Insight Article

Problems caused by oil in boiler feed water system

Oil-contaminated boiler feed water may cause the total breakdown of boilers.

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Problems

Engine manufacturers in the maritime industry spend a lot of time and effort in exploring new and better methods in order to reduce consumption and increase efficiency. A boiler is an important part of the system, especially when the main engines are running on heavy fuel and the oil needs to be heated to the correct temperature. Almost all of the larger shipping fleets today use heavy fuel oil (HFO) with different specifications or grades in their machinery.

Industry statistics indicate that breakdowns can occur in a steam system. There have been cases reported to Gard Services whereby oil contaminated boiler feed water has caused the total breakdown of boilers. This article outlines the problem of oil contamination in the boiler feed water system.

Oil leakages can start as a result of minor cracks in HFO heating coils or in different heaters in the engine room, or in other places where steam is used for heating. In a complex engine room today there are several possibilities for oil leakage to occur. Thin layers of oil are not always visible. Experience shows that 15-20 ppm (parts per million) oil pollution will not be visible. With a boiler capacity of 20 tons of steam per hour and with 25-ppm oil pollution, approximately 12 kg of oil will accumulate in the steam drum each day. Thin layers of oil at the boiler tubes or any of the directly heated surfaces of the boiler might cause local overheating of the material and possible damage to the boiler.

There are many ways to prevent the entry of oil-contaminated feed water into the boilers, such as the use of observation tanks with detection-filter systems in hot well tanks.

An Example

The following incident occurred on board a bulk carrier during a port call in Rotterdam some years ago.

The vessel was equipped with one auxiliary boiler, one exhaust boiler and with a constantly-running circulating pump from auxiliary to exhaust boiler. Since this was a bulk carrier, the steam system was only for heating HFO and for the purifier system. During a routine inspection one of the engineers discovered excessive amounts of HFO in the observation tank and in the hot well. Due to earlier problems with the detection system in the observation tank, no alarm was given (it had been disconnected a long time ago).

The engineer immediately stopped the auxiliary boiler and the circulating pump for the exhaust boiler. During inspection it was discovered that the feed water system was completely polluted by oil. As the circulating pump was running this also included the exhaust boiler. The investigation also revealed a feed water leakage into the flame chamber, since the wall panel in the auxiliary boiler was cracked, and some pin tubes were broken/melted due to local overheating. Because all the heating systems had to be shut down, the main engine fuel supply had to be changed over from HFO to DO (diesel oil).

The shipowner decided to take the vessel off-hire for complete cleaning of the feed water system and renewal of the pipe system in the auxiliary boiler. The total estimated time for cleaning and pipe replacement was three weeks.

The cause of the boiler feed water contamination was found tobe a broken heating coil in one of the HFO tanks. During the past year the vessel had been dry-docked at a North European yard and the heating coil at the actual tank had been renewed, but further inspections revealed that the complete coil was mounted without pipe clamps and as a result,vibration had caused the breakdown of the heating coil.

Lessons learned

Minor issues (in this case disconnection of the alarm for the observation tank) may cause major damage. The breakdown may have been avoided if the alarm had been in order and doubtless the situation would have been discovered at an earlier stage, which could have minimised the damage.

There should also have been a better inspection during the yard work.

If the heating coils had been mounted properly with pipe clamps, possibly there would have been no incident at all.

Any comments to this article can be e-mailed to the Gard News Editor .

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