

The Usumacinta Disaster

Chris Hanlon

Memorial University
St. John's, NL A1C 5S7, Canada
cmhanlon@mun.ca

ABSTRACT

The Usumacinta is a mat-supported jack-up based on the prior design of the Bethlehem JU-200-MC. It was delivered in 1982 by Bethlehem Steel in Singapore to Perforadora Central operating out of Mexico. The Usumacinta's main operational role is to move from site to site to perform drilling support for stationary platforms and does so with a crew of 81 personnel. In October 2007, the Usumacinta was contracted to drill a well for Petroleos Mexicanos (also known as PEMEX)'s Kab-101 platform in the Bay of Campeche approximately 75 kilometres off the coast of the Tabasco region near the port of Dos Bocas.

On Sunday, October 21st, 2007 the Usumacinta arrived in position next to the Kab-101 platform to finish the drilling of the Kab-103 oil well. Within three days onsite a cold front moved across the Bay of Campeche creating wind speeds up to 130 km/h and 8 meter waves. This storm caused the closure of eight separate ports in the Gulf for commercial traffic. These conditions were described by Carlos Morales, director of PEMEX's exploration and production unit as "extreme weather conditions we've never registered before." [2] These operating conditions caused oscillations in the Usumacinta resulting in a collision of the cantilever deck of the Usumacinta and the top of the production valve tree of the Kab-101 platform, causing a leak in oil and gas at approximately 1200 hours on October 23rd, 2007.

Around 1420 hours the subsea valves of wells 101 and 121 were closed by PEMEX in order to stop the leakage of oil and gas. Unfortunately the valves were damaged in the collision and some leakage continued after these safety valves were closed. This resulted in an evacuation of the 81 crew members occurring at approximately 1535. On November 13th, a spark from on-going containment work caused a significant fire to ignite on the Usumacinta. This fire was put out on November 14th at approximately 2350 hours. A second fire occurred on November 20th causing immense damage to the Usumacinta platform including the collapse of its derrick and severe damage to the cantilever deck and connecting bridge.

This incident will be covered extensively with a focus on possible preventative measures that would have been put in place to avoid similar disasters from occurring in the future.

1 INTRODUCTION

The mat-supported jack-up, Usumacina was based on the previous design of the Bethlehem JU-200-MC. It was delivered in 1982 by Bethlehem Steel in Singapore to Perforadora Central operating out of Mexico. The offshore vessel's main operational role is to move from site to site and perform drilling support for stationary platforms. The crew accommodation of the rig is 81 personnel.[2] In October 2007, the Usumacinta was contracted to drill a well for Petroleos Mexicanos (also known as PEMEX)'s Kab-101 platform in the Bay of Campeche approximately 75 kilometres off the coast of the Tabasco region near the port of Dos Bocas.



Figure 1: The Bay of Campeche and Surrounding Area

The Bay of Campeche is the second most productive oil field in the world and supplies approximately two thirds of Mexico's crude oil output. It has also been deemed a main breeding spot for Atlantic hurricanes during the summer months and is prone to extremely hazardous seas states.

The Kab-101 platform is a Sea Pony-type light-production platform that produced approximately 5,700 barrels of oil and 700,000 cubic feet of natural gas from two separate oil wells. The Usumacinta platform was brought in to drill a third well, deemed Kab-103.[2]

2 CAUSATION AND EVENT

On Sunday, October 21st, 2007 the Usumacinta arrived in position next to the Kab-101 platform to finish the drilling of the Kab-103 oil well. Within three days onsite a cold front moved across the Bay of Campeche creating wind speeds up to 130 km/h and 8 meter waves. This storm caused the closure of eight separate ports in the Gulf for commercial traffic. These conditions were described by Carlos Morales, director of PEMEX's exploration and production unit as "extreme weather conditions we've never registered before." These operating conditions caused oscillations in the Usumacinta resulting in a collision of the cantilever deck of the Usumacinta and the top of the production valve tree of the Kab-101 platform, causing a leak in oil and gas at approximately 1200 hours on October 23rd, 2007.[2]



Figure 2: The Usumacinta Leaning Against the Kab-101 Platform

Around 1420 hours the subsea valves of wells 101 and 121 were closed by PEMEX in order to stop the leakage of oil and gas. Unfortunately the valves were damaged in the collision and some leakage continued after the safety valves were closed. This resulted in an evacuation of the 81 crew members occurred at approximately 1535. On November 13th, a spark from on-going containment work caused a significant fire to ignite on the Usumacinta observed in Figure 3. This fire was put out on November 14th at approximately 2350 hours. A second fire occurred on November 20th causing immense damage to the Usumacinta platform including the collapse of its derrick and severe damage to the cantilever deck and connecting bridge. This damage can be observed in Figure 4.



Figure 3: The First Fire on the Kab-101



Figure 4: Collapse of the Usumacinta's Derrick and Heavy Damage Caused by the Second Fire

3 INCURRING LOSSES DUE TO THE DISASTER

3.1 Human Losses

PEMEX reported that 86 personnel were involved in this evacuation consisting of the 81 crew members and 5 sailors who were sent in to assist in the rescue. The personnel utilized life rafts as the means of evacuation from the Usumacinta but the rough seas resulted in the breakup of at least one life raft. By October 24th, PEMEX had found 58 survivors and an additional lifeboat was found but was unable to be recovered due to the harsh weather conditions. Overall there were 21 reported deaths during this disaster and one additional crew member lost and presumed dead making this disaster the ninth deadliest oil and gas accident of all time.[2]

3.2 Environmental Losses



Figure 5: A View of the Spilling Oil

Control teams were sent to the Usumacinta to assist in containing the oil spillage and terminate the leakage but were severely delayed due to the rough sea conditions and the hazardous gases released in the leakage. Initially spill was estimated to leak 442 barrels of light crude a day. PEMEX estimated that approximately 40% of this spillage was evaporated. PEMEX used a variety of chemicals to recover the lost oil and successfully obtained a total of 8701 barrels.[2] PEMEX estimated however that 5000 barrels of oil were unable to be recovered. PEMEX noted however that the leakage was more gas than oil which was impossible to retain and was left to enter the environment. Additionally some spilt oil was observed to have been absorbed into beaches nearby the oil well. PEMEX reported the recovery of over 500 tons of sand with hydrocarbons that is estimated to be equivalent to 394 barrels of oil. [2]

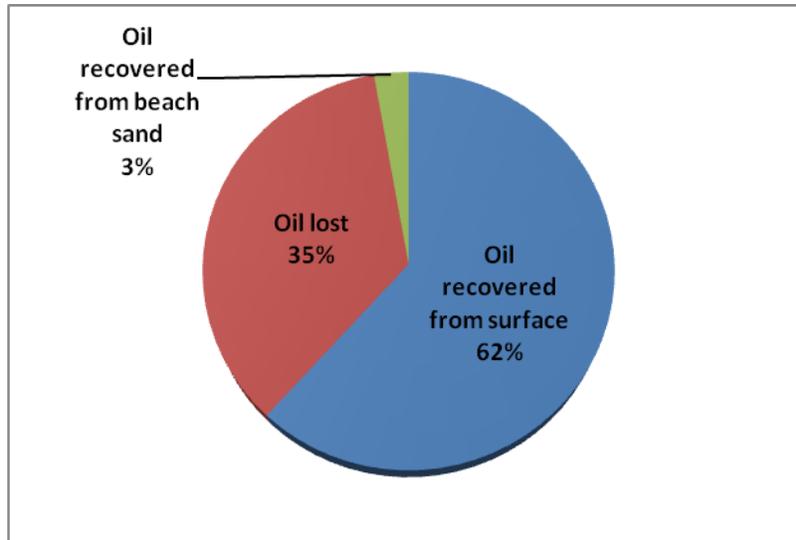


Figure 6: Oil Recovered and Lost

3.3 Economical Losses

The exact economical loss due to this disaster for both PEMEX and the surrounding area affected by the oil and gas spillage has not been publically available. Due to the quantity of oil lost and the extent of the cleanup effort on PEMEX's behalf it can be estimated as fairly significant. An investigation by PEMEX has been begun but the findings have not been made available for public use at this time.

4 RISK CONTROL STRATEGIES

Upon the realization that the safety valves had been compromised and the evacuation had been ordered, PEMEX assigned the ship Morrison Tide and three other vessels to provide support in the case of a fire. In hindsight this was a very smart strategy on PEMEX's behalf because during the course of attempting to control the spillage two fires broke out aboard the Usumacinta. These vessels can be seen in Figure 7 extinguishing the second fire that ignited.



Figure 7: Support Vessels Extinguishing a Fire

The Usumacinta was properly outfitted with enough life rafts to evacuate all members however as survivor Eder Ortega Flores told Televisa television network commented "The life rafts didn't hold up under the force of the waves. They broke up, at least the one I was on, little by little, until the raft sank, and all my co-workers went into the sea." [2]This highlights the fact that although there were enough rafts, the life rafts were not structurally strong enough to handle the weather conditions that the Usumacinta was contracted to work in. This fault was one of the direct causes of the severe loss of life in the Usumacinta disaster.

PEMEX put in place many risk control strategies for getting help to the evacuating personnel including six PEMEX helicopters, two Mexican navy helicopters, and four rescue ships.

Oil and gas spill control was another area of critique in this accident. From the initial collision to the complete control of the well was a total of 56 days. As previously stated, the control teams were delayed due to the severe weather. Proper control procedures for severe weather would have allowed for a quick response and therefore less environmental damage.

Other control work was completed in order to mitigate the risk of the situation including removal of debris from the Usumacinta, the installation of a blow-out preventer to eliminate the chance of a blow-out occurring and dramatically increasing the oil leakage. One additional risk control strategy that was put in place by PEMEX that significantly decreased the amount of oil and gas leaked from the Kab-101 was the installation of a valve that facilitated control burning. Instead of the excess oil leaking into the water it is instead burnt off and controlled by the fire support vessel to ensure no damage was incurred.



Figure 8: The Control Burning Valve in Use

5 HUMAN ERRORS

The Usumacinta was not properly designed for the working conditions that occurred on October 23rd. The engineers in charge of determining the response of the platform in these conditions misjudged the horizontal motions that occurred due to the heavy wind and wave loading. The resulting sway was larger than the distance between the Usumacinta and the stationary Kab-101 platform which led to the collision of both platforms. If a drilling platform with good horizontal motions in the sea state that occurred on October 23rd was used or a larger clearance between the two platforms was evident then this entire disaster could have been avoided. It could be argued, however, that since these weather conditions were more severe than ever recorded in this area that it was significantly improbable that this event would ever occur. At the end of the day though there were significant losses, both human and environmental that could have been avoided.

The human losses could have been minimized if an earlier evacuation had occurred as well. Survivor Eder Ortega Flores commented that the workers abandoned the Usumacinta only after the leaked gas had reached dangerous levels and the emergency breathing devices had run out of air. [2] This was a difficult judgement call, however, because the longer the personnel stayed aboard the vessel trying to stop the leakage the higher the chance of a stoppage. At the end of the day however these attempts were fruitless and the personnel evacuated in undesirable conditions with very little safe air left aboard the platform.

Human error was also evident in causing the first fire onboard the platforms when a spark ignited a fire onboard. This fire (observed in Figure 3) luckily did not cause any injury but caused severe onboard damage. This could have been avoided by more stringent protocols for those working in such a risk-filled situation thus lowering the chance of human error causing these scenarios.

6 CONCLUSION

The Usumacinta accident was a significant event in the oil and gas sector from which many lessons can be taken from. It is important that a situation like this never occurs again to avoid both human loss and extreme environmental damage. If proper response is taken from this scenario the oil and gas sector will be a safer more risk-free environment for businesses operating within this area and the employees both in and offshore.

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