भारत सरकार/ GOVERNMENT OF INDIA
पत्तन,पोत परिवहन और जलमार्ग मंत्रालय
MINISTRY OF PORTS, SHIPPING AND WATERWAYS
नौवहन महानिदेशालय, मुंबई
DIRECTORATE GENERAL OF SHIPPING, MUMBAI

F.No.25-19012/17/2023-NT-DGS (Comp. No. 26075) Date: 20.01.2025

DGS Circular 01 of 2025

Casualty Branch Circular – 01 of 2025

Sub: Fatality on board a tanker while undergoing repairs at berth

1. Overview

This circular is issued to highlight a recent unfortunate incident on an Indian-registered oil tanker at an Indian port which was berthed at layup berth for repair, which tragically resulted in the loss of one life and injuries to three shore-contracted personnel on board. The casualties occurred due to an explosion inside the port-side Slop tank while cutting of nuts and bolts, using hot work, was being carried out on the Inert Gas line at the main deck.

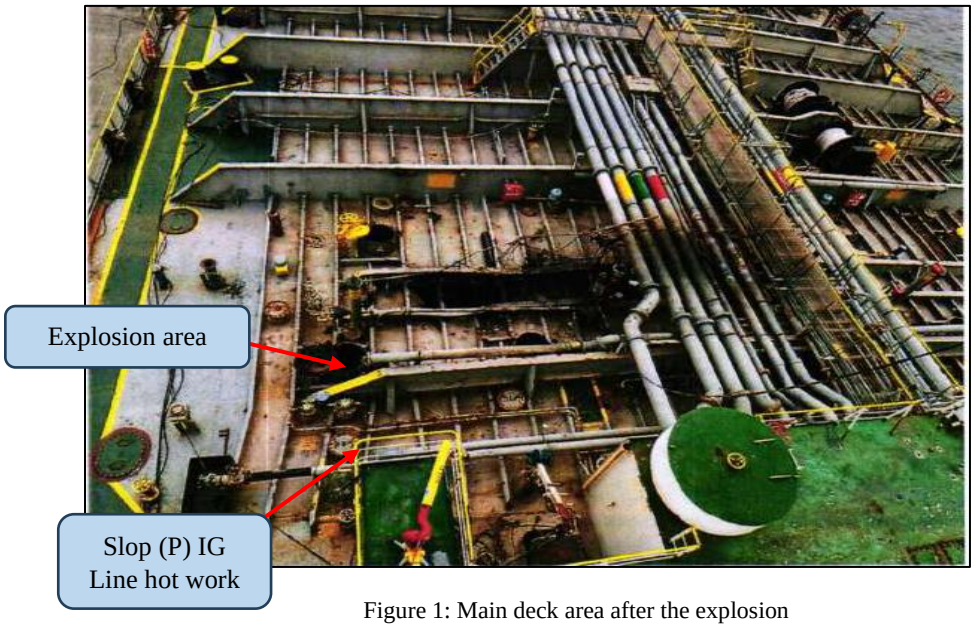

Figure 1: Main deck area after the explosion

Hot work permission had been obtained from the Port, along with a (gas-free certificate) [1]for man-entry and gas-free certificate for Entry to wet and dry berth (repair berth) from the Petroleum and Explosives Safety Organization (PESO[2]).

[1] As per ISGOTT A certificate issued by an authorized Responsible Person confirming that, at the time of testing, a tank, compartment or container was gas free for a specific purpose

[2] The Petroleum and Explosives Safety Organization (PESO) is a nodal agency in India for regulating safety of hazardous substances such as explosives, compressed gases and petroleum. PESO's major work is to administer the responsibilities delegated under the Explosives Act 1884 and Petroleum Act 1934.

2. What Happened

An Indian flagged tanker was undergoing repairs that included renewal of sections of the Inert Gas (IG) pipeline on main deck at the Port of Chennai at repair berth since 30th October 2023 after taking the necessary permissions from Port authorities and PESO. Repairs were on going on the boiler and hence additional repairs were planned on the deck area by the onsite team.

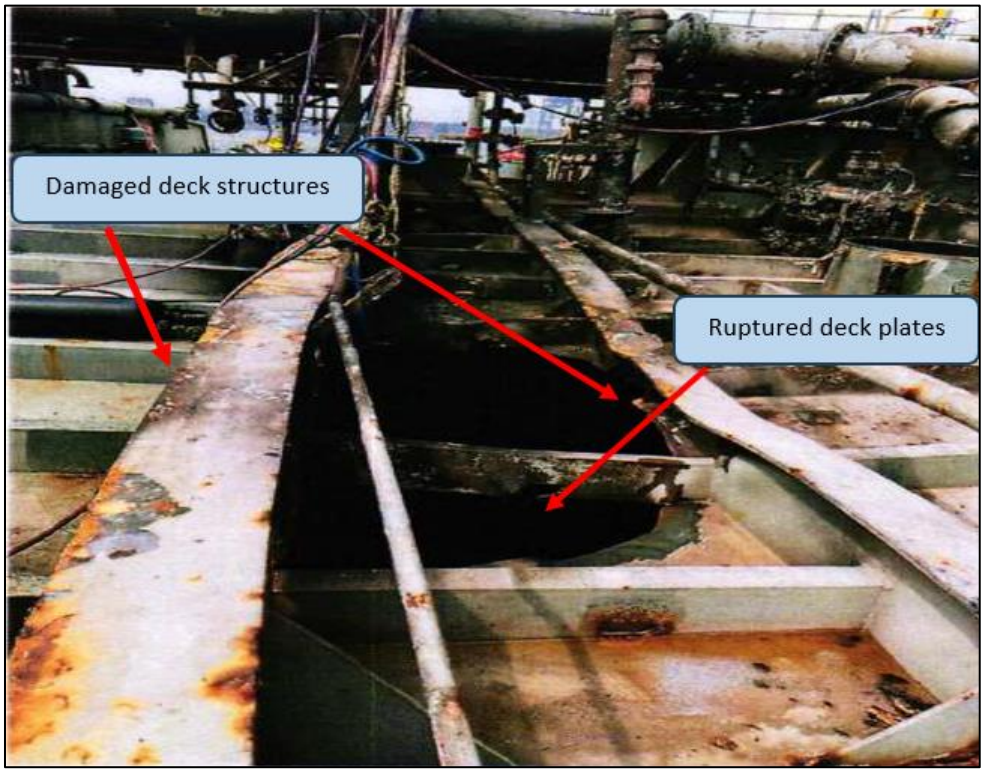

Figure 2: Damaged structural members on main deck

On 10th November 2023 at 0005 hrs. there was an explosion followed by fire on the tanker while the repairs were being carried out near the vicinity of Slop tank (port) which led to the fatality of one shore personnel and injuries to three others from the shore team. The vessel's tank dome and the internals of the Cargo Oil Tank No.7 (port) and Slop tank (port) were damaged and the main deck plating between Frame No. 49-50 were badly ruptured. There was no report of environmental pollution following the casualty or damage to the Port infrastructure following the incident.

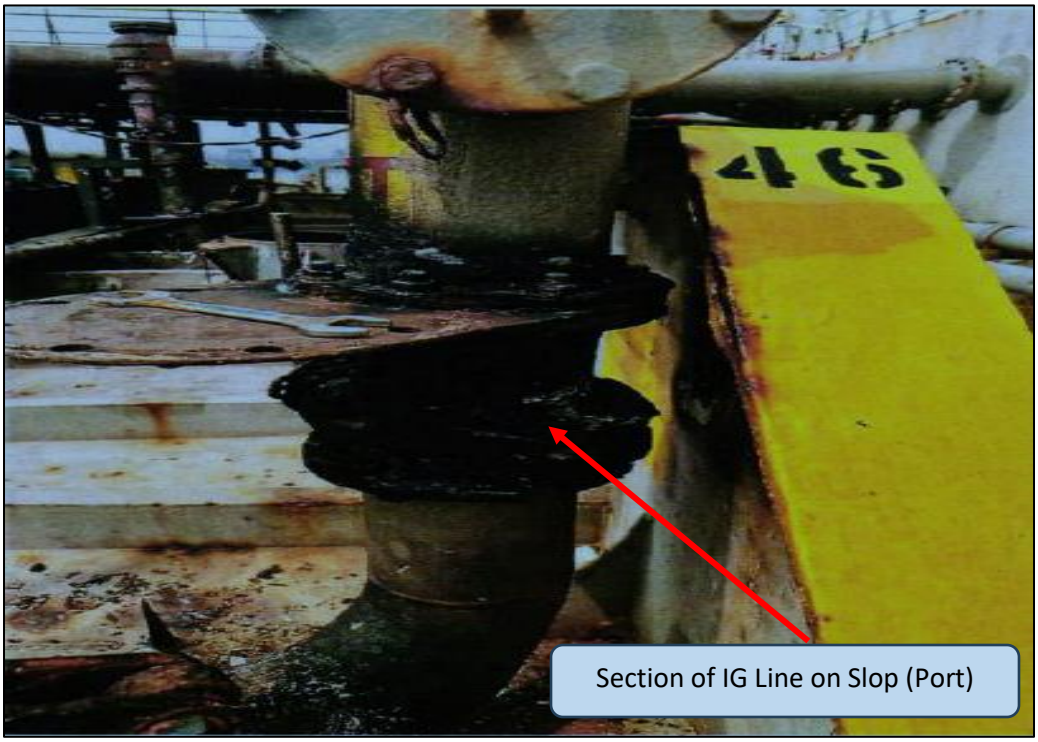

Figure 3: Section of Inert Gas line where unscheduled job was carried out

3. Why it happened

a. The vessel was sufficiently manned, held all required valid statutory certificates, and encountered moderate, cloudy, and occasionally rainy weather during the incident.

b. Gas freeing was not carried out as per industry standards as per ISGOTT due to non-availability of IG system[3] for purging since boiler was not operational.

c. All other cargo tanks were gas-freed before the vessel came to the repair port after discharging the cargo at Paradip. The tank washings were collected in the slop tank, which were later discharged ashore at the Port of Chennai. The cargo tanks were thereafter gas-freed by the introduction of fresh air in fresh air mode by IG blowers and the HC was brought below 1% Lower Explosive Limit (LEL)[4].

d. Due to non-availability of inert gas on board at berth, the tank cleaning & gas freeing operations of Slop P tank were carried out after checking that tank atmosphere was having HC less than 2% by Volume. As the vessel did not have inert gas, the only condition

[3] As per ISGOTT Ch. 1.4.11 Inert Gas is principally used to control cargo tank atmospheres to prevent the formation of flammable mixtures. The key requirement for IG is low oxygen content.

[4] The concentration of a hydrocarbon gas in air below which there is insufficient hydrocarbon to support and propagate combustion, sometimes referred to as Lower Explosive Limit (LEL)

applicable in this instance would be ('Non-Inerted ships')[5] and vessel was required to take precautions thereof. However, vessel carried out tank cleaning and gas freeing using HC content of less than 2% by volume instead of 10% LEL during this operation.

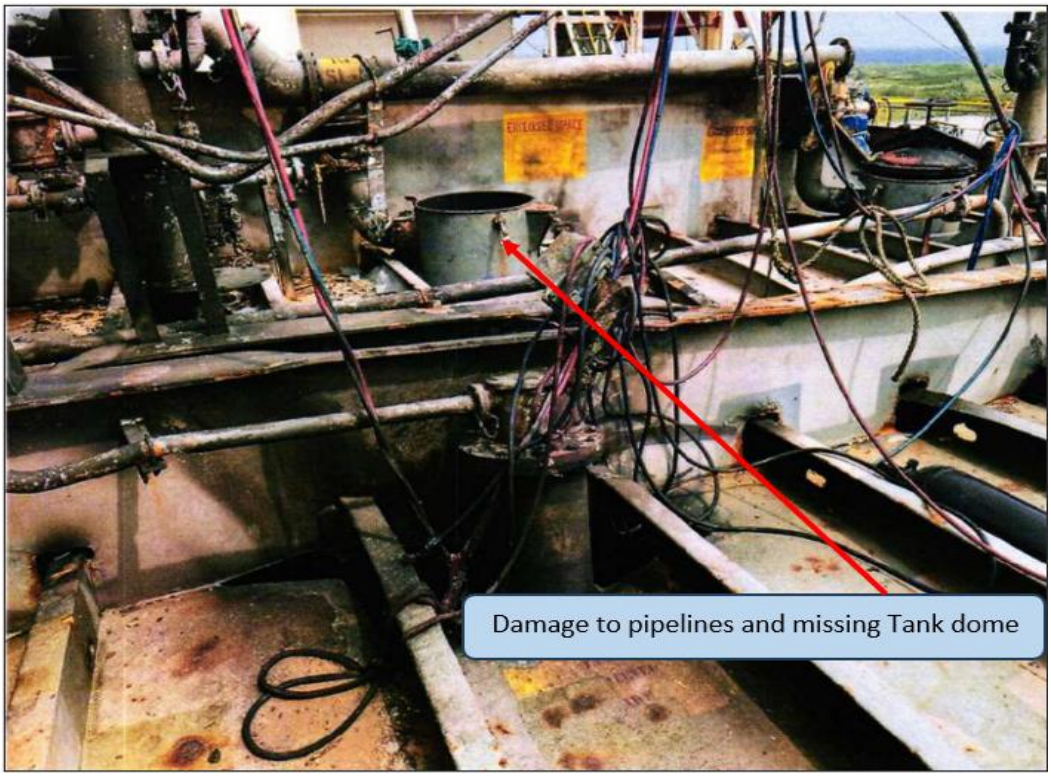

Figure 4: Extent of damage on main deck

e. While de-slopping the last tank (typically the Slop (P) tank), the tank was also water-washed in an open cycle by drawing water directly from the sea chest. During this process, the tank residues were continuously discharged ashore via the MARPOL line using the stripper pump. It is recommended that this washing be carried out with (hot water) using the tank cleaning heater to ensure proper Cleaning, adequate drainage, and overall safety. Also, all the solid residues in the tank to be removed completely for undertaking Hot work.

f. It appears that the tank cleaning procedure was not performed effectively, resulting in the formation of gas pockets within the tank. Though the records indicated that vessel had

[5] As per ISGOTT Ch. 9.4.5.2 Tankers without an Inert Gas system: The compartment where hot work is to be done should be cleaned, gas freed to meet hot work requirements and continuously ventilated. Adjacent cargo tanks, including those positioned diagonally, should either have been cleaned and Gas freed to meet hot work requirements or completely filled with water.
All slops should be either removed from the ship or securely isolated in a closed and non-adjacent tank at least 30m from the hot work location. For this purpose, tanks located diagonally should be regarded as adjacent tanks. A non-adjacent slop tank should be kept closed, securely isolated from the vent main and isolated from the piping system far the duration of the hot work. Vapour or vent lines to the compartment should be ventilated to not more than 1% LFL and then isolated. The possibility of using an external source of Inert Gas (IG) should be considered.

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carried out 03 cycles of washing which were of 45 Minutes duration each, in-adequate isolation of Inert Gas line also contributed towards accumulation of gases in the inert gas pipeline.

g. Although a risk assessment[6] for the operation was conducted and signed by the Management team onboard, upon review, it was found to be insufficient for the operations performed, as it did not address the inherent risks associated with the entire operation. Additionally, neither the risk assessment nor the hot work permit approval was obtained from the Company.

h. The inquiry indicates that verification and oversight by company was still necessary because the superintendent was on board, and the local agent reportedly applied for the hot work permission to the Port Authorities.

i. It was also observed that the (hot work permit)[7] application submitted by the vessel to the Port lacked specific details and was not properly addressed by the Port. The Port issued the hot work permit for an extended duration and without verification of the appropriate conditions, based on the list of works provided by the Master.

j. Classification Society[8] (RO) IRS was not informed about the repairs on the vessel by the company.

4. Recommendations

The Preliminary Inquiry conducted by this Directorate has identified specific gaps in safety measures that may have contributed to the incident and resulted in the casualties. To prevent similar incidents in the future, stakeholders are strongly encouraged to consider the following recommendations and to update their Safety Procedures in Ports and shipboard Safety Management Systems (SMS) accordingly.

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[6] As per ISGOTT Ch. 4.2 A risk assessment can identify potential hazards, i.e., anything that may cause harm, and analyse the likelihood and severity of a hazard arising and the consequence of it happening.

[7] As per ISGOTT A document issued by a Responsible Person permitting specific Hot Work to be done during a particular time interval in a defined area.

[8] As per SOLAS Ch. IX-1 regulation 1. Recognized organizations or the classification society is a non-governmental organization that oversees and upholds technical standards for the construction and functionality of marine vessels and offshore structures

A. Compliance with International Safety Guide on Tankers and Terminals (ISGOTT) and Safety Management System (SMS)[9] procedures (Tank Cleaning – Gas Freeing):

Tank cleaning guidelines provided in the ISGOTT[10] need to be strictly adhered to. The concept of reducing the HC content to less than 2% volume does not provide an acceptable referral level for any hot work, when cargo tanks are not inerted. A provision of reduction to less than 10% LEL should be maintained. Further, detailed records of such critical operations shall be maintained for future reference where required.

B. Compliance with ISGOTT and SMS procedures (Hot-Work):

The Company's Safety Management procedures must be strictly followed at all times. The Ship's Master and crew are responsible for maintaining complete oversight of shore-based workshops and subcontractors to ensure the safety and regulatory compliances of hot work operations conducted onboard the vessel during repairs at port berths. This is distinct from dry-docking facilities, where the shore fire team oversees safety. Emphasis should be placed on documenting Risk Assessments and the Office's responses for such repair activities, with all necessary approvals carefully maintained.

C. Critical Importance of Proper Isolation and Ventilation:

When performing hot work or any maintenance on systems connected to potentially hazardous areas like Slop tanks, it is essential to ensure that all pipelines, inlets, and tank domes are properly closed or isolated before starting work. This is to prevent dangerous atmospheric conditions, such as flammable gases or lack of oxygen, from affecting the workspace. Leaving tanks open to the atmosphere, especially when connected to other systems (such as IG piping), creates a high-risk environment that could lead to serious safety incidents.

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[9] Company's safety management system ensures compliance with the rules and guidelines of the ISM. The requirement of this code is applied to all kinds of ships and highlights the company's environmental protection policy.

[10] As per ISGOTT Ch.12.3.5.2 non-inert cargo tanks washing should only be done when both the source of ignition and the flammability of tank atmosphere are controlled to do this as per above

As per ISGOTT Ch.9.10.10 Cargo and associated lines all cargo lines, Crude Oil washing lines and stripping lines to slops to be well drained to be cleaned, well stripped and drained.

D. Adjust Washing Protocols, Assess Cleaning Equipment and Techniques

The current washing protocol adopted by vessel, involving 3 cycles for a duration of 45 minutes each should be reviewed to ensure it is adequate for effectively cleaning the Slop Port Tank. It may be beneficial to assess the efficiency of the washing process and determine if more cycles or longer durations are needed to ensure the tank is thoroughly cleaned and free from hazardous residues. After completing the washing cycles, conduct a thorough check to verify that the tank is free of any oil residues, flammable vapors or hazardous gases. This should be a mandatory step before any further maintenance, such as hot work, is carried out to avoid unsafe working conditions.

E. Document and Monitor Cleaning Procedures and Tank Conditions

The condition of the tank before, during, and after cleaning, using gas detection devices to ensure safe working conditions shall be continuously monitored. Detailed records of the washing cycles, duration, and any issues encountered during the cleaning process are to be properly documented. Regularly review this documentation to assess whether the existing procedures are sufficient or need adjustments for future operations, ensuring both safety and efficiency.

F. Risk Assessment (RA): A comprehensive risk assessment[11] process must be conducted for vessels undergoing repairs at repair berths. This assessment should be tailored to the specific tasks being performed and outline the necessary precautions to ensure safe execution. The risk assessment must also receive formal approval from the Company, with records properly maintained.

G. Hot work Permit: Shore hot work permits[12] issued to vessels should specify designated times for conducting repair tasks involving hot work, preferably limiting such activities to daylight hours. Exceptions may be granted by the Port Authority in cases of emergency, allowing work to proceed outside these hours with special permission.

[11] As per ISGOTT Ch 4.2.2 Risk assessment should consider the possibility of human errors introducing a hazard or a control failure. In this situation, Safety critical Task analysis (SCTA)[11] may be used to help prevent, detect or respond to human Errors.

[12] As per ISGOTT A document issued by a Responsible Person permitting specific Hot Work to be done during a particular time interval in a defined area.

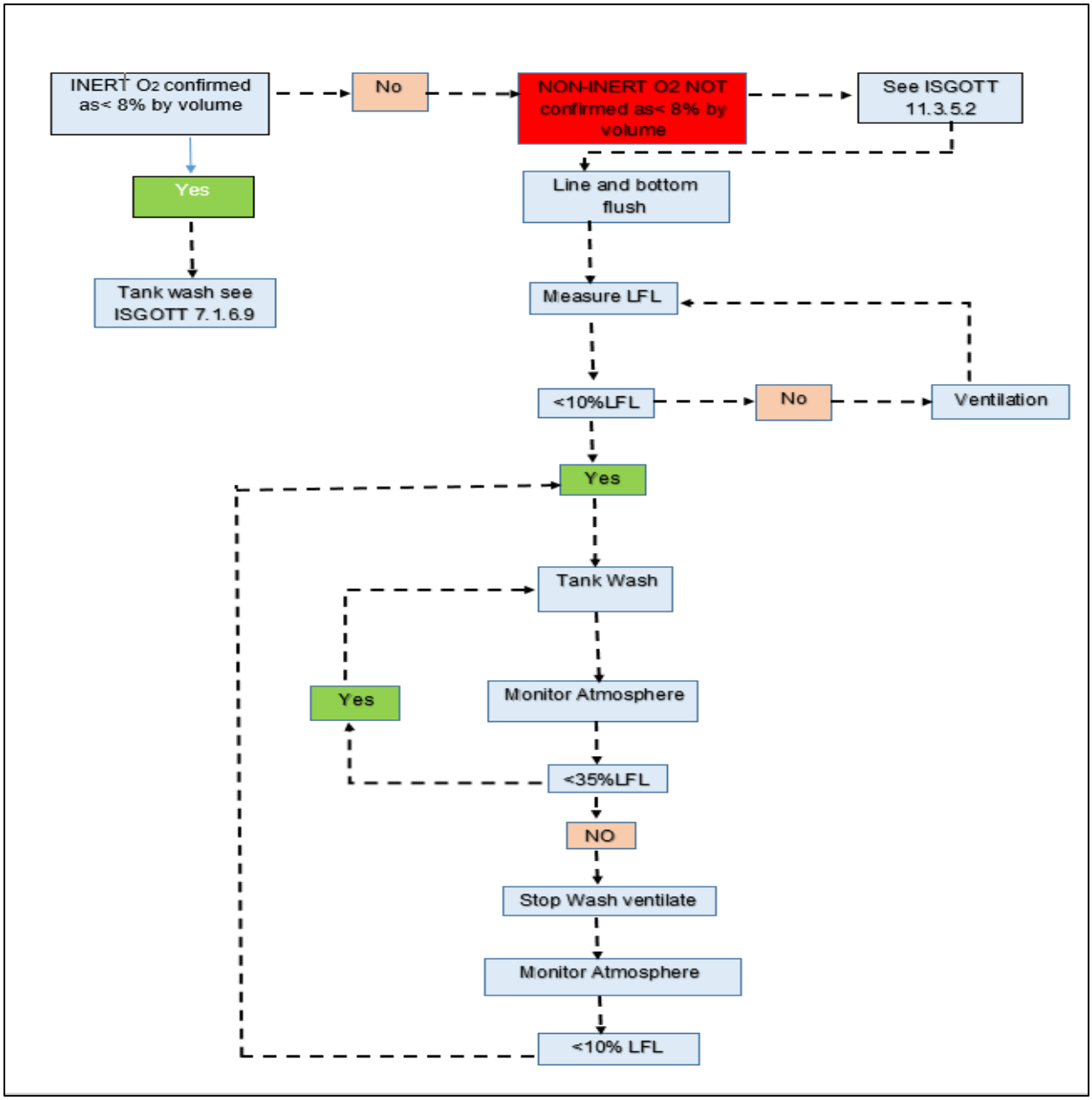

Figure 5: Flow chart showing steps to control the 'fuel' while tank washing in the non-inert tank atmosphere

H. Frequent Atmosphere Monitoring in Tanks and designated areas[13]: Ship staff must perform regular atmospheric checks in accordance with standard industry guidelines to verify that the areas designated for hot work and adjoining tanks / spaces are safe for workshop personnel to carry out their assigned tasks.

[13] ISGOTT chapter 12.4.4 Test the atmosphere regularly during gas freeing to monitor progress. Test at several level and each compartment of the tank if it is subdivided by bulkhead[13] in large compartment tests at widely separate positions.

I. **Job Planning:** Comprehensive planning[14] must be undertaken for major tasks, with a clear action plan developed and responsibilities assigned to all stakeholders involved.

J. **Notification to Classification Society:** All extensive repairs to auxiliary machinery must be reported to the vessel's Classification Society to ensure their approval and attendance and verification of the repair work.

K. **Management of Workshop Personnel:** Workshop personnel engaged in vessel repairs must be closely supervised[15]. Ship staff should conduct regular meetings with all workshop personnel on board to ensure they are fully informed about ongoing repair activities and the associated safety measures. The assignment of additional Safety Supervisors should also be considered to enhance safety during extensive repair work.

L. **Role of Port Authorities:**

(i) The execution of hot work in high-risk environments requires strict adherence to clearly defined procedures and protocols, as outlined in Industry standards such as ISGOTT guidelines and mandatory Company SMS procedures.

(ii) Ports should establish specific protocols for vessels performing repair work at berths, as the generic permissions granted did not account for the unique hazards posed by tankers.

(iii) The Port Fire Department must conduct regular inspections to ensure that fire safety guidelines are consistently followed throughout the duration of the repair work on the vessel.

(iv) Nighttime cutting and welding work should be prohibited at cargo or repair berths on Tankers where adequate facilities for such operations are limited.

(v) Port Hot Work Permits should be limited in duration, particularly for hazardous or potentially dangerous vessels undergoing repairs at port facilities.

(vi) Port officials must exercise thorough due diligence before issuing hot work permits to hazardous or potentially dangerous vessels.

(vii) ChPA should conduct internal procedural reviews to prevent the recurrence of similar incidents in the future.

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[14] As per ISGOTT Ch. 9.10.7 Work planning meeting should be held before starting any work and on each workday. They normally involve representative from ship and contractors. These meeting ensures all are aware about daily schedules and interrelation ship between contractors, area of concerns and any precautions, including permit requirement and method of control.

[15] As per ISGOTT Ch. 9.7 the master should be satisfied that when contractors or work gangs are employed arrangements are made to ensure they understand and comply with all relevant safe working practices. A formal safety induction should be completed. A responsible officer should supervise and control contractors

M. Role of PESO:

(i) The certificate[16] should be issued to the vessel only after a thorough physical verification of the cargo spaces, and should not rely solely on the Master's statements.

(ii) Atmosphere checks must be conducted directly by PESO, and should not be based on the Master's submissions.

(iii) PESO should perform internal procedural reviews to prevent the recurrence of such incidents in the future.

N. Classification Society:

(i) It has been noted from previous IRS visit reports and correspondence between the company and IRS surveyors prior to the incident that the vessel had an issue with a leaking boiler water tube before the Paradip cargo discharge. However, no PR 17 was raised by the classification society, nor was a Major Non-Conformity identified or an additional SMC issued by Class, despite evidence of a failure in the Safety Management System (SMS).

(ii) The vessel underwent a class special survey, renewal statutory surveys, and dry-docking in August 2022, along with annual surveys in August 2023 by the Recognized Organization (RO).

(iii) The quality of the surveys should be scrutinized, as annual endorsements were given despite the need for significant repairs, such as the renewal of pipelines on the main deck of an oil tanker within three months.

O. Company Action on preventive recurrence of safety incidents:

(i) **Afloat & Layby Berth Repairs:** Safety procedures for hot work during repairs were reviewed and implemented, requiring safety team approval for afloat repairs. Safety Procedures for approval by Safety team was in the SMS however same was not complied with.

(ii) **Fleet Safety Assessment:** A fleet-wide safety assessment was conducted, including an additional management review meeting in December 2023.

(iii) **Hot work Approval System**: Hot work in designated areas now requires centralized approvals from the ISM department.

[16] "This certificate states the condition of the tanks, compartments etc.only.at the time of test, even though the gas free condition is expected to continue for some time, and it gives no assurance that it will remain gas free".

(iv) **Safety Campaign:** A Concentrated Inspection Campaign (CIC) focused on hot work procedures to ensure SMS compliance.

(v) **Training:** Training programs, including computer-based, video-based sessions and development of course for Training staff were implemented to ensure SMS awareness. The company also partnered with a leading content creator for enhanced digital training.

These recommendations are applicable to all vessels at Indian ports and to all Indian ports and any non-compliance with these guidelines will attract appropriate action. All the ports are required to develop and implement the Standard Operating Procedure and Safety Protocols to avoid recurrence of such incidents in future.

This is issued with the approval of the Competent Authority.

(Capt. Harinder Singh)

Nautical Surveyor and Dy. Director General of Shipping (Tech.)

Details of the Ship

Particular	Details
Name /Flag	M.T. Patriot / India (Ex Name-Ceylon)
Hull Number	5138
Type	Oil Tanker /Product Carrier
Imo No	9242156
Call sign	VTEB
GRT	28099
NRT	11613
DWT	46001
LOA	179.88 m
LBP	172.00 m
Beam	32.20 m
Depth	18.70 m
Draft summer	12.022 m
Built	M/s Shin Kurushma Dockyard Co Ltd ,Ehime prefecture Japan
Flag	India
Owner	Seven Island Shipping Limited, Mumbai
P&I	North of England
Local agents	M/S Atlantic Shipping
Class	Indian Register of shipping
Cargo & Quantity	Nil
Main Engine	B&W,6550MC-C
Bottom hull /Ship Side Color	Blacktop-Red Bottom
SMT	+0530 Hrs. in SMT / IST