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MARS 201058

Turbocharger explosion and engine room fire

During open-sea loaded passage, the main engine unit no. 6 piston, cooling oil high-outlet temperature alarm suddenly activated. The duty engineer gradually reduced the engine RPM and eventually stopped the engine (over a few minutes). Other engine parameters were checked for any abnormalities and found to be in order. However, some smoke was seen emanating from nos. 5 and 6 units' exhaust manifold. All of a sudden, the aft turbocharger exploded and debris flew all over the engine room. A fire started at the location and the engine room filled with thick black smoke. The emergency alarm was sounded and the engine room was promptly evacuated. Three crew members sustained serious burn injuries while escaping from it.

The engine room was then effectively sealed by closing all fire dampers and doors. Remote stops and quick closing valves were activated, which stopped all running machinery. Thereafter, the fixed CO_2 flooding system was activated after confirmation that all crew were present at the muster point. The fire was effectively put out and, after a safe interval, entry was made as per SMS procedures. As a result of the fire, the main engine was rendered inoperative, even though the generators were restored.

All the units of main engine were opened up to investigate cause and assess internal damage. The crankcase and gear train were checked.

Root cause/contributory factors

1. Improper maintenance: Erosion and deterioration of the piston crown were not acted upon at the time of periodic overhauls and routine inspections;

2. Missing documents: A critically important technical bulletin issued by the makers specifically addressing piston crown damage, possible causes and maintenance procedures was not available on board;

3. Damaged piston crown: A burn hole of about 10 mm diameter was found in no. 6 piston crown and heavy erosion/wastage/pitting was also evident elsewhere on the crown and skirt. Numbers 2, 3, 4 pistons also showed considerable but scattered erosion, but no burn hole had developed on them;

4. Unauthorised alterations: On all these four piston crowns, the recessed threaded sockets for lifting eye bolts had become so wasted that previous ship's staff had welded nuts over the sockets without recording the event or informing the management. Subsequent crews had failed to report this matter;

5. During every power stroke, exhaust gas entered the piston cooling oil system through the hole in no. 6 unit piston crown, causing overheating and contamination of the oil;

6. Similarly, during every exhaust stroke, the piston cooling oil from no. 6 unit found its way into the hot exhaust manifold;

7. Accumulated lube oil in the exhaust manifold reached auto-ignition temperature and this fire spread to the turbocharger and caused it to explode.

Lessons learned

1. Routine inspections of engine parts and analysis of all oil samples must be performed as per maker's technical specifications. In case of abnormal results, prompt corrective steps must be implemented in consultation with management and makers.

2. If any unauthorised modification (welding of the nut in this case) is found on critical components, the matter must be referred to the management and makers.

3. It was found that those crew members who were familiar with escape routes suffered fewer injuries than those who were not. Engineers and ratings should be fully familiar with all exit doors of the engine room so that in an emergency, they can evacuate safely.

4. Injuries sustained were initially grossly underestimated by the officers on board and the casualties were repatriated five days after the incident.

5. An emergency escape breathing device (EEBD) containing normal air was used as first aid for a crew member suffering from smoke inhalation instead of the oxygen resuscitator that was available in the hospital.

MARS 201059

Problems with heavy lift cargoes

I am a port captain and among other jobs, I oversee the discharge of a large number of project cargo consignments. I have often noticed that the ship's staff has not planned the lifting and discharge process properly. Most worryingly, in some cases they were ignorant of the actual weights of the heavy lifts, and were intending to use the ship's gear without realising that the weight(s) exceeded the SWL. At the load port, shippers and ship's staff must ensure that crucial information like gross weight, slinging points, centre of gravity etc are prominently marked on each unit (preferably on each side and the top) and discharging arrangements at the destination port are clearly understood between all the parties involved.

Some receivers put pressure on the vessel to handle heavy lifts during the night; in my opinion, this must be resisted and charter-party clauses worded so to ensure that such work is to be conducted only during daylight and in 'safe' weather conditions.

One must appreciate that the consequences of an accident when handling heavy lifts can be very serious. Apart from the obvious danger to life and limb, there is the certainty of severe damage to cargo, vessel, lifting gear, berth and shore installations, resulting in long down times and huge claims.

▲ Figure 1: A heavy lift without proper shipping marks

■ **Editor's note:** As an example of best industry practice, a condensed extract from North of England P&I Club's Signals Newsletter Issue No 76 is reproduced below as a MARS report. Further information can be obtained from http://www.nepia.com/cache/files/3841-1248253978/Signals76.pdf#zoom=70 and Nepia's loss prevention guide, *Cargo Stowage and Securing – A guide to good practice*.

MARS 201060
Project and heavy lift cargoes

Edited from North of England P&I Club's Signals Newsletter, no 76

Shipping high-value and often fragile project cargoes can result in extremely costly claims if preparation, loading and discharge procedures are not carried out in strict compliance with manufacturers' recommendations and industry best practice. The key to success is detailed planning, which should involve a representative of the shipper, cargo superintendent and surveyor appointed by the carrier.

Pre-planning should include provision of suitable information describing the cargo in detail and include gross mass, centre of gravity, principal dimensions (including scale drawings), bedding requirements and careful preview of the arrangements at load and discharge ports/berths. The ship's classification society and flag state may need to be consulted to verify the adequacy of the vessel's cargo-handling equipment, cargo spaces, and documentation for the intended cargo.

Heavy lift items should be stowed in a fore and aft direction and as close to the ship's centre of motion as possible. Details of securing points must accompany the cargo information and include their maximum strength and optimum angle of restraint. An angle of 25° to the horizontal is often considered optimum for resistance to sliding and 45° to 60° the preferred angle for tipping resistance.

Calculations should be carried out to determine the number and strength of lashings as outlined in the vessel's Cargo securing manual (CSM) and/or IMO's publication Code of Safe Practice for Cargo Stowage and Securing (CSS Code). The lashing material should be of appropriate strength and design for each piece of equipment being secured. It may be necessary to attach additional securing points to the vessel, but welding to frames and fuel tanks should not take place without class approval. Voyage details (including weather forecasts and worst case stability condition: Editor) will have to be pre-assessed to ensure safe conditions throughout. On ships that frequently carry heavy lift and project cargoes, the Cargo securing manual (CSM) and/or the vessel's SMS should include a checklist for loading and discharging such cargoes.

MARS 201061
Injury due to slip in engine room

In rough sea conditions on a loaded passage on a VLCC, an engineer officer was going down the engine room from the second deck to the third deck. While doing so, he slipped and fell down the ladder, sustaining contusion injuries on both legs.

Results of investigations

1. The stairwell was clean and there were no slippery areas or surfaces;

2. The area was well illuminated;

3. The officer was walking down the stairs using both his hands to hold the rails, and the cotton gloves which were being worn were slightly damp due to perspiration;

4. Proper safety shoes and PPE were being used;

5. The officer was well rested and was not fatigued;

6. It is thought that the officer lost his balance while going down the stairs due to the combined effects of vessel's rolling and a momentary lapse in concentration.

Root cause/contributory factors

1. Lack of compliance: The company's personal protective equipment (PPE) matrix clearly states that leather gloves are to be used while in the engine room;

2. Damp cotton gloves had lesser grip than dry leather gloves;

3. Inadequate care exercised while moving around the vessel in rough sea conditions.

Corrective/preventative actions

All vessels are to:

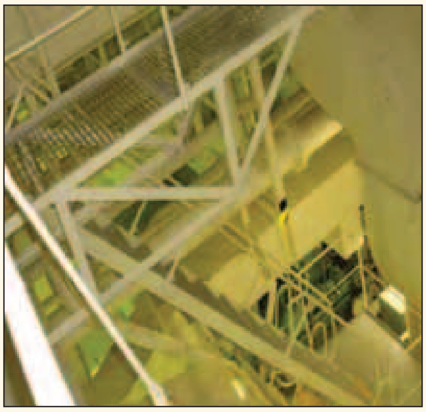
1. Discuss the above incident at their next safety meeting.

2. Ensure that personnel are well rested and in full compliance with STCW rest hours.

3. Clean up any slippery surfaces immediately on being noticed.

4. Ensure proper PPE in good condition is used at all times including appropriate gloves, helmets, boiler suits, safety shoes, safety goggles, ear muffs etc.

5. Warn personnel to exercise due care while moving around the vessel especially in adverse sea conditions.



◀ Figure 2: Steep stairway in engine room where the accident occurred

MARS 201062

Grounding on river passage

The vessel was bound for a river berth in a South Asian country. The previous evening, detailed passage instructions were received from the pilot on VHF, including information on defective and missing buoys. After the pilot boarded in the morning, master-pilot information was exchanged and the intended route to the berth was discussed.

The vessel's draught was 6.8 m even keel and it was confirmed from the pilot, agents and charterers there was sufficient depth for this draught throughout the passage. However, after about 4.5 hours' steaming, the vessel grounded in soft mud. At the time of grounding, depth around the vessel was observed to be six metres.

Root cause/contributory factors

1. Incorrect maximum permitted arrival draught advised by agent and charterers;

2. Inadequate and unreliable hydrographic survey data;

3. Information regarding river depth/chart datum shown on the plan used by pilot was different from the BA chart in use by bridge team;

4. Actual depth was about one metre less than that advised by the pilot.

Immediate actions taken

1. Soundings taken around vessel;

2. Class, flag, local authorities informed;

3. All ballast tanks were inspected and bunker tanks monitored and no ingress of water was noted;

4. Vessel lightered her cargo into barges and refloated at high tide;

5. Diver's inspection was carried out and no damage was noted.

Corrective/preventative actions

1. Owners advised that the port should be considered unsafe for this size of vessel.

2. Incident report circulated to the fleet and industry.

3. UK Hydrographic Office informed.

■ In the interests of safety and pollution prevention, mariners should note the approximate position of grounding as Lat 22° 28′.96N Long 089° 35′.33E: Editor.

MARS 201063

Fatality during PWC launch

While at anchor, a large yacht was launching personal water craft (PWC, commonly referred to as a 'jet ski'). When the first PWC had been lowered to main deck height, a deckhand boarded the craft to ride with it to the water, to release the lifting slings and bring the PWC round to the stern of the yacht. The deckhand was standing on the PWC and maintaining balance by holding the synthetic crane cable. With the PWC suspended approximately two metres above the water, lowering was resumed. Almost immediately, the inboard lifting slings failed and the PWC dropped to the water.

Without the support of the PWC, the deckhand was unable to hold on to the crane cable and fell on to the PWC in the water. He landed face down and although remaining conscious throughout, sustained serious chest injuries. The deckhand was removed from the water and transferred to a local hospital. Sadly, he subsequently died from his injuries.

Root cause/contributory factors

1. Deterioration of synthetic fibre web slings due to combined effects of exposure to solar UV radiation and tight crimped eye loop around corroded steel spreader beam;

2. Inadequate onboard maintenance and inspection regime;

3. Inadequate documentation – the history and origin of the lifting sling were not readily apparent. It was stated that it was supplied with the PWC, but the model and manufacturer of the sling could not be identified and no manufacturer's documentation of certification could be located.

Lessons learnt

1. The risks inherent in all lifting operations, including the launching of watercraft, must be rigorously assessed and safe working practices developed.

2. Procedures for lifting operations should be developed, adhered to during use and periodically reviewed.

3. 'Man riding' activities should only be carried out using certified and tested loose gear.

4. The guidance in the Code of Safe Working Practices for Merchant Seamen, section 15.2 (Working aloft and outboard) and section 21.2 (Use of lifting equipment) should be fully taken into account.

5. Loose gear should be visually inspected before each use and be integrated into the onboard maintenance, inspection and testing regime.

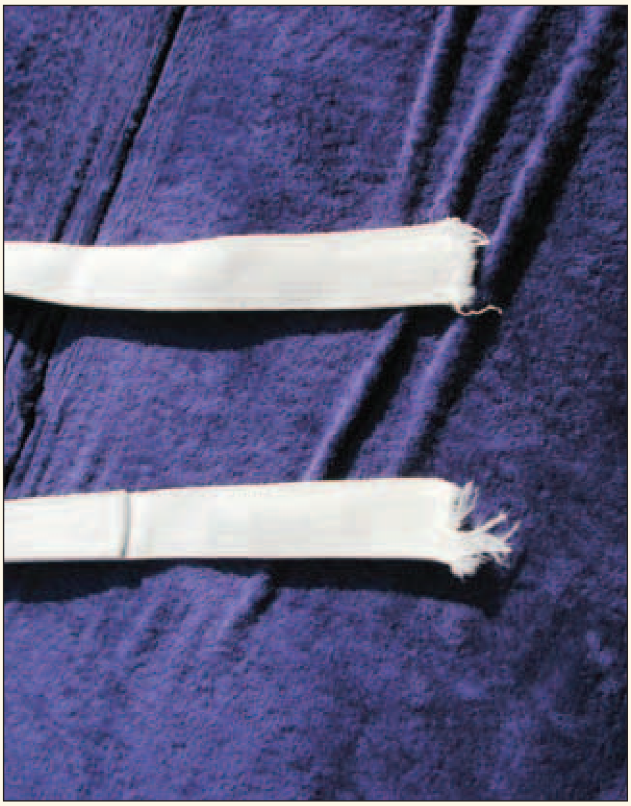
6. Examinations of lifting appliances and loose gear should be carried out by persons competent, by virtue of their knowledge and experience, to do so.

7. When visually inspecting loose gear, sufficient areas under tape and other 'protective coverings' should be inspected such that the overall condition of the loose gear can be properly assessed.

Recommendations/preventative actions

1. All webbing and rope strops should be stowed out of sunlight and, in any case, ought to be replaced at least every second season.

▲ Figure 3: Typical PWC slinging arrangement



▲ Figure 4: Evidence of deterioration caused by exposure to solar UV radiation

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MARS is strictly confidential and can help so many – please contribute.

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