JRC - Learning Opportunity Notification (LON) - 002

Incident Details		Incident Impact	
Incident	Mumbai High North	People	22 dead
Date of Incident	27-Jul-05	Environment	Pollution
Location/Country	Arabian Sea, India	Asset (adjusted claim at the time of loss)	USD $370 million
Type of Incident	Boat Impact	Reputation	
Offshore/Onshore	Offshore		
Asset Type	Fixed Platform		
Asset Status	Operational		
Immediate Cause	Loss of Containment		
Similar Root Cause Incidents	LON - 001, LON - 003		
Date Updated	29-Mar-21		

Incident Description

The Mumbai High Field was discovered in 1974 and is located in the Arabian Sea, 160km off the west coast of India. The field comprises four platforms linked by bridges and the first one was built in 1976. The complex imported fluids from 11 other satellite wellhead platforms and exported oil to shore via subsea pipelines, as well as processing gas for gas lift operations. The Mumbai High North (MHN) platform had five gas export risers and ten fluid import risers situated outside the platform jacket envelope. On July 2005, a multi-purpose support vessel (MSV) collided with the MHN platform, severing at least one gas riser and causing a massive fire, which destroyed the MHN platform within two hours.

At the time of accident on 27 July 2005, the Noble Charlie Yester (NCY) jack-up was undertaking drilling operations in the field and was positioned over the NA platform. The MSV Samudra Suraksha was working elsewhere in the field supporting diving operations when a cook on-board the MSV cut off the tips of two fingers. Monsoon conditions had grounded helicopters onshore, so the injured person had to be transferred from the MSV to the MHN by crane lift for medical treatment. While approaching the MHN on the windward side, the MSV experienced problems with its computer-assisted azimuth thrusters which were normally controlled by a dynamic positioning system (DPS) so the MSV was brought in stern-first under manual control.

At around 16:05 hours, strong swells pushed the MSV towards the MHN platform, causing the helideck at the rear of vessel to strike and sever one or more gas export risers on the MHN jacket. The resultant gas leak ignited within a short time. The close proximity of other risers and lack of fire protection caused further riser failure. The subsequent fire engulfed the platform MHN, causing the complete destruction of the MHN platform along with the bridges connecting other platforms. Emergency shut-down valves (ESDVs) were in place at each end of the risers and the flow was shut down via sub-surface ESDVs, but some risers were up to 12 km long and riser failure caused large quantity of gas to be uncontrollably released. The fire also engulfed the MSV Samudra Suraksha, with heat radiation causing severe damage to the NA platform and the Noble Charlie Yester jack-up. The MSV caught fire and its personnel had to abandon the vessel. Six divers in saturation chambers on MSV were left behind when the vessel was abandoned but rescued 36 hours later. The MSV suffered extensive fire damage and was towed away from scene but later sank on 01 Aug 2005, about 18km off the coast. A helicopter on-board the platform was also lost. Personnel on-board Noble Charlie Yester, which also was affected by the fire, jumped into the sea. A clean-up operation was also performed after a 10 nautical mile oil spill resulted from the fire.

A total of 384 personnel were on board the MHN complex and NCY jack-up at the time of the accident. All installations were abandoned with 362 crew rescued and 22 reported dead (11 fatalities with 11 missing).

Incident Analysis and Findings (including Causal Factors)

Incident analysis has been performed based on causal factors and are presented below together with the findings:

Process Safety Management (PSM) - Although ESDVs were initiated, the MHN platform topsides collapsed within two hours of the initial fire, leaving only the heat distorted top of the jacket above sea level. The scale of the fire was due to the large inventory in the risers – a risk based study should have been undertaken to consider justification of a Subsea Safety Isolation Valve (SSIV) on larger inventories. A thorough HAZID and HAZOP analysis should have been performed during the design and operational stage to identify those risks and manage the risks.

Communication - It was reported that the Offshore Installation Manager and the MSV Master were under extreme pressure to evacuate the injured person and as a result, they may have overlooked the necessary risk assessments and prevailing weather conditions. The failure of the DPS on the MSV also introduced a change to the manner in which the vessel approached the platform.

Layout/Design - The location and vulnerability of the risers in the jacket relative to platform loading zones was compromised. Some riser protection guards were in place just above sea level, but these were only suitable for smaller offshore supply vessels and were not considered suitable for larger multi-purpose support vessels. Riser guards (protection barriers etc.) weren't provided at the top of the riser section.

Fire/Blast Protection – Risers had no active or passive fire protection on MHN. Active and passive fire protection on the risers may have reduced the severity of the loss.

Life Saving Equipment - Although there was adequate redundancy on all life saving equipment at installations as per the SOLAS guidelines, it wasn't distributed all around the platform. Sufficient number of rope ladders, scramble nets, life rafts, life jackets, life buoys, need to be placed all around the production complex to offer emergency escape alternatives for a range of scenarios. Escape routes for workers should be available all around the platform levels. The life rafts, both capacity and numbers, needed to be increased. Each complex needed an individual study to provide an increased level of safety.

Emergency Response - The incoming flow of oil and gas was shut down with the help of ESDVs. Since the platforms were connected by bridges, those on MHN could quickly escape to other platforms by following the evacuation procedures under the disaster management plan. However, no alternative medical evacuation methods were available or identified (helicopters were grounded, the leeward cargo crane wasn't available for a basket transfer). Significant problems were reported with the abandonment of all installations involved. Only two of eight lifeboats and one of ten life rafts at the complex were launched. Further, an escape route should have been identified for divers.

Training and Procedure compliance – Although a safety management system was in place at MHN, it wasn't extensive enough to cover the bridging aspects such as: loading of support vessel, contingency measures etc. It was also evident that some contractual workers travelling by Helicopter did not have valid HUET training.

Root Causes

Equipment Failure				Human Performance				Other	
Repeat Failure		Unexpected Failure		Human Engineering	X	Training	X	Sabotage	
Preventive/Predictive Maintenance				Procedures	X	Management System	X	Natural Peril - Wind Storm	
Design	X			Communications		Quality Control		Other	
Equipment/Parts Defective	X			Immediate Supervision					

Lessons Learned

Regulatory Body - After the incident, India has set up a regulatory body to provide oversight of offshore oil and gas production.

Improvement in safety management systems – Development of bridging documents for various offshore fleets and installations including guidelines for evacuation of injured persons.

Operating Procedures/Training - Guidelines and procedures for marine operations during monsoon, gales, cyclone and other adverse weather conditions. Appreciation of weather conditions and the prevailing / seasonal direction to be established together with control to limit the number of POB during adverse weather conditions. Hyperbaric evacuation points should be provided for divers. All personnel who travels to the offshore site to have HUET training.

Subsea Safety Isolation Valve (SSIV) - Requirement of Emergency Shutdown Valves (ESDV) on risers was introduced after the Piper Alpha incident (LON-001). Requirement of SSIVs should also be considered to limit the consequences of any riser damage below topside ESDV valve. Installation of SSIVs are considered as good practice.

Fire/ Blast Protection - Risers should have active and passive fire protection system.

Risk Mitigation – Vessel Approach Risk Charts – For all offshore operations, consideration should be given to drawing up simple vessel approach risk charts. These would show the platform complex on plan, with each face of the jacket(s) categorised according to a traffic light system with green for permitted access, red for no permitted access, and amber for conditional access. This will help to mitigate the ship impact risk – dissemination of the information to all marine contractors will be an important part of the process.

Riser protection - For new structures risers should be located away from the cargo loading zones and should be located either inside the jacket envelope or should be protected by a suitably designed riser protection frame. The vessel loading points should be designed away from prevailing weather. For existing structures, consideration should be given to retrofitting a suitably designed riser protection frame.

Process Safety Management (PSM) - Risers are considered as safety critical elements due to their high inventory and should be subjected to independent risk assessment.

Effective Communication - Effective communication channel should be established together with proper procedures to manage marine operations.

Emergency Response - The importance of different modes of evacuation methods should be established with well-written and audited procedures and emergency drills for all possible evacuation scenarios.

References

1. World's dealiest Offshore-oil Rig Disasters, Offshore Technology.

2. Mumbai-High North Incident Summary 27-Jul 05, IChemE.

3. Mumbai High North Platform Disaster, J Daley 2013.

4. The Willis Loss Database.