Final Report

DEATH OF A CREW DUE TO FIRE ONBOARD CD MANZANILLO AT PACIFIC OCEAN ON 10 OCTOBER 2023

TIB/MAI/CAS.150

Transport Safety Investigation Bureau
Ministry of Transport
Singapore

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The Transport Safety Investigation Bureau of Singapore

The Transport Safety Investigation Bureau (TSIB) is the air, marine and rail accidents and incidents investigation authority in Singapore. Its mission is to promote transport safety through the conduct of independent investigations into air, marine and rail accidents and incidents.

TSIB conducts marine safety investigations in accordance with the Singapore Transport Safety Investigations Act 2008, Transport Safety Investigations (Marine Occurrences) Regulations 2023 and the Casualty Investigation Code under SOLAS Regulation XI-1/6 adopted by the International Maritime Organization (IMO) Resolution MSC 255(84).

The sole objective of TSIB's marine safety investigations is the prevention of marine accidents and incidents. The safety investigations do not seek to apportion blame or liability. Accordingly, TSIB reports should not be used to assign blame or determine liability.

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ABBREVIATIONS

COSWP	Code of Safe Working Practice
CDM	CD Manzanillo
CIRM	International Radio Medical Centre
DOC	Document of Compliance
GMP	Garbage Management Plan
GT	Gross Tonnage[1]
ISM	International Safety Management
JRCC	Joint Rescue Coordination Centre
MARPOL	International Convention for the Prevention of Pollution from ships
MEPC	Marine Environment Protection Committee
MEDEVAC	Medical Evacuation
PPE	Personal Protective Equipment
RA	Risk Assessment
SDS	Safety Data Sheet
SMS	Safety Management System
SWA	Stop Work Authority
UTC	Coordinated Universal Time[2]

[1] Gross tonnage (GT) is a measure of a ship's overall internal volume and referred to as an overall size of a ship.
[2] UTC is the primary time standard by which the world regulates clocks and time.

Designation (Relevant Personnel)	
Chief Mate	CM[3]
Second Mate	2M
Third Mate	3M
Bosun	BSN[4]
Able Seafarer Deck	ASD
Ordinary Seaman	OS[5]
Officer of the Watch	OOW
Chief Engineer	CE[6]
Third Engineer	3E

[3] Head of Deck department.
[4] Member of the Deck department and supervises deck crew.
[5] Member of the Deck department and typically the starting rank for a seafarer in the deck department.
[6] Head of Engine department.

SYNOPSIS

On the morning of 10 October 2023, amidst overcast skies and a southerly breeze, the CDM was en route from Peru to South Korea. The BSN and OS were tasked by the CM to segregate onboard garbage. Subsequently, they were directed to burn plastic waste in an empty 200-liter oil drum on the exposed poop deck, using paper waste as an accelerant.

Instead of using paper waste as an accelerant, the OS had apparently used thinner to ignite the plastic waste. This had caused an explosion and subsequent fire at the poop deck which resulted in the OS' coverall becoming engulfed in flames. Although, the BSN managed to extinguish the fire on the OS, but unfortunately, the OS was seriously injured and succumbed to his injuries on 13 October 2023.

The Transport Safety Investigation Bureau classified the incident as a very serious marine casualty.

Investigation findings indicated that the explosion and subsequent fire likely originated from an uncapped thinner tin placed near the oil drum used for burning plastic waste. Contributing factors included poor communication among crew members, failure to comply with safety requirements, and unauthorised burning of plastic waste on the exposed poop deck.

VIEW OF SHIP

Figure 1 – *Source:* Open source – Vessel Finder

DETAILS OF SHIP

Name	CD MANZANILLO
IMO Number	9883120
Licence No./ Callsign	9V6477
Flag Administration	Singapore
Classification society/ ISM[7] Recognised Organisation	Class NK – Nippon Kaiji Kyokai
Ship type	Bulk Carrier
Year Built	2020
No. of Hatches/ Holds	5 Hatches/ 5 Holds
Company / Operator	Goodwill Maritime Pte Ltd./ Cleanocean Shipmanagement Inc. (Philippines)
Gross tonnage	35956
Length overall	199.98m
Breadth	32.24m
Summer Freeboard	5.782m
Summer Draught	13.42m
Mean Draft	13.05m
Main engine(s)	1DE : 2 SA 6 CY, Mitsui E&S Machinery Co., Ltd. Tamano Machinery
Service Speed	13.5 knots @ Full Laden Condition 14.4 knots @ Ballast Condition

Table 1

[7] In accordance with ISM Code – SOLAS Chapter IX, IMO Res.A.741(18) as amended thereof.

1 FACTUAL INFORMATION

All times used in this report are Ship's Mean Time, aligning with Oceania (Pacific Ocean) Local Mean Time (UTC - 11.0 hours).

In the conduct of marine safety investigation into the circumstances surrounding this death occurrence, the investigation team carefully examined the information provided by the Company and conducted interviews with pertinent personnel.

1.1 Sequence of events

1.1.1 On 21 September 2023, CDM departed Port of Callao, Peru, after completing the loading of copper concentrate. The ship was bound for Port of Onsan, Korea, where it was scheduled to bunker before proceeding to Port of Yantai, China, for a planned cargo discharge on 28 October 2023.

1.1.2 In the early morning of 10 October 2023 at 0630 hours, the BSN reported to the CM in the bridge to discuss the day's deck work[8]. The BSN was tasked with checking lashing and movable objects on the forecastle deck in preparation for anticipated bad weather on the following day, directing the deck crew to carry out painting jobs, and segregating garbage in the garbage room. Additionally, the BSN was instructed to clear the plastic wastes by burning them in an empty 200-litre oil drum at the aft of the accommodation's open deck[9]. The BSN then left the bridge and proceeded to have breakfast around 0700 hours.

1.1.3 At 0800 hours, after turning over bridge watchkeeping duty to the 3M, the CM convened a toolbox meeting in the ship's office with the BSN, three ASDs, and the OS to discuss the day's tasks, which included painting and garbage segregation. During the meeting, the CM emphasised the importance of safety measures, such as the mandatory use of appropriate PPE, warned about potential slip hazards, and reiterated the prohibition of open flames near freshly painted surfaces and paint containers.

1.1.4 Following the meeting, the CM and BSN approved the day's work activities, and the CM specifically instructed the BSN and the OS to burn the plastic wastes in an empty oil drum using wastepaper as an accelerant, although this instruction

[8] This is a daily routine for the deck department between the BSN and CM to discuss the deck work and to deconflict other activities (like cargo work, weather and sea condition.). These discussions are essential for ensuring the smooth and efficient operation of the deck department and for maintaining a safe working environment for all crew members.
[9] The crew commonly referred to this area as the poop-deck, which is situated on the upper-deck and houses the garbage room.

was unfortunately not documented.

1.1.5 Subsequently, the CM had breakfast in the crew mess before completing administrative work in the ship's office and retiring to his cabin for rest at approximately 0950 hours. Meanwhile, the three ASDs began preparation for painting work at the upper deck alleyway, while the BSN and OS carried out housekeeping tasks in anticipation of inclement weather.

1.1.6 After completing the housekeeping duties, the BSN started preparing paint for the ASDs to use on the upper deck alleyway. Concurrently, the BSN also instructed the OS to ready a 200-litre empty oil drum for the burning of plastic wastes later. After preparing the paint, the BSN joined the OS in segregating plastic wastes for burning in the empty oil drum. This activity continued until around 1000 hours when they stopped for coffee break.

1.1.7 At around 1030 hours, following the coffee break, the three ASDs resumed painting the upper deck alleyway while the BSN began painting the interior of the changing room and gymnasium. The OS proceeded alone to burn the three trash bags of plastic wastes in the empty oil drum located at the poop deck. (See **figure 2**)

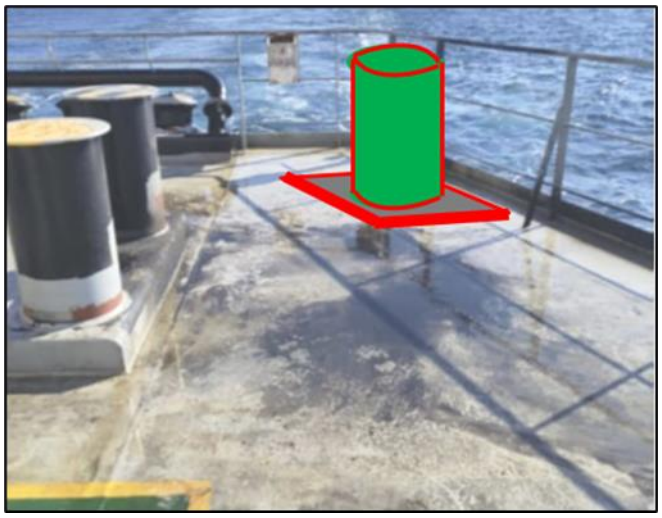

Figure 2 - Image depicting the empty oil drum used for burning the plastic wastes at the poop deck. Source: The Company. Sketch illustration by TSIB.

1.1.8 Around mid-day, at approximately 1200 hours the crew stopped for lunch and resumed their work at around 1300 hours. During this time, the 2M being the OOW was on the bridge for navigation watch, the Master was attending to tasks

in his office, and other crew members were either working inside the accommodation areas, engine room, or resting inside their cabins.

1.1.9 At about 1420 hours, an explosion was heard on the ship, followed by the activation of the fire alarm on the bridge's display panel, indicating a fire on the poop deck. The 2M promptly sounded the general alarm and broadcasted a public announcement, alerting the crew to the fire on the poop deck.

1.1.10 Concurrently, the three ASD and the BSN heard the explosion and cries for assistance coming from the poop deck, followed by the general alarm and announcement. Upon hearing this, the Master rushed to the port bridge wing, where he saw the OS, whose coverall was engulfed in flames near cargo hold #5[10]. The Master also witnessed that the BSN successfully extinguishing the fire on the OS' coverall using water from a garden hose within a few moments. (See **figures 3**.)

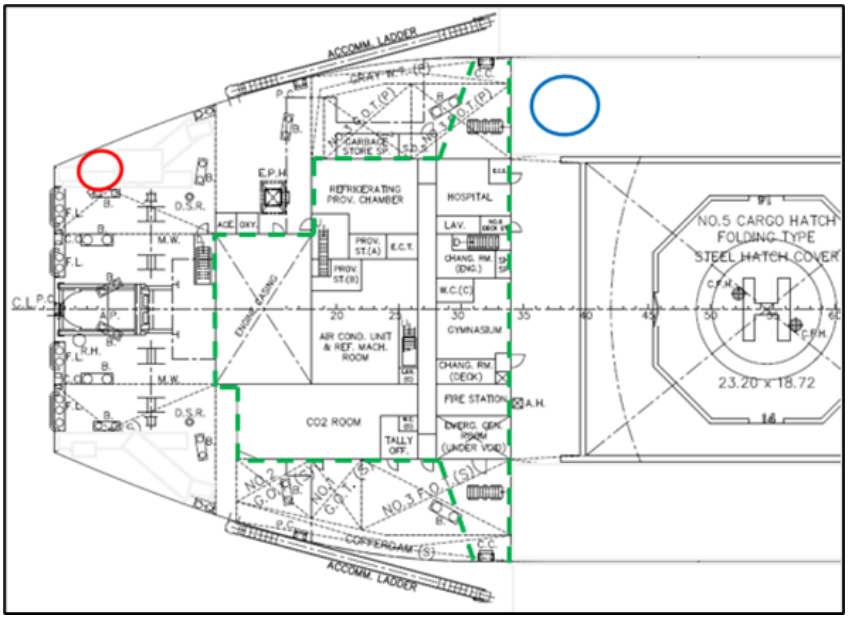

Figure 3 - The red circle on the poop deck marks the spot where plastic wastes was burned. The blue circle on the upper deck indicates where the OS had moved after catching fire and the BSN sprayed freshwater on the OS. The green dashed line outlines the approximate boundary of the accommodation block – Illustration not to scale. *Source:* The Company. Annotation by TSIB.

[10] The OS had likely run from the poop-deck to the location adjacent to cargo hold #5 (forward of the accommodation) to seek assistance after catching fire.

1.1.11 Shortly after extinguishing the fire on the OS' coveralls, the BSN was joined by the remaining crew members. The Master directed for the OS to receive medical treatment at the ship's hospital and to put out the fire at the garbage burning site.

1.1.12 The Master then instructed the 3M to assume navigation watch duties and accompanied by the 2M, proceeded to the hospital. At the hospital, the Master delegated the task of attending to the OS' injuries to the 2M while also inquiring about the circumstances leading to the fire. The OS explained that he had placed plastic wastes inside the empty drum in preparation for burning, poured paint thinner over it, and placed the uncapped paint thinner tin beside the drum. The OS then ignited the plastic wastes from the access hole at the bottom of the drum with a lighter, which inadvertently caused an explosion and resulted in his coveralls and body in flames. **Figure 4** shows an enactment by the ship's crew after the occurrence depicting the proximity of the paint thinner and the drum.

Figure 4 - Illustrates a crew member trying to ignite the garbage in the drum through the opening at the bottom of the drum. The opening of the drum is represented by yellow stripes, and the opening of the uncapped paint thinner is marked by the red dashed line. *Source:* The Company. Annotation by TSIB.

1.1.13 The Master reported the incident to the Owner and follow-up with a call to the

CIRM[11] for medical assistance. The CIRM advised the Master on how to treat the injured OS and asked the Master to monitor the OS' condition and provide constant updates to CIRM.

1.1.14 Unfortunately, the OS' condition deteriorated on 12 October 2023, two days following the initial incident. Consequently, the Master was recommended by the CIRM to divert the ship to the nearest port i.e. to Port of Hawaii, to seek medical assistance on shore.

1.1.15 Later that evening, during transit to Port of Hawaii, the Master noted further deterioration in the OS' condition and promptly contacted JRCC[12] to request for a medical evacuation for the injured OS.

1.1.16 Following extensive efforts from both ship personnel and shore paramedics to revive the OS, the OS was ultimately declared deceased by a JRCC attending Medical Doctor on 13 October 2023, at approximately 0820 hours.

1.1.17 With the advice from the Company, the body was subsequently landed in South Korea on 2 November 2023.

1.2 Crew's qualifications, roster and roles

1.2.1 At the time of the incident, CDM's manning comprised 20 officers and ratings from the Philippines. The Company confirmed that all crew joining CDM received their familiarisation training upon joining ship, as per the SMS requirements. The OS and BSN went through the same familiarisation on 28 January 2023 conducted by the former BSN when they joined CDM.

1.2.2 According to work/rest hour records maintained onboard CDM, for the 24-hour period prior to the occurrence, the OS had a total of 16hours of rest before the toolbox meeting on the 10 October 2023. For the last 7-day period, the OS had 119 hours of rest. These records indicated compliance with the STCW and MLC Convention's requirement, concerning the hours of work and rest.

1.2.3 The crew experience matrix of relevant persons is shown in the **table 2** below.

[11] International Radio Medical Centre – Centro Internazionale Radio Medico – Organisation headquartered in Rome, Italy, providing free medical advice and assistance to ships internationally.
[12] Joint Rescue Coordination Center (Honolulu – Hawaii).

Designation onboard	Nationality	Age	Qualification	Duration onboard (month)	In-rank service (Year)	Time in Company (Year)	Working schedule onboard
Master	Filipino	46	STCW II/1, IV/2	09	2.7	14.7	N.A.
CM	Filipino	36	STCW II/1, IV/2	09	1.0	3.0	0400-0800 1600-2400
CE	Filipino	55	Chief Engineering Officer STCW III/2	07	6.0	6.0	N.A.
BSN	Filipino	45	Deck Rating STCW II/4	09	9.2	0.8	Day Worker
OS	Filipino	26	STCW II/1, IV/2	09	0.8	1.7	Day Worker

Table 2

1.3 Interview with the crew

1.3.1 Master

1.3.1.1 The Master informed the investigation team that during the first meal break on 21 September 2023, after departing from the loading port of Callao – Peru, he informed the CE that the Company had arranged for the discharge of garbage in China upon arrival for cargo unloading.

1.3.1.2 The Master confirmed that he had not told the CM nor any other crew about this arrangement before the incident. The Master added that the usual practice was to notify the crew regarding pertinent work arrangements and operations only a couple of days before arrival to the next port.

1.3.1.3 The Master was aware of the increasing amount of the plastic wastes but he did not recall the CM raising any related concerns to him. On the day of incident, the Master was in his cabin carrying out administrative work after his breakfast and lunch and was not aware of the clearing of plastic wastes by burning them in the oil drum.

1.3.2 CE

1.3.2.1 The CE told the investigation team that on 9 October 2023, a day before the incident, the 3E had asked him regarding the CM's request to use the ship's incinerator for plastic wastes burning.

1.3.2.2 The CE rejected this request as he knew that the garbage had been arranged to be discharged in China, as informed by the Master, and hence did not see a need for the garbage to be incinerated. However, the CE did not provide this reason to the 3E.

1.3.3 CM

1.3.3.1 The CM stated that the CE had declined the request to incinerate plastic wastes. Despite this, the CM was concerned about the possibility of plastic wastes being washed or blown overboard. Consequently, he instructed the BSN to burn some of the plastic wastes collected outside the garbage room.

1.3.3.2 The CM confirmed that he had instructed the BSN and OS to use only wastepaper as an accelerant. However, he was surprised to discover after the incident that the OS had used the paint thinner instead. Furthermore, the CM was aware that the method of burning the plastic wastes is not approved by the Company, but he was more concerned about the plastic wastes outside the garbage room being washed or blown overboard, particularly, if weather conditions worsened during the Pacific Ocean crossing.

1.3.4 BSN

1.3.4.1 The BSN informed the investigation team that he had followed the instructions of the CM without confirming whether the method of burning the plastic wastes was permitted. The BSN stated that the instructions from the CM, which were also acknowledged by the OS, specified that wastepaper was to be used as the accelerant.

1.3.4.2 The BSN expressed confidence in the OS' ability to carry out the task and subsequently left the OS unsupervised to continue painting tasks inside the accommodation. However, the BSN was unaware of when or how the OS obtained and used the paint thinner[13] as an accelerant.

1.4 The Company and its SMS

1.4.1 The Company was issued a DOC certificate by NK on 11 November 2023, following a verification process completed on 5 November 2023, which was

[13] These paint thinners were kept below the storage at one of the lifting cranes onboard. The storage area was not locked.

valid until 11 November 2024.

1.4.2 After an external audit conducted on 20 November 2023, CDM received a SMC from NK, valid until 9 December 2025.

1.4.3 The ship held the necessary certificates for compliance with the ISM Code and SMS. Onboard documents included organisational policies, procedures, manuals, checklist, etc, and reference to industry publications such as the COSWP[14].

1.4.4 The essential components of an SMS involved establishing safety and environmental protection policy. The SMS included implementing procedures for safe ship operations; environment protection; reporting for accidents and non-conformities; defining authority levels and communication channels and emergency preparedness and response plans, as well as having processes for internal audits and management reviews.

1.4.5 Adhering to the ISM Code, CDM maintains a comprehensive environmental safety policy onboard. This requires the crew to conduct RA and Toolbox meetings before commencing daily tasks, especially new ones. The Company has outlined the roles, responsibilities, authorities, and relationships of personnel involved in safety and pollution prevention through the GMP, ensuring all crew members understand their obligations in maintaining a safe and environmentally conscious work environment.

1.4.6 Risk Assessment (RA)

1.4.6.1 CDM has onboard a hazard identification and RA process to ensure safe and environmentally responsible practices. The RA highlights the importance of crew awareness regarding garbage disposal areas and the necessity to familiarise themselves with GMP.

1.4.6.2 The RA also emphasises that improper segregation of garbage can lead to mixing of food waste with other materials, resulting in pollution when disposed of at sea. Additionally, failure to appropriately dispose plastics, pyrotechnics, medicines, and batteries may lead to penalties imposed by ports for landing for mixed garbage. Inadequate storage and collection bins could result in detention

[14] The COSWP published by the UK Maritime and Coastguard Agency (MCA) provides best practice guidance for improving health and safety on board ships. It is not a mandatory publication to be carried onboard Singapore registered ships. The Company's SMS made reference to the COSWP, and a copy of the publication was onboard CDM.

during Port State inspections.

1.4.6.3 It is noted that while plastic wastes may be burned in a shipboard incinerator, the Company's SMS prohibit the burning of garbage on the exposed deck. Hence there has been no RA for burning plastic wastes on open decks. All crew members must be vigilant in adhering to proper waste management procedures to promote a safe and clean maritime environment.

1.4.7 Stop Work Authority (SWA)

1.4.7.1 In accordance with the Company's SMS, among others, the following procedures are to be strictly adhered to:

a) Any person who observes an unsafe act or condition has the authority to stop it, explain safe behaviours to the person involved, correct the unsafe condition (self or by informing the senior), and shall be documented;

b) The Company's Stop Work policy/ authorisation states that all staff shall:

i. Be actively involved in improving behaviours and preventing accidents;

ii. Always be alert to unsafe acts and conditions in the workplace;

iii. No work will resume until all SWA issues and concerns have been adequately addressed.

c) Stop work reports from the ship shall be reviewed by the Company to measure participation, trend common issues, identify opportunities for improvement, and facilitate sharing of learning.

1.4.8 Garbage Management Plan (GMP)

1.4.8.1 The GMP onboard CDM adheres to the regulations for the Prevention of Pollution by Garbage from ships – Annex V of MARPOL 73/78 and has been developed in compliance with resolutions MEPC.201 (62), MEPC.220 (63), MEPC.277 (70), and MEPC.295 (71). It is based on Regulation 9(2) of the revised MARPOL Annex V 73/78 and serves as a comprehensive set of guidelines for the Master and crew onboard the ship to manage and dispose of

garbage properly.

1.4.8.2 The primary objective of this GMP is to establish a structured approach to the handling and controlling of garbage in the marine environment as mandated by MARPOL 73/78 Annex V. It includes documented procedures for minimising, collecting, processing, storing, and disposing of ship-generated garbage, as well as designating the responsible personnel onboard to execute the plan.

1.4.8.3 Furthermore, CMD was required to equip with a Garbage Record Book to record each discharge into the sea or reception facility, as well as incineration activities. This encompasses discharges into the sea, to reception facilities, to other ships, and accidental loss of garbage.

1.4.9 Training

1.4.9.1 The most recent Environmental Management training/ meeting conducted by the shipboard management team occurred on 7 October 2023. The training addressed the environmental impact of shipboard operations and promote best practices for environmental management in accordance with industry regulations and company's policies.

1.4.9.2 Topics discussed during the session included the ecological harm caused by marine garbage, the availability of reception facilities, the repercussions of non-compliance with regulations, and the significance of implementing a GMP onboard.

1.4.9.3 In addition, the designated personnel responsible for executing the plan, procedures for garbage collection, processing, storage, and disposal, as well as the record-keeping obligations were covered. Emphasis was placed on relevant Resolutions to the MARPOL Conventions concerning pollution prevention at sea.

1.4.9.4 It was noted during the training that, similar to RA, there is no provision for burning of garbage on the exposed deck.

1.5 Thinner SDS

1.5.1 Reference to the SDS provided to CDM, the characteristics and potential risks associated with marine paint thinner was determined as a colourless liquid with

a solvent odour and falls under Category 2[15] flammable liquid, with the primary danger being its highly flammable nature in both liquid and vapor forms. To mitigate these risks, specific precautions were recommended, including ensuring the substance is kept away from heat, sparks, open flames, and hot surfaces, as well as prohibiting smoking in the vicinity. It is also advised to keep the container tightly closed to prevent any escape of flammable vapour, accidents or spills.

1.5.2 The data sheet further provided the physical and chemical properties of paint thinner and indicated its flash point[16] as 12°Celcius and its ignition temperature as 240°Celcius. The substance has a lower explosive limit of 1.1% and a higher explosive limit of 12%. Additionally, it is noted that the vapour and gas produced by paint thinner are heavier than air, which may influence its behaviour in different environments.

1.5.3 In the event of a fire involving paint thinner, it is recommended to use water spray or dry chemicals as fire-extinguishing media to effectively contain and extinguish the flames.

1.6 Environmental information

1.6.1 At the time of the occurrence, CDM was proceeding on a westerly heading, encountering a strong southerly breeze blowing from port to the starboard quarter. The ship's movement combined with the true wind's force and direction resulted in an apparent[17] wind condition of near light air on the poop deck. Additionally, the weather conditions were overcast sky, with rough seas.

[15] Category 2 shall include liquids having flash points below 23°Celcius and having a boiling point above 35°Celcius.
[16] Flash point: the minimum temperature at which a liquid gives off vapour within a test ship in sufficient concentration to form an ignitable mixture with air near the surface of the liquid. The flash point is normally an indication of susceptibility to ignition.
[17] Apparent wind refers to the wind experienced by an observer or an object in motion.

2 ANALYSIS

The investigation looked into the following:

(a) Cause of explosion and fire

(b) Lack of communication and sharing of information

(c) Company SMS for burning on exposed deck

2.1 Cause of explosion and fire

2.1.1 The OS had chosen to use thinner, instead of paper as an accelerant to start the fire in the empty oil drum for the burning of plastic waste. The uncapped thinner tin was placed near to the drum bottom opening had exacerbated the situation, increasing the risk of explosion and fire.

2.1.2 Thinner emits flammable gases, especially when the thinner tin is left uncapped. The light air condition at the poop deck further contributed to the buildup of hazardous flammable gases in the vicinity.

2.1.3 Hence, it is possible that the explosion was caused by the uncapped thinner tin being closed to the source of heat, either when the OS was lighting the plastic waste or when the plastic waste was burning in the oil drum. This explosion had resulted in OS being burnt by the fire from the explosion and subsequently succumb to the burn injuries.

2.2 Lack of communication and sharing of information

2.2.1 The investigation revealed some communication issues onboard CDM. The CM’s concern about plastic waste washed or blown overboard and the potential repercussions during Port State Inspections were valid. However, the CM did not bring this concern to the Master. Instead, the CM instructed the BSN to burn the plastic waste on the exposed poop deck using wastepaper. The CM also did not inform the Master of his intention to clear the plastic waste by burning them on the poop deck.

2.2.2 The investigation team was informed that there was no real urgency to get rid of the plastic waste as there was a plan to dispose them in the next port in China. Although the Master had informed the CE about the plan of disposing the garbage in China, other crew members, including the CM, were not

informed. When the CE rejected the request from the 3E to burn plastic waste using the shipboard incinerator, the CE did not provide the reason of rejecting. Had the CE informed the 3E of the plan to dispose the garbage, including the plastic waste, the CM would not have thought that there was an urgency to dispose the plastic waste before the next port.

2.2.3 There is a clear issue with communication which resulted in the lack of sharing of essential information among the crew onboard CDM. Communication is crucial for the safety and efficiency onboard ships, facilitating the sharing of critical information, operational directives, and safety procedures with all crew members.

2.3 Company SMS for burning on exposed deck

2.3.1 The method of burning plastic waste on the exposed deck was not approved by the Company's SMS. Despite this, the CM instructed the crew to carry out the task, revealing a gap in adherence to established procedures.

2.3.2 Instead of instructing the BSN to burn plastic waste on the exposed deck, it would be more appropriate to designate a specific location for storing only plastic waste, awaiting proper disposal. Despite knowing that the Company SMS forbids burning on the exposed deck, the BSN did not question nor challenge the CM’s decision.

2.3.3 Non-compliance with company procedures undermines the effectiveness of SMS and increases the risk of incidents or accidents. Departing from established practices endangers safety of the crew members, the ship and poses environmental risks.

2.3.4 Fostering a culture of accountability and responsibility is crucial for promoting compliance with company procedures. Crew members must understand the importance of following the rules and feel confident in speaking up about any problems. If anyone notices something unsafe, they should use the SWA, which allows them to stop the activity immediately, as permitted by the SMS.

2.3.5 The crew went against the SMS and performed plastic waste burning at the exposed deck and none of the crew had use the SWA to stop this unauthorised and unsafe practice. The occurrence clearly demonstrated that the SMS was not effectively implemented onboard CDM.

3 CONCLUSIONS

From the information gathered, the following findings are made. These findings should not be read as apportioning blame or liability to any particular organisation or individual.

3.1 The explosion and subsequent fire had likely originated from the uncapped thinner tin which was placed near to the bottom opening of the empty oil drum used for burning the plastic waste.

3.2 The fire associated with the explosion had caused the OS to suffer fire injuries and succumb to the injuries.

3.3 There were significant issues in communication and sharing of information onboard the ship. Despite the Master informing the CE about plans to dispose of garbage, including the plastic waste at the next port, other crew members, including the CM, were left uninformed. The CM did not inform the Master of his concern on the building up of plastic waste and his plan to burn the plastic waste. The CE did not inform the 3E the reason for not allowing the use of onboard incinerator to burn the plastic waste.

3.4 The CM and BSN did not adhere to Company SMS and proceeded to burn plastic waste on the poop deck, a practice that was forbidden.

3.5 While noting that burning on the open deck was prohibited, the BSN did not exercise SWA when instructed by the CM to burn plastic waste on the poop deck. The OS also did not exercise SWA when instructed by the BSN to burn plastic waste on the poop deck.

4 SAFETY ACTIONS

Arising from discussions with the investigation team, the Company (Cleanocean Shipmanagement Inc. Philippines has taken the following safety actions.

4.1 Corrective actions (Completed October 2023)

(a) Company immediately send circular to all fleet to prevent recurrence.

(b) Master conducted a safety meeting for proper garbage incineration and discuss the incident with all crew.

(c) Company Superintendent conducted safety audit and onboard training for the crew.

4.2 Preventive measures, among others. Includes:

(a) Thoroughly monitoring of ship garbage record book by sending to the Company on weekly basis.

(b) Company reviewed its SMS procedure and added following details:

i. Burning of garbage using improvised equipment on an exposed deck is strictly prohibited.

ii. Garbage incineration request form (COMI-SM-5-61) to be sent to Company for approval at least one (1) day before or earlier prior operation.

(c) Company conducted familiarisation and briefing session to all crew prior joining ship. This session included sharing of investigation findings from previous incidents, highlight the importance of compliance to SMS, and the significance of communication among the crew.

5 SAFETY RECOMMENDATIONS

A safety recommendation is for the purpose of preventive action and shall in no case create a presumption of blame or liability.

For the Company (the ISM Manager of CDM):

5.1 Remind its fleet not to burn garbage on the open deck and to advise ships' crew to check onboard and remove any drums previously used for burning garbage. [**TSIB Recommendation RM-2024-016**]

5.2 Encourage its crew to exercise Stop Work Authority when unsafe act is being performed. [**TSIB Recommendation RM-2024-017**]