Piper Alpha Oil Rig Explosion

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The tragedy in 1988, of the Piper Alpha Oil Rig, remains to be one of the worst safety mishaps to occur in the oil and gas industry. On July 6th of 1988, failures in safety precautions led to multiple high intensity explosions aboard the Piper Alpha Pipeline. These explosions led to the disintegration of the oil rig as a whole in just under three hours, while claiming the lives of 165 of the 226 men on board, two of those lives being claimed being lives of rescue men trying to aid the burning rig. After the tragedy, left with 61 survivors and 3.4 billion dollars in insured damages, the Piper Alpha Oil Rig explosion remains, as stated above, to be one of the worst events to happen in the industry of oil and gas. An article written by Marc Reid goes into detail about his father's experience as a survivor of this disaster. Reid states at one point, "As I grew older and more mature, so too did the forthcoming details of my father's ordeal. His once funny-looking hands now told the story of a man who screamed with uncontrolled fear when he was in plunged into darkness after the first explosion hit the rig. His tired and elderly hands were the same hands used to squeeze tomato juice onto his burning face to relieve the intense heat of the evolving fire aboard Piper Alpha." This statement shows the magnitude of what exactly happened at Piper Alpha Oil Rig, as Reid aged in his life, he realized what exactly had happened to his father and what he had faced. Luckily, he was one of the survivors, however there were 156 other men who did end up losing their lives on that catastrophic evening.

The Piper Alpha Oil Rig was situated off the coast of Scotland. It had 12 years of highly successful operation. The rig was known to be highly rated in production, which led to high profits for the operators Occidental Petroleum as well. Piper Alpha Oil Rig along with 2 other platforms were set up in a tight triangle with two other platforms, however these other platforms were not used for drilling. The setup can be easily seen to the right in Figure 1. These two other platforms were added after the prime platform began production in 1976 mainly just working as an oil platform. Later, the Piper Alpha Oil Rig added on these two extra platforms to add gas production from the rig. These platforms, Claymore & Tartan, connected t production of Piper Alpha. These 3 platfor Aberdeen, Scotland. Along with those 3 pl This was part of the system that carried gas Terminal, which was located on shore in Sc

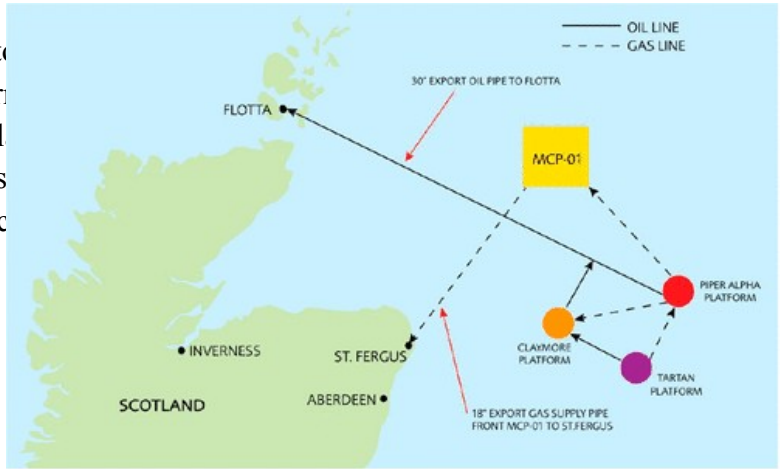

Figure 1. Above is an image that shows the full layout of the Piper Alpha Oil Rig and its corresponding platforms, along with MCP-01.

As stated above this disaster was caused by a series of failures in certain safety precautions that should have been taken by the crew. This led to multiple explosions throughout the oil rig ultimately igniting a fire and swallowing the whole platform/rig into flames. As stated above, ultimately the entire rig was practically disintegrated in the explosions and fire that took place. Now it is known what happened, but what exactly caused it? According to The Chemical Engineer, the accident begins to occur at around 9:45 P.M. on the evening of July 6th, 1988. At this time condensate pump B trips and after gas alarms began to activate. This was followed by stage gas compressors being tripped and the reading which was observed by the crewman was observed to be much larger than normal. Shortly after, at around 10:00 P.M. the first explosion was ignited on The Piper Alpha Oil Rig. This explosion ripped through the entirety of the rig, as many of the crewman were in the accommodation block were thrown about as if they were ragdolls. This initial explosion, which occurred in Module C, which was the gas compressor module, in turn caused a condensate line tying into the primary oil line to explode in Module B, which was the oil separation module. Following the second rupture, gas line connecting to the Tartan platform operated by Texaco, a different company from Occidental Petroleum, ruptured and began to release gas at about 3 tons per second. Then, at around 10:50 P.M., a Total-operated gas line exploded, which started to release gas through Piper Alpha from MCP-01. This explosion ended up destroying one of the rescue crafts sent in for assistance and ended up claiming the lives of two out of the three rescue workers, along with claiming the lives of six crewman from the rig that were on board the vessel. About 80 minutes after the previous explosion, at about 11:20 P.M. the gas-line to Claymore ruptured. At this point, the overall structure of the Alpha Piper Rig was so structurally weakened that the top of the rig began to collapse, while the main shelter module on the rig, which was a 4-story building, began to slide into the ocean, claiming the lives of everyone inside. By the early

Figure 2. Image from safety4sea, which shows the Oil Rig after the explosions, while on fire.

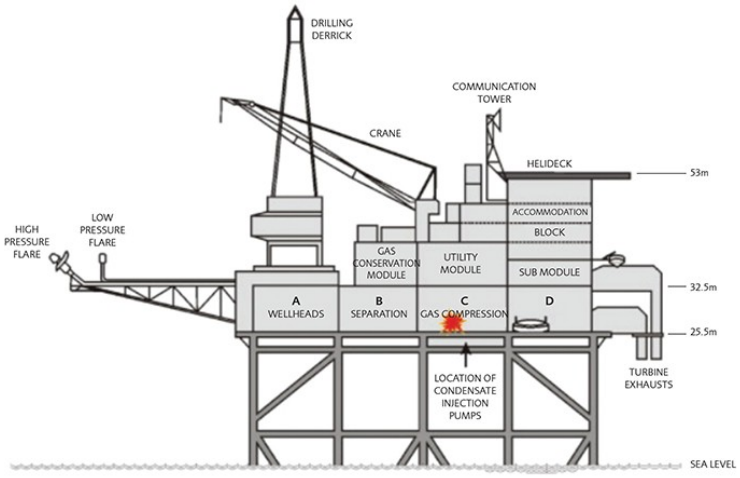

Figure 3. Above is an image from The Chemical Engineer which shows the different sections/modules of the Piper Alpha Rig. This image is a great tool to help follow the events that ultimately led to this catastrophic event.

morning of July 7th majority of the Piper Alpha Oil Rig, lay at the bottom of the sea floor. The fires from the different explosions and oil/gas burning created flames that rose to be over 200 meters tall, along with a peak rate of energy consumption of 100 gigawatts, which is three times the legal amount in UK total energy consumption. After three weeks, the entirety of the fires had yet to be fully extinguished.

There were many issues that led to the disaster of Piper Alpha Oil Rig. In terms of attempting to put out the fires, no water from Piper Alpha itself was applied to try and control the fires. It most likely would not have done much to stop these fires in whole but could have provided some sort of cooling factor to the structure of the rig. So, why was no water applied? This was because the crew had a safety procedure that would switch the fire pumps to manual if there were ever divers in the water. That being said, this was a very common occurrence for oil rigs therefore these fire pumps were set in manual mode majority of the time. This precaution valued the life of 1 diver equal to every crew member on board, which ethically is incorrect. These pumps should have been left on automatic and should have provided some sort of assistance throughout the catastrophe. Instead, they were left on manual and could only be turned on locally, which sadly nobody could reach to activate because of the fire already.

Another flaw in procedure that led to the disaster at Piper Alpha was poor communication between shifts. Night shift workers were well aware of the shut down on Pump A for maintenance and were also made aware that the maintenance had not yet begun. Instead, the maintenance was pushed to be done the next day and left notices in the safety room on Piper Alpha but none in the Control Room. The next shift operators in the control room were never made aware that the shutdown of Pump A had been suspended till the next day. The communication of what is going on from day to day was between personnel between shifts and departments and were mainly tailored to what the individual's job was. These were mainly informal communications as they were just simple communications from shift to shift. Operators were known to keep a log but never recorded maintenance activities. The set-in standard for Occidental was that maintenance and operations would meet together and inspect the worksite as a team, then they would both be required to sign off on the work permit. As time went on, operators were kept busy, and it began where maintenance would sign off on these permits and leave them in the control/safety room to wait for the operator's signature and would never be discussed at a shift change. This combined with the placement of pressure relief valves led to the ultimate downfall. The relief valves should always be placed as close as possible to what it is protecting, yet the pressure relief valves for these pumps were located on the above floor. The reason for this placement was because these pumps needed to drain to a separate area, therefore they needed to place the valve a floor above. These valves had no "lock-out" system for maintenance, a sort of way to ensure the pumps had no way of being activated/automatic actions to take if attempted to be activated to shut-down.

One of the largest failures in safety aboard Piper Alpha was the lack of an evacuation plan, or at least a good plan. It was thought that if there was needed to be an evacuation, it would be mainly by helicopter. After the first explosion, the entire helipad became engulfed in black smoke from the oil fires, that it was made impossible for helicopters to land aboard Piper Alpha to pick-up crew men. There was a safety sea vessel stationed close to Piper Alpha called, "Tharos" which was not meant for firefighting, however proved to have great firefighting ability, although was shut down for a short amount of time as the power draw was too great to try and fully use the vessel to its maximum capabilities. As well as no life rafts/boats successfully made their way into the sea. All survivors had survived simply from making their way into the water by whatever means possible, many rappelling down knotted ropes off the side of the rig and many simply jumped, some from as high as the helipad which stood 50 meters above sea level. Ultimately all of these safety failures combined to cause one of the largest tragedies in the Oil and Gas industry claiming in total 156 lives, as a whole this case has been used as an example to help and prevent disasters like such from happening in the future.

Figure 4. Above are three of the sixty-one survivors seen recovering from injuries sustained on that tragic day.

References

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