KISH P&I CLUB

KISH P & I LOSS PREVENTION CIRCULAR KPI-LP-68-2013
(MARS Jan-2013 Accidents & Lessons to be Learnt)

►Accident no.1-Crew injuries from oil heater explosion:

Over a period of two days at anchor, one of the two vertical thermal oil heaters of a product tanker was observed to be not firing reliably.

The crew opened and cleaned the burner unit and also adjusted the igniter electrodes twice, but after the second attempt, the heater refused to fire. On the third day, the C/E discussed the remedial action plan with the crew. They opened up the burner unit and cleaned the burner lance and igniter electrodes again. This time, the heater operated for about 90 minutes (eight firing cycles), after which it again failed to ignite. Resuming work after lunch, the electrician re-inspected electrical systems while the 3/E and cadet dismantled and cleaned the burner lance and nozzle unit, reassembled it under the C/E supervision and refitted it to the heater one more time.

When the test firing commenced, the 3/E, cadet and electrician positioned themselves on the top of the heater to monitor the automatic starting and firing sequence. The forced-draught fan went through a four-minute purge programme, but when the igniter sparked, there was a violent explosion.

The explosion lifted the thermal oil heater casing top, snapping most of the securing bolts. The burner arrangement was pushed out of alignment and the inspection cover was torn from its securing bolts. The ducting from the externally mounted forced-draught fan was torn apart at the flexible insert. Fuel lines running across the top of the thermal heater were deformed, and at least one began to leak from a weakened joint.

The explosion triggered the engine room fire detection system, initiating a fire alarm on the panel at the fire control station, and also activated the local automatic water mist system. The three persons on top of the heater suffered burns over large portions of their bodies as the flame front engulfed them momentarily, but they were able to walk from the area to the accommodation. They were assisted by the mustered crew, who removed the remnants of the burnt coveralls and ill-advisedly pierced and drained (lanced) the blisters before placing dressings on the burns. The injured persons were also given painkillers and water to drink but remained seated in a cabin despite being in severe pain and trauma.

About half an hour after the explosion, the Master reported the incident to the port control and his local agents and requested medical assistance. Unfortunately, his request for helicopter evacuation (medevac) was initially denied due to the mistaken assumption ashore that helicopter operations over a tanker that had just suffered an explosion would be hazardous. Subsequent miscommunication between the response teams on shore added to this delay.

Paramedics boarded by launch about an hour after the accident and after rendering further medical treatment, they insisted on immediate evacuation of the casualties by helicopter. Eventually, after another hour, the men were winched off and conveyed to a shore hospital.

***Result of investigation:**

1-The burner nozzle had been incorrectly assembled, probably during the several investigation and repair attempts. As a result, the needle valve stem became bent and due to an improper seal, the circulating fuel continued to spray into the furnace during the pre-ignition start sequence;

2-The crew, except the C/E, had very limited experience in servicing this equipment;

3-The manufacturer's manual was poorly written, and lacked a clear drawing of the burner, details of spare parts, instructions for troubleshooting, servicing, inspection or testing;

4-In order to reduce maintenance costs, at some time prior to the incident, the company had approved a change of fuel from heavy fuel oil (HFO) to marine gas oil (MGO) for the heater, but the crew failed to make the necessary changes to the fuel pre-heating circuit and the auto-start programme;

5-Excessive diesel fuel entered the furnace which was probably at about the operating temperature (about 160 degrees C), and instantly vaporised (flash point 68 degrees C) and formed an explosive mixture with the charge air;

6-The crew failed to refer to the proper sources for advice on the treatment of burn injuries, resulting in the casualties being given inappropriate first aid (especially the deliberate puncturing of blisters);

7-The port's contingency plan for responding to a vessel casualty and medical emergency in the anchorage lacked detailed documentation that would have ensured reliable information exchange among the concerned parties.

***Corrective/preventative actions:**

1 The ship's operator renewed the burner units for both oil-fired heaters and altered the control system to better suit the fuel being used and the load demands placed on the heaters;

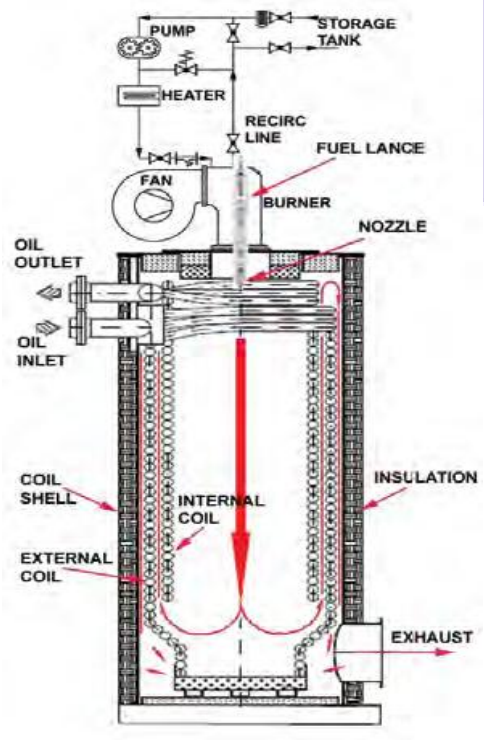
2-The heater makers reviewed and amended relevant sections of the equipment service manual and relayed the incident details to ancillary equipment suppliers, including the burner equipment manufacturer;

3-The port reviewed the emergency contingency plan and implemented revised procedures, including training, drills and exercises for its staff.

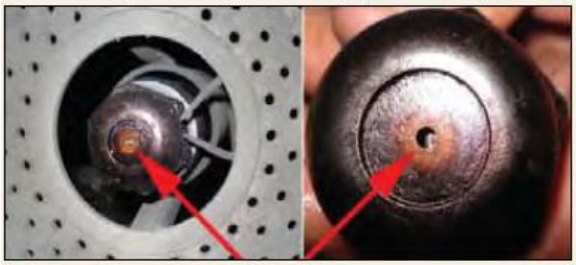
***Lessons learnt:**

1-Ship's crew must remain vigilant to safety even when conducting repeated or seemingly simple tasks;
2-Manufacturers must provide comprehensive and accurate documentation for onboard service and maintenance and the crew must follow these along with the more generic procedures given in SMS;
3-Manufacturers should conduct research and implement engineering solutions to resolve potential design weaknesses that may lead to failure or hazardous conditions in service;
4-It is desirable that critical items of equipment are serviced by specialist shore-based technicians, but if this is impracticable, ships' crews must be given appropriate training arranged by the makers or suppliers of such equipment;
5-In case of illness or injury on board, ships' crews must first refer to the approved publications carried onboard, if required, supplemented.

Schematic view of an oil fired heater:

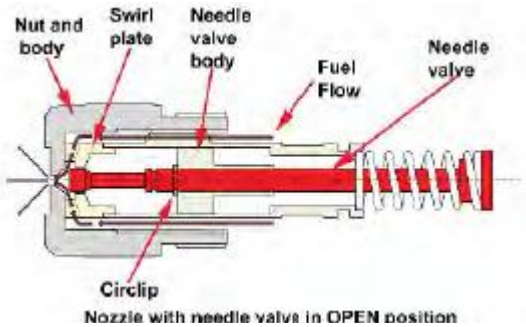


Needle valve spindle damaged due to improper re-assembly

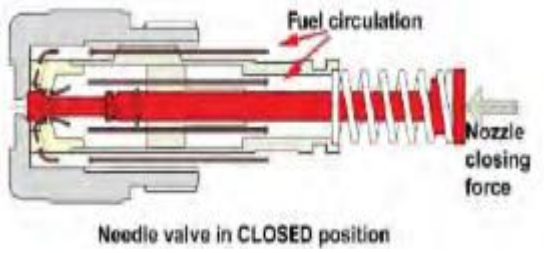


Misaligned needle valve failed to close fuel nozzle during pre-ignition air purging of furnace

View of damage between top of heater and overlying grating



Nozzle with needle valve in OPEN position



►Accident no.2- Leg severed by towline:

A tug and tow arrived at the outer roads of a port and was preparing to embark a pilot. Due to restricted sea room, the tow wire had to be shortened in order to enter the port. As the tug began to heave in the tow wire, the towing winch suffered a burst hydraulic oil line which could not be immediately repaired. In order not to abort the port entry, the crew quickly stoppered off the wire, and after turning the slack around the capstan on the port quarter, resumed the shortening operation.

As the capstan heaved in the wire, the crew manually flaked about 75 metres of it on the deck to achieve the desired length of tow.

Intending to belay the wire around a pair of bitts, the crew re-applied the chain stopper. However, due to the relative movement of the vessels, the towline came under sudden tension. The chain stopper was unable to hold the wire, which began running uncontrollably off the deck and over the stern roller. Unfortunately, the C/O was standing to seaward of the rapidly escaping wire and his right leg was caught in a bight and severed. The casualty was quickly air lifted to a hospital along with the severed limb packed in ice. Although his leg could not be saved, he was extremely lucky that he was not killed.

***Lesson learnt:**

A hasty change to a planned task or operation in progress is very likely to lead to an accident, especially if a new risk assessment is not conducted.

►Accident no.3-Collision with jack-up barge in TSS:

A VLCC in ballast was anchored off a major oil exporting port. As per instructions from the loading terminal, she weighed her anchor at about 2330 hrs and proceeded from the waiting area to meet the berthing pilot at the boarding area at 0130 hrs, which was about 20 miles to the south. Pre-departure procedures and checklists were duly completed and, as per the passage plan, the tanker initially steered due south in order to join the SW-bound traffic lane from the side. Positions were being plotted on the approach (paper) chart at intervals of about six minutes.

At 2345 hrs, while proceeding on a course of 180 degrees at about 12 knots, the OOW acquired a target located in the NE-bound lane, bearing a few degrees on the starboard bow at about 5.5 nm distance. A single white light was seen along the bearing of the target, and the bridge team presumed it to be a small local craft. The plot indicated that the target was proceeding slowly in a NWly direction, and it was assumed that it was intending to cross the traffic lanes.

At 0005 hrs, the tanker entered the SW-bound lane from the west side and altered her course to 226°, aligning herself with the general direction for that lane. By this time, the other vessel was located within the separation zone, bearing about two points on the tanker's port bow and about 2 miles off. Based on the target's low speed vector, it was again assumed that the small craft would keep clear of the VLCC navigating along the traffic lane.

At this time, the OOW suddenly saw that the target was actually a self-propelled jack-up barge and was showing the starboard (green) sidelight and was intending to cross ahead of the tanker.

In the absence of signals to indicate restricted manoeuvrability, the bridge team of the VLCC treated the barge as a normal power-driven vessel underway and expected it to manoeuvre as the give way vessel in a crossing situation (Rule 15). With the distance rapidly closing, the tanker's Master began an alteration to starboard, away from the barge, but the two vessels collided at about 0015 hrs.

Port control was informed of the incident. Acting on their instructions, the tanker continued the passage to the pilot station, embarked the pilot and proceeded to the holding anchorage, where she anchored at 0405 hrs, pending an investigation into the incident.

***Consequences of collision:**

1-The large crude oil consignment that was assigned to the tanker had to be shipped on another vessel;

2-The ship-owner and manager suffered severe financial loss (loss of charter income, costs for directing the vessel to the nearest repair facility, cost of repairs and other associated costs);

3-Huge liability claims were filed against the tanker's owners from the company owning the jack-up barge for damage, repairs, loss of hire and other charges;

4-The coastal state imposed a punitive fine for unsafe navigation;

5-Loss of reputation;

6-Loss of man-hours (both on board and in the office).

***Root cause/contributory factors:**

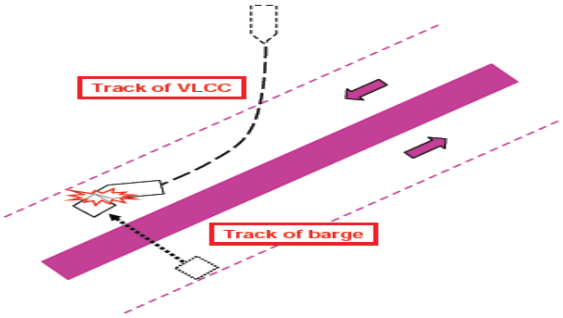
1-Ineffective bridge team management;

2-Failure to obtain traffic information from the port before commencing the passage and entering the approach TSS;

3-Illogical assumption that the other vessel was a small, local craft, when the target's identity was clearly being shown on the AIS;
4-The ship's speed of about 12 knots was considered to be excessive and was not reduced promptly when a close quarter situation was developing and there was doubt as to the intentions of the crossing vessel (Rules 6, 7 & 8);
5-Failure to communicate doubt by means of prescribed sound/light signals (Rule 34 d);
6-Actions to avoid collision were not implemented in sufficient time and were not substantial enough (Rule 8);
7-The navigation lights of the jack-up barge were not seen earlier by the tanker's bridge team due to the many obstructions on its deck;
8-There was a loss of situational awareness – the bridge team wrongly assumed that there was a charted shoal close to the west of the vessel, when, in fact, it was about 1.5 miles SW.

***Lessons learnt:**
1-Every member of the bridge team must pro-actively contribute to safe navigation – in this case, after initially informing the Master about the presence of a 'small coastal vessel' ahead, none of the bridge team members took an active part in the conduct of the vessel or challenged the Master's actions;

2-Information on existing and expected vessel movements and other operations in the port and approaches must be obtained from the VTS / port control / pilot station (as appropriate) prior to transiting these areas;
3-Assumptions should never be made on basis of scanty information;
4-Despite its limitations, the AIS can potentially provide reliable data on a target's identity and movement, if both vessels are equipped and the system is correctly configured;
5-Although not advisable, prudent bridge-to-bridge VHF communications at an early stage can assist safe passing between vessels, provided both are sure of each other's identity and location;
6-Crew tend to become complacent when they call frequently at a port or region and are more likely to overlook basic precautions;
7-All passages should be properly planned and discussed among the bridge team members ensuring that vital parameters are defined and adhered to for each leg during execution and monitoring;
8-Risk assessments for all critical movements (e.g. arrival/departure port, narrow channels, restricted waterways, TSS etc.) must include the possibility of encountering 'rogue' give way vessels that may not comply with Colregs, and appropriate contingencies and escape routes should be included in the passage plan;
9-The bridge team must assess the relative movement of traffic in the area before making an alteration of course (e.g. trial manoeuvre function on the ARPA), and they must not hesitate to slow down or stop the vessel to avoid a collision.



***Corrective/preventative actions:**
1-An alert was sent to the fleet about the incident with the instruction to hold a meeting at the earliest to discuss the report and review all aspects of bridge procedures on board;
2-A campaign on safety of navigation with special emphasis on bridge team management, maintaining situational awareness and collision regulations will be initiated by the company, comprising of: a) A video on safe navigation and bridge team work;
b) Onboard navigational audits to be carried out by Masters and visiting superintendents;
c) Training sessions conducted on board addressing human element factors including procedures, communications, stress, operational environment, fatigue and culture issues;
3-The company Bridge Procedures Manual has been amended requiring vessels to obtain all relevant information from port control/VTS/local authorities before transiting within port limits;
4-Officers will be trained in bridge team management at reputed training institutes and the course will be monitored/reviewed to ensure its effectiveness.