having inadequate maintenance and safety procedures
- The enquiry made 106 recommendations for changes to North Sea safety procedures.
- The disaster led to insurance claims of around US$ 1.4 billion.

Lessons, actions for the future?

- Management:
  - An effective Company Management System for the management of the operation as a whole
  - An effective Operational Management System for the management of the facility on site (PTW system is crucial)
  - Regular audit and review of the system to make sure it is being used and is effective
  - Training in use of the SMS and training in understanding the risks of the operation

Lessons, actions for the future?

- Safety Engineering:
  - Use tools such as QRA and ALARP to understand the risks and hazards
  - Segregation of hazardous areas from control rooms and accommodations, use of firewalls, blast walls, protected control rooms and muster areas
  - Active and passive fire protection systems
  - Riser ESDVs properly positioned and protected
  - A variety of escape systems

Lessons, actions for the future?

- Operational Management:
  - Understand the risks and hazards, communicate those and look for ways to manage and control them
  - PTW system is the most crucial system
  - Training and competence is essential
  - Training and practicing for emergencies is vital

and finally?

- It can happen, has happened and will happen again, without action:
  - Never be complacent

  - Do not be “too easily satisfied”

References

- ConocoPhillips Project Development - *Piper Alpha: 20 years on Alaister McIntosh*, June 2008.
- Steven Duff, *Remembering Piper Alpha Disaster,* BBC News, 2008.
- *Wikipedia: Piper Alpha,* retrieved in 2012.