

Isle of Man Ship Registry

Casualty Investigation Report No. CA 137

Fishing Vessel FREY (CT 137)

Engine Room Fire

11th November 2021

Statement of Intent

Extract from

The Isle of Man Merchant Shipping

(Accident Reporting and Investigation)

Regulations 2001 – Regulation 4:

"The fundamental purpose of investigating a casualty, an accident, or an incident under these Regulations is to determine its circumstances and the causes with the aim of improving the safety of life at sea and the avoidance of accidents in the future.

It is not the purpose to apportion liability, nor, except so far as is necessary to achieve the fundamental purpose, to apportion blame"

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Summary

Between the hours of 13:10 to 13:18 on 11th November 2021, a fire occurred in the engine room on board the Isle of Man registered fishing vessel "FREY".

The fire started at the portside of the main engine resulting in heat and smoke damage to the engine room's fixtures and fittings.

Within minutes of the discovery of the fire, the fire was extinguished by the actions of the on board crew: There were no injuries to the crew and no pollution damage.

The FREY requested emergency assistance from Belfast, Maritime Rescue Control Centre (MRCC) and Douglas, Marine Operations Centre (MOC). The vessel was later safely towed back to Douglas harbour by the Douglas RNLi lifeboat (LB), where the vessel safely berthed at the Edward Pier.

The attendance of the Douglas fire-brigade checked the vessel and found the vessel safe to remain alongside with no further indication of a fire on board¹.

The Isle of Man Ship Registry conducted an investigation and the following was identified:-

1. A breach in the flexible lubrication oil (LO) hose from the LO pump and thence to the LO gauge, allowed heated engine-sump LO under pressure, to enter the heated atmosphere of the engine room, hot surfaces and electrical motor, and to be ignited;
2. The ignition of the LO resulted in a fire concentrated at the portside of the main engine since this was the location of the LO pump and flexible hose. As the engine was not stopped, the constant flow of heated LO provided fuelling to maintain the fire until it was extinguished by the on board crew.

Position of Incident

54-07.59.95N 004-19.55.06W approximately: South from Douglas Head, Isle of Man²:

Weather: South West 1 to 3 backing South 5 to 7 and occasionally gale 8 later, then veering South West again later.

Sea state: Smooth or slight becoming moderate or rough.

Visibility: Fair then rain or drizzle at times: Moderate or good occasionally poor later.

Tides: Douglas:- HW 16:29: LW 23:10

Times: UK-GMT/UTC.

¹ Fire incident log Douglas Fire-brigade

² Position obtained from Douglas Marine Operations Centre time-log.

Narrative of Events and Factual Information³

11th November AM/PM: The Fishing vessel FREY departed Douglas harbour in the early morning of the 11th November to engage in fishing operations within the 3 mile limit from Douglas harbour.

Fishing operations continued throughout the morning up to midday on the 11th November. The weather was deteriorating and a decision was made by the skipper to cease fishing, clean the decks and return to Douglas harbour.

The skipper went to the engine room to change over the valve at the main engine for the deck wash and all was found well in the engine room.

Having cleared and cleaned the decks, the FREY set-course for a return voyage to Douglas harbour.

13:15: The skipper was in the wheelhouse with his crewman engaged in watchkeeping duties and noticed that there was a loss of power from the engine and to the navigational equipment; seconds later the engine room heat detector alarmed, indicating there was a problem in the engine room.

The skipper instructed the crewman to check the engine room by opening the access hatch at the rear of wheelhouse and found smoke and flames; this was reported to skipper.

The crewman was sent forward to the accommodation to get two foam portable fire extinguishers (PFEs).

The skipper used the PFEs to spray into the engine room aiming at the deck-head over the affected area at the portside and centre of the engine room in a random movement.

The results of his action sufficiently extinguished the fire; the main engine was stopped by the skipper soon after the smoke cleared in the engine room.

13:31: The skipper contacted MRCC authorities with the emergency portable handheld GMDSS VHF radio to contact Belfast MRCC and Douglas MOC for assistance.

Both crew members waited for assistance since the engine had now stopped and the vessel was drifting.

There were two fishing vessels nearby, the Our James and Sapphire who were instructed by the MRCC to standby to assist.

The skipper called Ramsey Shipyard for attending the FREY on the 12th November.

³ Belfast MRCC and Douglas MOC received log records.

13:31: Belfast MRCC received a call from the skipper of the FREY reporting a loss of power due to an engine room fire. The reported fire on board, was now extinguished but the vessel was without power and approximately 3 miles from Douglas Head.

13:36: Douglas MOC receive a call from the skipper of the FREY reporting a loss of power due to an engine room fire.

13:40: Douglas MOC contacted and requested Douglas RNLI Lifeboat (LB) to be launched explaining that skipper of fishing vessel FREY was unable to provide a position, due to the complete loss of power and passed the mobile number of the skipper to Douglas LB Coxswain.

13:45: MOC Senior Watch Officer (SWO) advises f/v Our James and f/v Sapphire; both proceeding to the FREY.

13:48: Sapphire is called by MOC and tasked to obtain a visual and report back.

13:50: MRCC Hailed Our James: No response.

13:52: Cleared to launch Douglas RNLI LB.

13:53: MRCC contact FREY; "has got radar and sounder, visibility poor will send 'what 3 words'⁴ link to casualty".

13:55: Last known position of the FREY 54 07'59.95N 004 19 55.06W obtained from MRCC.

13:58: Our James reports visual on the FREY.

13:59: Douglas RNLI LB Launched.

14:01: Our James in contact with Lifeboat.

14:02: MRCC receive on VHF Ch 16 FREY position: 54 09.22N; 004 20.55W.

14:07: MRCC – Our James Position 54 09.27N; 004 20.77W approximately 0.5 mile from FREY.

14:16: Douglas Station Officer (SO) tasked by MOC - requests a call once estimated time of arrival (ETA) of the Douglas RNLI LB been established.

14:21: Emergency Services Joint Control Room (ESJCR) called by MOC to request a fire asset to meet on arrival.

14:25: LB on scene looking to establish a tow will get back with an ETA Douglas harbour.

14:25: Duty fire officer confirmed fire appliance will attend.

⁴ What3words divides the world into three-metre squares and gives each one a unique three-word address in order for people to be easily found in emergencies

14:43: Douglas RNLI LB requested by MOC to give an ETA as soon as they have it. Message passed to bring the casualty vessel alongside the Victoria Pier to have fire status confirmed before bringing into harbour due to gas tanker laying alongside.

14:40: Port Security call to arrange the last of the Manx Independent Trailers to be removed before FREY arrives.

14:42: Confirm ETA in to Douglas of 17:30.

14:44: Douglas SO advised of ETA.

14:47: ESJCR given ETA by MOC.

14:49: Port Sec. advised of ETA.

15:37: Passed an update of ETA for the Douglas RNLI LB 16:30 Douglas Coast Guard (CG).

16:06: Update now towing through Douglas bay with the Douglas RNLI LB.

16:16: Cleared into harbour as weather too risky to put casualty on Victoria Pier. Douglas RNLI LB are 100% confident fire is out. They will tow vessel to King Edward Pier allowing the gas tanker as wide a berth as possible.

16:18: Updated with new location for fire engine.

16:27: Douglas RNLI LB advised fire service and CG on King Edward pier.

16:31: FREY and Douglas RNLI LB enters Douglas harbour.

16:57: FREY alongside King Edward Pier; dismissed Douglas RNLI LB.

17:04: Fire Rescue Service onboard with thermal camera, no fire detected.

17:15: Fire Services have arranged an ambulance to attend as skipper has inhaled smoke and has black around his face.

17:18: Update: no ambulance attending; fire services will check FREY and skipper and crewman themselves as a health check.

17:23: MOC Casualty vessel recovered – incident closed.

17:35: Belfast MRCC updated as advised from MOC; incident closed.

Comments and Analysis

The Fire

12th November: Attendance on board the FREY was conducted in the afternoon of the 12th November by two IOMSR surveyors.

On board at the time were two engineers from Ramsey Shipyard who had been requested by the skipper to attend the vessel for repairs and had removed some of the electrical and gauge connection arrangements and fire debris at the port-side of the engine.

Source of the Fire

As there had been a removal of some of the crucial evidence of the source of the fire by Ramsey Shipyard engineers under instructions by the skipper, the attending IOMSR surveyors were tasked with having to reconstruct the layout of the surrounding configuration of pipes, gauges and cables, for a better understanding of the original layout to determine the source of the fire.

The fire services incident log suggested that the cause of the fire was from an electrical issue.

Upon closer inspection and reconstruction of the scene, the cause of the fire was in fact the breach/split caused by a 'kink' in the flexible LO pipe running back upon itself, from the LO pump to the LO gauge. This released the heated LO running from the LO pump to the LO gauge into the engine room space

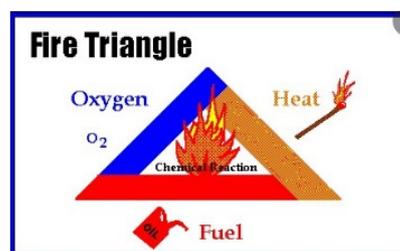
It is suggested that the LO pipe's direction had been kinked over time before the breach in the line occurred and with the LO under considerable pressure; containing heat from the engine sump; the effects allowed a high-pressure vapour of heated LO to be sprayed into the engine room and on to the heated engine and alternator.



Analysis:

Cause and extinguishing of the Fire

The evidence gathered and reconstructed, finds that the source of the fire was generated following the escape of heated LO in a fine vapour spray and under pressure from the breached LO flexible pipe. The heated LO vapour ignited after entering into the engine room heated atmosphere, making contact with hot surfaces, and with the alternator windings at the main engine.



Since the engine had not been stopped, the fuelling of the heated LO from the LO pump, still running, was constantly being injected into the space.

The loss of power in the engine room being reported⁵ indicates that the LO was now not providing sufficient lubrication to the main engine as the LO was escaping from the engine-sump. With this reduction of LO, the action of the LO pump was reducing the amount of LO into the engine room space. Since there was also reduction in the LO fuel source, the fire was able to be controlled and finally extinguished by the use of the two PFE's.

The rapid extinguishing of the fire, into what became a smoke filled engine room (ER), can be explained from the following reasoning.

The Flash Point (FP) of LO is 215° Celsius and the viscosity (resistance to flow of a liquid) is much higher than that of diesel (FP 52-82° C).

Since the viscosity of LO is much higher than that of diesel, LO when cooled, increases its resistance to flow and reduces the ability to re-ignite.

The cooling effect of the PFE (water and foam solution) increased the resistance to flow and prevented re-ignition, enabling the fire to be extinguished with speed and efficiency within 2-3 minutes (as stated by the skipper). It is noted that the skipper was firing the PFE randomly into the engine room space from the access hatch. This action swiftly brought the fire under control and contained the area of the LO to flow any further, supported by the reduction of the LO available supply as the sump LO level started to fall and the engine stopping.

This case indicates that the PFE's used (properties of smothering and cooling) acted rapidly to contain and douse the LO on the surrounding equipment and preventing re-ignition.

The electric air-fan ceased operating due to a melted impeller, which also stopped the forced airflow in to the engine room. This also limited the oxygen to the fire.

⁵ Skippers statement – ARF1

LO replacement:

Information was provided that approximately 35 litres of LO was replaced into the engine sump whilst the vessel was making ready for her departure from Douglas to Peel on 22nd November.

This information corroborates the analysis that the probable source of the fire was LO escaping from the LO flexible pipe into the engine room space.

Damage as a result of the Fire.

The ER was found to have suffered initial fire damage to electrical cables; melted heat detector; wooden structure and steel tanks charred and paint damage; damage to electrical engine control box; LO and temperature gauge assembly; other areas had smoke damage to under side of the ER; soot residue on most of the portside of the engine itself and other areas concentrated in and around the portside bottom plates.

Fishing Vessel Fire Protection Requirements applicable to the FREY:**Fire protection - general (Safety Provision Rule (SPR) 1975: Part H-55/58)/ FV Code (15m-24m *existing* vessels Chapter 5-85).**

Every vessel **15 metres length overall and over** to which these Rules apply shall be so constructed and equipped that there is no substantial fire risk to the vessel or to persons on board the vessel.

SPR Section 56(14): In every such vessel **pipes conveying oil or other combustible liquids** or compressed air **shall be constructed from steel** or other suitable material. Jointing materials used shall be such that they shall not be rendered ineffective by heat.

FV Code 85.11: Pipes conveying oil, combustible liquids or flammable gases should be constructed from steel or other suitable material. Jointing materials should not be rendered ineffective by heat.

Flexible hose(s):

The braided LO hose fitted between the LO pump and the LO gauge was constructed of an inner rubber sleeve and surrounded by a steel braid for protection from heat with a final cover and is deemed not as suitable for heated LO and under pressure nor as a 'suitable material' for the purpose for which it serves.

Causes of flexible hose failure use⁶:-

There are various reasons why a flexible hose may fail while in use.

1) *Mis-application* - Perhaps the greatest cause of failure is using a hose, fitting, or clamp in an application that it is not designed for.

2) *Kinking at or near the fittings* - Once the barb of the fitting cuts into the tube of the hose, the product being conveyed can escape into the reinforcement and eventually lead to bubbling or blistering of the cover within several feet of the end.

3) *Temperature Exposure* - As temperature increases pressure ratings decrease. Excessive hot or cold temperatures will lead to discoloration, cracking, or hardness - as well the build-up of static electricity if hose wire has not been ground properly.

4) *Surging or excessive working pressure* - Usually a burst with torn reinforcement, typically along the outside of a bend.

5) *External damage to hose carcass* - Kinks, crushed sections, and cover damage which exposes reinforcement will eventually break down the reinforcement and lead to a hose failure.

6) *Exceeding the minimum bend radius* - Kinking, crushing, or forcing a hose to bend beyond its minimum bend radius (measured from the inside edge of the hose, not the centre-line). This is commonly seen on high pressure hoses or vacuum hoses.

7) *Tube or cover not compatible with fluids or environment* - Usually results in discoloration, swelling, sponginess, or the breakdown of the hose carcass. For material handling hoses, always rotate to ensure even wear of the hose tube.

8) *Old age* - Hose is not 'pipe', it is a flexible component that will degrade over time. Shelf or service life will range from 1 to 20+ years, depending on its composition, application, and environment. Older hoses become discoloured, stiff, or burst at low pressures.

9) *Incorrect hose length* - Too short of a length does not allow the hose to expand/contract due to changes in pressure or temperature and causes excessive stress on the fittings or hose reinforcement.

Comments:

The fitting of a solid stainless steel or steel pipe used for take-offs from pumps to gauges to reduce the chances of failure over-time with pipes being under constant pressure, heat carrying fluids and vibration.

Flexible pipes are more frequently used for cold or low temperature fluids and as such solid fittings are deemed better suited for the engine room in fishing vessels.

⁶ On-line Hose and fitting ISO 9002 QA: Hydraulics and Pneumatics: Parker Safety Systems Guidelines for Hose selection.

Conclusions

The main cause of the fire was the breach of the flexible LO pipe and the escape of heated LO under pressure in a vapour. The vapour being airborne, then making contact with a heated air-space, hot surfaces and possible electrical equipment providing an ignition source. This was further supplied with forced-air from the electric fan adding fresh air to the ER and that the air vent for the engine room had not been closed.

The action by the skipper and crewman was immediate in the fact that they were able to extinguish the fire within a very short-time to the best of their ability and thereafter to call for assistance.

The rapid extinguishing of the fire supports the fact that the characteristics of LO being very viscous in property, allowed the LO to be quickly dampened and contained, resulting in the fire being doused by the use of two of PFE. The aftermath was a smoke filled space from the residue of the liquid LO.

The main engine should have been stopped since the engine operation allowed the LO pump to maintain a fuel source for the fire. The skipper kept the main engine running in the hope that he could return to port, however he realized that the main engine was not running properly and decided to stop the main engine after the smoke in the engine room had cleared.

The actions by the emergency services at the time with the Belfast MRCC; Douglas harbour; RNLI and Fire Service were all recognized as playing an integral part in the safe return of the vessel and the checking of the crew member's health and safety.

The actions by the f/v Our James and Sapphire in standing by the incident prior to the RNLI arrival and taking the vessel under tow to return to port safely, is welcomed and acknowledged in support for the safety of life at sea.

There was no evidence of any onboard maintenance of vessel's equipment to ensure that all equipment especially fixtures, fittings, pipes and electrical equipment in engine room are monitored frequently. Had this been done, the damaged flexible hose may have been identified earlier and prevented the fuel source of the fire.

The external air damper into the engine room was found not to have been closed prior to the attempts to douse the fire. Had this been closed, the closure would have restricted air-intake into the space.

Fuel oil tank quick closing valves (FV Code 63.11) were found not to have been closed and isolated since the engine remained running.

The vessel requires a complete re-fit to the engine room in way of electrical installation and fire detection amongst other areas to comply with the FV Code requirements.

The crew of the Frey did not report the accident to the Isle of Man Ship Registry and repairs were already underway when the Ship Registry was eventually made aware of the accident and an investigation had commenced.

Recommendations

The following recommendations are provided to the fishing industry in the aim to improve fire safety and fire prevention on board and better awareness of maintenance of all fixtures and fittings.

1. That flexible LO and other heat carrying and/or pressure pipe-lines to gauges from plant and machinery as fitted on the Frey are to be replaced by solid steel or stainless steel pipe-work in order to prevent similar situations recurring.
2. During any fire on board that the engine must be stopped to enable full attention to the incident especially during an engine room fire (Code 93).
3. The FV industry to be reminded of the obligation to report to the IOMSR any accidents and incidents.
4. The FV industry is to be reminded to resist the removal of crucial evidence where such evidence is required and remain to be provided for investigative purposes.
5. FV owners/skippers and crews to be notified of this fire-incident to prevent recurrence.

Submitted:



Pictures of the ER smoke damage after the fire.





LO Line at Portside Engine



Starter motor