Boiler Explosion

To: Shipowners, Ship Managers, Ship Operators, Masters, Officers and Crew of Hong Kong registered ships and Classification Societies

Summary

Three separate boiler explosion incidents occurred recently on board Hong Kong registered ships. These accidents had resulted in the loss of four lives and caused serious injuries to ten crew members and damage to the vessels. This Note draws the attention of the Shipowners, Ship Managers, Ship Operators, Masters, Officers and Crew of Hong Kong registered ships and Classification Societies to the important lessons learnt from these accidents.

The Incidents

1. The first accident occurred on board a Hong Kong registered tanker when she was at anchor at Moreton Bay, Australia. One of the ship’s two oil-fired thermal oil heaters exploded causing serious injuries to three crew members. The explosion also seriously damaged the thermal oil heater top cover and its surrounding equipment and fittings. On the day of the explosion, the thermal oil heater failed to fire on a number of occasions. The ship’s engineers then carried out maintenance work on its burner unit. On completion of the maintenance on the burner, the engineers fired the thermal oil heater. The explosion occurred during firing. The cause of the accident was that the fuel nozzle had not been correctly assembled. Fuel oil leaked from the nozzle into the furnace throughout the pre-ignition period of the firing sequence. Explosion occurred inside the furnace when the fuel ignited.

2. The second accident happened on board a Hong Kong registered bulk carrier when she was anchoring at Qinzhou, China. Before the accident, the fuel oil solenoid valve controlling the supply of fuel to the burner of the boiler was found to be leaking. As spare solenoid valve or its valve disc and seat were not available on board, the lapping process was used to repair the damaged valve and seat of the solenoid valve. The fuel oil solenoid valve unit was taken down and installed a number of times for testing and repair. Prior to the explosion, large quantity of fuel oil had accumulated in the furnace due to the leaky fuel oil solenoid valve from the repeating leak tests. The purging period prior to ignition of the burner was unable to get rid of the fuel oil vapor accumulated inside the furnace. Explosion occurred when the burner was ignited. No crew member was injured in this accident. The explosion only damaged the boiler ignition system and the engine room fittings surrounding the boiler front.
3. The third accident occurred on a Hong Kong registered general cargo vessel while she was berthing alongside a dockyard in Yizheng, China after repair and during the process of preparing the boiler for Class survey. The safety valves of the boiler had previously been taken down to the workshop in the dockyard for overhaul and test. After the steam valves were mounted back on the boiler, the boiler was fired up. Steam was found leaking from the safety valves and the gaskets of some boiler fittings when the steam pressure shown on both the local and remote pressure gauges on a gauge board at the boiler side and in the engine control room were only about 1 kg/cm². The ship superintendent instructed the replacement of the safety valves by new ones which were also tested in the workshop prior to their installation on the boiler. However, steam was still found to leak from gaskets of some boiler fittings when the steam pressure shown on the pressure gauges was at about 1 kg/cm². The superintendent then instructed to blank off the safety valves and renewed all leaky gaskets. The boiler was fired up again with the safety valves blanked. After firing up for two hours, the pressure shown on the pressure gauges was still at about 1 kg/cm². The boiler suddenly exploded then. The entire boiler exploded causing damage to the upper engine room and the whole of the crew accommodation superstructure surrounding the engine room. The accident caused the death of four persons and severely injured seven crewmembers. The investigation found that the local pressure gauge and the pressure transmitter that sent signal to the remote pressure gauge in the engine control room were all taped off from the same valve installed on the boiler steam space. This valve was probably shut off causing the false indication on both pressure gauges. As a result, the steam pressure inside the boiler built up to an excessively level when the boiler continued to fire for two hours. With the pressure safety valves blanked off, the boiler was over pressurized and exploded.

Lessons Learnt

4. The important lessons learnt from these accidents are that:

- maker’s recommendations on the maintenance and repairs to boiler burner units must be strictly followed at all times;
- essential spare parts for boiler burner units should be kept on board;
- all systems must be tested and confirmed to be in operational conditions before firing up the boilers; and
- safety valves should never be blanked off under any circumstances.

5. The attention of shipowners, ship managers, ship operators, masters, officers and crew of Hong Kong registered ships and Classification Societies is drawn to the lessons learnt above.

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