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REPORT MARINE 2022/06

***Work accident on board 'Stavanger Bliss'
off Yeosu in South Korea on
5 November 2020***

The Norwegian Safety Investigation Authority (NSIA) has compiled this report for the sole purpose of improving safety at sea.

The object of a safety investigation is to clarify the sequence of events and causal factors, elucidate matters of significance for the prevention of maritime accidents and improvement of safety at sea, and to publish a report with possible safety recommendations. The NSIA shall not apportion any blame or liability.

Use of this report for any other purpose than for improvements of the safety at sea shall be avoided..

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Notification of the accident

At 11:47 on Thursday 5 November 2020, the Norwegian Maritime Authority (NMA) notified the Norwegian Safety Investigation Authority (NSIA) of a work accident on board the oil tanker 'Stavanger Bliss'. The ship's captain had died after entering a cargo tank. The vessel lay at anchor off Yeosu in South Korea. The NSIA initiated an investigation into the accident on 9 November.

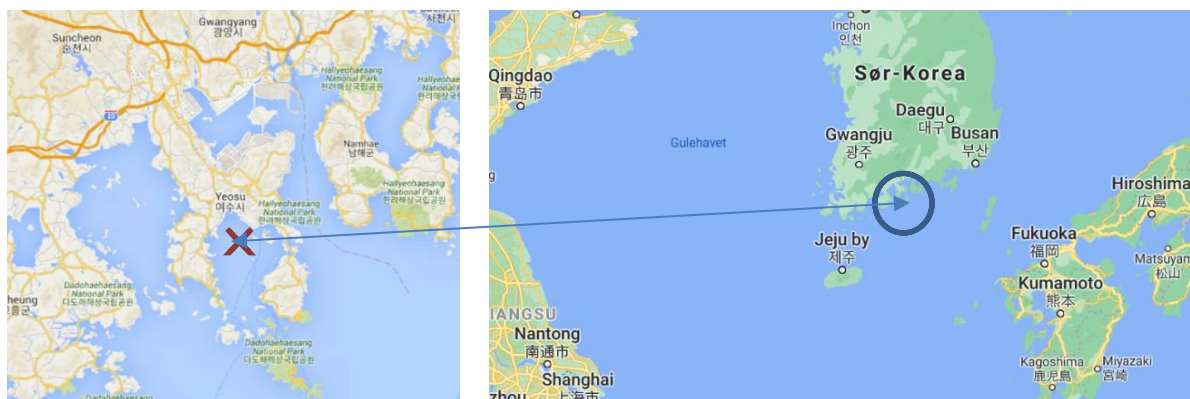


Figure 1: Accident site off Yeosu in South Korea. Map: Google Maps

Summary

On 25 October 2020, the oil tanker 'Stavanger Bliss' had completed unloading a cargo of oil in Dalian, China. The coronavirus pandemic had made it challenging for the management company Wallem to secure the relevant personnel at the right time. The vessel also had to deal with a coronavirus outbreak among the crew on board and did not have a functioning chief officer in the port of discharge, Dalian. The vessel had been granted dispensation from the Norwegian Maritime Authority (NMA) to sail with a reduced crew.

In connection with the unloading operation, the captain assumed the duties of the chief officer, and the 3rd officer was assigned the duties of the 2nd officer. A cargo surveyor from shore should have measured the tanks after unloading, but this was not possible due to coronavirus restrictions.

After departure Dalian, the captain received notice, in the form of a ROB claim, that the vessel had too much cargo remaining on board (ROB) after the unloading. The NSIA is of the opinion that the captain was concerned about this and wanted to check the ROB status in the tank despite plans being in place to inspect this later.

The captain died when he, alone, entered a cargo tank that had not been cleared for entry. The tank contained inert gas and the atmosphere was unsafe. The cause of death was a coronary infarct. It cannot be concluded with certainty that the coronary infarct was due to carbon monoxide poisoning.

The bosun attempted to use the Stop-Work-Authority (SWA) card in accordance with the company's procedures before the captain entered the tank, but it did not work as a barrier to prevent him from doing so.

The shipping company had established tank entry procedures, which clearly set out that entering tanks with an unsafe atmosphere was not permitted. It is unclear why the captain nonetheless decided to enter the tank.

The NSIA is of the opinion that the many challenges facing the captain and crew on board during the period created an extraordinary situation that affected the decisions that were made and thus contributed to the accident arising.

Following the accident, the shipping company has implemented several measures to prevent similar accidents. The NSIA will therefore not submit any safety recommendations following this accident.

About the investigation

Purpose and method

The NSIA has classified the incident as very serious. The purpose of this investigation has been to determine possible causes to the accident, as well as the compensatory measures this management company has introduced in retrospect.

The accident and the circumstances surrounding it have been investigated and analysed in line with the NSIA's framework and analysis process for systematic safety investigations (the NSIA method¹).

Focus and delimitation of the investigation

The focus of the investigation has been on the management company's handling of ROB claims² from the recipient of an oil cargo. It has also looked at how the vessel's safety management system could have prevented entry of a tank with an unsafe atmosphere.

Sources of information

The factual information was based on interviews and conversations with personnel in the management company Wallem GmbH & Co KG in Hamburg (hereinafter referred to as Wallem), the owner DSD Shipping AS in Stavanger and relevant members of the vessel's crew. The NSIA did also have access to the management company's internal investigation report and the company's safety management system. Data from the vessel's Ship Voyage Data Recorder (S-VDR) have also been used in the investigation.

All times given in this report are local times (UTC + 9 hours) unless otherwise stated.

The investigation report

The first part of the report, 'Factual information', describes the sequence of events, related data and information gathered in connection with the accident.

The second part, the 'Analysis' part, contains the NSIA's assessment of the sequence of events and contributing causes based on factual information and completed investigations/examinations. Circumstances and factors found to be of little relevance to explaining and understanding the accident are not discussed in any depth.

The NSIA's conclusions are described at the end of the report.

¹ NSIA – Norwegian Safety Investigation Authority. See <https://www.nsia.no/About-us/Methodology>

² ROB claim – compensation for remaining cargo on board.

1. Factual information

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1. Factual information

1.1 Sequence of events

1.1.1 INTRODUCTION

The vessel left the port of discharge (Dalian, China) on 26 October 2020 for anchorage at OPL Yeosu in South Korea to await reloading.

After unloading of the tanker had been completed, the terminal in Dalian notified the charterer Teekay that approximately 2.76 per cent (987 metric tonnes) of the total cargo of Ruby crude oil loaded onto the vessel in Vietnam was missing. Due to the COVID-19 pandemic, a cargo surveyor had not been on board in Dalian to sound/measure the tanks, and the terminal was unsure of how much cargo remained on board (ROB).

After departure on 26 October, the charterer Teekay contacted the captain of 'Stavanger Bliss' claiming there had been a 'huge loss' of cargo that had not been unloaded in Dalian. The owner DSD Shipping AS had received the same information and informed the management company Wallem that day.

Wallem's operations superintendent contacted the captain of 'Stavanger Bliss' soon thereafter. The captain was informed that the cargo claim made by the terminal seemed exaggerated and therefore improbable. They talked about there being other cases of exaggerated cargo claims from the same terminal in Dalian. The operations superintendent and the captain therefore agreed to await the results of a joint inspection of the tanks by the surveyors from both bodies (charterer and owner). The conversation concluded with the captain being advised to focus on safely navigating the vessel through the traffic in the Korea Strait.

1.1.2 THE ACCIDENT

In the days following 26 October, 'Stavanger Bliss' was on its way from Dalian to the anchorage at OPL Yeosu. The captain had asked the pumpman on board to measure the relevant tanks at regular intervals to check their ROB status.

On Thursday 5 November 2020, the tanker had anchored at OPL Yeosu in South Korea. It was in ballast condition awaiting the signal to load. The 3rd officer and a junior officer were working the bridge watch.

At 07:50, the chief officer held a morning meeting with the deck crew, at which the day's work plans and control measures were reviewed. The tasks discussed were preparations for the next loading operation and general lubrication work.

At 08:57, the captain said to the junior officer on the bridge in their mother tongue, which was Russian, that he had observed zero ROB in the last port of discharge. However, as a result of the subsequent report of a huge amount of ROB, he went on to say, 'it doesn't look very good' and that 'there is too much ROB'. The captain also said that 'we missed something in the cargo heating'.

Earlier that morning, the captain and the chief officer had been in the cargo control room where they had discussed remaining cargo in the tanks with the pumpman, and the captain had said that he would like to enter the tanks to check. The captain initially wanted to open the number 3 starboard tank, but since it proved difficult to open, he wanted the number 2 port cargo tank opened instead.

At 08:59, the captain asked the pumpman to open the number 2 port cargo hatch. At 09:27, the tank was isolated from the inert gas (boiler flue gas) system. The crew opened the number 2 port cargo tank and transferred tank entry equipment.

At 09:39, the pumpman discussed the condition of the number 2 port cargo tank with the chief officer. The pumpman reported that the tank seemed very dry. They waited for the captain and were unsure of what he would want to do. The pumpman assumed that the captain would issue new instructions or that he would want to enter the tank. The chief officer responded that they would have a better idea of this when the captain arrived at the site. At 09:40, the chief officer told the pumpman to keep the hatch to the cargo tank open, but not swung open to the side. This instruction was followed.

At 09:41, the 3rd officer commented to the junior officer on the bridge; 'I can see that they're preparing to enter the tank. He [the captain] won't listen'.

After the coffee break at 10:15, the bosun, two able seamen and an ordinary seaman were preparing the mooring ropes on the forecastle. The chief officer of the watch being relieved, and the relieving chief officer were in the cargo control room testing the oil discharge monitoring equipment, as part of the handover between them. The chief officer of the watch being relieved had handed over responsibility to the new chief officer when he boarded the tanker in the last port of call.

The captain turned to the bosun and asked him to also open the hatch to the number 1 starboard cargo tank. The pumpman was in the pump room servicing the oil discharge monitoring equipment (ODME). At 10:40, the bosun observed the captain near the number 2 port cargo tank wearing a self-contained breathing apparatus (SCBA).

The bosun and the ordinary seaman ran over to the number 2 port cargo tank. Based on the company's internal tank entry procedures and the pertaining Stop-Work-Authority (SWA) policy, the bosun asked the captain to stop and to not enter the tank. The captain nonetheless entered the cargo tank at 10:41.

At 10:48, the bosun communicated with the captain on his handheld UHF radio while he was inside the tank to check how the captain was doing. At 10:58, the pumpman asked the chief officer on his UHF radio to come to the number 2 port cargo tank and told him that 18 minutes had passed since the captain entered the tank. According to the chief officer, his UHF radio had been set on low volume while he was in the cargo control room and he had not registered the whole of the first call due to excessive background noise. The chief officer then turned up the volume on his UHF radio and called up the pumpman. The pumpman told him that 18 minutes had passed since the captain had entered the tank, and that the crew members were very concerned because they were unable to establish contact with him.

At 11:00, the junior officer notified the 3rd officer on the bridge that the captain had told him on his UHF radio that he had started exiting the tank.

At 11:01, the chief engineer arrived on the bridge, and the junior officer informed him that the captain was down in the tank. The chief engineer then said, 'but there's inert gas in the tank' and asked if approval had been obtained from the management company.

1.2 The rescue operation

At 11:02, the chief officer was informed by a member of the crew that they had called the captain to ask him to exit the tank, but that he had not answered. The chief officer immediately went to the number 2 port cargo tank and, at 11:03, after becoming aware of the situation, declared an

emergency. At 11:06, the 'emergency situation' was announced on the public announcement (PA) system from the bridge.

At approximately 11:15, rescue team 1 (3rd officer and able seaman) entered the tank wearing breathing apparatus and found the captain unconscious on his back on platform 2. The captain's face mask had come loose, and they could detect no pulse or breathing. The SCBA set the captain had used had run out of air. Rescue team no 1 then left the tank because the seaman felt uncomfortable.

At 11:25, rescue team 2 (3rd officer and 2nd officer) entered the tank to retrieve the captain.

At 11:30, the deck crew, assisted by the 3rd officer and 2nd officer inside the tank, lifted the captain up and out of the tank using ropes. When the captain was out on deck, his condition was checked, but no pulse was observed or breathing detected. Cardio-pulmonary resuscitation (CPR) and oxygen resuscitation were administered immediately, but without a response.

At 11:45, the S-VDR recording indicates that the captain had been transferred to the ship's hospital.

At 11:50, the chief officer phoned the designated person ashore (DPA) to inform them of the incident.

The owner, DSD Shipping, was informed of the death by a duty phone call from Wallem Hamburg.

1.3 Injuries to persons

The captain died and the post-mortem report showed that the cause of death was a coronary infarct.

1.4 Vessel

1.4.1 GENERAL INFORMATION

'Stavanger Bliss' was an Aframax³ oil tanker built in 2008, with a dead weight tonnage (DWT) of 105,400 tonnes. The vessel was registered in the Norwegian International Ship Register (NIS), and is 228.6 metres long and 42 metres in breadth. The crew comprised 22 members.

³ Aframax – Average Freight Rate Assessment Max.



Figure 2: The oil tanker 'Stavanger Bliss'. Photo: Wallem Ship Management/DSD Shipping

1.4.2 OWNER AND MANAGEMENT CONDITIONS

1.4.2.1 General information

'Stavanger Bliss' was owned by DSD Ships 1 AS. DSD Shipping was the owner's agent and follows up its interests. DSD Shipping was neither involved in the chartering nor manning of 'Stavanger Bliss', but followed up that it could operate as agreed.

'Stavanger Bliss' was commercially operated by Teekay Charterer Pool, which managed chartering of the vessel. The tanker 'Stavanger Bliss' had been chartered by Teekay Tankers Chartering Pte. Ltd.

'Stavanger Bliss' was technically operated (day-to-day operation, personnel and maintenance) by Wallem Hamburg. Wallem also held the Document of Compliance (DOC) in accordance with the ISM Code and was the employer of the crew on board. Wallem Ship Management manages more than 350 vessels and has more than 6,000 seafarers in operation. The Stavanger Bliss was sold by owners and assigned to another management since 2021.

1.4.2.2 Remaining cargo on board (ROB)

The handling of a potential ROB claim is dealt with by the management company's office in Hamburg. In such cases, the vessel is included in the discussion to help maximise the outcome, and thus reduce the likelihood of high ROBs and to limit potential disputes about the result. After unloading the cargo, the vessel is expected to monitor, and report observed ROBs to the management office in Hamburg.

In connection with potential ROBs, the owner DSD Shipping has stated that it considers whether to invite an independent surveyor or inform the insurance company on a case-to-case basis. The threshold for informing the insurance company is when the potential claim exceeds the insurance deductible. In this instance, the insurance company was notified about a large loss. DSD Shipping therefore followed up by sending an email to Wallem on 28 October, asking them to invite a surveyor from the owner's P&I club to inspect the tanks in the next port.

The surveyors were invited to board the vessel when it was scheduled to lay at anchor at OPL Yeosu on 6 or 7 November. However, it was not until the vessel reached Nakhodka, Russia on 10 November, i.e., after the accident had occurred, that the surveyors boarded the tanker to sound the

tanks. The surveyors confirmed that 5,303 BBLs⁴ of cargo remained on board after unloading in Dalian. As a result, the vessel was issued a ROB claim from the charterer Teekay. The official ROB claim was received by the owner on 22 December 2020 and amounted to USD 229,895.66.

1.5 Operating conditions

1.5.1 CARGO AND CARGO HANDLING

The Ruby crude oil cargo had high viscosity, which meant it had a thick/sticky consistency. The crew on board had previously found that unloading this cargo in a cold climate often resulted in a considerable amount of sticky cargo that was not easy to unload. The cargo therefore had to be heated on board to achieve a satisfactory fluidity (15 °C) that enabled efficient unloading. The boilers in the tanker's engine room were used to heat the heating pipes/coils installed in the bottom of the tanks.

Since the outdoor temperature in Dalian at the end of October 2020 was cool (between 8 °C and 15 °C), the boilers were used during the unloading operation to keep the cargo fluid. In interviews with the crew, the NSIA was told that the charterer had complained about the extensive use of boilers during the unloading operation in Dalian.

After the unloading operation, the tanks were flushed with boiler flue gas, used as an inert gas to suppress explosive gases as a consequence of potential remaining cargo in the tanks.

1.5.2 TANK ATMOSPHERE

1.5.2.1 Introduction

The atmosphere in the number 2 cargo tank contained inert gas (boiler flue gas) and hydrocarbon gases with an oxygen level below 5 per cent. The next two chapters describe the physiological effects on humans of entering a space with this type of atmosphere.

1.5.2.2 Physiological effects of boiler flue gas that contains carbon monoxide (CO)

Carbon monoxide (CO) is a toxic gas that is colourless and odourless. Carbon monoxide is formed by incomplete combustion, i.e., the combustion of materials where there is limited access to oxygen.⁵

The capacity of carbon monoxide to bind to haemoglobin is roughly 250 times that of oxygen. At a carbon monoxide concentration of 0.08 percentage by volume (800 ppm) in inhalation air, the COHb⁶ value will, after a while, exceed 50 per cent, and around half of haemoglobin's capacity to transport oxygen will be blocked. Carbon monoxide poisoning primarily causes symptoms affecting the brain and heart. Symptoms generally do not appear in otherwise healthy people at rest until a blood COHb level of around 20–25 per cent. Unconsciousness occurs at COHb concentrations of more than 50 per cent.⁷

Symptoms and signs of a lack of oxygen (hypoxaemia) are apparent in the acute phase of carbon monoxide poisoning. A non-ST-elevation myocardial infarction or type 2 infarct is common.⁸

⁴ 5,303 BBLs (barrels) ~ 843 cubic metres ~ 768 MT (metric tonnes)

⁵ <https://www.helsenorge.no/giftinformasjon/giftige-gasser/karbonmonoksid/>

⁶ carboxyhaemoglobin

⁷ Store medisinske leksikon/toksikologi/karbonmonoksid

⁸ Jacobsen, D: 'Karbonmonoksid – den indre kveleren.' *Tidsskrift for Den norske legeforening* 2020; 129: 10.4045/tidsskr.20.0903.

1.5.2.3 Physiological effects of reduced oxygen levels in the atmosphere

A normal atmosphere will contain approximately 20.9 per cent oxygen. In general, a lack of oxygen leads to impairment of mental functions, impaired judgement, and reduced task performance. This occurs in a short space of time, and without the person being aware of it.

Table 1 shows the effects of oxygen deficient atmospheres on individuals. The values in the table are approximate and can vary from person to person. Exposure to an atmosphere containing less than 18 per cent oxygen poses a risk, and there is a risk of death at oxygen concentrations of less than 11 per cent.

Table 1: Asphyxia – effect of oxygen concentration.⁹

| Asphyxia – Effect of oxygen concentration | |
|---|--|
| Volume % O ₂ | Effects and symptoms |
| 18–21 | No discernible symptoms for the individual. |
| 11–18 | Reduction of physical and intellectual performance without the sufferer being aware of this. |
| 8–11 | Possibility of fainting within a few minutes without prior warning. Risk of death at concentrations below 11% by volume. |
| 6–8 | Fainting occurs after a short time. Resuscitation possible if carried out immediately. |
| 0–6 | Fainting almost immediately. Brain damage may occur, even if rescued. |

1.5.3 CAPACITY AND USE OF BREATHING APPARATUS

The breathing apparatus used by the captain was filled to the maximum level of 150 bar, which should correspond to 1200 L breathing air. This corresponded to breathing air for up to 30 minutes depending on the level of exertion and the person's physical fitness. Information that has emerged, confirmed that the apparatus used was empty, when the captain was found.

1.6 Crew

1.6.1 GENERAL INFORMATION

The crew mainly comprised Indian and Russian crew members. The captain was a Russian national.

1.6.2 LACK OF CREW DUE TO THE CORONAVIRUS PANDEMIC AND OTHER ILLNESS ON BOARD

A lack of crew due to the coronavirus pandemic and other illness-related challenges on board led to the captain opting for an alternative unloading operation in Dalian. Neither the chief officer nor the 2nd officer, who both normally worked 6/6 watches (6 hours on and 6 hours off) during loading and unloading operations, were in active service. The captain therefore decided that himself and the 3rd officer would oversee the unloading operation and work 6/6 watches.

⁹ Source: University of Oxford <http://www.admin.ox.ac.uk/safety/s403.shtml>. Norwegian translation by the NSIA

The vessel had applied for and been granted dispensation by the NMA to operate without a chief officer and 2nd officer. This dispensation was closed four days before the accident on 1 November, after new crew members signed on in Japan, with one new chief officer, one new 2nd officer, one new junior officer and a new able seaman boarding the vessel. No one signed off as this was not permitted by the Japanese authorities due to COVID-19 restrictions. The vessel thus had a full operational crew on board immediately before and during the accident.

When the chief officer, who had signed on in Singapore on 22 September, became ill on board, Wallem contacted an external doctor who performed an examination by phone (two calls). Following this examination, the doctor gave him the go-ahead to resume his duties in full, but the captain of 'Stavanger Bliss' was not convinced that the chief officer was ready for this and decided therefore not to let him return to active service on board.

1.6.3 REDISTRIBUTION OF TASKS AND RESPONSIBILITIES DURING THE UNLOADING OPERATION

The captain, who was normally not part of the watch system, took over the 6/6 unloading watch with the 3rd officer during the unloading operation in Dalian. The captain had not worked an independent unloading watch for 15 years.

The 3rd officer, who had signed on the vessel just two weeks before the accident, had no prior experience of independent watch duty during an unloading operation on board a tanker. He had sailed for 12 months on a tanker prior to this contract and held a valid 'Oil/Dangerous Cargo Endorsement'.

1.7 The coronavirus pandemic

1.7.1 GENERAL INFORMATION

COVID-19 has led to many seafarers having to work extended periods of service and being refused shore leave in most ports. The maritime industry has found it very challenging over a long period to organise regular crew changeovers due to the pandemic.

1.7.2 THE MANAGEMENT COMPANY'S EXPERIENCE AND MANAGEMENT OF THE PANDEMIC

The pandemic also created challenges for Wallem in relation to crew changeovers in the different ports. The management company had to make frequent amendments to the regulations for crew changeovers during the pandemic. Compliance with different COVID protocols were adopted by different countries, including time limits between testing and boarding, and only using authorised laboratories. The authorities in most countries did not allow seafarers to stay in hotels, and crew members were required to be transported directly from the ship to the airport and vice versa.

Wallem experienced strict visa restrictions due to the closure of various embassies, which impacted the seafarers' travel to and from vessels. Some seafarers refused to sign on vessels during the pandemic, thereby violating the terms of their sign-on agreement. They also experienced port authorities refusing crew changeovers and quarantine requirements following changeovers, which meant that vessels had to spend 14–30 days at sea after each crew changeover.

Wallem has stated that the crew changeovers were severely hampered, which increased stress for everyone on board. The NSIA has been informed through the interviews conducted with a number of the crew members that this increased the workload for the captain and the rest of the crew on

board. This was communicated by several members of the crew to Wallem's staffing office in Mumbai and was thus also something that the Wallem organisation in Hamburg was aware of.

Wallem made considerable efforts to secure a crew changeover in China, despite the pandemic. The travel restrictions in place meant that they concentrated their efforts on Chinese tanker officers. A local Chinese chief officer was approved for appointment on board, but he decided to take a job with another shipping company. A Chinese 3rd officer was also lined up and ready to travel to board, but he tested positive for COVID-19 and was thus no longer an option.

Wallem also found that they had limited opportunity to visit the vessels, which prevented them from monitoring the vessels' operations in person. In the case of 'Stavanger Bliss', the company was also unable to pay an on board visit to the vessel during the first weeks after the accident.

1.8 The management company's safety management

The shipping company had an established safety management system. Relevant procedures and excerpts for the investigation are reproduced in the next chapters.

1.8.1 TANK ENTRY PROCEDURES

The shipping company had prepared extensive procedures for entering confined spaces. Among other things, they set out that:

- *entering confined spaces is not permitted until the atmosphere of the tank has been tested and the oxygen level is found to be satisfactory and free of hydrocarbons and toxic gases*
- *ventilation must be carried out before entry is permitted in a confined space and must continue throughout the period of entry.*

Excerpt from the 'Entering spaces with an unsafe atmosphere' procedure:

- *Only in very exceptional circumstances (e.g., in an emergency situation where lives are at risk) may entry into a non-gas-free space or a space suspected as not having a safe atmosphere be permitted.*
- *The number of persons entering the space must be kept at a minimum, but not be fewer than two, and they must be equipped with breathing apparatus and attached to a safety line.*
- *The persons entering the space must be well trained in using breathing apparatus and be aware of the hazards of removing their mask in unsafe surroundings.*
- *A fully equipped rescue team wearing breathing apparatus and with rescue equipment must be positioned at the entry point opening.*

1.8.2 STOP WORK AUTHORITY (SWA), ENTRY OF TANKS:

The safety management system authorises all officers and crew members to exercise their STOP WORK AUTHORITY as follows:

- *STOP WORK is a responsibility to stop work when the risk to health, safety and the environment has not been understood or clearly established.*
- *It is a form of intervention and one of the most important safety tools in the workplace.*
- *STOP WORK is supported and authorised by the senior management of Wallem.*

- *Every seafarer is authorised and entitled to, and moreover has a responsibility to exercise a STOP WORK intervention. STOP WORK is a positive intervention, and seafarers who exercise STOP WORK will not be punished or given negative feedback.*

1.8.3 THE DESIGNATED PERSON ASHORE (DPA) SCHEME:

A designated person ashore (DPA) had been appointed as a link between the company and those on board. The DPA's responsibility was to verify and monitor all safety-related and environmental activities in connection with the operation of the vessel.

1.8.4 HANDLING ROBS

The shipping company had its own procedures for how to handle any issues concerning ambiguities relating to ROBs. This was set out in the Chemical Tanker Operations Guidance on Cargo Measurement & Sampling, dated 1 Sept. 2017.

1.9 Implemented measures

Wallem Hamburg has planned/implemented the following measures after the accident:

1. Develop a road map for necessary behavioural changes in the onshore offices and on board the vessels to improve our safety and justice culture.
2. Improve the justice culture process for the purpose of further developing a progressive sanction system ranging from formal warnings to dismissal if a person does not comply with Wallem's guidelines.
3. The 2021 safety campaign shall include:
 - Stop Work and Confined Space Entry (Q1 2021)
 - Perceived commercial pressure and communication (Q1 2020)
 - Process for unplanned work (Q2 2021)
 - Wallem's safety rules (Q3 2021)
4. The safety recommendations will be sent to vessels, staffing offices and training centres to communicate the standards, guidelines and administrative checks for confined space entry.
5. Greater focus on use and expectations of Stop Work Authority in connection with visits to the vessels and in dialogue with management.
6. Implement assessment of the distance in power relationships and assurance on board vessels and the onshore office in connection with management training, through simulation and role play.
7. Improve the systems for follow-up, guidance and motivation of captains and chief engineers following unsatisfactory performances.
8. The following procedures must be improved and include safety-related matters being reported to the designated person ashore, and immediate reporting of nonconformities by senior officers.
 - Course for safety officers.
 - STOP WORK procedures.
9. Training of subordinates should emphasise the roles and training responsibility for persons stationed outside a confined space that has been entered. Training should include checking a completed checklist for confined space entry and emphasise the right to stop entry if the checklist has not been completed correctly.
10. Expand the existing seminar for subordinate officers to also include other subordinates. These seminars should focus on Wallem's safety priorities, and on subordinates being entitled to challenge their superiors without fear of repercussions. Subordinates should be confident that the office will support and reward them if they address genuine concerns (after the pandemic).
11. The process for following up Seavoice reports (from our anonymised and confidential system) is to be reviewed.
12. Dialogue between the vessels and superintendent, or manager, to highlight the importance of avoiding what can be perceived as commercial pressure and the importance of communication.
13. Webinars are to be held with all technical, operations and safety superintendents, and with staffing managers, on communication and engagement with all senior officers when potential problems arise.

2. Analysis

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2. Analysis

2.1 Introduction

The analysis starts in section 2.2 with an assessment of the sequence of events prior to the accident. Section 2.3 discusses the accident itself and how it arose. The NSIA has subsequently looked more closely at the company's safety management and relevant follow-up of the crew on board in connection with the coronavirus pandemic.

2.2 Sequence of events prior to the accident

The pandemic made it challenging for Wallem to secure the relevant personnel at the right time. At the same time, the vessel also had to deal with a coronavirus outbreak among the crew on board and did not have a functioning chief officer in the port of discharge Dalian. The captain assumed the duties of the chief officer, and the 3rd officer was assigned the duties of the 2nd officer, which meant that they worked 6/6 watches throughout the unloading operation.

The extraordinary situation and the fact that the captain was to take over duties he had not performed for 15 years may have led to an increased workload for both the captain and the 3rd officer.

The notice received from the charterer Teekay on 26 October concerning a large loss of cargo represented an undesirable situation for the captain. The captain was informed by Wallem Hamburg's operations superintendent that the terminal's loss-of-cargo claim seemed exaggerated and therefore improbable, and that this would be checked by surveyors at the next port. The NSIA believes this situation may have led to the captain becoming uncertain.

Just an hour or two before the captain entered the tank and the accident occurred, the captain spoke to the junior officer on the bridge about whether they had overlooked something while heating the cargo during the unloading operation in Dalian. The NSIA considers it likely that the captain was still concerned about the ROB, which probably contributed to the decision he subsequently made to investigate the tank for ROB despite the joint inspection being planned.

2.3 The accident

On board the vessel, the captain wanted the pumpman to regularly sound the relevant tanks to check for any remaining cargo. The NSIA has not received information clarifying why the captain wanted such measurements to be taken. This was probably because the tanks had not been sounded by an independent surveyor for any remaining cargo after they had concluded unloading at the terminal in Dalian, and that the captain was therefore keen to determine the actual status before the surveyors should come on board to perform their measurements.

When the captain entered the tank, the bosun attempted to prevent him by using the company's established Stop Work Authority (SWA) policy. The captain did not respond to this and probably intended to gain an overview of the situation in the tanks for himself following the ROB claim reported in connection with the remaining cargo.

When the captain entered the tank, the oxygen level was very low and there were toxic gases in the atmosphere. The captain was found with the breathing apparatus mask off, and according to the post-mortem the cause of death was coronary infarct. However, since the post-mortem

examination of the captain provides no information about the COHb¹⁰ value, it cannot be concluded with certainty that the coronary infarct was due to carbon monoxide poisoning.

2.4 The management company's safety management

The NSIA is of the general opinion that the content of the company's internal tank entry procedure safeguards safety requirements in a satisfactory manner. It is difficult to assess the company's and vessel's implementation of the procedures without an extensive review of the vessel's safety management system, but, based on the crew's use of the SWA policy to stop the captain from entering the tank, the NSIA finds that this was in order.

According to the company, a process was also in place to handle ROB claims, in which the vessel was to be included to reduce the likelihood of exaggerated ROBs. This had also been communicated to the captain by the operations superintendent and was to be checked at the next port. It has emerged that the captain had not been responsible for an unloading operation for 15 years, which means that it cannot be ruled out that he was not familiar enough with neither the handling of ROB nor tank entry. However, it is difficult to ascertain why the captain decided to go down into the tank, as this is a well-known, clear and present hazard. The NSIA believes it is important that issues relating to compensation in connection with cargo claims are handled at the organisational level to ensure that they in no way interfere with the safe operation of the vessel.

As a result of the accident, the shipping company has implemented several measures to prevent similar accidents. The NSIA will therefore not submit any recommendations following this accident.

2.5 The management company's follow-up of the vessel and captain

The coronavirus pandemic resulted in the management company struggling to sign on new qualified personnel for the vessel. Travel restrictions and the different entry/exit rules in the countries visited by the vessel reduced the company's opportunity to carry out crew changeovers as planned. The NSIA assumes that the management company did what they could to supply new crew members under the prevailing conditions.

The pandemic made crew changeovers very challenging for the entire maritime industry, and this was in reality beyond the management company's control during this period. There was an outbreak of illness among the crew during the period, which led to increased workloads and changes being made to personnel duties. Subsequently, the charterer submitted a claim to the captain for a large loss of cargo. It cannot be ruled out that the combined challenges facing the captain and crew during the period created an extraordinary situation that affected the decisions that were made and thus contributed to the accident arising.

¹⁰ Carbon monoxide poisoning is caused by breathing in carbon monoxide, which is toxic because it makes oxygen disassociate from the haemoglobin in the red blood cells and forms carboxyhaemoglobin (COHb), which reduces the flow of oxygen to the tissue and hinders breathing.

3. Conclusion

| | |
|---------------------------------|----|
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| 3.2 Investigation results | 22 |

3. Conclusion

3.1 Main conclusion

The management company had established tank entry procedures, which clearly set out that entering tanks with an unsafe atmosphere was not permitted. It is unclear why the captain nonetheless decided to enter the tank. He probably intended to gain an overview of the situation in the tank as a result of the ROB claim reported in connection with remaining cargo after the last unloading operation.

3.2 Investigation results

- A. It cannot be ruled out that the combined challenges facing the captain and crew during the period created an extraordinary situation that affected the decisions that were made and thus contributed to the accident arising.
- B. The captain was concerned after receiving notice that there was too much ROB after the unloading. This probably contributed to the decision he made to investigate the tank for ROB despite the fact that this was going to be checked at the next port.
- C. The bosun used the Stop Work Authority card in accordance with the company's procedures, but it did not work as a barrier to prevent the captain from entering the tank.
- D. The captain died when he, alone, entered a cargo tank that had not been cleared for entry. The tank contained inert gas and the atmosphere was unsafe. The cause of death was a coronary infarct. It cannot be concluded with any certainty that the coronary infarct was due to carbon monoxide poisoning.
- E. Following the accident, the shipping company has implemented several measures to prevent similar accidents. The Norwegian Safety Investigation Authority is therefore not submitting any safety recommendations.

4. Safety recommendations

4. Safety recommendations

The investigation of this marine accident has not identified areas in which the Norwegian Safety Investigation Authority deems it necessary to submit safety recommendations for the purpose of improving safety at sea.

Norwegian Safety Investigation Authority
Lillestrøm, 22 June 2022

Appendices

Appendix A Details of the vessel and the accident

The Stavanger Bliss was sold by owners and assigned to another management since 2021.

| Vessel | |
|---|---|
| Name | Stavanger Bliss |
| Flag state | Norwegian International Ship Register |
| IMO Number/Call signal | 9364239/LAGE7 |
| Type | Aframax oil tanker |
| Build year | 2008 |
| Owner | DSD Ships 1 AS |
| Administrative owner | DSD Shipping AS |
| Management company (ISM) | Wallem GmbH & Co KG |
| Technical/Staffing | Wallem Shipmanagement (India) Pvt. Ltd. |
| Commercial operator | Teekay Tankers Chartering Pte. Ltd. |
| Construction material | Steel |
| Length overall (LOA) | 228.6 m |
| Breadth | 42 m |
| Gross tonnage | 55,898 |
| Deadweight tonnage (DWT) | 105,400 |
| Voyage | |
| Port of departure | Dalian, China |
| Type of voyage | International |
| Persons on board | 22 |
| Information about the accident | |
| Date and time | 11:20 on 5 November 2020 |
| Type of accident | Personal injury |
| Location/position where the accident occurred | At anchor off Yeosu in South Korea |
| Place on board where the accident occurred | Number 2 port cargo tank |
| Injuries/deaths | One person died |
| Damage to vessel/the environment | None |
| Ship operation | At anchor |
| At what point in the voyage was the vessel | Awaiting mooring space to load |
| Environmental conditions | Daylight |