Safe System for Universities

Module 1 Tutorial

Case study: Piper Alpha drilling platform explosion

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Introduction:

On 6 July 1988, the Piper Alpha drilling platform, located nearly 200km north-east of Aberdeen in Scotland, suffered a catastrophic explosion that crippled the platform and ultimately led to the deaths of 165 people working on the platform and two crew members from a rescue boat. Piper Alpha was originally built in the early 1970s to supply oil from the Piper oil field. Production of oil started in 1976. A gas recovery module was later installed with gas production starting in 1978.

Timeline:

The following timeline describes the critical events that led to explosion and subsequent loss of life. This is not an exhaustive reconstruction. As most physical infrastructure was destroyed and all the platform's management team died in the accident, uncertainty surrounds the immediate events prior to the explosion. The information in this timeline was sourced from The Chemical Engineer and Wikipedia.

- Piper Alpha was constructed in the early 1970s and began oil production in 1976. The platform was chosen to act as a central transfer point for production, with nearby drilling platforms transferring production to Piper Alpha before being piped to the mainland. This decision would play a critical role in the disaster.
- For safety reasons, personnel areas were kept well away from the most hazardous areas of production. In 1980, the platform was converted to allow gas production in addition to oil. With this conversion, a number of hazardous operations were brought closer to crew areas, including locating the gas conservation module near the crew's accommodation quarters.
- In the late 1980s, upgrade and reconstruction work to the platform had begun. Part of this work called for upgrade of a gas conservation module (CGM). While the CGM was being upgraded, the decision was made to continue oil production and transfer of gas from the other drilling platforms, instead of ceasing production altogether.
- Part of the upgrade works occurring at the time required divers to be in the water under the platform. Procedure called for the normally automatically controlled firefighting pumps to be placed in manual mode whenever divers were working. After the first explosion, system controls were destroyed to the extent where the firefighting equipment could not be manually started.
- On 6 July, 1988, Pump A of two condensate pumps was scheduled for routine maintenance. These pumps were used for removing condensate from gas being transferred from the other

platforms, before it was piped to the mainland. The pump's pressure safety valve was removed during this work. Because the maintenance could not be completed before shift change over, a temporary cover plate was used to seal the pump's open pipework. Because it was meant to be temporary, the plate was only hand-fastened.

- When the shift change-over occurred, the maintenance engineer filled in the appropriate paperwork notifying that Pump A was offline and not to be started. Because he could not speak to the oncoming shift controller, the engineer did not inform him of the situation. While the paperwork was completed, it was stored in a different location to the original maintenance work permit form and was never found by the oncoming crew.
- At some point, Pump B, which had been taking the entire condensation load, failed and was not able to be restarted.
- As the on-duty crew was not aware of Pump A's condition, it was started. The temporary cover plate failed to hold and gas started to escape from the pipe. The gas ignited and exploded.
- The firewall designed to isolate the condensate pump was not designed to withstand such an explosion and so it failed, leaving the nearby control room to be destroyed and disabling several critical control systems.
- Without the control room, the platform's chain of command soon collapsed and proper emergency procedures failed to be actioned. Upon learning of the explosion, the majority of the platform's crew escaped to the fireproof accommodation quarters.
- The firefighting equipment was still in manual mode. The equipment's manual control systems were damaged during the initial explosion, ensuring the platform's own firefighting equipment would not start. Even if it had been started, Piper Alpha was transferring gas and oil from nearby platforms. Due to company pressure to maintain production, the crews of these platforms had not shut down production upon hearing of the emergency. Despite Piper Alpha's own production being stopped, gas was still flowing at a rate that made the fire virtually unstoppable.
- Due the intensity of the fire and subsequent explosions, the platform's structure nearest to the initial explosion started to disintegrate. The accommodation quarters were one of the initial structures that collapsed and fell into the sea, resulting in the deaths of all who were sheltering inside.

Sources

The Chemical Engineer (2019), *Piper Alpha: The Disaster in Detail*, viewed 4 Dec 2019, https://www.thechemicalengineer.com/features/piper-alpha-the-disaster-in-detail/

Wikipedia (2019), *Piper Alpha*, viewed 4 Dec 2019, https://en.wikipedia.org/wiki/Piper_Alpha