

Report from the Division for Investigation of Maritime Accidents

Engine room fire – MAERSK MASTER

Factual information

MAERSK MASTER, OXEI2, IMO No. 8409379 is an anchor handling supply tug of 3949 BT. The vessel was built in 1986 at Odense Stålskibsværft and is registered under DIS.

MAERSK MASTER is owned by A.P. Moeller Maersk, operated by Maersk Supply Service and is performing off-shore operations such as anchor handling, towing, supply duties etc.

During a tanker lifting operation on 4th February 2008 a fire broke out in the engine room. The fire could not be extinguished by means of portable extinguishers so actions were taken to engage the engine room water mist system and subsequently the CO₂ system. After approximately 15 min. the fire was under control. The vessel was shortly after towed to a nearby shipyard for inspection.

There were no casualties.



MAERSK MASTER: By courtesy of Maersk Supply Service

Narrative

The below description of events is based on statements from the vessels Master, Chief Engineer, Chief Officer & 1st Engineer:

The vessel was tanker lifting at position 22 29 0 S – 040 06 0 W, holding a shuttle-tanker with 500 m of work wire paid out.

Weather: Wind NNE 10 knots. – current about 1.5 knots from NE – see about 1 to 1.5 m.

The fire

At approximately 0430 hrs an engine room alarm was sounded. The Chief Engineer, hereinafter CE, who was on duty went down to the engine room to check the alarm.

When entering the engine room he could see smoke and yellow light from flames coming from below ME2 turbo charger.

He went into the control room and called the bridge to advise the Chief Officer, hereinafter CO, about the fire but hang up before the CO got to the phone on the bridge because he observed that the fire was increasing. He then made an attempt to extinguish the fire by means of a portable fire extinguisher, but the fire was now so intense that it was impossible to get near it.

In the meantime the first fire alarm had sounded on the bridge, but the CE was not aware of this. Therefore he rushed up the staircase with the aim to announce the fire. He shouted loudly that there was an engine room fire and found that he had been heard by the CO who was now aware of the situation. Furthermore the CE informed the CO that he would engage the water mist system assisted by the 1st Engineer, hereinafter 1E.

Engagement of water mist system

The water mist system could not be engaged manually from the control panel situated by the engine room entrance. The starter button was to be pushed in for 3 seconds according to the instructions by the panel. The CE believed that he pushed the button for 3 second but was not certain. When the CE realized that the system did not start he remembered that there were a number of manually operated bypass valves in the winch garage that could be opened. The CE and 1E proceeded to the winch garage and opened the valves.

The water mist system was now activated.

After the fire it was discovered that the panel had a malfunction by way of the built-in battery.

The water mist system is being tested every month. No malfunctions in the system have been discovered during these tests.

Stop of pumps and ventilators

In order to limit further increase of the fire and to prepare for CO₂ release the CE now returned to the engine room entrance and activated emergency stop for engine room ventilation and fuel pumps.

Engagement of CO₂ system

Secondly he ran to the bridge where he encountered the Master, hereinafter MA, for the first time during the event. The MA was informed that the intention was to

activate the CO₂ system and that emergency stop of all main engines and quick closing valves had to be activated. Engine room fire flaps were to be closed as well.

At this time main engine 2 & 3 were already stopped and the CO was engaged in closing the fire flaps.

The muster station had been altered from the smoking saloon to the bridge due to smoke in the accommodation. Before the CO₂ release the master demanded a head count.

Upon successful closure of fire flaps and completion of head count the CE released the primary pilot bottle for the CO₂ release. As the pilot bottle began releasing its content it became obvious that there was a leak. Quickly the CE spotted the leak and by means of an adjustable spanner from a nearby toolbox the leaking was stopped.

At approximately 0440 the CO₂ was successfully released.

The CO₂ system had been surveyed and serviced recently by UNITOR, Brazil. It is not certain whether the system was pressure tested as a part of the survey.

Communication to other vessels

During the above described period the mooring master on the shuttle-tanker was informed about the situation and that engine power was lost.

Due to the direction of the wind and currents the shuttle-tanker and MAERSK MASTER stayed clear of the nearby floating production and offloading vessel (FPSO).

MAERSK CHIEFTAIN that was sailing stand-by about 8 nm away was informed about the situation and was requested to proceed at full speed for assistance.

Emergency power

As supposed the emergency generator was started up automatically during the event but could not be connected to the main switch board. Upon checking the emergency generator the CE realized that the cooling fans for the emergency generator cooling radiator were not running. Since lack of cooling could result in overheating and shutdown the CE did various attempts to energize the fan motors, which were powered by the emergency switchboard and had control wiring via the main switch board, by disengaging and reengaging the generator breaker.

There were two small fans and one big. The two smaller fans were started by setting their selector to manual mode and pushing the starter buttons constantly.

The third and bigger fan did not start like this. Assisted by the 1E the CE used a multi-meter to verify any potential over the starter button. As this was confirmed they switched off the starter cabinet main switch and made a connection bypassing the starter button. When the starter cabinet main switch was reengaged the fan started.

At this time it was evident that the emergency generator would not be able to get connected to the main switch board. The MA was informed on this issue.

Assessment of fire development

After dealing with the emergency generator the CE took initiative to make sure that the fire was suppressed by the CO₂ and began checking the temperature developments for bulkheads and decks. As a part of this he entered the void space situated in front of the accommodation and above the engine room. The area of the void space bottom, placed above the engine room, was not fire insulated. He was concerned that heat from the fire would ignite the miscellaneous oils and chemicals stores in the void space.

There was smoke in the void space but the CE deemed it safe to enter. As safety precaution he maintained verbal contact with an able seaman and instructed him to run for help if the verbal contact would cease. The temperature of the floor was observed 6 – 7 times during the next couple of hours and finally he concluded that the temperatures were stable.

At this point the fire was believed to be contained. The engine room was not inspected or opened until the vessel was safe at berth in Niteroi, Brazil.

Fire pump outside the engine room

On the bridge it was observed that the control lamp for the fire pump outside the engine room was not lit and hence assumed that it did not function. The pump was subsequently not tested.

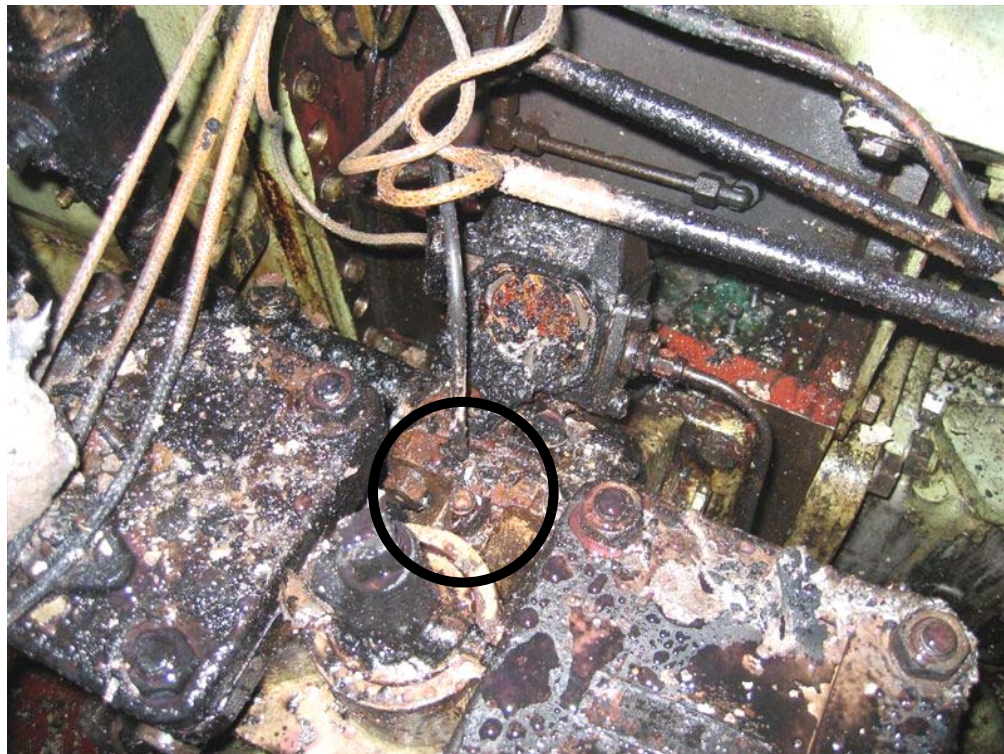
During the stay at the ship yard no malfunctions on the fire pump outside the engine room could be established, except for a fault on a light bulb by way of the bridge control panel.

Analysis and conclusion

Cause of fire

The cause of the fire became evident as soon as the engine room was inspected:

One of the pipe connections for a differential pressure gauge mounted on the duplex fuel filter for main engine 1 had failed. This had caused the diesel oil to leak at high pressure. The diesel oil was then deflected onto the surroundings and further to hot surfaces where it was finally ignited. See picture below.



Failed connection for differential pressure gauge: By courtesy of Maersk Supply Service

Damage caused by the fire

It was evident that all wiring for power supply and control had burned which had caused the disturbances in the power supply for the emergency generator cooling fans.

Analysis:

The Investigation Division sees a number of potential hazards during the fire fighting.

- 1.) The water mist system should have started automatically but because of inappropriate placement of smoke and heat detectors it did not. Furthermore it could not be engaged immediately by using the control panel by the engine room entrance. It has not been possible to establish why the system did not start when the CE pushed the buttons on the panel. There were no instructions by the panel stating the possibility of operating manual valves in the winch garage. It was only by memory that the CE knew this. The above mentioned details caused delays in engaging the water mist system.
- 2.) Emergency stop of fuel pumps and ventilators did not take place as the first precaution after the fire was rendered impossible to extinguish manually. Though only 30 seconds passed from the first attempts to start the water mist and to the emergency stops were engaged, the quantity of diesel oil fuelling the fire would have been reduced.
- 3.) Despite the recent service of the CO₂ system it had a major leak by way of the pilot release bottle. It later showed that a threaded connection on the pilot bottle was wrongly fitted. Had this bottle been emptied in vain the release of the CO₂ system would have been delayed further.
- 4.) As the cooling system for the emergency generator did not work properly there was a possibility that it would have shut down at a sudden point. It is possible that the cooling fans did not run due to burnt and hence short-circuited control cables. The emergency supply and controls are not to be compromised by an engine room fire. After the fire new cables were reinstalled as before the fire.
- 5.) Entering the void space for inspections without safety equipment could have been fatal since it was concluded that smoke had entered from the engine room. This means that CO₂ could have entered as well.
- 6.) Oils and chemicals should not have been stored in the void space.

It is the opinion of the Division that the CE, given the serious situation, acted efficiently and competent with regard to announcing the fire, engaging the water mist system, tightening the CO₂ pilot system and by restoring cooling for the emergency generator.

Recommendations and initiative

Initiatives made by the ship owner.

- Smoke and heat detector setup has been altered in order to ensure improved prerequisites for automatic start up of the water mist system.
- Steps have been made to improve control, start and testing of the water mist system.
- The alarm system and surveillance of the water mist system control panel has been substantially improved.
- The general alarm system has been altered such that the fire alarm will have its own designated signal in the engine room.
- All filters for fuel and lubrication oils have been shielded by custom made covers.
- Lubrication oil coolers close to hot surfaces have been shielded by custom made covers.
- Anti-leak shut of valves have been installed by instruments and hook-ups at risk in case of leaking pipes.
- The power management system has been altered such that the emergency generator will be automatically connected to the main switchboard when started.
- A fleet campaign has been initiated to reveal “hot spots” in exhaust systems by means of infrared thermography.
- Oils and chemicals have been removed from the void space on both MAERSK MASTER and the sister vessel MAERSK MARINER.

The ship owner is recommended to:

- Review procedures and instructions with regard to emergency stop of pumps and ventilators in connection with a fire.
- Review electrical power supply and control systems for the emergency generator, the fire pump outside the engine room and any emergency system to ensure they are not rendered ineffective in case of a fire.

30.5.2008

The Division for Investigation of Maritime Accidents