UEIM Transport Safety Investigation Center

RETROSPECTIVE MARINE SAFETY INVESTIGATION REPORT

VESSEL NAME	: EREN TURGUT
IMO NO	: 9422342
FLAG OF THE VESSEL	: Turkish
LOCATION OF CASUALTY	: Strait of Dover
DATE and TIME OF ACCIDENT	: 24.11.2010 – 15:55 (GMT+0)
FATALITY / INJURY	: 1 Dead - 2 Injured
DAMAGE DEGREE	: Damage to the engine room
ENVIRONMENT POLLUTION	: Not reported.

Board Decision No: 20 / DNZ – 08 / 2023	Date: 23.10.2023

The sole objective of this investigation is to make recommendations for prevention similar accidents and incidents within the framework of the Transport Safety Investigation Center regulation.

This report neither has the value of judiciary and administrative investigation nor bears the purpose of apportioning blame or liability.

LEGAL BASIS

This marine casualty has been investigated by the provisions of the "By-Law on The Investigation of Marine Casualties and Incidents" published and enacted in the Official Gazette dated 27.11.2019 and numbered 30961.

Also, IMO Resolution MSC.255(84) Code of the International Standards and Recommended Practices for a Safety Investigation into a Marine Casualty or Marine Incident (Casualty Investigation Code), as well as IMO Resolution A.1075(28) Guidelines to Assist Investigators in the Implementation of the Casualty Investigation Code, have also been taken into account for the procedures and principles of the investigation.

CONTENT

DEFINITIONS and ABBREVIATIONS

DNV : Det Norske Veritas (Norwegian Classification Society)

GMT : Greenwich Mean Time

HFO	: Heavy Fuel Oil
IFO	: Intermediate Fuel Oil
IMO	: International Maritime Organization
ISM	: Safe Management System (SMS)
ISO	: International Organization for Standardization
MoU	: Memorandum of Understanding
MT	: Metric Ton
PSC	: Port State Control
SOLAS	: International Convention for the Safety of Life at Sea
UTC	: Coordinated Universal time

SOURCE OF INFORMATION and REFERENCE LIST

- Vessel Logs and Records
- Certificates and Documents of EREN TURGUT
- Insurance Company's findings and observations at the scene of the incident

LIST OF FIGURES

SUMMARY

Image 1 Location of the Accident

Note: All times used in the report are local time. (GMT +0)

Turkish flagged dry bulk carrier EREN TURGUT started her navigation to carry 3181 MT Atabuljit cargo from Dakar / Senegal to Grove Wharf / UK. While navigating in the Dover Strait on 24.11.2010 at 15:55 UTC, an explosion occurred in the engine room. The captain stopped the main engine as soon as he heard the explosion (51^0 11,893' N - 001^0 46,987' E). When the chief engineer went down to check the engine room, he saw that the HFO[1] service tank had exploded.

It was observed that the 2nd Engineer, 3rd Engineer and Oiler, who were in the engine room at the time of the explosion, suffered injuries and burns due to the explosion. While the 2nd engineer came out of the engine room by his own means, the 3rd engineer and the oiler were taken out with the help of the crew. The UK Coast Guard Department was contacted, and three injured crew members were taken to hospital by helicopter. The vessel was towed by tugboat from the accident area to Rotterdam / Netherlands Port. One of the three crew members who were hospitalized after the accident died, and the other two were discharged from the hospital after their treatment.

[1] HFO: Heavy Fuel Oil

SECTION 1 - FACTUAL INFORMATION

1.1 Information on the Vessel

EREN TURGUT

Flag	Turkish
Call Sign	TCTK2
IMO Number	9422342
Type	General Cargo Ship
Place and Year of Building	Quang Ninh / Vietnam / 2007
Gross Tonnage	2683
Length Over All	92,0 meters
Width	15,0 meters
Main Engine Power	1765 Bhp
Hull Construction	Steel

Image 2 EREN TURGUT

1.2. Information on Vessel Navigation

EREN TURGUT

Port of Departure	Dakar / Senegal
Port of Arrival	Grove Wharf / UK
Cargo Information	Atabuljit
Number of Crew	14
Type of Navigation	International

1.3 Information on the Accident

EREN TURGUT

Date / Time of Accident	24.11.2010 – 15:55 (GMT+0)
Accident Type (IMO)	Very Serious Marine Casualty
Type of Accident	Engine room fire
Location of Accident (Latitude / Longitude)	51^0 11,893 N - 001^0 46,987 E
Dead / Injured	1 Dead - 2 Injured
Damage	Damage to the engine room
Pollution	Not reported

1.4 Information on Environmental Conditions

Since the weather conditions prevailing in the region at the time of the accident did not directly or indirectly affect the accident, no information is provided on environmental conditions.

1.5 Information on EREN TURGUT

The vessel was last subjected to Port State Control on 31.03.2010 at Gabes Port of Tunisia within the scope of the Mediterranean MoU, and PSC found no deficiency. The vessel was

subjected to an intermediate survey by Türk Loydu on 15.06.2010 in Tuzla / İstanbul, and the vessel's certificates were approved.

The ship certifications and class documentation of the vessel, EREN TURGUT, were valid on the accident date, and the survey period had not expired. Vessel navigates with 3181 MT Atabuljit cargo from Port of Dakar / Senegal to Grove Wharf / UK. There are no navigation restrictions.

1.6 Manning of the Vessel

There were 14 personnel on board EREN TURGUT on the day of the accident, including the master, in accordance with the Minimum Safe Manning Certificate issued in accordance with Rule V/14 of the International Convention for the Safety of Life at Sea (SOLAS 74). The vessel was equipped with a sufficient number and qualification of seafarers in accordance with the rule. Also, there were neither deck cadets nor passengers on board. 2nd Engineer of the crew is a citizen of Azerbaijan. All other crew members are Turkish nationals, and the working language of the vessel is Turkish.

1.7 Vessel Certificates

There is no discrepancy between the issuance and annual control dates of the class certificates and documents belonging to EREN TURGUT. In the ISM inspection conducted by the Ship Classification on 13.03.2009, it was stated that there were no defects or deficiencies to be eliminated and on 03.06.2009, the Safety Management Certificate (SMC) was issued by the Classification Society to which it belongs in accordance with the ISM Code. In addition, on 25.02.2010, the Safety Management Certificate was issued by the Ship Classification. After the accident, the certificates related to the accident were examined, and their validity periods are stated below.

- Dates of International Load Line Cert: 04.02.2009 – 30.05.2012
- Dates of Safety Construction Cert.: 16.06.2010 – 03.05.2012
- Dates of Safety Equipment Cert: 16.06.2010 – 30.05.2012
- Minimum Safe Manning Cert.: 16.06.2010 – 30.05.2012

SECTION 2 – NARRATIVE

The sequence, timing and location of the events leading to the maritime accident under investigation are based on eyewitness statements, interviews and photographs

2.1 Development of the Accident

While the general cargo ship named EREN TURGUT was navigating in the Strait of Dover towards Groove Wharf / UK Port in the Strait of Dover with a cargo of 3181 MT Atabuljit from Dakar / Senegal Port, an explosion occurred in the engine room at 51°11.893 North, 001°46.987 East at 15:55 UTC. At the time of the explosion in the engine room, the 12:00-16:00 shift changed with the 16:00-20:00 shift. Therefore, the 2nd Engineer, 3rd Engineer and the Oiler on shift are in the engine room.

In the statement of the vessel's Chief Engineer, it is stated that he was in the restroom at the time of the accident and that the door of the restroom was strongly shaken with the effect of the explosion. The chief engineer stated that there was nothing abnormal in the engine room before the accident, and he did not understand why the fire alarm system was activated. He said that as soon as he heard the explosion, he went to the emergency shut-off valves of the oil/fuel tanks in the engine room and the engine room ventilation fans and closed the valves.

When he opened the door to check the engine room, he saw black smoke and hot air coming from a possible fire and immediately closed it back. When the Chief Engineer and Oiler, who was coming out of the 12:00-16:00 shift, put on emergency respirators and entered the engine room to check the engine room, they encountered the 2nd Engineer inside. 2nd Engineer told the Chief Engineer that he saw Oiler, who was on shift, flying in the air during the explosion. The 2nd Engineer then left the engine room by his own means. The chief engineer and the Oiler-A took the slightly injured 3rd engineer out of the engine room. When they returned to the engine room to rescue the oiler-B, they saw the oiler-B lying motionless on the floor, injured. When they took the oiler-B out of the engine room, they saw that the casualty was in a severe condition. The Coast Guard was contacted, and three injured crew members were taken to hospital by helicopter. The chief engineer noticed small fires in the engine room, which were extinguished with portable fire extinguishers.

2.2 Condition of the Engine Room at the Time of the Accident

As a result of the interview with the vessel's Chief Engineer, the following pictures were prepared showing the position of the engine crew in the engine room at the time of the

explosion and after the explosion. Image 3 also shows the fuel tank and machinery personnel positions before the explosion at 15:55 on 24.11.2010.

Image 3 Location of Engine Room Personnel on Board Before the Explosion

2.3 Condition of The Engine Room After the Accident

Image 4, just after the explosion on 24.11.2010, at 15:55 shows the positions of the Engine personnel.

3rd engineer on the middle floor

2nd engineer on the ground floor

B-Oiler's position after explosion

Fuel Tank

Explosion of fuel tank through vertical weld seam

Image 4 Location of Engine Room Personnel After the Explosion

SECTION 3 – ASSESSMENT

While assessing the marine casualty under investigation, the sequence of events and the data obtained during the investigation were taken into account together to determine and identify the factors that led to the occurrence of the casualty in order to reach beneficial conclusions that lead to safety recommendations on the root causes.

3.1 Fuel Tank

During the investigation, no detailed tank plan other than the schematic on the image belonging to the fuel tank was found. During the investigation, it was realized that there were many pipe circuits on the fuel tank and entering the fuel tank, but these circuits were not shown in the drawing.

Those indicated in the drawing:

LAH: level high-level alarm

TLA: Temperature alarm

LAL: Low-level alarm

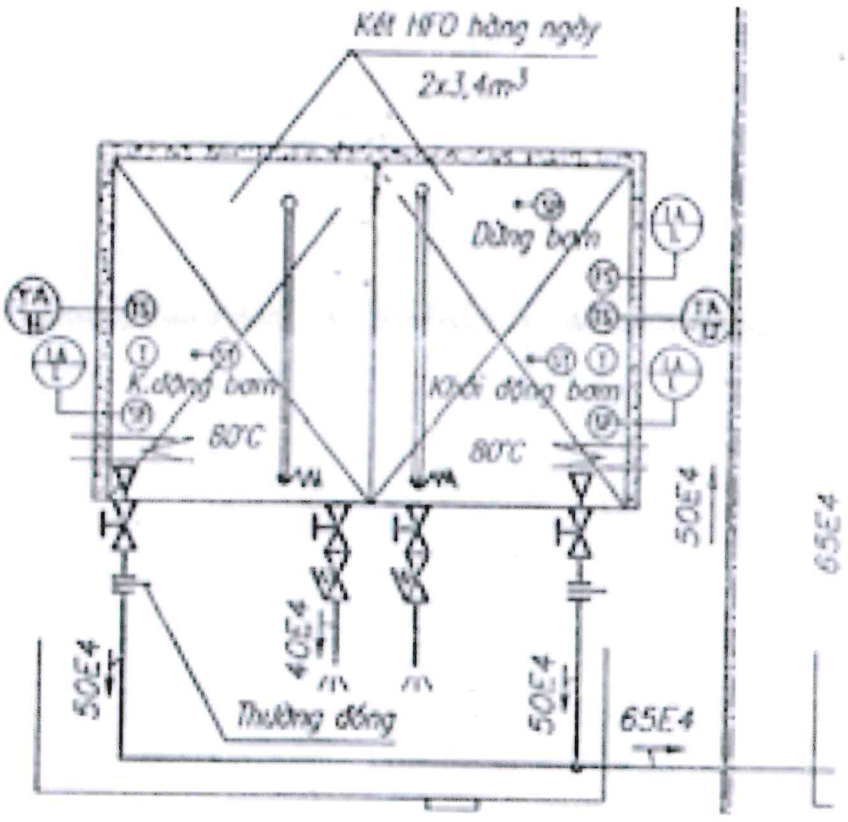

Image 5 Exploding Fuel Tank in EREN TURGUT

Due to the darkness of the engine room and the fact that the area of the explosion and the surface of the fuel tank were covered with heavy fuel oil, it was impossible to compare the existing tank with the drawing above. It was impossible to get close enough to the fuel oil service tank to inspect the torn and rough areas of the tank seam and the confined space above the tank.

In addition, since the vessel was less than 5 years old at the time of the incident, the fuel tank was not subjected to any classification inspection in the pre-accident period since there was no class requirement for underwater survey.

3.2 Fuel Used on Board

The fuel used on board EREN TURGUT at the time of the accident was IFO 180[2] cst, a medium fuel oil with a viscosity of[3] 180 centistokes (centistoke). This fuel type is used in marine diesel engines and boilers and meets ISO 8217 Fuel Standard 4th Edition 2010 is covered. The fuel sample taken from the EREN TURGUT vessel was analyzed in comparison with DNV classification society and Caltex company parameters. During the investigation, it was observed that the IFO 180 fuel of EREN TURGUT was within ISO 8217 parameters.

[2] IFO 180: Intermediate fuel oil (fuel oil type with a viscosity of 180 cSt)
[3] Viscosity The resistance of a liquid to flow. In other words, the numerical expression of whether a liquid is thick or thin. The viscosity of a liquid decreases with increasing temperature, i.e. the liquid flows more easily as it is heated. For a viscosity value to be meaningful, it must always be specified at what temperature. The most commonly used unit of viscosity: Centistoke cSt. (centi stock) mm2/s.

Source			DNV data		Caltex data	Eren Turgut sample
Parameter	**Unit**	**Limit**	**RME 180**	**RMG 180**	**RME 180**	**180**
Viscosity at 50°C	mm^2/s	Max	180.0	180.0	180.0	170.1
Density at 15°C	Kg/m^3	Max	991.0	991.0	991.0	937.7
Micro Carbon Residue	% m/m	Max	15	18	15	
Aluminium + Silicon	mg/kg	Max	50	60	80	
Sodium	mg/kg	Max	50	100		
Ash	% m/m	Max	0.07	0.1	0.1	
Vanadium	mg/kg	Max	150	350	200	
CCAI	-	Max	860	870		
Water	% V/V	Max	0.5	0.5	0.5	0.1
Pour Point (upper) summer	°C	Max	30	30	6	
Pour point (upper) winter	°C	Max	30	30		
Flash point	°C	Min	60	60	64	73
Sulphur	% m/m	Max	Statutory requirements	Statutory requirements	4.0	0.357
Total sediment	% m/m	Max	0.1	0.1	0.1	
Acid number	mgKOH/g	Max	2.5	2.5		
Hydrogen Sulphide	Mg/kg	Max	2.0	2.0		

Table 1 Analysis Table of the Fuel Taken from the Vessel

3.3 Fuel System Used on Board

In general, the fuel to be used in marine diesel engines are as shown in the diagram below (as Image 6), works with a classical circuit diagram consisting of a bottom tank, settling tank, transfer pump, separator, service tank, supply pump, heater, viscometer, filter and valve systems.

Fuel is first taken into the vessel's main tanks. Fuel is taken from these tanks, called 'Bottom Tank' or 'Double Bottom', by transfer or transfer pump and given to the settling tanks. The fuel, partially settled to the bottom by settling in the settling tank for a while, is passed through a separator and then transferred to the service tank as thoroughly cleaned. The tanks that contain the fuel that will enable the engine to operate for a specific period and always contain clean diesel or fuel oil are called service tanks.

These tanks, also called service tanks, are always built with the capacity to run the engine for 12 hours at full load. Service tanks must also be equipped with a gate valve extending the rod to the deck to cut off the fuel to the main engine and auxiliary engines in case of an emergency outside the engine room. Service tanks are the types of wing tanks and have the same equipment as the settling tanks.

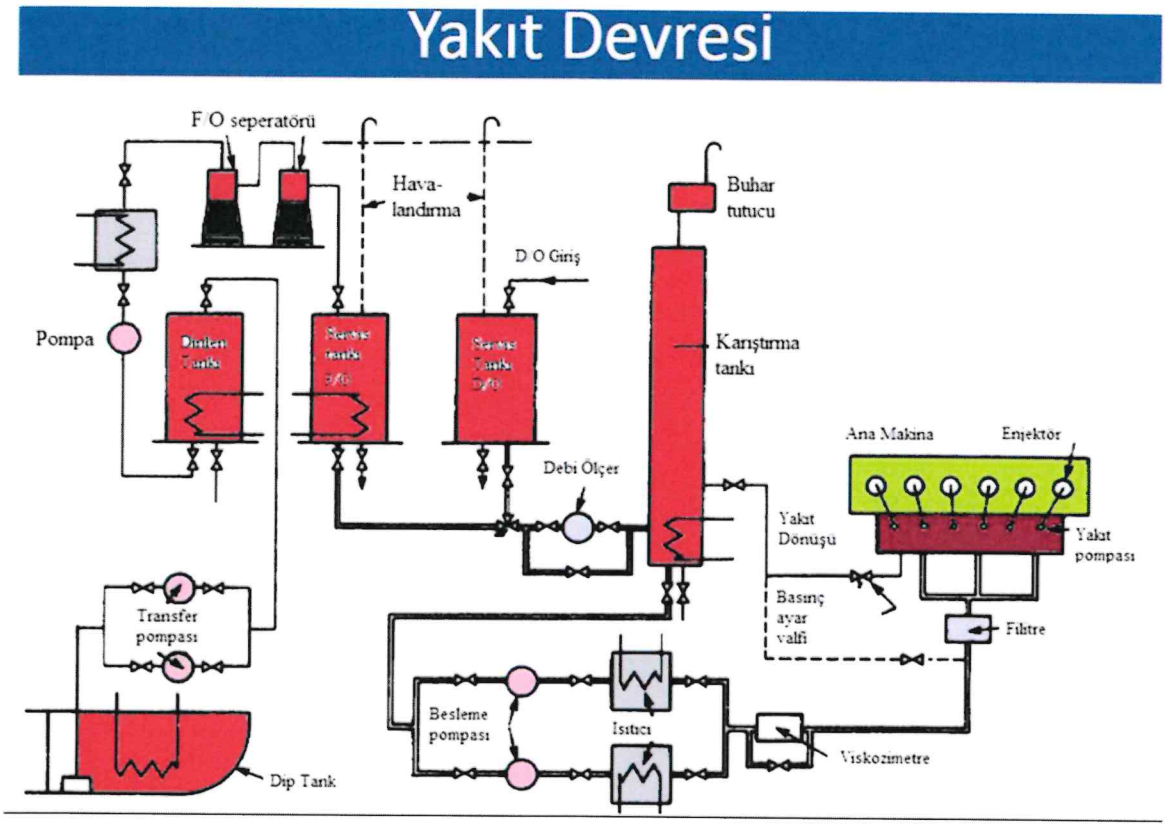

Image 6 General Vessel Fuel Circuit

3.4 Tank Test Methods Applied in the Building Phase of Vessels

During the initial building of vessels, building controls such as block control, block joining control, welding controls, tank tests, etc., are completed by the classification to which the vessel is subject until the vessel enters service. The most common tests on tanks consist of air testing and hydrostatic testing.

The results of these tests should be recorded and kept in the technical file of the vessel.

3.4.1 Hydrostatic Test

In this method, tanks are filled with water. While small tanks can be tested before launching, large tanks should be tested after launching as follows.

Water Heights

Double bottom: The airflow must be filled to the top of the vent pipe.

Deep tanks Test with water height up to the top of the overflow pipe or 2.45 m above the top of the tank. (The more significant value is taken)

Cargo tanks and cofferdams on tankers: It refers to the water height from the deck, which forms the upper part of the tank, up to 2.45 m on board or to the top of the hull. (The more significant value is taken)

3.4.2 Air Test

After the welded fabrication is finished, the tightness of the tanks should be tested with air. Tank air tests are performed with 0.2 bar pressure. It will be useful to use two calibrated manometers or water level bottles during tank tests in terms of the safety and quality of the test. (Image 7)

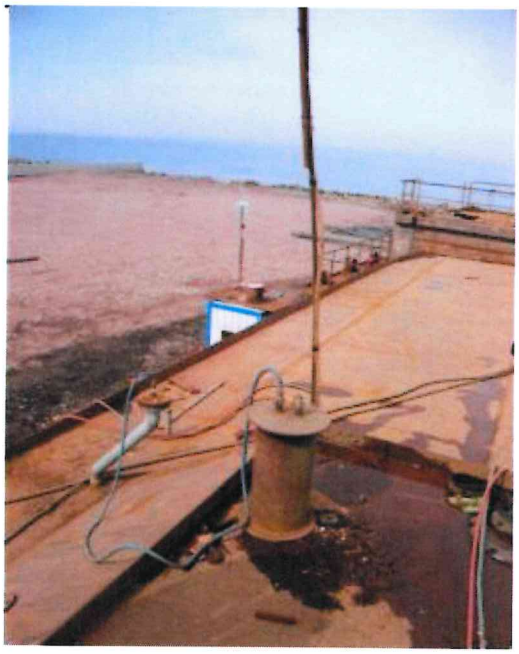

Image 7 Tank Testing by Air on New-Built Vessels

The technical plans of the vessel, including tank tests, could not be accessed by the classification society and the vessel's insurance company during the previous classification surveys and post-accident inspections.

Although the vessel was built recently (the vessel age was three years old at the time of the accident), the fact that the projects mentioned above, test and manufacturer certificates could not be accessed suggests that the cause of the fuel tank explosion may be a manufacturing defect caused by the lack of supervision.

3.5 Temperature of Exploded Tank on EREN TURGUT

After the accident, it was reported by the vessel's engine personnel that the alarm system indicating the temperature of the fuel in the fuel tank was found in the project (Image 5). Still, there is currently no alarm system for high temperatures; the temperature is read by means of an analogue thermometer on the tank (Image 8). Still, it was stated that this fuel temperature value was not recorded in the Engine Room Logbook. It was also stated that the only fuel temperature recorded in the Engine Room Logbook was the temperature value taken from the main engine supply pump outlet. However, the Engine room Logbook was requested from the vessel for control during the investigation but could not be reached.

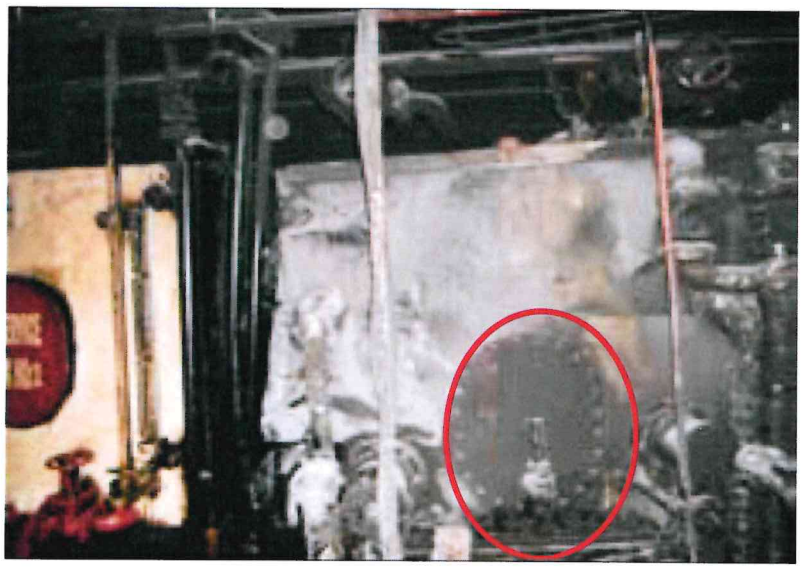

Image 8 Condition of Fuel-Oil Service Tank After the Explosion

3.6 Fire Fighting

3.6.1 Fixed Fire extinguishing system (CO_2)

Although the vessel's engine personnel stated that the vessel did not have a fixed fire extinguishing system (CO_2), it was determined that there was a CO_2 room. There were 30 CO_2 cylinders in this room, and ten were reserved for the engine room fire and used for fire extinguishing. (Image 9, Image 910)

In addition, small fires that occurred after the explosion were extinguished with portable fire extinguishers.

On the other hand, it is understood from the photographs that the fixed fire extinguishing system (CO_2), known to be the most effective in engine room fires according to SOLAS rules, was also used in the fire on board. It is understood that the engine personnel who stated

that there was no fire extinguishing system on board were not familiar enough with the vessel.

Image 9 CO_2 Detonation Mechanism

Image 10 CO_2 Cylinders Reserved for the Engine Room

3.7 Causes of the Explosion

Such fuel tanks, which generally supply fuel to the main engine and auxiliary machinery, are equipped with a curved ventilation pipe extending to the deck to maintain the external pressure inside and on the fuel surface and prevent the tank from exploding. It is also unusual for a tank of steel construction, which has a high value in terms of strength, to have exploded during voyage.

As possible causes of the explosion in the fuel tank on board, EREN TURGUT;

- Fuel oil used as engine fuel must be heated before use to ensure combustion and fluidity. Fuel oil is heated with steam or thermal oil on board; it was understood from the statements of the shift engine personnel that they measured the temperature of the tank manually from a thermometer mounted on the tank.

  The fuel vapor in the tank could not be evacuated due to the blockage / insufficient level / absence of tank ventilation pipes. The pressure of the fuel vapor increased extraordinarily with the increase in temperature, and the environment in the tank became suitable for explosion. With this, the temperature in the tank may have exploded as a result of spontaneous ignition caused by static electricity as a result of the fuel reaching the flash point; the vapor formed due to the temperature of the fuel in the tank may have exploded as a result of igniting the fuel vapor by taking sparks from the electrical equipment such as level alarm, temperature display equipment, etc. installed in the tank. It comes to mind that there may be an explosion due to igniting the fuel vapor by sparking from the electrical equipment installed in the tank.

However, when the marine accidents that occurred due to an explosion in the engine room were investigated, there was no record of a previous accident related to the explosion of the fuel settling tank.

In light of the above findings and evaluations, since a sudden pressure may have occurred in the fuel oil fuel tank due to overheating beyond the design parameters, and this pressure may not have been relieved due to blockage of the air-fuel-air vent pipe, etc., tearing occurred in the vertical seams of the fuel tank due to pressure, and 2.9 tons of heavy fuel in the tank into the engine room is considered to have been spilt.

3.8 Damages to The Engine Room After the Accident

After the heavy fuel tank explosion, 2.9 tons of fuel spilt into the engine room. As a result of the contact of the fuel with the hot surface of the generators, small fires broke out in the engine room. The crew extinguished these fires before they grew too big.

After the fire, generators, electrical cables, electrical cabinets, engine control room, and auxiliary equipment in the engine room were damaged. (Image 11-12-13)

Image 11 Damage to The Main Engine Components

Image 12 Damage to the Alternator

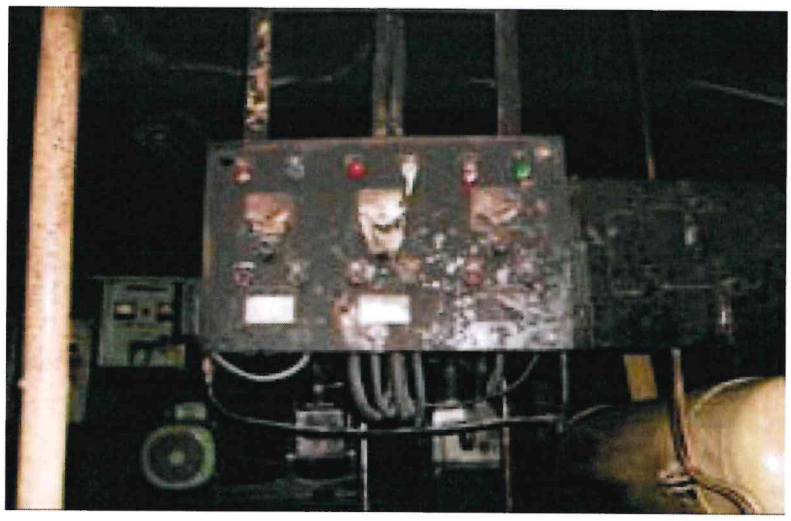

Image 13 Damage to the Main Engine Control Panel

SECTION 4 – CONCLUSIONS

- An explosion occurred in the engine room of Turkish flagged general cargo ship named EREN TURGUT at 15:55 on 24.11.2010 during on voyage in Dover Strait while carrying 3181 MT Atabuljit cargo from Dakar / Senegal to Grove Warf / England.
- One personnel died in the accident, and two were slightly injured.
- The explosion occurred in the fuel oil service tank of the vessel, and 2.9 tons of heavy fuel in the tank spilt into the engine room.
- The fuel vapor in the tank could not be evacuated due to blockage of the ventilation pipes of the fuel tank / insufficient capacity to evacuate the fuel vapor / none at all. With the rise in temperature and the extraordinary increase in fuel vapor pressure, the environment inside the tank became suitable for the explosion, and the fuel temperature reached the flash point. The cause of the explosion is thought to have occurred due to a spark caused by static electricity. (3.7)
- After the explosion, small fires occurred due to the contact of the fuel spread to the engine room with hot surfaces, and the crew extinguished these fires.
- In the statements of the vessel's engine personnel after the fire, it was seen that they were not familiar enough with the vessel. (3.6.1)
- After the accident, the vessel lost its mobility and was towed to the shipyard with the help of a tugboat.
- Although the vessel was a new building at the time of the accident, the projects of the vessel and the test and manufacturer certificates of the fuel tank could not be reached.
- During the marine safety investigation, no documentation of the tank's compliance with tightness and hydrostatic tests was found.
- According to the results of the analysis of the IFO 180 fuel sample of EREN TURGUT by the vessel's insurance company, it was seen to be within the ISO 8217 parameters.

NOTE: A retrospective marine safety investigation was conducted, and no recommendations were made in the report.