



# 香 港 商 船 資 訊

## HONG KONG MERCHANT SHIPPING INFORMATION NOTE

### Thermal oil heater explosion caused by improper maintenance of the burner unit

*To : Shipowners, Ship Managers, Ship Operators, Masters, Officers and Crews, Manufacturers and Classification Societies*

#### *Summary*

After the maintenance of the furnace of a thermal oil heater on board a Hong Kong registered vessel, the furnace exploded during test run. The explosion caused serious injuries to three crewmembers and damage to the thermal oil heater cover and its surrounding equipment and fittings. This Information Note draws the attention of the shipowners, ship managers, ship operators, masters, officers and crews, manufacturers and classification societies to the lessons learnt in the accident.

#### **The Incident**

1. The accident happened on board a Hong Kong registered oil tanker when it was anchored at Moreton Bay outside Brisbane River.
2. Before the explosion, the No. 2 thermal oil heater on board the vessel failed to fire on a number of occasions. The engineers then worked on the burner unit to rectify the problem. The accident occurred when the engineers tried to fire the furnace after completed the maintenance of the burner unit. During the trial, fuel oil was circulating through the heater and the temperature of the furnace was around 160°C. The fuel in use was marine gas oil of flash point 68°C. The explosion occurred when the engineers started to fire up the furnace.
3. Investigation after the accident found that the burner nozzle was incorrectly assembled with a deformed needle valve stem. The supply of gas oil could not be sealed by the needle valve stem and fuel oil leaked from the tip of the burner into the furnace of the heater during the pre-ignition cycle.

4. For the thermal oil heater on board, the manufacturer recommended that if heavy fuel oil (HFO) was used, the pre-ignition cycle time should include time for fuel oil heating plus sixty seconds for pre-ignition purging. The total pre-ignition cycle time set on board the vessel was four minutes when using HFO for the heater. Before the explosion, the fuel supply to the burner unit had been changed to MGO which required no heating. However, the pre-ignition cycle time had not been reduced to one minute accordingly as recommended by the manufacturer. Fuel oil leaking from the incorrectly assemble burner unit during the pre-ignition cycle vaporized under high temperature inside the furnace. As a result, a large volume of combustible gases accumulated inside the furnace prior to the ignition. When ignition started, the combustible gases inside the heater exploded causing the accident.

5. The investigation into the accident conducted by the Australian Transport Safety Bureau also revealed that:

- a) The swirl plate was not properly installed in the burner nozzle thus causing the needle valve not rested on its seat which resulted in fuel leakage after the burner unit was installed on the oil heater;
- b) The instruction manual of the thermal oil heater did not provided sufficient information for the maintenance of the burners.

6. It was also found that the engineers on board had no training and had little experience for the maintenance of the burners. There was no equipment on board to test the function of the burner after maintenance.

### **Lessons Learnt**

7. For the maintenance of machinery components, they must be assembled correctly according to the manufacturer's instructions and manual. If the instructions are not very clear, the functions and correlation of each component must be clearly understood before assembling them together. Tests must be carried out under such circumstances to ensure that the unit functions properly after assembly.

8. The attention of shipowners, Ship Managers, Ship Operators, Masters, Officers and Crews, Manufacturers and Classification Societies is drawn to the lessons learnt above.