Failure of Offshore Rig Structures in Gulf of Mexico

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Abstract Failure of offshore rigs around the world was analyzed with a special focus on the Gulf of Mexico offshore platform failures. Based on the analyses more than 25% of the failures in Gulf of Mexico were caused by hurricanes and 94% of the failures caused by hurricanes in the world occurred in Gulf of Mexico.

1. Introduction

Adequate investigation on the failure of offshore structure is very essential before the abandonment of an offshore rig. The longevity of the offshore structure mainly depends on the maintenance of the structure. However unprecedented events such as tornado and hurricanes could affect the structure can lead to sudden failure to the structure also bringing with it fatalities. There are around 7500 offshore structures situated all over the world with a major concentration of 4500 structures situated in the Gulf of Mexico. Around 950 units are located in the far-east part of Asia and 445 units belong to South American continent. These numbers indicate the concentration of structures near North America which emphasizes the knowhow to deal with potential failures of the structure. Based on the weight of the structure, if the structure weight was less than 20,000 tonnes then it is a shallow water structure and if the structure is more than 20,000 tonnes in weight, it is considered to be deep water structure (Parente et al, 2005). Failure of the structure can occur because of faults occurring in the platform or because of natural causes such as hurricanes. A total of 184 failures were supposed to have happened so far in the history of offshore rig platforms apart from the failures that happened in the North Sea area (http://home.versatel.nl/the_sims/rig/index.htm). Of the 184 failures, 61 failures occurred in Gulf of Mexico alone next highest being 11 failures occurring in Norwegian Continental Shelf and 11 in UK continental Shelf.

2. Objectives

Objective of this study was to investigate the reasons for the failure of offshore structure and to quantify the failures due to hurricane.

3. Causes for failure

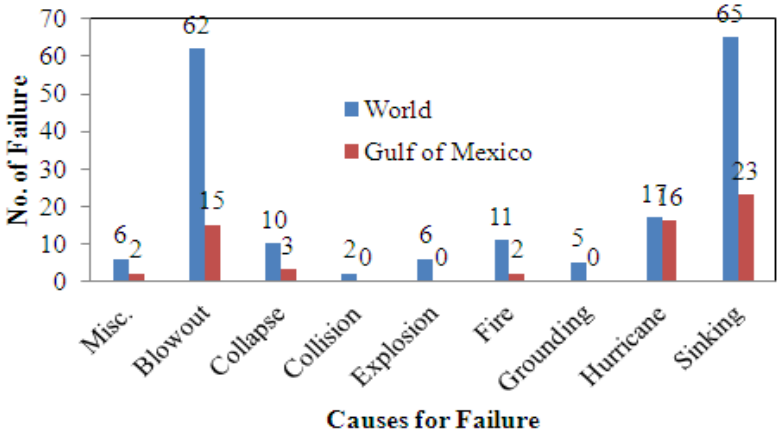

Figure 1: Causes for Rig Failures in the World and Gulf of Mexico

The causes for the rig failure were studied and it was observed that the failures can occur because of the following reasons a) Blowout, b) Collapse, c) Collision, d) Explosion, e) Fire, f) Grounding, g) Hurricane and h) Sinking. Figure 1 shows the number of failures occurred by the above mentioned causes. It is important to note that of the 61 offshore rigs that were damaged in the Gulf of Mexico (GOM), 16 were attributed to hurricane damage which is second only to 23 damages caused by sinking It was of interest to note that of the 184 failures that have occurred, 17 of them were contributed by hurricanes and 16 of them were in the Gulf of Mexico region. Hence 27% of the failures in the GOM caused by hurricanes and 94% of the hurricane failures occurred in the Gulf of Mexico.

4. Failures by Hurricanes

Of the 16 rigs that failed due to hurricane in the Gulf of Mexico region, 11 were Jack up rigs, 3 were platforms and 2 were semisubmersible rigs. None of the failures resulted in fatalities however, brought in major damage to the structure. Table 1 summarizes the list of failures caused by hurricanes in the Gulf of Mexico region.

Table 1: List of Offshore Rigs Damaged due to Hurricanes

S.No.	Rig Name	Failure Date	Hurricane Name	Category	Remarks
1	Marlin 3	8/27/1992	Andrew	5	
2	Ensco 64	9/15/2004	Ivan	5	Insured for 65 million
3	Medusa Spar	9/15/2004	Ivan	5	
4	Thunderhorse	7/10/2005	Dennis	4	
5	Hercules 25	8/29/2005	Katrina	5	
6	PSS Chemul	8/29/2005	Katrina	5	
7	Shell Mars	8/29/2005	Katrina	5	involved over 1 million man hours for recovery
8	Rowan Odessa	9/28/2005	Rita	5	working since 1976. now retired
9	Rowan New Orleans	8/31/2005	Katrina	5	insured for 1.1 million.
10	Noble Max Smith	9/9/2005	Rita	5	
11	Chevron Typhoon	9/27/2005	Rita	5	turned into reefs after failure
12	Adriatic VII	9/28/2005	Rita	5	sold for $ 30 million after failure
13	High Island III	9/28/2005	Rita	5	
14	Rowan Fort Worth	9/28/2005	Rita	5	working since 1978. now retired
15	Rowan Halifax	9/28/2005	Rita	5	
16	Rowan Louisiana	9/28/2005	Rita	5	working since 1975.

5. Conclusions

- The rig failures were caused by hurricanes of category 4 or higher.
- 94% of the offshore rig failures due to hurricanes occurred in Gulf of Mexico.
- The rig failures caused because of hurricanes did not cause any fatalities but caused severe structural damages.

6. Acknowledgement

This study was supported by THC-IT with funding from the industries. Sponsors are not responsible for any of the findings.

7. Reference

http://home.versatel.nl/the_sims/rig/index.htm
http://csc.noaa.gov/hurricanes/#