Fatal Accident due to Explosion in Auxiliary Boiler Furnace

Casualty Circular No. 3 of 2006

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Fatal Accident due to Explosion in Auxiliary Boiler Furnace

INCIDENT/ACCIDENT:

Loss of life due to explosion in the Auxiliary Boiler Furnace of an Indian registered Oil Tanker.

NARRATIVE

On completion of cargo operation, preparation was on in Engine Room for banking the Auxiliary Boiler used for cargo operation. Among other normal routine operations, the banking involved changing over fuel oil consumption from H.F.O to D.O. While carrying out this operations, the boiler tripped off and could not be restarted in spite of several attempts. At this point the fourth engineer who was carrying out the banking operation informed second engineer who in turn called the off duty third engineer, as he was familiar with the operation of the boiler. The third engineer who was taking rest after his night watch came down to attend to the boiler.

The third engineer tried several times to fire the boiler on auto mode but could not succeed. Then he also made several attempts to fire the boiler in emergency mode but in vain. Finally, the boiler pilot burner electrodes were removed, cleaned and put back. When trying to fire the boiler again in emergency mode, there was a violent explosion in the furnace followed by fire and thick smoke. The second engineer and fourth engineer who were present near the scene panicked and ran away, while a engine room rating who was engaged in cleaning the floor plates around the boiler furnace, reacted admirably by attempting to extinguish the fire with portable fire extinguishers kept in the vicinity. but did not succeed as he was asphyxiated by thick smoke and partially burnt by the fire emanating from the boiler furnace. Later the fire was brought under control and extinguished by the ships staff. After extinguishing the fire, the ships staff found third engineer knocked unconscious in front of the boiler with severe burns. The third engineer was shifted to hospital but, unfortunately, declared dead on arrival. The fourth engineer and engine room rating who were also shifted to hospital were treated for shock and severe burn injury respectively.

The explosion was so severe that the burner assembly holding down bolts on the furnace front were parted from its place, the diesel oil line got severed/ruptured and the entire burner assembly swung out from its place hitting the third engineer on head and face. The impact was so severe, that the third engineer fell unconscious on the spot. He was soon engulfed with fire emanating from the furnace and the burning diesel oil from the ruptured burner fuel oil pipe and sustained severe burns.

Cause of the Accident:

1. Evidence from the inquiry revealed that the fuel oil temperature was not lowered down sufficiently from 110 0

Celsius prior effecting changing over from HFO to D.O operation of the burner . This might have caused the D.O getting vaporized in fuel oil system resulting vapour lock and thereby tripping of the boiler burner.

2. Boiler was fired several times in emergency mode.

3. It is quite likely that the boiler was fired on emergency mode without carrying out sufficient purging of the furnace, thereby allowing fuel and combustible mixture to accumulate in furnace.

4. The dangers of boiler furnace explosions caused by accumulations of flammable gases in furnaces following burner defects, especially during flashing up procedures, are recognized and well known. In this case the accumulated fuel oil and vapours might have created an explosive atmosphere inside the furnace and the spark from the naked electrodes of the pilot burner caused the violent fire and explosion (Back Fire)

Lessons learnt:

1. Particular attention is drawn to the need to purge the furnace and gas passages with air following flame failure or ignition failure however short the period of failure or prior to any lighting up operation. Warning notices must be displayed near the boiler - The furnace must be properly purged before attempting to ignite the boiler on emergency mode. All precautions in the operating manual must be complied with at all times.

2 Temperature requirement for fuel oil change over procedure from HFO to D.O and vice versa to be strictly adhered.

3 Instructions for boiler operation, both in instruction manuals and on notices near the boiler, should additionally contain adequate warning regarding extra precautions necessary when operating with degraded logic systems of the automatic boiler ignition system, or with manual or local overrides in use, and operators must be sure they understand all the implications of such instructions and act upon them. These instructions should also state the duration and rate of purge in accordance with the designers burner logic sequence. When the logic system is overridden by manual or local overrides this should be indicated at the control positions so the operator can take due care.

Whenever any machinery is required to be operated on emergency mode, Chief Engineer Officer must be informed, who in turn must give specific instructions for such an operation and take immediate steps to restore the normal mode. Prolonged operation of machinery/equipments on emergency mode must be avoided.

When using distillate fuels (D.O.) in burners designed for use mainly with heavier fuels these dangers are increased especially during change over from H.O. to D.O. operation

4. Operators should periodically check the condition of igniters and flame scanners, to ensure that they are in good working order, Automatic fuel oil shut offs should, as a routine, be tested to ensure that the fuel valves operate efficiently for fault conditions (e.g. flame failure and combustion air failure). Burners should be lit with fuel oil at the minimum firing rate compatible with flame establishment and operators should not attempt to light a burner immediately after its flame failure.

5. Company should ensure that ship specific requirements for key machinery operations are developed and ensure that all concerned personnel are fully conversant with such operations.

6. Excepting emergency situations, all heads of departments must ensure observance of rest period, as per ILO Convention 147.

7. To organize training course to ship staff on the safety and to improve reaction response in case of casualties with emphasis on adoption of practical methods, procedures, team work, responsibilities and human ethics.

8. The procedures for Operations of Steam Plant must be enhanced by including details of procedures of firing

boilers in all kind of situations.

Sd/-
(D.Mehrotra)
Dy. Chief Surveyor-cum-Sr.DDG(Tech.)