

Report of Investigation
into the fatal accident on board
the Hong Kong registered ship
“Saga Monal”
on 2 May 2007



The Hong Kong Special Administrative Region
Marine Department
Marine Accident Investigation Section

Purpose of Investigation

This incident is investigated, and published in accordance with the IMO Code for the Investigation of Marine Casualties and Incidents promulgated under IMO Assembly Resolution A.849(20). The purpose of this investigation conducted by the Marine Accident Investigation and Shipping Security Policy Branch (MAISSPB) of Marine Department is to determine the circumstances and the causes of the incident with the aim of improving the safety of life at sea and avoiding similar incident in future.

The conclusions drawn in this report aim to identify the different factors contributing to the incident. They are not intended to apportion blame or liability towards any particular organization or individual except so far as necessary to achieve the said purpose.

The MAISSPB has no involvement in any prosecution or disciplinary action that may be taken by the Marine Department resulting from this incident.

Table of Contents		Page
1	Summary	1
2	Description of <i>the Vessel</i>	2
3	Sources of Evidence	4
4	Outline of Events	5
5	Analysis of Evidence	6
6	Conclusions	11
7	Recommendations	12
8	Submissions	13
9	Appendix	14

1. Summary

- 1.1 An accident happened onboard the Hong Kong registered ship "*Saga Monal*" while she was on voyage from New Orleans to Santos on 2 May 2007. The Chief Engineer found unconscious inside the oily bilge tank by an engine room wiper. He was certified dead by the Master of "*Saga Monal*".
- 1.2 The investigation revealed that the enclosed oily bilge tank was not properly ventilated prior to the entry of the Chief Engineer. He was overcome by the oxygen deficient atmosphere inside the oily bilge tank.
- 1.3 The investigation has also identified the following contributory factors to the accident:
 - The communication between the engine staff was inadequate. The Chief Engineer did not discuss with or seek assistance from engine staff prior to the entry of the oily bilge tank;
 - Lack of safety awareness in general. The Chief Engineer was not fully aware of the risks associated with entry into confined space; and
 - Procedures of the safety management for entry into confined space were not followed.

2. Description of the Vessel

a) Particulars of *the Vessel*

Name of the Vessel : " *Saga Monal* "
Port of Registry : Hong Kong
IMO No. : 9117739
Official No. : HK- 1246
Call Sign : VRZQ9
Classification Society : Det Norske Veritas
Type of Ship : General Cargo Ship
Year of Built : 1997
Built At : Mitsui Engineering & Shipbuilding Co., Ltd. Tamano Works.
Ship Manager : Patt, Manfield & Co. Ltd., Hong Kong
Length : 199.90 metres
Breadth : 32.20 metres
Depth : 19.50 metres
Gross Tonnage : 36,463
Net Tonnage : 16,961
Engine Power : 13,130 kW



Figure 1: M.V. "*Saga Monal*"

- b) "*Saga Monal*" (hereinafter referred as *the Vessel*), a double hull, eleven-hold general cargo ship built by Mitsui Engineering & Shipbuilding Co., Ltd. Tamano Works, Japan in 1997. She is powered by a six-cylinder marine diesel engine B & W 6 S 60 MC, capable of developing engine power of 12,130 kW. *The Vessel* was owned by Attic Forest AS, Norway and managed by Patt, Manfield & Co. Ltd, Hong Kong. (hereinafter referred as *the Company*). At the time of the accident, *the Vessel* was chartered by Saga Forest Carriers, Tonsberg Norge, Norway.

- c) *The Vessel* is fitted with two gantry cranes that run on fixed rails. Each gantry crane has a lifting capacity of 40 tonnes.

3. Sources of Evidence

- a) The Master and Crewmembers of “*Saga Monal*”
- b) Patt, Manfield & Co. Ltd., Hong Kong , the management company of “*Saga Monal*”

4. Outline of Events

- 4.1 *The Vessel* sailed from New Orleans, USA on 21 April 2007 for Santos, Brazil.
- 4.2 On 2 May, *the Vessel* was at her service speed in the approximate position 17° 15'S 34° 26'W. At about 0800, the Chief Engineer started his work as usual, entered the engine room for supervising day work in the engine room.
- 4.3 At 0820, the Chief Engineer instructed the Wiper to open a manhole of an oily bilge tank without giving any reasons. After the Wiper had opened the manhole, he returned to his engine room duties.
- 4.4 All engine room staff were busy at their respective work in the engine room, the Chief Engineer did not request any assistance from them. Nobody knew that he had requested the Wiper to open the manhole of the oily bilge tank.
- 4.5 At 1205, the engineers had problems with a generator and tried to inform the Chief Engineer but could not find him. At about 1210, the Wiper remembered that he had opened the manhole of the oily bilge tank for the Chief Engineer, so he proceeded to the oily bilge tank and found the Chief Engineer lying unconsciously on a side frame inside the tank.
- 4.6 The Wiper immediately informed the engineers and the officers. They raised the general alarm and made announcement to seek assistance to all ship staff via the public address. A rescue team was set up and one crewmember picked up a breathing apparatus and entered the oily bilge tank to lift the Chief Engineer out from the tank. First aid was applied but the Chief Engineer showed no sign of life. He was certified dead by the Master at 1300.

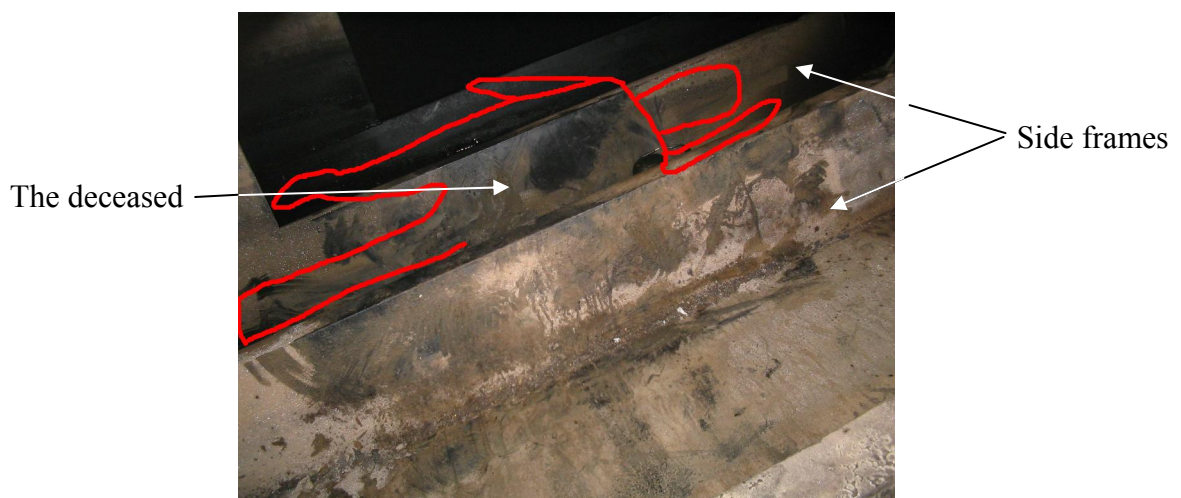


Fig. 2: The Chief Engineer was found collapsed inside the oily bilge tank

5. Analysis of Evidence

The Engine Room Staff

- 5.1 The Engine Department of *the Vessel* consisted of nine engine room staff. A Chief Engineer, a Second Engineer, a Third Engineer, a Fourth Engineer, an Engine Cadet, two Electricians, a Wiper and an Oiler. The Chief Engineer was British while the others were Filipinos.

The Chief Engineer

- 5.2 The Chief Engineer was a male of age 54. He held a British Certificate of Competency as chief engineer for motor ship. He had served as chief engineer for more than ten years. He first joined *the Vessel* on 1 April 2004 and had served on board *the Vessel* for four contracts of 4 to 6 months durations. According to *the Company*, he was an experienced chief engineer.

Oily bilge treatment

- 5.3 *The Vessel* had experienced problems in discharging engine room oily bilge to the required standard with the oily water separator. It was reported that the engine room bilge had always been emulsified into finely dispersed liquid that could not be handled by the oily water separator. *The Company* had supplied a chemical named “Nalfleet Ultrion 71225” to *the Vessel* to treat the engine room bilge in April 2007. After the incident, the crew found that about eight litres of the chemical had been consumed, which was sufficient to treat 26.7 m³ to 160 m³ of oily bilge. However, there was no record of such chemical dosage into any tank. A few days before the accident, the Chief Engineer mentioned to the Master that he had treated the double bottom bilge holding tank that contained 26.4 m³ oily bilge with the chemical but with unsatisfactory result. It is believed that the Chief Engineer applied the chemical dosage into the oily bilge tank for better result. He probably intended to check the degree of dispersion of the emulsion after the chemical treatment through the opened manhole door of the oily bilge tank.
- 5.4 “Nalfleet Ultrion 71225” is a chemical product of the Nalco Company, a British registered company producing various chemicals for marine use. The chemical is used to demulsify the emulsified oily bilge and allowing the oil in the oily bilge to be removed by the oily water separator. According to the Material Safety Data Sheet provided by the Company of the chemical product, “Nalfleet Ultrion 71225” is a liquid blend contains water, aluminium salts and polymer. The product does not have apparent inhalation hazard. It appeared that the death of the Chief Engineer was not related to the chemical

properties of the “Nalfleet Ultrion 71225”

The Oily bilge tank

- 5.5 The oily bilge tank has a capacity of 25.90 m³, it is located at port side tank top of the engine room between frame numbers 30 and 33. A manhole is fitted on top of the tank for maintenance and inspection. A ventilation pipe is fitted on top of the tank leading up to upper deck. At the time of the accident, the oily bilge contained 8.3 m³ of oily bilge with a tank sounding of 1.84 m.

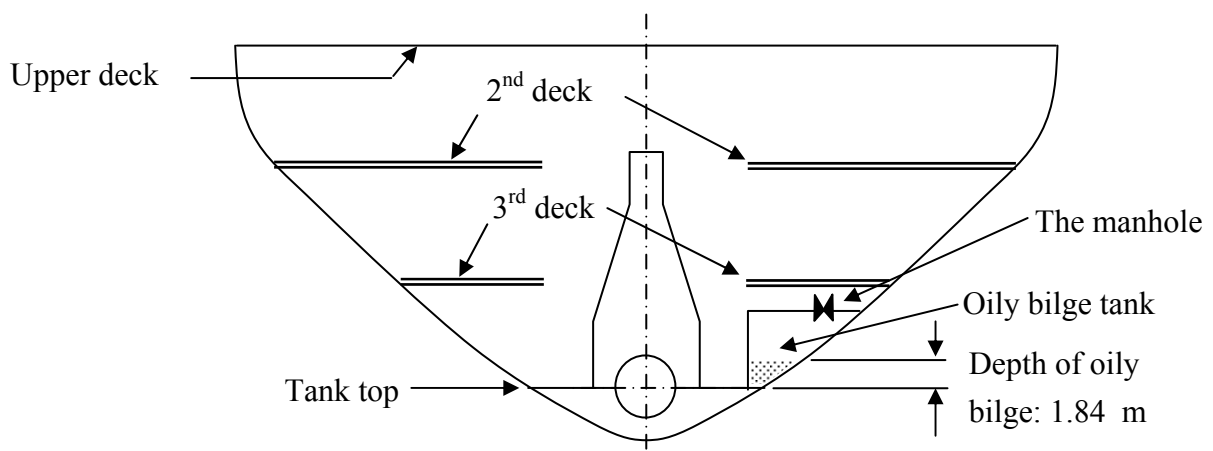


Figure 3 : Location of the oily bilge tank (Looking aft)

- 5.6 The outboard side plate of the oily bilge tank was a part of the shipside shell that fitted with a number of longitudinal side frames. The side plate flared out from bottom to top and the manhole was situated near port side shell of the ship (see figure 3). People could get into the oily bilge by stepping on the side frames. It is believed the Chief Engineer tried to get entry into the tank via the side frames to check whether the oily bilge was effectively treated there. However, he was not aware that it was risky to enter the tank without observing any safety precautions.
- 5.7 The oily bilge tank contained 8.3 m³ of engine room oily bilge. Signs of rusting were found at the sides. The oily bilge contained oil, seawater, pollutants and bacteria that could absorb oxygen due to chemical changes. Corrosion on steel plates could also deplete the oxygen inside the tank. The tank would have remained closed and unventilated for long periods before the accident. The tank was a confined space and the atmosphere inside

probably became deficient in oxygen. After the accident, the oxygen content at the manhole opening position was found to be 16% by volume. It is believed that the oxygen content inside the tank at the time of the accident was well below the 16% and the atmosphere inside the tank was lethal to personnel.

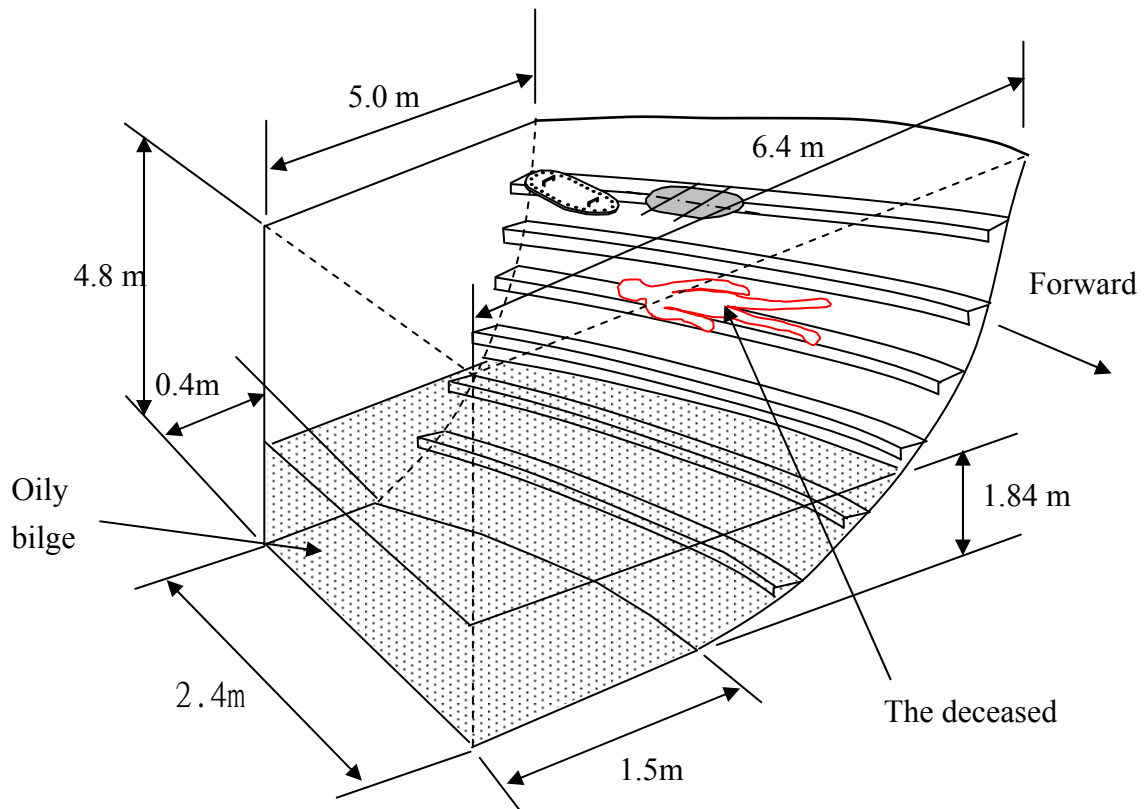


Fig 4: Details of the oily bilge tank

Communication

- 5.8 Apart from instructing the Wiper to open the oily bilge tank, the Chief Engineer did not inform or request assistance from the other engine room for the entry into the oily bilge tank. It appeared that the communication between the Chief Engineer and the engine room staff was inadequate, as no one knew the reason to open the manhole of the oily bilge tank.

Code of Safe Working Practices for Merchant Seamen

- 5.9 According to chapter 17 of the Code of Safe Working Practices for Merchant Seamen, the atmosphere of any enclosed or confined space is potentially dangerous. There could be a

deficiency of oxygen in the space or presence of toxic vapours or fumes. Procedures for entry into any confined space should be observed for personal safety.

Shipboard Safety Management Manual

5.10 The Shipboard Safety Management Manual (SMM) stipulates following requirements before entry of enclosed spaces or confined dangerous spaces:

“Tanks, holds, hatch access trunks, void spaces, double bottoms, duct keels, pump rooms, cofferdams, chain lockers, CO₂ rooms, sewage tanks, pressure vessels, battery lockers, inter barrier spaces, IG scrubbers, etc.

Entering any confined space is hazardous and can result in rapid death from harmful gases and/or lack of oxygen...

The Master or Chief Mate MUST ensure that it is safe to enter an enclosed space by:

- 1. Identifying potential hazards.*
- 2. Ensuring the space is prepared for entry and has been thoroughly ventilated by natural or mechanical means.*
- 3. Testing the atmosphere of the space at different levels for oxygen deficiency and harmful vapour (where suitable instruments are available).*
- 4. Ensure procedures are instituted before and after entry. If any doubt as to adequacy of ventilation or testing ensure breathing apparatus is worn by all persons entering the space.*
- 5. Ensuring Officer and crew on watch carry a pocket size oxygen content meter. ...*

In all cases and prior to entry the enclosed space checklist must be completed (see the checklist in the appendix). Whenever entry is first made into a recently opened tank/hold there should be a qualified man positioned on deck tending the required life line and monitoring the situation. ...”

According to the SMM, the oily bilge tank, is identified as enclosed or confined dangerous spaces. It appeared that the following safety procedures had not been observed:

- The responsible persons as per the SMM i.e. the Master or the Chief Officer had not been informed prior to the entry of the oily bilge tank;

- The oily bilge tank had not been thoroughly ventilated and tested; and
- The “enclosed space checklist” had not been completed and the officer failed to implement the safety procedures for working in an enclosed space.

Cause of death

5.11 Autopsy of the deceased was conducted by Regional Forensic Office of Santos. The cause of death was “Acute Respirator Failure” resulting from lack of oxygen.

Similar cases

5.12 On 18 November 2003 and 16 November 2006, similar fatal accidents happened on board vessels “*Saga Voyager*” and “*Saga Spray*” respectively. Both the two vessels were also managed by *the Company*. It appeared that the safety management system of *the Company* is not effectively implemented.

6. Conclusions

- 6.1 An accident happened onboard *the Vessel* while she was on voyage from New Orleans to Santos on 2 May 2007. The Chief Engineer found unconscious inside the oily bilge tank by the Wiper. He was certified dead by the Master of *the Vessel*.
- 6.2 The investigation revealed that the enclosed oily bilge tank was not properly ventilated prior to the entry of the Chief Engineer. He was overcome by the oxygen deficient atmosphere inside the oily bilge tank.
- 6.3 The investigation has also identified the following contributory factors to the accident:
 - The communication between the engine staff was inadequate. The Chief Engineer did not discuss with or seek assistance from engine staff prior to the entry of the oily bilge tank;
 - Lack of safety awareness in general. The Chief Engineer was not fully aware of the risks associated with entry into confined space; and
 - Procedures of the safety management for entry into confined space were not followed. It should be noted that even the Chief Engineer, the head of the engine department, did not follow the required procedures stipulated in the SMM for entry into confined spaces.

7. Recommendations

- 7.1 A copy of this report should be sent to the Master and *the Company of the Vessel*, advising them the findings of this incident. Their attention is also drawn to the lessons learnt promulgated from the Hong Kong Merchant Shipping Information Note No. 30/2004. The Master and *the Company* should provide adequate and effective supervision to their vessels to ensure that the safety management system is effectively implemented, in particulars:
- Provide adequate training for confined space entry for all ship's staff; and
 - Ensure all the ship's staff to follow procedures of the safety management system.
- 7.2 The attention of ISM Section of the Marine Department should be drawn on the findings of the report and to consider taking appropriate measures to prevent the recurrence in future. This is the third similar case for ships managed by *the company* in 4 years.

8. Submissions

- 8.1 In the event that the conduct of any person or organization is criticized in a casualty investigation report, it is the policy of the Hong Kong Marine Department that a copy of the draft report is given to that person or organization so that they have the opportunity to rebut the criticism or offer evidence not previously available to the investigating officer.
- 8.2 The final draft report was sent to the following parties:
 - a. Patt, Manfield & Co. Ltd;
 - b. The Master of *the Vessel*; and
 - c. The International Safety Management Section, Marine Department.
- 8.3 No submission was received from them.

PATT MANFIELD & CO. LTD.
SAFETY MANAGEMENT MANUAL

Issue Date: 7th January, 2004
Issue Status: Issue 2
Authorisation: Yung Man - Tak

**ENTRY INTO ENCLOSED/DANGEROUS SPACE
CHECKLIST**

<u>ACTION CHECK LIST</u>	DELETE AS APPLICABLE
<p>Before entry into an enclosed space the appropriate safety checks listed below must be carried out by the Officer on Duty AND by the person who is to enter.</p> <p>NB For entry into cargo pumprooms only those items marked with an asterisk need to be checked. Date: Time:</p> <p>Section 1</p> <p>The safety of personnel requires all questions be answered affirmatively. To be checked by the Master or Chief Officer.</p> <p>1.1 Has the space been properly ventilated and tested where equipment is available and found safe? YES/NO</p> <p>1.2 Have arrangements been made to continue ventilation during occupancy of the space and at breaks? YES/NO</p> <p>1.3 Have arrangements been made to repeat, where applicable, testing at regular intervals during occupancy and after breaks? YES/NO</p> <p>1.4 Are rescue and resuscitation equipment available for immediate use at the entrance to the space? YES/NO</p> <p>1.5 Have arrangements been made for a responsible person to be in constant attendance at the entrance to the space? YES/NO</p> <p>1.6 Has a system of communication between the person at the entrance and those entering the space been agreed and tested? YES/NO</p> <p>1.7 Are access and illumination adequate? YES/NO</p> <p>1.8 Are portable lights and other equipment to be used of an approved type? YES/NO</p>	<p>DELETE AS APPLICABLE</p> <p>YES/NO</p> <p>YES/NO</p> <p>YES/NO</p> <p>YES/NO</p> <p>YES/NO</p> <p>YES/NO</p> <p>YES/NO</p> <p>YES/NO</p> <p>YES/NO</p>
<p>Section 2</p> <p>To be checked by the person who is to enter the space after the relevant checks in Section 1 have been made:</p> <p>2.1 Have you been given instructions or permission by the Master or chief Officer to enter the space? YES/NO</p> <p>2.2 Are you satisfied all relevant checks in Section 1 have been completed? YES/NO</p> <p>2.3 Are you aware you should leave the space immediately in the event of failure of the ventilation system? YES/NO</p> <p>2.4 Do you understand the arrangements made for communication between yourself and the responsible person in attendance at the entrance to the space? YES/NO</p>	<p>DELETE AS APPLICABLE</p> <p>YES/NO</p> <p>YES/NO</p> <p>YES/NO</p> <p>YES/NO</p>
<p>Section 3</p> <p>Where breathing apparatus is to be used, this section must be checked jointly by the Chief Officer and the persons who are to enter the space.</p> <p>3.1 Are you familiar with the apparatus to be used? YES/NO</p> <p>3.2 Has the apparatus been checked as follows? YES/NO</p> <p style="margin-left: 20px;">(a) Adequacy of air supply; YES/NO</p> <p style="margin-left: 20px;">(b) Low pressure audible alarm; YES/NO</p> <p style="margin-left: 20px;">(c) Face masks, air supply and tightness? YES/NO</p> <p>3.3 Have the emergency signals and other emergency arrangements been agreed? YES/NO</p> <p>3.4 Has "ENCLOSED SPACE - POTENTIAL HAZARD" notice been displayed? YES/NO</p> <p>Where instruction have been given that a responsible person be at the entrance to the space, the persons entering the space should show him their completed card before entering.</p> <p>Those entering an enclosed space should always wear appropriate protective equipment and avoid loose fitting clothing which might snag on obstructions.</p>	<p>DELETE AS APPLICABLE</p> <p>YES/NO</p> <p>YES/NO</p> <p>YES/NO</p> <p>YES/NO</p> <p>YES/NO</p> <p>YES/NO</p>