The Swedish Club

CASEBOOK

THE SWEDISH CLUB CASEBOOK

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Introduction

As part of its commitment to improving safety at sea The Swedish Club widely shares its claims experiences with the aim of helping the shipping community to understand the factors that can lead to common incidents, and to learn from the decisions that were made on board at the time.

Following requests for more case studies, we have now taken some of the most interesting and informative cases that we have previously published across our loss prevention titles and combined them into a new casebook which can be used to assist in crew training – both on board and in the classroom.

The cases cover both P&I and H&M claims on the most common types of vessel and represent situations that many seafarers may find themselves facing during the course of their careers.

The binder format enables us to continually add new cases to the publication, making The Swedish Club Casebook an essential tool for every vessel.

THE SWEDISH CLUB CASEBOOK

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Cargo - bulk

1.1 Charcoal: Incorrect declaration caused charcoal fire

The container vessel was sailing in open sea when smoke was seen coming from the vent of one of the cargo holds. The Master sounded the general alarm and all crew were mustered and accounted for.

A fire team was assembled and proceeded to shut off the ventilation and close the fire dampers for the cargo hold. An access hatch cover was opened for the fire team to enter the cargo hold, but it was full of smoke and there was no visibility, so the team turned back and closed the hatch.

CO_2 release

The Master decided to release CO_2 into the cargo hold and the vessel turned back to its last port of call. After the CO_2 had been released some smoke could still be seen coming from the cargo hold, but it was less than before. The crew could not find any hotspots on deck.

The crew inspected the adjacent cargo hold to see if there were any hotspots or discolouration. They could not find any.

After the vessel berthed the local fire brigade embarked and confirmed that the fire was extinguished.

Misdeclared cargo

The cargo manifest did not show any dangerous cargo loaded in the affected cargo hold. However, it was found that the container that caught fire was loaded with charcoal, and that the shipper had declared that charcoal was not classed as IMDG dangerous cargo.

It was later confirmed in laboratory tests that the cargo should have been classed as dangerous cargo as per IMDG code class 4.2.

What can we learn?

- The IMDG Code for charcoal, if it applies, requires adequate heat treatment and then cooling of the charcoal before packing. This is to reduce the charcoal's reactivity by allowing it to oxidise under controlled conditions.

- Charcoal may not be subject to the IMDG Code, if it passes a UN test for self-heating, thus indicating that it is not too reactive. This exemption requires correct sampling, testing and certification and it may assist to check the relevant documentation. This had unfortunately not been done correctly in this case.

1.2 Coal: Severely burned in an onboard explosion

The capesize bulk carrier had loaded steam coal in all seven of its cargo holds. The Master had received the cargo declaration from the shipper where it mentioned that there was a risk of methane release, which is common for coal cargo.

During the voyage the vessel had sailed through heavy weather conditions which reached Beaufort scale 8, but at the time of the incident it was a clear winter evening.

The vessel was approaching port to anchor while waiting for a berth to be ready for discharging, and the bosun and an AB went to the forecastle to prepare the anchor.

Access to windlass control room

To start the anchor windlass, they had to enter the windlass control room on the forecastle. The forecastle was slightly elevated from the main deck and a ladder had to be used to reach it. The door to the windlass control room was below the forecastle, facing the stern towards the cargo hatch coamings of cargo hold 1. The hydraulic panel for the anchor windlass was inside the control room as were other equipment panels. The access hatch to cargo hold 1 was also in the room.

Explosion

The two crew members entered the room and approached the windlass panel. The bosun pushed the start button. At that moment there was a major explosion in the room.

On the bridge they heard a large bang from the bow but could not really see what had happened because it was dark outside.

The Chief Officer and another AB rushed to the bow to see what had happened. The Chief Officer approached the forecastle and touched the bulkhead to the windlass room. He could not feel any heat. He then shouted for the bosun but got no answer. He decided to open the door. He looked inside and there was almost no smoke in the room, but there were two bodies lying on deck, not moving. He could see that it was the bosun and the AB and he called on the radio for medical assistance and asked that two stretchers should be prepared.

Medical assistance

The Master called the VTS and asked for medical assistance. It took 10 minutes for the Second Officer to arrive at the scene with first aid equipment, and soon afterwards crew members came with two stretchers. The bosun and the AB had severe burn injuries, and there was not much the Second Officer could do but to give first aid and ensure that both men were breathing.

An hour later a coast guard cutter with paramedics arrived and the injured crew members were taken ashore. They were flown to a specialist hospital where they received help.

Both survived but had to undergo painful surgery and it is unknown if they will ever be able to work at sea again.

What can we learn?

- It is probable that an accumulation of methane gas occurred within the windlass control room. The gas mixed with the air allowed the right concentration of gas to be ignited inside the hydraulic control panel by a switch or relay. The resulting ignition within the panel created an explosive flame and pressure wave that rapidly expanded into the control room. It seems likely that the methane gas entered the control room through the cargo hold access hatch.

- After the incident the windlass control room was classified as an enclosed space, which means that the crew must test the atmosphere before entry to ensure it is gas free and has enough oxygen.

- The crew had planned to carry out gas testing of the cargo during the voyage. However, because of the heavy weather no testing was done the first week. Tests were carried out during the last five days before arrival; no excessive amounts of methane gas were detected. An attending surveyor stated that the onboard gas testing equipment was not suitable for cargo testing but was designed for personal use when entering a cargo hold.

- There should be testing equipment on board that meets the requirements of the IMSBC Code. It is also critical that the crew is properly trained on how to use the equipment. The vessel should have at least two gas meters on board (in case one should fail) with certificates of calibration that will cover the period of the voyage. At a minimum the meters should measure methane (usually in % of Lower Explosive Limit or LEL), carbon monoxide and oxygen. The LEL is the lower limit, below which a mixture of methane and air will not explode. For normal air (21% oxygen) the LEL is 5% methane. Gas meters usually measure the percentage of LEL with 100% representing 5% methane in air. Coal emits methane to varying degrees.

1.3 Coal: Indonesian coal self-ignited during discharge

The bulk carrier had loaded Indonesian coal to be discharged at another Asian port. After loading, all the hatch covers and openings were closed and sealed. During the voyage, the cargo holds were monitored by taking gas readings and temperatures. All values were within the parameters stated in the IMSBC Code.

Discharging the coal

The vessel arrived at the anchorage for the discharge port. After a short wait, discharging began (by the vessel's grab into barges). Initially, all went smoothly. However, after a few days of discharging, smoke started coming out of cargo hold 3. The coal that remained in this cargo hold had been left heaped in 6 metre piles by the bulkheads. A fire team was assembled and when they reached the cargo hold they could feel heat on the deck. Thick, dense black smoke then began coming out of the hold, although no flames were visible. The atmosphere in the hold was tested by the fire team and it was 66° C, methane gas levels were at 120% LEL, and the CO level was above 3,680 ppm.

At this point smoke then started coming out of hold 4 which was almost empty. Again the cargo in this hold was in large piles by the bulkhead. The temperature was 69° C, methane levels were at 144% LEL, and CO levels were in excess of 10,000 ppm.

Expert guidance sought

The Master informed the DPA and charterer that the coal had self-ignited. Expert guidance was sought. There was now a risk of an explosion in holds 3 and 4. Flames could be seen on the surface of the coal. Two fire teams were assembled in full firefighting gear. They rigged the fire hoses and sprayed the coal with seawater.

The Master wanted the remaining coal from holds 3 and 4 to be discharged and the following night the discharge from holds 3 and 4 continued to different barges. The next day, and in conjunction with the expert's advice, the Master ordered holds 3 and 4 to be flooded. This action extinguished the fire.

What can we learn?

- There is nothing to indicate that the self-heating/combustion was in any way related to the actions of the Master and/or crew.

- Indonesian coal is prone to self-heating/spontaneous combustion. This is related to oxygen combining with carbon in the coal (oxidation) and this reaction produces heat. When the heat produced cannot dissipate - in this case due to the insulating effect of the surrounding coal - the temperature of the coal increases. Carbon monoxide (CO) is produced as a result of the self-heating/combustion reaction. As the temperature of the coal increases, so does the rate of the oxidation reaction. This is why guidance is given in the IMSBC Code to close the ventilation after loading as soon as it is apparent that flammable gas is not accumulating.

- When self-heating of coal has been restricted by reduced oxygen levels, such as during the voyage, self-heating will not become immediately apparent on exposure to higher levels of oxygen. Self-heating is a function of temperature, so the self-heating needs to occur for a sufficient time to raise the temperature of the coal before a runaway reaction will occur. This time period depends on the amount of oxygen that can permeate into the stow and support self-heating.

- The holds were not ventilated prior to the vessel's arrival at the discharge port. The holds were only opened when discharging operations began. During discharge, oxygen will inevitably have entered the holds.

- The period between the start of discharging and the noticeable increase in carbon monoxide is consistent with exposure of the coal to atmospheric oxygen levels during discharging operations.

1.4 Grains: Wet damage caused cargo loss

The handysize bulk carrier docked in a European port and loaded wheat into all its four cargo holds for discharge at an East African port. Prior to loading, the crew cleaned the cargo holds by washing them with seawater and rinsing them out with fresh water. A pre-load inspection took place at the port, during which the shipper's surveyor found the bilges dry and the cargo holds suitable for receiving the cargo.

Before departure from the loading port the water ingress alarm was tested by the Chief Officer and found to be in good order.

During transit through the Bay of Biscay the vessel encountered rough weather. The vessel's logbook recorded winds of Beaufort Scale 7-8, with high waves washing over the cargo hatch covers. Although daily sounding sheets showed no water in the bilges and no water ingress alarms sounded, the Master nevertheless prepared a note of sea protest in connection with the heavy weather.

Discharge

Upon arriving at the discharge port the holds were opened and the cargo was visually inspected by the cargo receiver. No issues were noted during this inspection and there was no sign of water ingress.

Discharge operations began via grabs into trucks, with all the cargo holds being discharged simultaneously. The trucks transported the cargo to the receiver's facility. Upon arrival at the receiver's facility the trucks unloaded their cargo in a single grain intake pit from where it was transferred into silos.

Damaged cargo

As discharge progressed and after most of the cargo had been discharged, a surveyor acting for the cargo receiver noticed some damaged cargo towards the bottom of cargo hold 1. This was described by the crew as a thin layer of wet cargo near the tank top. Efforts were made by the crew to segregate the relatively small amount of wet cargo from the sound by placing it in plastic drums, but the stevedores insisted that discharge operations were suspended. After some consideration and several days delay, it was agreed that the damaged cargo could in fact be properly segregated, and discharge operations resumed.

However, after only some three or four truckloads of dry cargo had been discharged, the separation process became confused, resulting in wet and dry cargo being discharged together. This initial failure of segregation was exacerbated when the cargo was subsequently dumped into the single grain intake pit and from there was transferred into the receiver's silos.

Analysis

The discoloured/wet cargo was analysed by a local laboratory, and the results showed the cargo had been contaminated with seawater. No actual laboratory analysis for food safety parameters was carried out. However, based on the test results the laboratory stated that the cargo was unfit for human consumption. The laboratory did not suggest applying these results to the entire cargo from hold 1, only to the samples that were analysed.

Nevertheless, the cargo receiver applied this ruling to a substantial amount of the cargo from hold 1 - far greater than the amount of cargo that had been segregated by the crew.

Vessel arrest

The cargo receiver subsequently arrested the vessel and requested security of EUR 2,000,000 to cover their losses.

Subsequent investigation

The receiver sought to rely on the clean bill of lading and the fact that cargo was discharged in damaged (wet) condition. While there was undoubtedly an issue of wetting while the cargo was on board the vessel, subsequent investigation showed that the real issue was the way in which the cargo had been handled during and following discharge from the vessel, as the stevedores failed to take proper care to effectively segregate sound from damaged cargo, but in fact mixed the few tons of wet cargo with a much larger quantity of sound cargo that had been discharged from other cargo holds. This led to a far larger claim than ought ever to have arisen.

A full investigation into the source of the water ingress could only take place at the next port, when the vessel was cargo-free. That inquiry revealed the source to have been a partially corroded pipe, which had not been picked up during an inspection of the cargo holds at the loading port.

Settlement

The cargo receiver subsequently sold some 7,000 million tonnes of the cargo as animal feed, although they were unable to provide adequate documentary evidence to demonstrate the reasonableness of that decision. The receiver's overall claims were subjected to London arbitration. Those claims were eventually settled amicably for around 15% of the total initially sought.

What can we learn?

- In general terms, when wet cargo is discovered on board the prudent action for a cargo receiver seeking to mitigate any loss is to segregate visually affected cargo from visually sound cargo during discharging. Sound cargo should then be stored separately from affected cargo and any alleged damage, or reduction in quality, should be proved by representatively sampling the suspect cargo followed by appropriate testing of the samples.

- In this case, efforts by the Club and the appointed P&I surveyor to properly investigate the extent of the wet cargo were hindered by the fact that attendance was not requested by the member until after the allegations of wet cargo were initially brought by the receiver (by which point the crew had already finished their initial segregation of the wet cargo). As a matter of good practice, it is extremely important that prompt notification is made to the Club whenever there is any allegation or suggestion of cargo damage. This is essential in order that the Club and their local representatives can properly investigate the facts and take all steps necessary to gather evidence and protect the member's position.

- Here, neither the cargo receiver nor the stevedores took appropriate steps to segregate this allegedly damaged cargo during discharge. On the contrary, their actions during discharge from the vessel and subsequently while transferring the cargo from the trucks to the grain intake pit and thereafter the silos were the cause of the largest part of the damage. These actions turned what should have been a nominal cargo damage claim into something far more serious.

- A foodstuffs expert hired by the owner was of the opinion that based on the test results the wheat would still have been suitable for milling and that it was uncommercial and unreasonable to have taken a decision to downgrade and sell so much of the cargo for animal feed production without making any proper attempt to establish the overall quality. Further, there was no evidence concerning the fate of the 7,000 million tonnes allegedly sold as animal feed.

- The best preventive action the crew can take in a situation like this is to take pictures and make detailed reports about any damaged cargo that is found. Clear photographs of the cargo and the loading operations are also invaluable. These should include an overview of how the cargo was loaded, the general view of the cargo in the holds during loading and, where possible, close-up photographs of the cargo itself.

- Before leaving port, the crew should inspect the hatch covers to ensure they are in weathertight condition. There should be no cargo in the drain channels, each hatch cover should be secured properly, paint should be intact and the gaskets and coamings should be in good condition. Cargo holds should be inspected not only in terms of cleanliness, but also for any signs of leaks or possible sources of water ingress that risks causing damage to the cargo.

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1.5 Grains: Incorrectly applied fumigation pellets caused explosion

A bulk carrier loaded bulk grain in the US Gulf. The cargo was fumigated on completion of loading with the fumigator applying aluminium phosphide pellets to the surface of the cargo. The fumigation documents stated that the fumigation was a subsurface application with the aluminium phosphide applied evenly across the hold.

Explosion

Shortly after departure there was an explosion in one of the holds and the hatch cover was partially displaced. The crew then ventilated the other holds as a precaution.

Incorrect application

After the explosion, it was determined that the fumigant was only applied to the cargo surface from the hatch covers in two distinct longitudinal lines. This was evident from the fumigant residue in the other holds. The fumigant pellets were poured from buckets and there were piles of pellets visible on the cargo surface in direct contradiction to the fumigation manual application methods which advises that piles of fumigant should be avoided.

In addition to the structural damage to the vessel, the damage to the hatch cover meant that poor weather conditions caused cargo damage, despite the crew's attempts to cover the displacement caused by the explosion.

What can we learn?

- It is important to ascertain:
  - The fumigation application method and check that it corresponds to the information provided in the fumigation documents or certificate.
  - The type of fumigant, the formulation (pellets, tablets …) and brand of the fumigant.
  - The type of recirculation fan (if used).
  - The quantity of fumigant being used in each hold.
  - The distribution of the fumigant on the cargo.
  - The type of gas filter provided with any gas masks or PPE.
- In this case the fumigation pellets were applied incorrectly. A diligent Master needs to ensure that the fumigator's instructions are carefully followed to ensure that in transit fumigations are performed without undue risk.
- The Master and the crew should familiarise themselves with proper fumigation practice and maintain a detailed record of how the fumigation is carried out.

1.6 Grains: Ship's sweat caused cargo damage

A vessel loaded a cargo of white maize in Topolobampo, Mexico for discharging at several ports in Southern Africa. The temperatures experienced during loading were in the 30°Cs. The cargo was fumigated on the completion of loading. The vessel sailed around South America via the Magellan Straits and experienced ambient temperatures close to 0°C. The fumigation instructions required that the holds remained closed, and they were not opened until 12 hours prior to arrival at the discharge port.

Damaged cargo

On arrival at the first discharge port, the surface of the stow in all holds was found to be mouldy, condensation stains could be seen on the hatches and hatch coaming, and maize had germinated in areas of heavy wetting. This was a clear example of ship's sweat where moisture inside the hold space condenses on the interior steelwork due to the difference in temperature and then drips or runs into the cargo.

The surface layers of damaged cargo were manually segregated by stevedores and by grab. Once the surface layer of mould damage was removed the remaining cargo was discharged in sound condition.

What can we learn?

- The mould damage to the surface due to condensation wetting could have been prevented or minimised if the holds were ventilated after a more typical fumigation exposure period (often 10 days).
- It is important to clarify the ventilation instructions with the fumigators and charterers, as the fumigation instructions are focused on achieving an effective fumigation and do not account for the changes in environmental conditions the vessel may experience during a voyage.

1.7 Grains: Infested cargo

The supramax bulk carrier had loaded wheat for human consumption in a European port for discharge at a Middle Eastern port.

Cargo transfer

The cargo was loaded on board the vessel from a barge alongside and also directly from the quay, transported there by lorries which dumped the wheat in a pile on a large steel plate positioned on the quay. From this open pile the cargo was picked up by a ship crane and loaded into the holds. The vessel had five cargo holds.

Weather interruptions

The loading took about two weeks and during this time there were 12 breaks because of rain. At each rain break, the cargo remaining on the steel plate was picked up by the crane, loaded back on the lorries and removed from the quay. The steel plate was then supposed to be dried prior to loading resuming.

The Master was concerned at the frequent rain interruptions and the way the cargo was loaded from the quay. He stated that he had seen cargo being dumped on the wet steel plate, but he did not issue a letter of protest and nor did he clause the mate's receipts or bills of lading.

The cargo log showed that loading into the lower part of hold 3 took place across two hours in the evening and two hours in the early morning of the following day. This stoppage was due to rain.

Poor visibility

Due to the time of year, it became dark at 1600 and so it was difficult for the crew to observe the condition of the cargo properly during loading, or to see if the cargo in the hold was wet or not. There were no extra lights rigged for the cargo holds.

Fumigation

Before departure the cargo was fumigated professionally with aluminium phosphide tablets and seals were applied to all cargo holds. The crew also applied tape and foam on the cargo hatch covers to prevent any fumigant gas from leaking out.

Inspection

The vessel arrived at the discharge port and anchored. Officials boarded the vessel and unsealed the holds so they could inspect the cargo. The vessel then remained at anchor for another three weeks.

Issues at discharge

The vessel finally came alongside, and discharge commenced. Almost all the cargo in hold 3 had been unloaded when infested cargo was found at the bottom. In addition some of the cargo was lumpy indicating wet damage. The cargo that had already been unloaded was found to be sound and in good condition.

A salinity test was carried out on the damaged cargo and the result was negative. No saltwater damage was found.
The cargo receiver rejected the remaining cargo in the hold because of the insects and lumpy cargo.

After the damaged cargo was found, no more cargo was allowed to be discharged and the vessel had to depart.

What can we learn?

- It is likely that the cargo damage was caused by wet cargo being loaded on board in addition to inefficient fumigation in cargo hold 3 - there were no insects found in the other holds.

- It took 14 days for the vessel to be loaded and there were 12 rain stops during this time. Cargo was dumped on wet steel plates on the quay. It is unknown how the barge alongside protected its cargo from rain. All these circumstances are likely to have resulted in wet damage.

- Fumigation was carried out during the voyage and was undertaken with a gas recirculation system.

- If the fumigation failed for cargo hold 3, what was specific to this hold? It is probable that this hold, unlike the others, was not sufficiently tight. Before departure it is imperative that the Master checks that the cargo holds are weather-proof. It should be noted that hatch covers cannot be expected in practice to be 'gas-tight'. What is required for effective fumigation is that enough of the gas is retained in the hold for long enough to ensure the death of all insect life.

- Gas leakage from the hold may occur due to movement of the hatch covers during the sea voyage.

- It is important to ensure that all rubber packing on the cargo hatch covers is in good condition. The best way to do this is by an ultrasonic test.

- Make sure there is sufficient lighting at night to enable visual inspection of the cargo during loading. It is also essential that the crew monitors the weather reports and radar so that the cargo hatch covers can be closed before any rain starts. There was no note in the deck logbook as to whether the cargo hatch covers were closed or not during loading.

- If any wet-damaged cargo is observed during loading the Master should issue a letter of protest, make appropriate remarks in the mate's receipts and clause the bills of lading.

1.8 Soya beans: Discolouration

The ship loaded soya beans in South America. During the loading it was found that a very high percentage of the cargo had purple spots on the beans. After a joint survey, it was determined that 7%-8% of the cargo had purple spots on its surface.

Letters of Indemnity

Accordingly, the Master claused the mate's receipt, which the shipper protested about. The charterers and sub-charterers were also called upon to resolve the matter. Eventually, the mate's receipts were issued clean in exchange of Letters of Indemnity issued by the charterers and sub-charterers.

No claim made

At the discharge port, no claims were made in relation to the purple-spotted cargo. This was due to the receiver having been informed of the discolouration prior to loading. This demonstrates the importance of engaging in a dialogue with all relevant parties when discolouration is first discovered at the loading port rather than the discharging port.

What can we learn?

- Discolouration of beans can occur due to self-heating, or due to the growth of a fungus, or by dirt. If the soya beans are not damaged or discoloured internally, they are considered sound.

- The Club strongly recommends that members pay close attention to the apparent condition of the cargo prior to loading.

- The owner/manager should always consider obtaining assistance from an experienced surveyor, or cargo expert, or more conveniently call their Club for assistance whenever there are doubts about the condition of the cargo that is being loaded.

1.9 Soya beans: Poor condition when loading

The vessel loaded soya beans in a South American port, to be discharged in China. At the discharge port, the vessel was arrested for a claim for USD 3.8 million as it was found that 7%-8% of the soya beans were black.

Issues on loading

Investigation revealed that the black-coloured beans were already in this discoloured state prior to loading. It was further determined that there was no further discolouration generated on board during the voyage. It transpired that the discoloured cargo had been mixed with sound cargo during loading.

Problems observed

When loading, the Master had observed the extraordinary amount of black-coloured beans and informed the shipowner. However, no report was made to the Club and no surveyors were dispatched. The Club reserved cover relying on Rule 4 Section 3 of the Club Rules because the bill of lading was not issued properly, but was issued clean without any comments on the condition of the cargo. Eventually, the receivers waived a majority of their claim by settling for less than 10% (i.e. USD 300,000) of the initially claimed amount.

What can we learn?

- Carriage during hot seasons, prolonged storage at pre-shipment, and carriage of soya bean cargo with a high moisture content should all be avoided to reduce the risk of self-heating. It is nearly impossible to prevent self-heating damage when a cargo has a high moisture content, and this cannot easily be detected by the vessel's crew during loading. Therefore, members should always be aware of the factors that can contribute to a high moisture content in soya bean cargoes, which are as follows:

  • Ingress of rain and/or seawater
  • Broken pipes or overflowing bilges
  • Condensation due to lack of ventilation

- To avoid the risk of cargo damage, a vessel's crew should be warned of the potential risks beforehand.

- Discolouration of beans can occur due to self-heating or due to the growth of a fungus or by dirt. If the soya beans are not damaged or discoloured internally, they are considered sound.

- The Club strongly recommends that members pay close attention to the apparent condition of the cargo prior to loading.

- Cargo experts should be called upon immediately to observe the pattern of damage in the cargo hold(s) and to take samples for analysis for evidential purposes (i.e. for potential defence against a claim by cargo receivers).

- The owner/manager should always be ready to provide the Master with any assistance necessary in recording appropriate remarks on the bills of lading. When in doubt, the Club's assistance should be sought immediately. Such proactive response by members could significantly change the outcome of a soya bean cargo damage claim.

- The owner/manager should always consider obtaining assistance from an experienced surveyor, or cargo expert, or more conveniently call their Club for assistance whenever there are doubts about the condition of the cargo that is being loaded.

1.10 Soya beans: Ship's sweat caused cargo damage

A vessel loaded a cargo of soya beans in bulk at Santarem, Brazil in January due for discharge in Qingdao, China. The vessel sailed around the Cape of Good Hope and bunkered in Singapore, before continuing to Qingdao, China. During the first 15 days of the voyage, fumigation prohibited ventilation of the holds.

Delay at anchorage

The vessel arrived at Qingdao anchorage in March. The vessel was delayed at anchorage for over one month. No ventilation had been carried out during the voyage to China, but ventilation started in late March according to the Three Degree Rule. During the delay at anchorage, the surface of the cargo in all five holds started to deteriorate and mould growth became visible. As the vessel was only equipped with natural ventilation the effectiveness of this ventilation whilst the vessel was stationary at anchor was therefore extremely limited.

The voyage and delay totalled 105 days. According to the Three Degree Rule, there were between nine and 11 days (depending on the hold) when ventilation was required but not carried out. This means that for most of the voyage the correct ventilation decision was made.

Mould damaged cargo

The vessel eventually berthed and began discharging in late April. The first stages of discharge segregated the surface layers of mould-damaged cargo from each of the five holds and this was stored in a separate warehouse facility.

What can we learn?

- Inspections and cargo temperatures revealed heat damage throughout the stow, not only at the surface although the cargo condition gradually improved with depth.
- Representative sampling and analysis of the 'sound' cargo revealed heat damage throughout the whole cargo, which was worse in the quantity initially segregated from the surface.
- It was concluded that most of the cargo damage was caused by the condition of the cargo at loading and the subsequent delay at anchorage in Qingdao.
- The mould damage on the surface was exacerbated by the self-heating within the cargo which led to condensation in the headspace and occurred despite the crew's ventilation efforts.
- It is unlikely that the crew could have taken any further action that would have had a significant impact on the condition of the cargo at discharge.

1.11 Soya beans: Self-ignited after several months at anchor

A bulk carrier had loaded soya beans by conveyor belt in a South American port bound for a port in the Gulf of Arabia. The vessel arrived at the discharge port, but berthing was significantly delayed. The vessel had to remain at anchor for four months as the charterers had not been paid for the cargo. One day the crew discovered smoke and heat coming from inside the holds. Two days later the vessel berthed.

Total loss

Eventually, it was ascertained that a considerable amount of the cargo was damaged. The invoiced value was over EUR 4 million. However, due to the damaged cargo, the local authorities declared the entire cargo to be a total loss and ordered the cargo to be destroyed. The cargo receiver arrested the vessel and demanded over EUR 5 million in compensation.

Inherent vice

It appears that self-heating damage occurred solely due the inherent nature of the cargo. It was established that there was no water ingress of any kind. It was also established that the damage was not caused by heat from any fuel oil tanks adjacent to the cargo holds. All possible causes involving the negligence or unseaworthiness of the vessel were excluded in the investigation of a fire expert.

However, the Club received legal advice from local lawyers that it was highly unlikely that the owners could successfully rely on the 'inherent vice' defence before the local courts. The main reasons given were that: 1) local court action could drag on for years and 2) the local courts tended to protect local companies when they were in dispute with foreign companies.

Recovery

Based on the local lawyers' legal advice, the Club had to settle the case amicably with the cargo owners. However, the Club in turn made a full recovery by bringing a claim against the charterers under the charterparty between the owners and the charterers (more specifically, by relying on the Interclub Agreement).

The recovery action turned on the interpretation of clause 8(d) of the Interclub Agreement.

Clause 8(d) provides that:

"(8) Cargo claims shall be apportioned as follows:

...(d) All other cargo claims whatsoever (including claims for delay to cargo):

50% Charterers

50% Owners

unless there is clear and irrefutable evidence that the claim arose out of the act or neglect of the one or the other (including their servants and sub-contractors) in which case that party shall then bear 100% of the claims."

The arbitration tribunal agreed with the owners' argument. The English Court upheld the decision holding that the owners did not need to prove fault or negligence in connection with the charterers act. The charterers' appeal was dismissed.

The charterer ended up having to pay the owners the unpaid hire and 100% of the cargo claim the owners had paid, together with legal costs and expenses.

What can we learn?

- South American ports commonly use conveyor belts to load soya bean cargoes, which create airborne dust and particles around the holds. Under such conditions, the on-site crew may be unable to distinguish between dry cargo and cargo with a considerably high moisture content by visual and smell inspections. Nonetheless, the crew is advised to take photographs to demonstrate the poor visibility during loading operations.

- The Chief Engineer should ensure that all engineers and engine ratings are aware of the procedures for heating fuel oil to prevent any cargo damage.

- The crew should check the temperature of the cargo at regular intervals, preferably at least 50cm below the exposed surface of the cargo.

- The owner/manager should always consider obtaining assistance from an experienced surveyor, or cargo expert, or more conveniently call their club for assistance whenever there are doubts as to the condition of the cargo that is being loaded.

- During the voyage, the cargo should only be ventilated according to the Three-Degree Rule, which recommends that ventilation should only be carried out when the outside temperature is 3°C lower than the cargo temperature at loading.

- The ventilation logbook should be completed properly.

- At the discharge port, owners/managers are reminded to contact the Club immediately if there is any indication by the crew, the receivers, or the local authorities that cargo has suffered damage by self-heating.

- Cargo experts should be called upon immediately to observe the pattern of damage in the cargo hold(s) and to take samples for analysis for evidential purposes (i.e. potential defence against a claim by the cargo receivers).

- The carrier should not be held liable where the owner provides the same management and standard of care for the cargo holds containing the same type of cargo (i.e. soya beans), which was loaded in sound condition, but results in different outcomes in terms of damage.

- One of the most effective defences against cargo claims is the maintenance of clear and accurate records and documentation of each stage of the voyage, from loading through to discharge. The crew can assist by maintaining detailed and accurate logs and taking photographs throughout the voyage.

- The charterers alleged that the cause of the damage was the owners' failure to properly monitor the cargo temperatures. The Tribunal however found that the monitoring was not at fault and that the cause of the damage was a combination of the inherent nature of the cargo (and its oil and moisture content) together with the prolonged period at anchor at the discharge port.

1.12 Steel: Cargo damaged by rain during loading

The vessel was loading a cargo of steel. During loading intermittent rain occurred, at which point loading stopped, and the cargo hatch covers were closed. However, this was a time-consuming process as the cargo hatches could only be closed one-by-one which meant the top cargo became wet. The stevedores covered the cargo with tarpaulins to protect it from the rain.

A couple of hours later heavy weather hit the port and damaged the tarpaulin, which caused more water to enter the cargo hold. The crew covered the cargo with some plastic; however, 150 steel bundles were water damaged.

Interrupted loading

After the heavy weather had passed loading resumed, however more rain showers occurred, and the cargo hatch covers had to be closed three more times before loading was complete.

During the voyage the crew ventilated the cargo holds as per their procedures. In the discharge port the consignee claimed for rust damage to the cargo.

What can we learn?

- If any wet damaged cargo can be observed during loading, the Master should write a letter of protest and clause the bills of lading and cargo manifest.
- It is essential that the crew monitor the weather via weather reports and radar, so that the cargo hatch covers can be closed before the rain starts.
- Before loading commences, the Chief Officer should discuss the vessel's cargo securing manual with the stevedores and identify what is required for the specific cargo being loaded.
- A good preventive measure is to have a pre-loading meeting with the crew and stevedores before loading starts.
- If the temperature in the loading port is colder than the climate through which the vessel will sail, then no ventilation should be carried out. Cargo sweat will occur if the temperature of the steel is lower than the dewpoint of the atmosphere in the hold.
- If the steel is loaded in a warm climate, the holds should be ventilated to avoid the internal hold structures cooling to below the dewpoint of the atmosphere within the hold. This would cause ship's sweat to develop and drip on to the steel.
- When cargo is already present at the wharf key, observation must include all evidence of rusted steel with silver nitrate tests to verify any exposure to sea water/spray, any damage to products stacked at the wharf including bent bars, loss of strapping/unwinding of steel coils, extent of telescoping in the coil centre, loose outer laps on the coils, damage to coil edges and comments on the effectiveness of any covering for protecting the cargo at the wharf.
- The dunnage utilised must be suitably dried to avoid transfer of moisture to the product and to the hold's atmosphere. The dunnage must also be phytosanitary-certified and approved to ensure the wood is pest-free. Without this certification, the vessel may be banned from offloading cargo in some territories. Hardwood dunnage is preferred to avoid crushing during the voyage and consequential cargo damage.
- Ensure bills of lading are claused, relating to defects/abnormalities observed during the pre-loading and loading operations e.g. evidence of damaged straps, unwinding or telescoping, damage to packaging.

1.13 Steel: Cargo rejected

The handymax bulk carrier had loaded steel pipes and steel coils in Asia to be discharged in North America. Before loading, all holds had been swept with brooms, washed with seawater, and then rinsed twice with fresh water. A hatch cover test (hose & chalk) was carried out at the loading port and the holds were accepted for loading. The last three cargoes were potash, sugar and palm kernel in bulk.

Damage on loading

During loading there had been some intermittent rain but according to the crew the cargo hatch covers had then been closed and the loading had been stopped. The pre-loading inspection highlighted that some of the pipes were loaded in a partially dented condition and were rust stained. Furthermore, a few steel coils were noted to have physical damage, and the galvanizing of the outer covers had been affected by oxidation marks. There were also broad rust marks on the port side tank top.

Lumber dunnage, steel straps and wires were used to secure the cargo in the holds. Bundled steel pipes were wrapped with polypropylene sheets and tightly bound with steel bands. However, the ends were exposed. When the loading was completed, marine tape was used across the cross joint seams to prevent water from entering.

Heavy weather

During the vessel's voyage over the Pacific it encountered heavy weather at Beaufort scale 10 with green seas covering the deck and cargo hatches. After the heavy weather the crew found that the cargo had shifted. To secure the cargo the crew used additional timber dunnage, but it was to no avail.

Poor ventilation

In the discharge port many pipes were found to have white rust or zinc hydroxide (galvanizing affected by oxidation marks) and red rust on the exposed ends. Zinc hydroxide is the white or grey rust deposit formed by accelerated corrosion of the zinc coating when closely-packed, recently galvanized articles, are stored or shipped under damp and poorly ventilated conditions.

The vessel had both natural and mechanical ventilation, but this had not been used for a month because of the heavy weather.

Damage

A sliver nitrate test was carried out and it came out positive. Some of the pipes also showed physical damage (i.e. nicked/flattened ends) due to compression. Most of the rusted pipes were on the port side under the cross joints of the bi-folding hatch covers.

Stevedores in one of the discharge ports had placed steel plates over the cargo as a protective barrier in order to use their forklifts to handle the cargo. Because of this some of the pipes were damaged due to the forklift driving directly on top of the pipes. The Master issued a Letter of Protest to the stevedores.

The cargo hatch covers were inspected and found to be in acceptable condition.

The consignee claimed extensive and widespread physical damage including compression dents, crushed and torn ends, bending, broken bundles, as well as rust, corrosion and stains on their cargo.

What can we learn?

- Before sailing it is essential that the crew makes sure that all cargo hatch covers, and other openings are secured properly and are in a weathertight condition.

- To ensure that the cargo hatch cover is secured properly it should be secured in port as per the manufacturer's instructions.

- For complete information on how to maintain the cargo hatch covers, please refer to the manufacturer's manual. It is also important to always use original spare parts.

- Cargo holds are often washed with seawater after unloading, leaving chloride-laden residues behind. The final washing should be done with fresh water. This is especially important if coal, iron ore or phosphates have been loaded previously. If this is not done, ship's sweat containing salt crystals will contaminate the steel and accelerate the development of rust. This can also give a false impression that it is the cargo hatch covers that have been leaking.

- Coils are stowed with the coil eye in a horizontal position. This is done for ease of handling and to minimise surface damage. Coil stowage crucially depends on the correct location of the lower layer of coils, with dunnage used as necessary to avoid damage to the tank top (or supporting structure) and the outer bulkhead. Comprehensive guidance on dunnage placement is given in the IMO's Assembly Resolution A.714 (17), 1991 Code of Safe Practice for Cargo Stowage and Securing (CSS Code), as amended. The stowage of steel coils is quite complex, and guidance should be sought when in doubt.

- The dunnage utilised must be suitably dry to avoid transferring moisture to the product and to the hold's atmosphere. The dunnage must also be phytosanitary-certified and approved to ensure the wood is pest free. Without this certification, the vessel may be banned from offloading cargo in some territories. Hardwood dunnage is preferred to avoid crushing during the voyage and consequential cargo damage.

- Steel coils must be anchored by wooden wedges (dry wood), which are nailed in position to the supporting dunnage board; the wedges are positioned to stop coils moving during rough seas. A centre coil, known as the locking coil, is positioned and secured by steel straps to the coils immediately below.

- If defects/abnormalities are observed during the pre-loading and loading operations e.g. evidence of damaged straps, unwinding or telescoping, damage to packaging, then the bills of lading should be claused.

- Even if the charterer is responsible for loading the cargo, the Master is responsible for ensuring that the vessel is seaworthy before departure.

- To minimise the impact of heavy weather and the likelihood of excessive green seas on deck, corrective action, such as reducing speed or altering course, should be taken.

- Weather routeing is recommended as this not only provides vessels with the option of avoiding heavy weather, but also ensures that the vessel gets new, updated ETAs for the discharge port. This helps the crew on board the vessel, shoreside personnel, and cargo owners, to plan accordingly.

1.14 Steel: Concrete steel pipes damaged due to poor loading and unloading procedures

The vessel had loaded a cargo of concrete-coated pipes. Some of the pipes had been stored in the port without any cover, there was damage to the cement coating, rust, scratches, broken and missing strapping bands, so the Master claused the bill of lading.

Lack of protection

During loading, some of the pipes had no protection towards the bulkhead. There was also a lack of dunnage between the different layers of pipes.

In the discharge port the surveyor claimed that the pipes had been further damaged during the voyage. Some pipes were also damaged during discharge as they hit the ground and were dented as a result of carelessness by the stevedores. It was found that stevedores did not use proper dunnage and did not protect the pipes from touching the ground.

The cargo had damaged edges and barrels, cement chipped off, cracked sockets and other damage. The pipes with damaged edges and cement chipped off could be repaired but the pipes with compressed barrels and cracked sockets could not.

In the storage area the pipes had no proper dunnage or cover.

What can we learn?

- Before loading commences the Chief Officer should discuss the vessel's cargo securing manual with the stevedores and what is required for the specific cargo being loaded.
- A good preventive measure is to have a pre-loading meeting with the crew and stevedores before loading begins.
- It is important that the manager updates the CSM (Cargo Securing Manual) with any new securing requirement.
- Review the stowage plan prior to loading.
- A pre-loading survey is always recommended. A detailed pre-loading report should be produced showing the extent of any exposure to rain/sea spray, together with photos highlighting the cargo's condition during transporting the steel to the wharf, including rust observations and any steel distortion e.g. bent bars, bruised coils and damaged packaging.
- When cargo is already present at the wharf, key observations must include all evidence of rusted steel with silver nitrate tests to verify any exposure to sea water/spray, any damage to products stacked at the wharf including, bent bars, loss of strapping/unwinding on steel coils, extent of telescoping in the coil centre and loose outer laps on the coils, damage to coil edges and comments on the effectiveness of any covering for protecting cargo at the wharf.
- Ensure bills of lading are claused, relating to defects/abnormalities observed during the pre-loading and loading operations e.g. evidence of damaged straps, unwinding or telescoping and damage to packaging.

1.15 Urea: Caking of urea at the discharge port

A large cargo of urea was found to be 'caked' when it was being discharged in Africa. However, the cargo was discharged normally by grab etc. There were some lumps that remained in the urea when it was discharged. Direct bagging was employed on the dockside. There was not a grid on the hoppers for the packing, so part of the urea was discharged in bulk to a dockside warehouse for manual packing.

A cargo expert attended but by the time he arrived the urea had all been discharged and the ship was under arrest for the quality of the urea, specifically the nitrogen content, and for caking.

Local laboratory sampling

Tripartite samples had been obtained during an inspection by the interested parties and these had been submitted to two local laboratories. They had been analysed for nitrogen, biuret (an unavoidable chemical produced during the manufacture of the urea) and water (there will always be some remaining from manufacture – more can be accumulated during subsequent storage/transport).

Urea should contain at least 46% N. The calculated 'Missing %' was calculated from the nitrogen analyses achieved.

The stock was examined and there was no sign of anything other than urea present; all the cargo was pure white and the appearance of the prills (small pellets) looked normal. Any contaminant must therefore have been visually identical to the urea - pure white prills - but containing zero nitrogen to have reduced the nitrogen content to the observed levels.

Fines

Some of the samples were analysed for the percentage of fines (below 1mm). Results ranged from 7.0% to 17.1% with an average of 12.2% - the specification was a maximum of 10%

	LAB 1	LAB 1	LAB 1	LAB 2	LAB 2	LAB 2
	Hatch 3	Hatch 4	Hatch 3	Hatch 4	Hatch 3	Hatch 4
N analysis	40.92	44.37	41.09	44.29	40.99	44.30
% Biuret	0.89	0.91	0.90	0.93	0.89	0.91
% H_2O	1.82	0.75	1.06	0.8	1.67	0.76
Calculated 'Missing %'	10.38	4.06	10.78	4.18	10.38	4.20

Further laboratory testing

Further tripartite sampling had been carried out by the parties during discharge by dropping a grabful of urea onto the deck. Three surveyors then took samples from the load. The operation was repeated five times for three of the five holds. Samples were sent to an internationally recognised laboratory in England for analysis.

- All analysis results for nitrogen were in specification, exceeding the minimum nitrogen content. The local analyses above, were therefore highly suspect.

- The global average for moisture content was 0.38% - much lower than the local analysis result and well within specification.

- The percentage of fines was highly variable even for samples taken from the same grabful. However, the global average for fines was 8.9% and the specification was satisfied.

The arrest of the ship was lifted, and no further claim was made.

What can we learn?

- This case highlights the importance of good quality sampling and analysis in relation to quality disputes.

- Samples should ideally be taken during loading. The sampling procedure should follow local or international standards and should be documented with a Sampling Report.

- If a portion of the sample from the sampler after loading is provided, then preserve it for possible future analysis. Store it in a cool dry place away from heat and out of direct sunlight.

- If the urea becomes lumpy as discharge proceeds, with uniform lumps becoming harder at greater depth, then this is caused by 'caking'. Caking is caused by a combination of many factors but is NOT caused by any fault of the vessel. Caking of urea can easily be distinguished from lumps caused by water-ingress by an expert when provided with a suitable photographic record. Caking is NOT associated with water ingress. It is strongly recommended that there are suitable photographs taken and that expert advice is sought as soon as possible

1.16 Urea: Contamination

During discharge of a urea cargo, 'stripes' of dirty urea could be seen. Urea should be pure white. The contamination was believed to have been caused by using dirty wagons to transfer the urea to the ship.

Fertilizer grade vs industrial use

The cargo receiver required the urea for industrial use – the manufacture of urea-formaldehyde resin, which is used, for example, in the manufacture of white articles such as electrical light switches. The cargo receiver blamed the vessel for permitting the loading of contaminated urea (even though the vessel was not responsible for the cleanliness of the delivery wagons).

There was a long discussion between an expert and the cargo receivers, where it was highlighted that the vessel had followed procedures that were applicable for fertiliser grade urea rather than the more detailed cleanliness requirements that would be appropriate for their industrial grade.

Considerations with contamination

Other types of contamination of urea cargo have included contamination with foreign materials (coal, grain etc. from previous cargoes). If such contamination is observed during loading, there are several options. An obvious point to consider is to ask the ultimate cargo receivers "does this matter?" – appropriate measures can then be readily identified. A Letter of Indemnity could be appropriate.

At discharge port

If the contamination is only observed at the discharge port, it may still be acceptable to the cargo receivers. Contamination that is localised is probably due to inadequate cleaning from previous cargo – however, in virtually every case the holds would have been inspected prior to loading. Other sources of contamination might be the loading equipment or contamination of the urea during previous transport/storage or on the quayside.

Prior to loading

Contamination that is spread throughout the cargo is probably introduced from the urea prior to loading – it is very difficult to apportion blame in such cases and each must be treated on its merit.

Grains

Contamination with grain can be difficult to resolve. In some instances, entire cargoes have been sieved in order to remove maize kernels. Removal of wheat grains is not possible by sieving because they are a similar size to the urea and the cargo may have to be sold to a less-discerning customer.

What can we learn?

- Before loading a specification will have been agreed between the various parties. If no specification has been provided to the vessel, then it should be requested. If a specification is not provided, then this should be recorded.
- Urea is usually pure white. This means that any coloured contamination will be obvious. It is therefore particularly important to remove any traces of previous cargo especially grain or sulphur. Only a few grains of corn or a few granules of sulphur have given rise to customer complaints. Normal inspection of the holds should pick up such problems. Small quantities of contamination are relatively unimportant for fertiliser use but industrial customers need to have urea without contamination.
- Samples should ideally be taken during loading. The sampling procedure should follow local or international standards and should be documented with a Sampling Report.
- Check loading equipment for cleanliness prior to use. Do not load contaminated spillage and dispose of contaminated urea safely in line with local regulations.

1.17 Explosion caused by fumigation

A bulk carrier had loaded yellow corn in all cargo holds up to the hatch coamings. After the loading was complete, fumigation technicians came on board and fumigated the cargo with fumitoxin pellets.

As per the cargo documentation, the fumigation pellets were required to be applied subsurface. In this instance the technicians poured the pellets from flasks while walking on the hatch coamings or hatch covers. This work took a little more than an hour and afterwards all the cargo hatches were closed and the vessel sailed.

A series of explosions

A couple of hours later an explosion occurred in one of the holds. The crew noted that the hatch covers had moved slightly and blue gray smoke was seen coming from under the edges. About an hour later another explosion occurred in a second hold, and a couple of minutes later an explosion occurred a third. There were explosions in the remaining holds shortly afterwards.

Cause

Fumitoxin pellets and similar fumigants are made up of around 55% aluminium phosphide which reacts with water to produce phosphine, an extremely toxic and effective fumigant. Phosphine gas will form an explosive mixture when mixed with air at a concentration exceeding around 1.8% to 2% by volume (the lower flammable limit). The concentration of phosphine in the air in each of the holds exceeded this lower flammable limit.

The fumigant pellets in each hold had not been distributed across the entire cargo surface, or applied to the subsurface, but had been applied by simply pouring the pellets on top of the cargo. This method of application had permitted the accumulation of the pellets in limited areas and promoted a relatively rapid reaction of the pellets with moisture, generating concentrations of phosphine gas above the lower flammable limit, which lead to the explosions.

What can we learn?

- The manager should provide training to the crew to ensure that the crew is aware of the requirements and procedures for the fumigation operation. The crew need to ensure that the fumigation pellets are distributed as per the cargo documents.

- Agricultural products in bulk may be fumigated in ships' holds to prevent insect infestation. Solid aluminium phosphide (or similar) is often used for fumigation. Aluminium phosphide reacts with water vapour (humidity) in air to produce phosphine, a toxic and flammable gas, which kills insects. Heat is also given off during the reaction. The solid fumigant may be applied in fabric 'socks' or as pellets on the surface, just before closing holds. Holds are then kept closed for a period before ventilating. People must keep out of holds that are being fumigated due to the toxic fumigant.

- If there is an excessive amount of fumigant in one place, or if the fumigant is in contact with liquid water e.g. from sweating or condensation, then the fumigant can react too quickly. This can evolve excessive heat and lead to ignition of cargo and/or packaging such as bags or paper placed over the top of the cargo. Under certain conditions the fumigant gas itself may ignite, producing an explosion. It is important that fumigant is applied according to the correct instructions. As holds are always un-ventilated for a time after fumigation, there may be a risk of excessive condensation, which can produce sweating or dripping. This can lead to cargo damage as well as the fire and explosion risks mentioned above. The weather conditions and cargo conditions, such as moisture content, therefore need to be considered properly before fumigation, which is often carried out by specialist companies.

2

Cargo - containers

2

2.1 Reefer container: Damage to seafood

A shipment of containerised boxed shrimps transported from Argentina to China was found to be badly frosted. The shrimps inside the boxes were also beginning to blacken due to melanosis.

Melanosis

Shrimps and crustacea undergo melanosis (an enzyme catalysed oxidation) when they are kept at incorrect temperatures and/or past their shelf life. Melanosis is also related to the freshness of the product at the time of freezing and whether it has been treated with any preservatives. While melanosis is not dangerous for consumption, it is a quality control indicator, and renders the shrimps unsightly and unsaleable.

Frosting

The frosting is a second indicator that the product had suffered temperature abuse. Frosting appears when a product is thawed and then partially refrozen. Usually, the boxes are tightly packed into the containers, restricting airflow through the cargo and effectively insulating the cartons inside the stow compared to the ones in the outside. The product on the inside of the stow would be insulated against the worst damage by the cargo around it. It is then expected to observe a gradient of damage as the condition of the cartons is poorest nearest the door and the external edges of the stow, with the damage lessening towards the rear of the container.

Fluctuating temperatures

The container logs showed erratic temperature changes. Seven days after the start of the voyage, the temperature started to rise slowly but steadily from -25°C to a range between -10°C to -2°C on arrival, which is indicative of a refrigeration system malfunction. These temperatures are sufficient for melanosis and frosting to occur. The Master and the crew should have been warned of the malfunction and attempted to repair the container; however, the corresponding alarms were not relayed to the vessel, suggesting a secondary malfunction in the system.

What can we learn?

- The crew should check that the container set temperature complies with the shipper's specified carriage instructions.
- The crew should keep clear and accurate records. Document each stage of the voyage from loading through to discharge as well as obtaining date-stamped photographs of incidents which occur during the voyage.
- When carrying frozen cargo, the fresh air ventilation ducts should always be closed.
- The cargo should always be kept below the load line of the container, away from the container walls and not beyond the 'T' bars to allow the refrigerated air to flow freely around the whole of the stow.

2.2 Reefer container: Damage to fresh produce

A cargo of bagged white garlic was shipped from China to Central America. On arrival, it was noted that significant portions of the consignment showed signs of germination.

Storage of garlic

After curing (a process of drying after harvest), garlic can be stored at high temperatures (+25 °C) or low temperatures (-3 °C to 0 °C) to prevent germination of the bulbs and maintain the storage life of the product. Temperatures above 5 °C and below 20 °C are not appropriate for garlic storage and can cause dormancy break, advanced germination, and fungal/bacterial issues. It is common to see garlic transported in containers at low temperature (i.e. -3 °C to 0 °C). At these lower temperatures, the heat generated by respiration of the garlic bulbs is removed, helping to maintain a period of dormancy.

Temperature records

The temperature records indicated that it took several days for the temperature to reach +4 °C. Furthermore, the situation was exacerbated by the cargo being 'hot-loaded', meaning that the cargo was not pre-chilled before loading. The effect of these two factors was to prevent the cargo from meeting the required temperature range and thus, led to a significant portion of the cargo arriving with unacceptable levels of germination.

The crew should take care when checking that set point temperatures, as outlined in the carriage instructions, are properly applied to the containers. A failure to do so can lead to the onset of germination and/or spoilage of cargo through bacterial or fungal infections.

What can we learn?

- The crew should check that the container set temperature complies with the shipper's specified carriage instructions.
- It is important to note that the reefer container is designed to maintain the cargo's temperature rather than cool it. Ideally, all cargoes should be loaded at the intended carriage temperature to ensure product quality is maintained.
- The crew should keep clear and accurate records. Document each stage of the voyage from loading through to discharge as well as obtaining date-stamped photographs of incidents which occur during the voyage.

2.3 Reefer container: Meat damaged due to wrong temperature settings

The container vessel had loaded cargo in a South American port, to be discharged in Europe. Several reefer containers with meat were also loaded. The containers had been filled with superior chilled meat at a cargo temperature of around 0°C. The containers were set to chilling mode with a set point temperature of -1.4°C.

Freezing mode

However, one of the containers was switched to freezing mode with a set point of -18°C and remained at this setting throughout the entire month's voyage to Europe

Confusion re reefer list

On the bill of lading it was stipulated that the container should be kept chilled at a temperature of -1.4°C. However, during the loading operation the agent supplied an initial reefer list which had two separate entries for this container, one where it stated that the container should be chilled and another where it said it should be frozen. This mistake was discovered by the crew, and the agent then updated the reefer list confirming the set point temperature as -1.4°C for the container.

Frozen meat

One month later the vessel discharged the containers in Europe. When the cargo receivers inspected the meat, they found it to be frozen. The meat should have been chilled as it becomes damaged when it is frozen.

According to the container unit's records the temperature in the container fell a couple of days after departure. This caused the meat to freeze. Over a sufficiently long time, even a reefer container will achieve solid freezing of the entire cargo. In this case, there was clearly sufficient time.

Each piece of meat was packed in a heat-sealed vacuum plastic liner bag. When the cargo receiver inspected the meat it had turned dark red and slightly brownish and the vacuum bags contained a considerable quantity of blood.

The meat which was initially of superior quality could now only be used for lower end products and had to be sold for a loss.

What can we learn?

- The crew should check that the container set temperature complies with the shipper's specified carriage instructions.
- If the delivery or return air temperatures are incorrect, it is important to confirm with the shippers that any adjustment to the correct set temperature will not lead to cargo damage during the voyage.
- The crew should keep clear and accurate records. Document each stage of the voyage from loading through to discharge as well as obtaining date-stamped photographs of incidents which occur during the voyage.
- Another concern is miscommunication between the charterers and owners, where multiple entries are made in the voyage instructions for the same reefer container with different corresponding temperatures which have been sent by the shipper/charterer to the owner/Master. Unless theses entries are detected, incorrect instructions can be applied.

2.4 Reefer container: Damage to various food products

The container vessel had loaded cargo in a European port, to be discharged in Asia. Several reefer containers with meat, fish and other food had been loaded. The containers had been filled with frozen food at a temperature of -20°C and the temperature of the containers was set to freezing.

Temperature logged

During the voyage an AB checked the containers twice a day and logged the temperature between -19°C and -20°C.

One month later the vessel discharged the containers in Asia. When the cargo receivers inspected the meat, they found it to be thawing.

Actual conditions

According to the container units' records, the temperature in the containers had increased over a couple of days after departure from -15°C to +5°C. All the alarms for the containers had been disabled.

The airflow outlet to the containers had been open. This allowed a continuous flow of warm air into the containers. Why this had been opened after departure is not known.

The cargo was fully rejected and destroyed by the cargo receivers.

Incorrect record keeping

The crew had not verified the correct temperature of the container but only written down what should have been the correct temperature in the log as the actual containers' digital log showed +5°C and not -20°C as in the vessel's log.

What can we learn?

- A continuous supply of power to reefer containers is of the utmost importance during the voyage. The vessel's crew should regularly monitor this and ensure that all incidents regarding the vessel's diesel generators and reefer circuit breakers, and their associated alarm systems, are meticulously recorded.

- The crew should check that the container set temperature complies with the shipper's specified carriage instructions.

- The crew should keep clear and accurate records. Document each stage of the voyage from loading through to discharge as well as obtaining date-stamped photographs of incidents which occur during the voyage.

- When carrying frozen cargo, the fresh air ventilation ducts should always be closed.

3

Cargo - tankers

3.1 Hazardous chemical: Cargo contaminated cargo by tank coating

It was winter with temperatures around 2°C. The chemical tanker was in port loading a cargo of mixed xylenes (MX) (ref Marpol Annex II) in all its six cargo pair tanks. The previous cargo had been ethylene dichloride (EDC) (ref Marpol Annex II) which the vessel had carried on the two previous voyages.

During the voyage to the loading port the vessel carried out tank cleaning. The loading was uneventful, and the vessel departed the following day and proceeded towards the discharge port.

Sampling

The vessel berthed and a cargo surveyor came on board to carry out sampling. The cargo in all tanks was found to be off-specification regarding chloride content.

Coating

During the investigation into the contamination, the coating on the cargo tanks was identified as the cause of the contamination.

The tanks were coated with phenolic epoxy and it is believed that the coating was applied properly and in compliance with the requirements set out by the manufacturer of the paint.

Such organic coatings absorb significant quantities of solvent-like cargo into the paint layer and subsequently desorb (release) these residues following discharge of the cargo. It is this property of absorption and desorption into and out of organic coatings that has led to a significant amount of cargo contamination claims, which is also believed to be the cause in this case.

It should be noted however, that epoxy systems are resistant to strong acids and alkalis and do not generally absorb significant quantities of oil-like substances. These types of substances remain on the surface of the paint from where they can be removed using conventional cleaning techniques.

Cargo lines

As part of a change in cargo grade, a tank cleaning operation requires all cargo lines to be flushed to remove all traces or remnants of the previous cargo. Additionally, vent lines leading from the cargo tanks to the pressure/vacuum relief valves (P/V valves) also need to be flushed. This is done by opening the flange between the P/V valve and the vent piping for each tank and using a hose to flush this line. During the carriage of cargo, vapour from the tank can accumulate and condense within the vent line. These lines are designed to be self-draining to the cargo tank and any condensation will trickle back to the cargo tanks. It cannot be confirmed if this was done or not during the tank cleaning.

The cargo was finally discharged to shore tanks and sold at a salvage price with a considerable loss.

What can we learn?

- The condition of the coatings in the cargo tanks had been allowed to deteriorate and this allowed cargo seepage and accumulation between the coating and the substrate. Combined with the absorption of the cargo of EDC into the phenolic epoxy coating, this seems to be the likely cause of contamination of the mixed xylene cargo with chlorides.

- All tank coatings should be inspected by a manufacturer's paint technician and the damaged coatings repaired in accordance with the manufacturer's instructions. It would also be prudent for the owner to have the coating assessed by the manufacturer to ensure that the chemical resistant properties of the coating are adequate for the intended trade of the vessel.

- A coating resistance list should be placed on board the vessel and made available to the crew. This list should always be referred to and for all loading operations. Where the coating resistance list states that the coating has 'limited resistance' to a cargo, it must be ensured - as far as practically - that two successive loadings of aggressive cargoes are avoided and, charterers for the following voyage should be advised of the possibility of contamination and an indemnity sought. The owner's chartering department should also be made aware of potential risks when fixing the vessel.

- Tank cleaning procedures and guidance provided by the owner in their procedures should be revised to include not only the need to refer to published industry guidelines such as Dr Verwey's Tank Cleaning Guide or the Miracle Tank Cleaning Guide, but also to include guidance on the behaviour of different types of cargoes carried on chemical tankers and their effect on tank coatings.

- The crew needs to be trained in tank cleaning and tank coating maintenance.

3.2 Petro: Naphtha was off spec

The chemical tanker had loaded naphtha in port A. 10,000 MT of the naphtha was to be discharged in port B, and the balance to be discharged in port C. Before loading began the cargo tanks had been inspected by a surveyor and accepted. Not all the cargo tanks were used for the naphtha cargo.

Previous cargo

The vessel had previously carried EDC (ethylene dichloride). During loading of the EDC cargo, both the CPP1 (clean petroleum product) manifold on the port side and the port side's common pipeline had been used.

During loading of the naphtha, the manifold connection was changed from the CPP1 to the port side's common manifold. It is unknown whether the CPP1 manifold was drained during the shifting of the loading arm.

After discharging the EDC the tanks were ventilated. The ventilation took approximately 10 days to complete. After this the EDC tanks and the CPP1 manifold were subsequently washed with water, according to the Chief Officer. First the tanks were washed with sea water and finally with fresh water.

Loading the naptha

The same CPP1 manifold and pipeline that was used for the EDC cargo was used during the loading of the naphtha cargo.

After loading the naphtha in port A the vessel sailed to port B and discharged 10,000 MT of naphtha. The cargo receiver in port B decided to mix the 10,000 MT into a shore tank which already held 23,000 MT of naphtha.

The vessel departed from port B and sailed to discharge the balance of the cargo in port C.

Contamination

Contamination was later discovered in port B when the cargo was discharged from the shore tank to the refinery. The cargo from the shore tank to the production line was immediately stopped.

The vessel's cargo samples were taken and analysed. All the samples were found to be within specification. There was no contamination to the cargo on board, which had been loaded in port A.

Analysis of the shore tank's samples were however off-spec and were contaminated by organic chloride which was not produced at the refinery of port B. The cargo receiver in port A also confirmed that they had not handled any EDC cargo and that no such cargo was made at the refinery – the terminal in port B only receives naphtha cargoes.

The EDC cargo was not handled at port A which was the naphtha loading port.

This made it most probable that the contamination was from the vessel, as the previous cargo loaded had been EDC.

Discharge at port C

It was noted that there was no contamination to the naphtha cargo when it was discharged in port C. Here the discharging was via the foremost manifold of the CPP common line on the port side. The port side's CPP1 manifold, which had been used for the EDC cargo and naphtha cargo in port B, was not in use.

EDC in manifold

It is likely that the EDC remained confined inside manifold CPP1 following the change of the manifold connection from CPP1 to the port side's common manifold and contaminated the naphtha cargo in port B during discharging. The organic chloride was identified by the analysis of the shore tank to be ethylene dichloride (EDC).

The cargo receiver in port B later sold the naphtha at a public auction at a considerable loss which the shipowner had to pay.

What can we learn?

- It is unlikely that the cargo tanks were insufficiently cleaned after carriage of the EDC. Although not recorded in the cargo record book, the Chief Officer stated that the cargo tanks were correctly washed after the ventilation.
- It is likely that the CPP1 manifold was insufficiently cleaned by means of ventilation and/or washing. The contamination likely occurred when loading of naphtha commenced at port A via the manifold CPP1 and flushing the EDC material from the manifold into the first tanks opened to receive the cargo. As a result of the higher density, the EDC contaminant probably settled at the bottom of the cargo tanks, forming a very thin layer and/or pockets, allowing it to remain undetected upon completing the loading operation at port A and prior to the start of discharging at port B.
- The procedures carried out for ventilation and tank cleaning were not correctly recorded in the cargo record book and were only described by the Chief Officer when he was interviewed. It is imperative to keep correct records in the cargo record book.
- It is important to have good record keeping as per company SMS for tank cleaning.

3.3 Vegetable oil: Crude palm oil was contaminated with palm kernel oil

The vessel had loaded crude palm oil and palm kernel oil and the cargo was to be delivered to three different consignees in the discharge port.

Abnormal ullage readings

A couple of days into the voyage the Chief Officer was in the cargo control room and noticed abnormal ullage readings for the 4S & 2S cargo tanks. The ullage of 4S increased and the ullage of 2s reduced by the same amount. He opened the suction valves of 2S and 4S but closed the vales again as cargo tanks 4S and 2S were on the same discharge line. This stopped the increase of cargo into cargo hold 4S.

Cargo pair tanks

The vessel's cargo procedures covered the carriage of four different grades in its six cargo pair tanks and the slop tank.

These pairs were on the same discharge line and had one cargo pump per cargo tank group.

- One cargo in No 1 (P&S) and No 3 (P&S) - the same line should be for the same cargo.
- One cargo No 2 (P&S) and No 04 (P&S) - the same line should be for the same cargo.
- One cargo No 05 (P&S) & 06 (P&S) - the same line should be for the same cargo.

Each group had a separate cargo pump which pumped the cargo to a separate cargo manifold crossover.

Incorrect procedures

However, different grades of cargo had been loaded in the different cargo pairs. Cargo tank 4S was loaded with crude palm oil and 2S was loaded with palm kernel oil. This is not the normal procedure. As stated above the same cargo should be in cargo tanks 2S and 4S as they are on the same cargo line.

Internal leakage

As the 2S and the 4S shared the same discharge line, any internal leakage from the hydraulic valve would allow the cargo to contaminate the other tank.

An analysis of the crude palm oil cargo in 4S was carried out at a laboratory where it was confirmed to be contaminated with palm kernel oil.

The vessel discharged the non-contaminated and contaminated cargo into two different shore tanks. The claim was settled for more than USD 600,000.

What can we learn?

- This case highlights the importance of not deviating from the normal loading procedures. If the vessel had loaded as per the normal loading pairs it would not have been an issue if a valve between the tank pairs was leaking, or open by mistake, as the cargo would have been the same in the tank pairs.

- As an act of omission and commission, the possibility of inadvertently opening and closing both valves at the same time in the cargo control room cannot be ruled out during the voyage.

4

Collision/Contact

4.1 Collision as vessel was overtaken

Vessel A was a small general cargo vessel sailing at night in a busy area in the Baltic Sea. Visibility was good, and winds were westerly at Beaufort scale 3. The vessel was maintaining a speed of about 10 knots.

Bridge equipment

The S-band ARPA radar was set up in off centre, range 12 NM, north up, in relative motion mode, while the X-band radar was on standby. Both radars had similar blind zones as the masts were positioned close to each other on the ship's upper bridge. The bridge equipment included an ECDIS, which the Master who was on the 8-12 watch was monitoring. A lookout was also on the bridge.

Handover

There were a number of vessels astern of vessel A. Five minutes before midnight the Second Officer came to the bridge for his night watch. During the handover, the Master informed him about the vessels which were astern and advised that they were being overtaken by a number of them. After the handover the Master left the bridge.

The Second Officer was aware of a vessel overtaking them on the portside but was not aware of vessel B also overtaking them, but on the starboard side. He switched the radar between centred display to off-centre several times. The lookout was on the port bridge wing.

One minute from collision

The Second Officer was monitoring the ARPA S-band radar when he noticed a target astern on the starboard quarter - it was very close. This was vessel B and it was one minute from collision and only a few cables away. The officer turned around and looked out through the aft starboard bridge windows. Vessel B was almost on top of them. He tried to call the Master but could not reach him. He then switched to manual steering and altered hard to starboard which was towards the overtaking vessel, and the vessels collided.

Collision

Soon after the collision the Master came onto the bridge. He noticed that the engines were still full ahead and the rudder was hard to starboard, but the vessel was not turning. He reduced the engines to 60%. Vessel A was not moving. Vessel B had struck vessel A on the starboard side in way of cargo hold 2. After a while vessel B moved astern, and the vessels disengaged. The Master contacted vessel B but the OOW on vessel B responded that they had only been involved in a near miss. After a while they admitted that they had been involved in a collision.

Recording

The Master saved the VDR. However, only the X-band radar was interfaced with the VDR and as that radar was in standby mode, radar screenshots of the developing close quarter situation had not been recorded by the VDR.

COLREGs

Rule 5 - Look out:

Every vessel shall at all times maintain a proper look-out by sight and hearing, as well as by all available means appropriate in the prevailing circumstances and conditions, so as to make a full appraisal of the situation and of the risk of collision.

It is essential that the OOW ensures that a proper lookout is maintained all-round the vessel in cooperation with the AB on watch. This is the responsibility of the OOW. It is unclear why the lookout did not actively inform the OOW about the vessel overtaking on the starboard side.

Rule 7 - Risk of collision:

(a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt [then] such risk shall be deemed to exist.

This may include running both radars. The ARPA radars should always be used for plotting all critical traffic. The X-band radar was the only radar recorded by the VDR, which means that the X-band radar should always be running when the vessel is on passage. It is also imperative that the OOW is aware of the bridge equipment's limitations and is not over-reliant on any specific equipment.

Rule 13 – Overtaking:

(a) Notwithstanding anything contained in the Rules of Part B, Sections I and II, any vessel overtaking any other shall keep out of the way of the vessel being overtaken:
(b) A vessel shall be deemed to be overtaking when coming up with another vessel from a direction more than 22.5° abaft her beam.

In this collision vessel B was overtaking vessel A and should have kept out of the way of vessel A.

Rule 17 - Action by stand-on vessel:

(a) (i) Where one of the two vessels is to keep out of the way the other shall keep her course and speed.
(ii) The latter vessel may however take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these rules.

(b) When, from any cause, the vessel required to keep her course and speed finds herself so close that the collision cannot be avoided by the action of the give-way vessel alone, she shall take such action as will best aid to avoid collision.

Vessel A was the stand-on vessel. The OOW on vessel A noticed vessel B only one minute prior to the collision. The OOW took the action that he thought would be effective However, it was too late to be able avoid the collision.

What can we learn?

- In this accident vessel B did not alter course or adjust its speed at any point. Vessel A was the stand-on vessel and vessel B was the give-way vessel as it was overtaking vessel A on the starboard quarter. Vessel B would have been able to see the stern light of vessel A but not its sidelights.

- Rule 5 stipulates that every vessel shall maintain a proper look-out by all available means. The proximate cause of this collision was poor lookout by those on the bridge of vessel B. Vessel A was the stand-on vessel as it was being overtaken. However, it is essential that the bridge team (the OOW and the dedicated lookout) maintain a proper 360° lookout, track all traffic around the vessel and use all navigation equipment available on the bridge.

- It is imperative that the OOW and lookout discuss all traffic concerned and that the lookout updates the OOW with any change in the movement of the targets. It is the responsibility of the OOW to ensure that the lookout is actively reporting targets observed.

- The X-band radar can, depending on the sea conditions, be better at detecting smaller targets compared to the S-band radar. However, it was on standby. Preferably both radars should be running all the time, as with today's modern ARPA radars there is no reason not to do this. Furthermore, there is an IMO requirement on VDRs installed after 1 July 2014 that both ARPA radars should be recorded to the VDR which was not the case when the VDR was installed on vessel A.

4.2 Collision in restricted visibility when approaching port

Vessel A, a 1000 TEU container vessel, was approaching the pilot station at 17 knots. The vessel was in manual-steering mode and was on a course of 280°. That afternoon visibility was restricted to approximately 0.1 NM due to fog. The Bosun was on deck preparing the pilot ladder after which he would go to the forecastle to act as a lookout.

The bridge

The Master, the Second Officer and the AB were on the bridge. The Master had the conn, the Second Officer was monitoring, and the AB was on the wheel. Two ARPA radars were used alternatively on ranges between 6 NM, 3 NM and 1.5 NM. Both the Master and OOW were monitoring the vessel's progress on the radars.

Monitoring

The Master saw a target on the radar and acquired it on the ARPA as vessel B. The target was 10° on the port bow, 4 NM away with a CPA of 0.2 NM. Vessel A was overtaking vessel B. It could be seen that if vessel A maintained this course, it could hit vessel B on the starboard side. Vessel B was also on a course of about 280° and making a speed of 6 knots. The Master started the fog signal.

C -15 minutes: Vessel B was on course of 293° and the CPA was 0.14 NM. Vessel A was maintaining its course and speed.

C -10 minutes: Vessel B's course was 285°, CPA 0.04 NM and distant 1.4 NM.

C -5 minutes: Vessel B's course was 289°, CPA 0.03 NM and distant 0.65 NM.

C -2 minutes: Vessel B's course was 304° and CPA 0.01 NM and distant 0.3 NM. Vessel B was still on the port bow of vessel A. At this point the Master on vessel A realised that vessel B was very close and ordered hard to starboard and stop engines.

Collision: It was too late to avoid the collision and vessel A struck vessel B on its starboard side about midships. The Master saw that vessel B was a small tanker. Shortly afterwards vessel B began to list heavily to starboard and the crew were forced to deploy the life rafts and abandon ship. They were all rescued by vessel A.

COLREGs

Rule 5 - Look out:

Every vessel shall at all times maintain a proper look-out by sight and hearing, as well as by all available means appropriate in the prevailing circumstances and conditions, so as to make a full appraisal of the situation and of the risk of collision.

In this collision neither vessel seems to have maintained proper lookout.

Rule 6 - Safe speed:

Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions. In determining a safe speed, the following factors shall be among those taken into account:

(a) By all vessels:
(i) the state of visibility

The OOW must have time to take proper and effective action to avoid collision as required under Rule 6 to be considered to have proceeded at safe speed. Vessel A was making a speed of 17 knots in restricted visibility while approaching a congested area and a pilot station and this would probably be considered not to be a safe speed in the prevailing circumstances. This is also emphasised in *Rule 19*.

Rule 7 - Risk of collision:

(a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt [then] such risk shall be deemed to exist.

(b) Proper use shall be made of radar equipment if fitted and operational, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observation of detected objects.

Vessel B was plotted on the ARPA on board vessel A and showed a small CPA. Despite the small CPA, no action was taken by the bridge team on vessel A.
At about C-15, the CPA to vessel B was 0.14 NM, which indicated that a risk of collision existed between the vessels. Visibility was restricted and so it was even more important to ensure that the CPA was large enough to account for any margin of error in the equipment. As per ARPA performance standards regulation the CPA should be calculated by the ARPA within three minutes with an accuracy of within 0.5 NM. This means that if the ARPA reports a CPA of 0.5 NM the actual CPA could be 0.0 miles or 0.5 miles. The bridge team must factor in this margin of error of the CPA when planning any collision avoidance manoeuvres and the passing distances to other vessels.

Rule 8 - Action to avoid collision:

(e) Any action taken to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.

(f) Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar: a succession of small alterations of course and/or speed should be avoided.

It is prudent and good seamanship to take action at an early stage by altering course and/or reducing speed to open up the CPA. In this case neither vessel took any action to avoid collision.

Rule 13 – Overtaking:

(a) Notwithstanding anything contained in the Rules of Part B, Sections I and II, any vessel overtaking any other shall keep out of the way of the vessel being overtaken:

Vessel A was overtaking vessel B.

Rule 19 - Restricted visibility:

(a) This Rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility.

(b) Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility. A power-driven vessel shall have her engines ready for immediate manoeuvre.

(d) A vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters' situation is developing and/or risk of collision exists. If so, she shall take avoiding action in ample time, provided that when such action consists of an alteration of course, so far as possible the following shall be avoided:
(i) an alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken:
(ii) an alteration of course towards a vessel abeam or abaft the beam.

In restricted visibility both vessels have a requirement to stay clear of each other. It is likely that vessel B was altering course as per its passage plan. It is still the responsibility of vessel A to ensure they stay clear of vessel B as per Rule 19.

What can we learn?

- The bridge team on vessel A acquired vessel B on the ARPA at about C -15 minutes. The CPA was 0.14 NM. With such a small CPA this should be considered a close quarter situation. At this point the bridge team had time to make an alteration to ensure the collision was avoided but no action was taken on vessel A.
- When sailing in restricted visibility all vessels have a responsibility to stay clear of each other. All vessels also have a responsibility to proceed at a safe speed which ensures that they can stop quickly. Maintaining full speed in restricted visibility under these navigational circumstances could be considered proceeding at an unsafe speed. Vessel A was approaching a pilot station in restricted visibility which meant there was also an increased risk of encountering a greater concentration of different types of vessels.
- In restricted visibility both vessels have an obligation to stay clear of each other. However, we do not know why vessel B altered to starboard. It is possible vessel B altered course in accordance with their passage plan. Vessel A was overtaking vessel B which required vessel A to stay well clear of vessel B.
- It is important that the officers understand the rules and increased risks when sailing in restricted visibility. It is also important to understand the limitations of the navigation equipment. It appears that the bridge team on vessel A considered a CPA of 0.14 NM to be an acceptable margin. To ensure situational awareness is maintained, the bridge team should discuss all plotted targets, what risks they pose and take appropriate action.

4.3 Collision in river

It was the middle of the night and vessel A, a 6,500 TEU container vessel, was sailing out from a port in a busy river with a pilot conning the vessel. The weather was fine with clear skies and winds at around Beaufort scale 6. All navigation equipment on vessel A was in good working order except for the AIS transceiver, which was not working.

Vessel A was on an easterly course in the outbound deep-water channel of the river fairway. Vessel B was proceeding on a reciprocal course in the inbound fairway of the river. The vessels were in sight of each other. The Master, Chief Officer, lookout, helmsman and the pilot were on the bridge of vessel A.

Underestimated weather conditions

Vessel B, a handymax bulk carrier, then reduced speed in order to time arrival for its berth. However, the bridge team on vessel B underestimated the impact of the wind and current, and the vessel was set towards the outbound fairway and its heading altered to port and towards vessel A. This caused vessel B to enter the outbound fairway.

No room for manoeuvre

Vessel A was sailing in the fairway of the extended deep-water channel but towards the centreline between the inbound and outbound fairway. The bridge team saw that vessel B had slowed down and that its heading was changing towards them.

There was some room for vessel A to turn to starboard and still remain in the fairway, but it was limited. The vessels were approaching each other, and vessel A was not able to turn to starboard and clear vessel B and still remain in the fairway.

An attempt to communicate

The pilot on vessel A flashed the signal lamp and called vessel B on the VHF but vessel B did not respond. The pilot ordered full astern and tried to alter course to starboard with the bow thruster. This did not prevent the collision. The Master on vessel A saved the VDR data after the accident. There were no injuries or pollution.

COLREGs

Rule 5 - Look out:

Every vessel shall at all times maintain a proper look-out by sight and hearing, as well as by all available means appropriate in the prevailing circumstances and conditions, so as to make a full appraisal of the situation and of the risk of collision.

In this case vessel B failed to keep a proper look-out.

Rule 7 - Risk of collision:

(a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt [then] such risk shall be deemed to exist.

When vessel B drifted towards the outbound side of the channel it should have been clear to both vessels that a risk of collision was developing. Vessel B did nothing, and vessel A tried to contact vessel B instead of taking evasive action. The COLREGS do not mention the use of VHF. The rules are clear and should not require any discussion between the vessels.

Rule 9 - Narrow channels:

(a) A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable.

Neither of the vessels navigated near the outer limits of the fairway.

What can we learn?

- If we look at this case from vessel A's point of view, there are several problems in this collision which could have been resolved if the pilot had clarified the intentions of vessel B.

- The major fault in this collision lies with vessel B as it drifted into the opposite fairway when it slowed down. What happened on vessel B's bridge and why it did not respond to vessel A or take any action when it started to drift is unknown.

- It is important to continually evaluate all traffic, especially if the vessel is in a congested area such as approaching or departing a port. In the port state investigation, vessel A was found to be positioned close to its starboard side of the fairway, and this was identified as a fault. However, vessel B was found to be preponderantly to blame. The bridge team was not maintaining a proper look-out, they did not respond on the VHF and vessel B failed to stay clear of vessel A as it drifted into the opposite side of the fairway. The investigation also raised the issue of vessel A not having a working AIS.

- It is important that the bridge team has a departure briefing, where different scenarios are discussed, and the potential risks identified. When the pilot boards, the Master should discuss the plan for the pilotage. It is also important that the Master asks about local regulations, concerned traffic, expected currents and winds, and knows what the passing requirements are and how the pilot plans to approach the departure. If the local language is spoken the pilot must share the conversation, in English, with the bridge team.

- If the Master for some reason is not confident in the pilot's orders, he needs to voice this concern immediately. If he believes the vessel's safety is at risk, he must relieve the pilot. It is not uncommon for The Swedish Club to find that following navigational claims the Master has afterwards stated that he was concerned with the pilot and how they navigated the vessel. However, he did not relieve the pilot and take over.

- It is important that Masters are confident enough and are trained on how to challenge correctly. As in any line of work there is a vast difference in competence between different pilots and officers around the world. The safety of the crew and vessel should always be the Master's priority.

4.4 Collision in busy anchorage after grounding

In an evening with good visibility, vessel A, a 2,470 TEU container vessel, was approaching port. The Master had received orders to arrive at the pilot station at 20:40, which was one hour earlier than previously planned. To make the new ETA the speed had to be increased from 10 knots to 14 knots. Instead of following the passage plan, the Master decided to take a shortcut through an anchorage.

On the bridge was the Third Officer, who was the OOW, the Master who had the conn and the Chief Officer who was monitoring traffic both on the radar and visually. He was also talking on the VHF. An AB was manually steering whilst the Third Officer was filling out the logbook. The two ARPA radars were in north up, relative motion and the radars were switched between 3 NM and 6 NM range. The CPA alarm was set to 0.3 NM.

Passage plan not updated

The Second Officer who was the navigation officer, had already entered the waypoints for the original passage plan into both ARPA radars and the ECDIS, and a cross-track error alarm of 1 cable had been set up. During the approach he was not on the bridge and the passage plan was not updated for the shortcut as the Master did not consider it was necessary.

C -15 minutes: During the approach to the pilot station there were two smaller vessels ahead of vessel A that would be overtaken on their starboard side. Shortly after the vessels had been overtaken the Master ordered an alteration to port which meant that vessel A crossed in front of the bow of the two vessels.

C -12 minutes: The Master was also aware of two outbound vessels from the port, vessels B and C. These vessels were not acquired on the radar. Vessel B called up vessel A and asked what their intentions were. The Master responded that he would like to have a port-to-port passing. Vessel B replied that it was turning hard to starboard to make the passing. The Master altered course to starboard. At this time vessel B was about 1 NM away on the port bow.

C -9 minutes: The Master became aware of vessel C on the port bow. He could see the green, red and forward top lights on vessel C but did not take any action. Vessel A was maintaining a speed of 10 knots.

C -7 minutes: The Master decided to open up/increase the CPA by altering 5 degrees to starboard for vessel C. A minute later the Master realised that vessel C was very close, and he ordered full ahead and hard to starboard. The vessels just passed each other clear by 10 metres. When vessel C was abeam the Master became aware of an island just ahead and he ordered hard to port. When vessel C passed clear the Master ordered midships and then 20 degrees to port.

C -4 minutes: A minute later the pilot called the vessel on the VHF and asked why the vessel was heading dangerously close to the island. The vessel was now very close to it. The Master once again ordered midships and believed they would stay clear of the island.

C -3 minutes: Suddenly the vessel started to vibrate heavily and there was a loud noise. The vessel's speed was reduced to 5 knots. The Master was initially confused about what had happened but then understood that the vessel had hit the bottom but was still making way.

C -2 minutes: The Master identified that vessel D was at anchor only 0.15 NM ahead of them, at which point the AB informed him that the rudder was not responding. The Master ordered starboard 20 and then hard to starboard, but the AB repeated that the rudder was not responding. The vessel was now sailing at about 7 knots. The Chief Officer suggested dropping the anchor, but the Master declined.

Collision: The Master ordered full astern but shortly afterwards vessel A's bow hit the side of vessel D.
The Master reported the grounding to the VTS but did not consider it was necessary to report the collision.
Shortly afterwards the vessel managed to disengage from vessel D by engine manoeuvres and later dropped anchor.

COLREGs

Rule 5 - Look out:

Every vessel shall at all times maintain a proper look-out by sight and hearing, as well as by all available means appropriate in the prevailing circumstances and conditions, so as to make a full appraisal of the situation and of the risk of collision.

The bridge was manned properly in terms of the number of individuals present and number of functions represented. However, the different members of the bridge team had not been assigned properly defined roles and duties. The Master was in charge, but he did not use the members of the bridge team to provide him with the information he needed to make decisions about the safe navigation of the vessel.
A bridge team will be more efficient if roles and responsibilities are defined as outlined in The Swedish Club ***Bridge Instructions*** booklet.

Rule 6 - Safe speed:

Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions. In determining a safe speed, the following factors shall be among those taken into account:

(a) By all vessels:
(ii) the traffic density including concentrations of fishing vessels or any other vessels:
(iv) at night the presence of background light such as from shore lights or from back scatter of her own lights.

Proceeding at a speed of 14 knots through a busy anchorage can probably be considered to be unsafe. We know that the Master stated at the hearing following the incident that the vessel was not proceeding at a safe speed but that he was determined to make the ETA.

Rule 7 - Risk of collision:

(a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt [then] such risk shall be deemed to exist.

(b) Proper use shall be made of radar equipment if fitted and operational, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observation of detected objects.

All available equipment on the bridge should be used to determine if a risk of collision exists. In this case not all the vessels were plotted on the ARPA, not even vessels which were in close quarter situations. It is imperative to plot all vessels to determine if risk of collision exists. The bridge was manned with three officers including the Master. However, the Master had not delegated the task of monitoring surrounding traffic and reporting close-quarters situations before they became dangerous.

Rule 8 - Action to avoid collision:

(a) Any action to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.

(b) Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar: a succession of small alterations of course and/or speed should be avoided.

The Master appears not to have communicated his intentions to the bridge team. The Master did not make a proper appraisal of the possibility of arriving at the pilot station at the time requested by the pilots.

What can we learn?

- There are several reasons why this vessel went aground and also suffered a collision. These were set in motion by a change to the passage plan caused by the order to arrive earlier at the pilot station. This is a common root cause of groundings and other accidents.

- In his desire to arrive at the pilot station on time the Master lost focus on safe navigation.

  1. He improvised the passage plan, which meant that no evaluation of the safety of the route was made.

  2. He demonstrated a complete loss of situational awareness.

  3. He failed to communicate his intentions to the bridge team and did not delegate tasks to the officers on the bridge.

  A proper evaluation of the options would probably have resulted in the Master calling the pilots to say that they could not make the desired ETA but would arrive 20 minutes later.

- It is not good seamanship to cross in front of vessels that have just been overtaken. Once again it highlights the risks the Master was willing to take to make the ETA.

- Any deviation from the passage plan other than for collision avoidance should be documented and subject to a proper appraisal. The passage plan should be berth to berth and not only pilot station to pilot station. The new passage plan needs to be entered in the ECDIS. All bridge team members need to sign the updated passage plan. If paper charts are used, the charts must be updated and the route plotted on the charts.

4

4.5 Collision due to miscommunication when approaching port

Vessel A, a capesize bulk carrier, was approaching port while fully loaded with iron ore. It had an overall length of 325 metres, a breadth of 52.5 metres and drafts of 17.8 metres. The water depth in the fairway of the port was more than 18 metres. However, the water depth to the north and south of the fairway was less than 17 metres. Vessel A was constrained by her draught and had the correct lights displayed. The fairway was about 420 metres in breadth.

Pilot briefing carried out

The pilot had embarked, and three tugs were lining up to connect to the vessel. The Master and pilot on vessel A had carried out a pilot briefing and the pilot had received a copy of the pilot card. It was evening with clear skies and light winds. Vessel A had a speed of 7 knots and a course of 310 degrees and both steering pumps were switched on. All navigation equipment was working. The vessel was in manual steering mode. Both X-band and S-band ARPA radars were set to north up and true motion. The range was switched between 3 NM and 6 NM.

On the bridge of vessel A were the Master, the Third Officer who was OOW, the pilot and the helmsman. According to the wheelhouse poster the minimum manoeuvring speed for vessel A was 5 knots. In ballast condition, it would take it about 12 minutes to stop if the engines were put from full ahead to full astern. If vessel A was sailing at 15 knots in deep water, it would take about 153 seconds to alter course by 90 degrees at hard-over angle.

C -30 minutes: Vessel B outbound from the port was acquired on the ARPA. It was a panamax bulk carrier with a length overall of 225 metres, breadth of 32.3 metres and was about 10 degrees on the starboard bow, 6 NM away. The ship was on a course of 125 degrees making about 10 knots, giving it a course almost reciprocal to the course of vessel A. Vessel B had a CPA of 0.5 NM and was shaping up to pass down the starboard side of vessel A. Those in vessel A observed the starboard green sidelight and masthead lights on vessel B. The vessel had a pilot on board.

C -14 minutes: Vessel B was about 3 NM distant. Behind vessel B there was a third outbound vessel. Vessel B was still slightly on the starboard bow of vessel A. Vessel B was outbound and navigating in the waters outside and to the north of the fairway.

C -12 minutes: The pilot on vessel A talked to the pilot of vessel B in the local language, and was advised that vessel B's pilot had just disembarked, before which he had told the Master of vessel B that he should pass vessel A green to green. Vessel A's pilot ordered the tugs to standby as they were approaching the buoyed fairway.

C -11 minutes: The pilot on vessel A called vessel B on the VHF and asked to pass green to green, which an officer on vessel B agreed upon. Vessel A was now on a course of 300 degrees and making about 8 knots. At about the same time, the VTS called vessel B and informed it that vessel A was inbound. Vessel B's officer acknowledged that they were aware of vessel A and that they would pass green to green.

C -9 minutes: The pilot ordered the first tug to make fast on the stern, the second on the starboard side and the third to follow the vessel on the port side. Vessel B was at a distance of 2.3 NM.

C -2 minutes: When vessel B was about 0.5 NM off the starboard bow it started to alter to starboard and towards vessel A and the red side light on B could be seen. The pilot on vessel A was alarmed by vessel B and called on the VHF and yelled 'green to green vessel B' and at the same time ordered hard to port and stop engine. An officer on vessel B replied, 'too close have to pass port to port' and continued to alter to starboard.

Collision: The pilot on vessel A ordered hard to starboard and full astern but it was too late, and the vessels collided. Vessel B's port side shell plating was torn open from cargo hold 2 to cargo hold 6.

COLREGs

Rule 3 - General definitions:

(h) The term 'vessel constrained by her draught' means a power-driven vessel which, because of her draught in relation to the available depth and width of navigable water, is severely restricted in her ability to deviate from the course she is following.

Vessel B should have stayed clear of vessel A as she was constrained by her draught.

Rule 8 - Action to avoid collision:

(a) Any action to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.

(b) Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar; a succession of small alterations of course and/or speed should be avoided.

(c) If there is sufficient sea-room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation.

Reviewing the radar screenshots recorded by the VDR on vessel A shows that the vessels were positioned to make a safe 'starboard to starboard' passing had they kept their courses. At this point there was no risk of collision. However, just before the vessels began to pass each other, vessel B called 'port to port' on the VHF and altered starboard to cross ahead of vessel A. The distance between the two vessels was about 0.5 NM when vessel B called port to port. The sudden starboard alteration by vessel B changed a safe starboard-to-starboard passing into a risk of collision. Vessel B caused a risk of collision to arise.

Rule 9 - Narrow channels:

(a) A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable.

(d) A vessel shall not cross a narrow channel or fairway if such crossing impedes the passage of a vessel which can safely navigate only within such channel or fairway. The latter vessel may use the sound signal prescribed in Rule 34(d) if in doubt as to the intention of the crossing vessel.

Vessel A was sailing on the starboard side in the fairway/narrow channel with constrained draught.

Vessel B was outside of the fairway and then suddenly altered to starboard at a distance of 0.5 NM and tried to cross ahead of vessel A, which is in violation with (d).

Rule 18 - Responsibilities between vessels:

(a) A power-driven vessel underway shall keep out of the way of:

(ii) a vessel restricted in her ability to manoeuvre;

(d)

(i) Any vessel other than a vessel not under command or a vessel restricted in her ability to manoeuvre shall, if the circumstances of the case admit, avoid impeding the safe passage of a vessel constrained by her draught, exhibiting the signals in Rule 28.

Vessel B should stay clear of vessel A.

What can we learn?

- Vessel A was a huge vessel, constrained by her draught and was assisted by tugboats which made it difficult for her to manoeuvre. To enter the fairway, vessel A needed to be lined up at an early stage. The agreement between the two vessels was to pass 'starboard to starboard'. This meant that vessel B would keep sailing outside and to the north of the fairway (B was already sailing outside the fairway) whilst A would proceed in the fairway. If vessel B had not altered to starboard there would not have been a collision.

- The pilots on vessels A and B made a verbal agreement to pass 'starboard to starboard'. This was also confirmed later between the pilot on vessel A and an officer on vessel B. The VTS was also in contact with vessel B and informed them that vessel A was an incoming vessel. They also did not raise any concerns about the 'starboard to starboard' passing.

- Collisions between vessels in a narrow channel are one of the few scenarios in collisions between two vessels underway where one vessel can be held solely at fault for not maintaining position on its starboard side of the fairway. These are issues that Masters need to be aware of.

4.6 Collision in restricted visibility

Vessel A was a 2,692 TEU container vessel underway. Shortly after commencing the sea passage, visibility worsened. The vessel was sailing through dense fog with SW winds at Beaufort scale 6. On the bridge were the Master, OOW and a lookout. The Master had the conn. At 20:00 the Second Officer took over the watch from the Third Officer. The visibility was only 0.1 NM and the fog was persistent into the evening. The Master stayed on the bridge the entire time.

Speed of 17 knots

Vessel A was maintaining a speed of 17 knots on a course of 240 degrees, the vessel was sounding fog signals. Both the ARPA X-band and S-band radar were used and the ranges were changed between 3 NM and 6 NM.

C -12 minutes: Vessel B was on the port bow about 3 NM from vessel A, making a speed of 6 knots on a 010 degree course according to the ARPA. Vessel B was about 11 o'clock from vessel A and crossing from port to starboard. The CPA was 0.0 NM and so a risk of collision existed.

C -10 minutes: The Master saw the name of vessel B on the AIS and called it on VHF channel 16, but had no response. He also used the searchlight to flash at the direction of vessel B as a warning signal. It is unlikely that vessel B would have seen this.

C -5 minutes: The Master ordered hand steering and an alteration to port to 210 degrees, in order to let vessel B pass ahead of vessel A. Shortly afterwards vessel B started to alter to starboard, resulting in a distance of 0.5 NM between them. The Master on vessel A ordered hard to port.

Collision: The vessels collided, and vessel B struck the starboard side of vessel A. The Master on vessel A now saw that vessel B was a fishing vessel.

Continued at same speed and course

However, the Master of vessel A continued the voyage at the same speed and course. After a while the VTS called vessel A and told them to stop and await the coast guard. At the time of the collision the fishing vessel was fishing by casting fishing pots overboard.

COLREGs

Rule 5 - Look out:

Every vessel shall at all times maintain a proper look-out by sight and hearing, as well as by all available means appropriate in the prevailing circumstances and conditions, so as to make a full appraisal of the situation and of the risk of collision.

The bridge was manned sufficiently and the bridge team on vessel A plotted vessel B at an early stage. However, the bridge team did not act on their observations.

Rule 6 - Safe speed:

Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions. In determining a safe speed, the following factors shall be among those taken into account. [(a) By all vessels:]

(i) the state of visibility:

(ii) the traffic density including concentrations of fishing vessels or any other vessels:

A speed of 17 knots in restricted visibility in an area with fishing boats can be considered unsafe.

Rule 7 - Risk of collision:

(a) Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt [then] such risk shall be deemed to exist.

The CPA was 0 when vessel A plotted vessel B at C -12 minutes. It should have been apparent to those on the bridge of vessel A that there was a risk of collision.

Rule 19 - Conduct of vessels in restricted visibility:

(a) This Rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility.

(b. Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility. A power-driven vessel shall have her engines ready for immediate manoeuvre.

(d) A vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists. If so, she shall take avoiding action in ample time, provided that when such action consists of an alteration of course, so far as possible the following shall be avoided:

> *(i) an alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken:*
>
> *(ii) an alteration of course towards a vessel abeam or abaft the beam.*

Vessel A altered to port, which is in contravention of rule 19 as vessel B was on the port bow of vessel A. At no time did the Master on vessel A reduce speed.

What can we learn?

- The Master and OOWs must always consider the safe speed of the vessel. The crew may be under the impression that they have to maintain a high speed to meet a schedule and this can create conflicts of interest between meeting a schedule and sailing at a safe speed. This is something that the Master and the owners must deal with in their safety management procedures to ensure that the vessel is navigated safely.

- In addition, the greater risk of sailing at a high speed must always be evaluated by the Master and instructions conveyed to the bridge officers. Rule 6 advises that a vessel needs to be able to avoid a collision as per the prevailing situation. Proceeding at higher speeds will also attract a higher degree of blame when the courts apportion liability between the vessels involved in collision.

- The bridge team on vessel A was aware of vessel B for about 12 minutes before the collision. Despite the clear indication that the vessels were on collision courses, the Master of vessel A altered to port, towards vessel B and in contravention of rule 19. Under no circumstances should a vessel alter to port towards a vessel on its port bow in restricted visibility as vessel A did in this collision. The Master on vessel A stated that this manoeuvre was because he believed that vessel B was the give-way vessel and that vessel B would pass forward of vessel A. Under Rule 19, both vessels have an equal obligation to avoid a collision.

- It is not acceptable to continue a voyage after a collision and this was a very bad decision by the Master. He should have ensured that all crew on vessel B were safe before continuing the voyage, which he did not do.

- The Master had been on the bridge for five hours when the collision occurred. It is unknown how long he had been awake prior to this. However, according to the flag state investigation it is unlikely that the Master suffered from fatigue.

- In this case vessel B was plotted but the bridge team on vessel A did not act on the information and assumed that vessel B would alter course. It is important to ensure that bridge officers are well trained so that they can take critical decisions quickly and correctly. They must understand the consequences of their actions, appreciate when no action needs to be taken, and know how to prevent a close-quarters situation.

- Some safety management systems stipulate minimum CPA limits and manning levels in the navigation policy, depending on visibility and during critical operations such as approaching or leaving a port. However, generic requirements in the navigation policy may not illustrate to officers what are acceptable limits and what are unacceptable limits. Many of these issues are covered in the Club's ***Bridge Instructions*** booklet.

4.7 Contact while berthing in river

It was early morning and a 150 metre long, 14,900 DWT general cargo vessel, vessel A, was sailing up a South American river with a pilot on board. The Master and pilot had carried out a pilot briefing where the pilot presented the plan for berthing. The vessel would be berthed portside alongside, between two vessels which were already berthed. The Master asked the pilot if any tugboats would be necessary, but the pilot did not believe so as there would be a 200 metre gap between the berthed vessels, giving vessel A about 50 metres clearance from the berthed vessels.

Strong current and brisk winds

During the berthing the Chief Officer was by the radar and the ECDIS on the bridge, monitoring progress. The vessel had a speed of about 2 knots over the ground in the river and was on a NNW course. There was a strong SSE current at around 2-3 knots and a NE wind at Beaufort scale 3. During the final berthing manoeuvre the vessel passed one of the berthed vessels with only 20 metres clearance on the portside. The wind set the vessel towards the berthed vessel.

The Master had the conn and was positioned on the port wing. As he was manoeuvring the vessel, the pilot gave him advice and instructions. When the Master noticed that his vessel was very close to the berthed vessel he ordered full power to starboard on the bow thruster.

Master lost control

Despite the Master's efforts to turn the bow to starboard the vessel continued turning to port and the bow collided with the berthed vessel. The vessel's superstructure was forward, so the bridge wing also caused damage to the berthed vessel.

The Master finally managed to gain control of the vessel and berth it. Upon berthing the vessel, the Master noted that the distance between the two other vessels was 10 metres forward and 20 metres aft.

What can we learn?

- When the Master approached the berth, he should have evaluated if the available tugs should be used or not. If he was unsure about the clearance, he should have asked the pilot for tug assistance before berthing.

- It is important that the Master and pilot discuss what is anticipated and how to carry this out in the safest way. When the vessel was sailing up the river there were strong currents and some wind. During the manoeuvre the Master had the conn but needed constant updates from the pilot and Chief Officer about how strong the current was. These discussions should also have taken place during the pilot briefing. Having an NNW course and NE winds on the starboard bow will push the bow to port, especially when the vessel is lining up for the final approach and altering slowly to port and slowing down. The current will also make the approach more difficult as more power must be used during the final manoeuvre as the current would push the bow to starboard.

- The entire bridge team should be involved in berthing. In this instance the Chief Officer was by the radar and ECDIS and was the person who could have informed the Master about changing current or wind. The current also took the pilot by surprise. An efficient bridge team are assigned roles where they all know what they are expected to do and what the other persons are supposed to do. If someone makes a mistake this should be identified by a member of the bridge team. The Chief Officer was on the bridge and he should have supported the Master with information. This is further explained in the Club's ***Bridge Instruction*** booklet.

4.8 Excessive speed when approaching berth

It was morning with clear skies and NW winds at Beaufort scale 7. A 200 metre RoRo vessel had picked up the pilot. There had been a short pilot briefing where the bridge team were advised that that the vessel would berth starboard side at berth A which had a course of 285 degrees. The approach in the fairway was 090 degrees. This meant that the vessel had to make a large port alteration of 165 degrees to line up with the berth. The port had no breakwater and was open to the sea.

Two tugs standing by

The pilot had the conn and the vessel was sailing down the fairway on a 90 degree course and a speed of 9 knots over the ground. Two tugs were standing by but were not connected. At the position where the pilot decided to begin the alteration there were less than 500 metres of space between the quays in the port basin.

Wind pushed vessel away from berth

The pilot ordered the vessel to come around to port and stop the engines. The vessel was still making 9 knots. The vessel was sensitive to the wind because of the large hull and superstructure. This caused the NW wind to push the vessel away from the berth.

The vessel started to alter to port and was facing the berth at a 90 degree angle when it was only 50 metres away. The pilot realised the danger and ordered slow astern and hard to port, followed instantly with full to port on the bow thruster. As the speed was excessive for the bow thruster nothing happened.

Bow hit quay at speed

At the same time the Master realised that the vessel was not slowing down so he ordered the port anchor to be dropped and full astern on the engines. It was too late, and the bulbous bow hit the quay at a 90 degree angle.

After the contact the tugs were connected and berthed the vessel.

The vessel had to dry dock and repair the bulbous bow. The berth also needed extensive repairs.

What can we learn?

- The vessel was approaching at excessive speed. Maintaining a speed of 9 knots when starting to swing around and as close as 50 metres highlights that the berthing plan was not safe and that the bridge team had not planned it accordingly regarding wind and speed.

- The Master did not challenge the pilot until it was obvious that the vessel would make heavy contact with the quay. It is imperative during the pilot briefing that the approach is discussed in detail with the entire bridge team, so orders can be challenged if there is concern.

- Two tugs were standing by but were not connected. Once again, if the vessel had slowed down and had the tugs connected the berthing manoeuvre would have been controlled. If tugs have been ordered why not use them?

5

Fire

5.1 Misdeclared container caused fire

It was early morning and from the bridge the Master saw a large cloud of smoke issuing from the forward part of the vessel. At the same time the fire detection system for cargo hold 2 sounded on the bridge. The Master described the smoke as being white at first and then greyish. The Chief Officer, however, described the smoke as being "dark grey, almost black".

The ventilation fans for the cargo holds were stopped. The fans for cargo hold 2 were not operating at that time but natural ventilation was being provided for the holds as the covers for the vents were open. Crew members closed the covers of the vents for cargo hold 2 and no crew member entered the cargo hold.

Discharge of CO_2

Meanwhile the Master navigated the ship to a nearby anchorage. After various checks had been performed, the Chief Engineer released the contents of 197 CO_2 cylinders into cargo hold 2. This discharge was the designated full complement of CO_2 required for the hold, and appeared to extinguish the fire. A couple of hours later smoke began to issue from the hold and a further 57 CO_2 cylinders were released into cargo hold 2. About six hours later smoke was observed issuing from cargo hold 2 and the Chief Engineer released a further 57 CO_2 cylinders.

Salvors boarded the vessel the following morning. Shortly before midnight, temperature checks were completed by the vessel's crew indicating that the temperature in cargo hold 2 was rising so five more CO_2 cylinders were released. In the morning another 15 CO_2 cylinders were released. The salvors entered cargo hold 1 and measured the temperature for the bulkhead to cargo hold 2 - it was 83°C. It was decided that cargo hold 2 should be filled with water from the fire hydrants. The water filled three container tiers up and after a couple of hours the salvors considered the fire to be extinguished.

Dangerous cargo

The container where the fire started was not declared as dangerous cargo but was actually loaded with calcium hypochlorite and had been misdeclared by the shipper. The charterer had loaded the container as per the rules of the IMDG code. As per the manifest, the container was allowed to be loaded in the cargo hold, but as the cargo was calcium hypochlorite it should not have been loaded below deck or in the position it was stowed in.

What can we learn?

Cargoes that fall into this category include calcium hypochlorite and other oxidising solids. They are often used for swimming pool sterilisation and fabric treatment (bleaching or washing). These materials do not oxidise but they can be relatively unstable chemicals that decompose slowly over time, evolving oxygen. This self-decomposition can evolve heat. A self-heating process can therefore happen in which the material towards the middle of a body of cargo becomes hotter, so the rate of decomposition and heating increases. This can lead to 'thermal runaway' with very rapid self-decomposition and evolution of heat and gases, sometimes including further oxygen. The effects of this in a hold can be similar to an explosion. The heat and oxygen produced can lead to fire spreading.

Potential causes of self-decomposition incidents include:

- Exposure to heat e.g. solar radiation (before or after loading), cargo lights and heated fuel tanks.
- Cargo formulation.
- Contamination of cargo at manufacture.
- Spillage and thus reaction between cargo and combustibles e.g. timber.
- Excess quantity of cargo in containers giving insufficient dissipation of heat.
- Inadequate separation of packages in containers, also giving insufficient dissipation of heat.

5.2 Floodlights caused cargo fire on bulk carrier

A bulker had loaded sugar beet pellets in all three cargo holds with the operation taking 27 hours. When loading was completed the ventilation hatches and all other access points to the cargo holds were secured. In cargo hold 1 there were two metres of space between the cargo and the cargo hatch. In cargo holds 2 and 3 the cargo was almost up to the hatch coaming.

Smoke from cargo hold 2

Two days into the voyage the crew noticed smoke coming from cargo hold 2. Hot spots were discovered in hold 2 on the transverse hatch coaming, both forward and aft on the portside, and an additional hot spot was also discovered on hold 3 on the transverse hatch coaming, on the portside aft. All hot spots were located adjacent to recesses in the coamings for the cargo holds' floodlights.

The crew isolated the electrical power to the floodlights. Because of the increased temperature of the hot spots in hold 2, the Master released CO_2 into the hold. The CO_2 did not extinguish the fire but reduced its severity for a while. When the vessel arrived at the discharge port the cargo hatches were opened, and flames broke out from hold 2. At the same time a plume of smoke escaped from hold 3. The top layer of cargo in hold 2 had been burned.

Burn marks around floodlights

About 4 metres below the cargo surface the cargo was in good condition. It was discovered that the cargo in hold 3 had been damaged by condensation and tainted by smoke. There were clear burn marks around the floodlights and distinct burn marks by the coaming at the same locations where the hot spots had been discovered.

The floodlights were situated 1 metre below the cargo surface in holds 2 and 3 and there was black, burned cargo covering the floodlights. There were two floodlights fitted in cargo hold 1, port and starboard and four floodlights fitted in both cargo holds 2 and 3. All the floodlights were installed in recesses in the hatch coaming. The floodlights were protected by round bars preventing crane hooks, grabs etc from hitting them, but these bars do not prevent cargo like sugar beet pellets from covering the lights. The floodlights were controlled from the bridge on a panel with four key-switches. These switches were marked 1, 2, 3 and 4 respectively. No drawings or legends were attached clarifying which areas these key-switches served.

What can we learn?

- The subsequent investigation revealed that the cargo floodlights were not connected according to the approved 'as built' circuit diagrams delivered with the vessel. It was not clear on board which lights were controlled by which keyswitch.

- The fire was caused because a number of cargo lights were operating while cargo covered them, so the lights ignited the cargo. There was a lack of information on board about how the light circuits were connected and how the light system should be operated. There was also a lack of records concerning use of the lights.

- Many bulk carrier/general cargo holds have fixed cargo lights. Halogen-type lights can easily ignite combustible cargoes such as grain, animal feed, wood chips, pulp and paper if they are too close to the light.

- Cargo lights in holds need to be properly isolated before cargo is loaded. This is best done by removing fuses or other physical links in the electrical circuits so that the lights cannot be switched on by mistake. In container ships the lights need to be properly placed so that they do not overheat cargo or other combustibles and thus cause damage or fire. Lights in car carriers and ferries are usually fluorescent, which are unlikely to cause ignition. Nonetheless it makes sense to leave lights switched off when they are not needed, particularly in cargo areas where combustibles are present.

5.3 Hot work caused container fire

A container vessel was awaiting instructions for when to enter the port. During the wait the Chief Officer made the decision to carry out repairs to the cell guides in one of the cargo holds. The engine fitter and an AB began to prepare the welding job for the cell guides.

Container fire

Before the welding commenced a risk assessment and hot work permit were completed. As per the hot work permit, fire extinguishers were in place and one AB was the designated fire watch. The Chief Officer approved the job and was also present. Some time into the job, the engine fitter began to smell burned rubber, and on investigation saw that a container had caught fire. In the vicinity were a couple of oxygen and acetylene bottles which the engine fitter moved to safety. The Chief Officer ordered everyone to evacuate the cargo hold and informed the bridge that a container had caught fire. The general alarm was sounded and a fire team assembled and began boundary cooling.

The heavy smoke and high temperature made it impossible for the fire team to approach the fire so the Master decided to release the CO_2 system into the cargo hold, which extinguished the fire. The container that had caught fire was an open top container covered by a tarpaulin and containing cloths, tyres, wooden plates and machinery.

What can we learn?

- Many cargoes, including a wide range of bulk cargoes and general cargoes can be ignited by cigarettes and/or hot work. Smoking and hot work therefore need to be properly controlled. Control of smoking can be difficult where stevedores are working on board and hot work permits need to be properly considered, not just a 'tick box' exercise. Once a fire has started, some bulk cargoes will smoulder for long periods even after closing and sealing holds and using CO_2 to maintain a low oxygen concentration in the ullage space. This extended smouldering is often due to residual oxygen absorbed into the cargo and air/oxygen in voids in the cargo e.g. between pellets. In cases of extended smouldering the only option may be to discharge part or all of the cargo.

6

Grounding

6.1 Grounding in unsurveyed waters

A 50,000 GT RoRo vessel had been loading in a European port. The navigation officer had prepared the passage plan for the voyage to the next port of call which was in central America. Prior to departure the Master received weather routeing for the passage, which suggested a route over the Silver Bank and via the Windward Passage.

The navigation officer planned the route in the ECDIS and on paper charts and discovered that the minimum depth the vessel would encounter was at the Silver Bank where the water depth was 16 metres according to British Admiralty chart 3908.

The vessel's draft was 7.5 metres, so a 16-metre water depth was considered acceptable as per the company's ISM under keel clearance procedure. The procedure stated that there had to be a minimum of 20% under keel clearance of the maximum draught.

'Inadequately surveyed' warning

On the British Admiralty chart the Silver Bank is marked 'Inadequately surveyed' in three places. On the route planned by the navigation officer there was no specific mention of inadequately surveyed waters. The navigation officer did not consult the Admiralty Sailing Directions when preparing the passage plan.

After checking the entire route on the ECDIS and on the paper charts, the Master decided to follow the route suggested by the weather routeing company. The passage was uneventful over the Atlantic from Europe and the vessel maintained a speed of 13.5 knots. Shortly after entering the Silver Bank the vessel's bow suddenly swung to starboard, which caused a list for about 3 to 5 seconds, with excessive vibration. The OOW changed to hand steering. A couple of minutes later the vessel's bow swung to starboard, but this time with less vibration. The vessel's bow swung a third time to starboard and listed for about 3 seconds, with vibrations. After carrying out a damage assessment it was found that the forepeak tank and a water ballast tank had water ingress. All the fuel tanks were intact.

Vessel repaired in dry dock

The vessel arrived at the destination port, discharged the cargo and carried out an in-water survey. It was found that the tanks had been punctured as the vessel had touched bottom. The vessel had to be repaired in dry-dock.

What can we learn?

- The vessel had on board the Admiralty Sailing Directions NP 70, West Indies Pilot, where it is stated that Silver Bank has been inadequately surveyed and it is not advisable to attempt to cross it. The sailing directions had not been reviewed before or after preparing the passage plan. It is important to ensure that all reference literature is used when making a passage plan.

- It is important to perform a two-person check for critical operations such as a passage plan. It is more likely that another person will find a mistake rather than just carrying out your own double checking.

- The ECDIS chart information is based on data from the paper charts. If the quality of the data in the paper charts is poor, then so will the data in the ECDIS charts cell be. Each chart cell contains a CATZOC code (Category Zone of Confidence), which indicates the accuracy of the data in the cell. As part of the passage plan appraisal the navigation officer should check the quality of the data. The sailing directions will give good information about routeing and will also mention recommended routes. There are many areas in the world where the chart data is uncertain so even if the chart is vectorised as per IHO standards, it is necessary to check the quality of the data used.

6.2 Grounding as channel buoys were in the wrong position

A 20,000 DWT dry cargo vessel had picked up the pilot and was approaching the fairway to the port. It was morning with clear skies and light winds.

On the bridge were the Master, the pilot the OOW and the helmsman. The Third Officer was the OOW and had completed the pre-arrival checklist. The vessel was in hand steering mode and the pilot had the conn. The Master had given the pilot a pilot card, but they had not carried out a pilot briefing. The pilot asked for 7 knots in the fairway and lined up the vessel between the buoys.

Everything seemed in order

The OOW was monitoring the vessel's position on the radar and the ECDIS and was also filling out the logbook. The vessel passed the first buoys, and everything seemed in order to the Master when he looked outside.

Suddenly the vessel vibrated heavily and the speed fell rapidly until the vessel completely stopped. The Master realised that the vessel had run aground. He told the pilot that the vessel was aground, but the pilot did not believe him as the vessel was in the middle of the fairway.

When the pilot also realised that the vessel had run aground he started to talk on the VHF in the local language.

Vessel ran aground outside the fairway

The vessel had run aground on a bank which was outside the fairway. The vessel was clearly visible outside of the channel on the ECDIS and radar. This was also confirmed when the position was plotted.

The Master began to deballast the vessel and carried out engine manoeuvres in an attempt to get the vessel off the bank. Subsequently the Chief Engineer called the Master and told him that the steering gear was not responding.

The Master immediately stopped the engines and asked the Chief Officer to sound all tanks and also take soundings around the vessel.

Tugs called to assist

The pilot told him that two tugs were coming from the port to assist the vessel.

The Master had not signed any salvage contract, but the two tugs began to attempt to refloat the vessel with the assistance of the pilot and authorities. The tugs managed to remove the vessel from the bank the following day.

What can we learn?

- The bridge team did not check the position of the vessel on the chart, radar, or by any other means than visually.
- The passage plan should be berth to berth, so there should have been a planned route into the port which would have highlighted the discrepancy in the vessel's position on the ECDIS.
- The vessel had an ECDIS, but it appears no one was monitoring the display during the approach.
- There was a leading line for the approach, but for some reason it was disregarded. The bridge team did not monitor the vessel's progress with all the available navigational equipment.
- It is important that the shipowner has a navigation policy that details which navigation equipment should be used and how the bridge should be manned efficiently at different stages of the voyage. Leading lines should always be used, and the vessel's position should be confirmed by radar, GPS and visually. This was not done.
- In addition, the passage plan should be berth to berth and it should detail how to conduct a pilot briefing. It is obvious that the pilot should have known that the buoys were out of position. It is important that the bridge team follows the passage plan and monitor the actions of the pilot.

6.3 Grounding as the OOW missed waypoint

It was night and a 700 TEU container vessel was sailing near the coast towards the next port. It was raining, so visibility was reduced.

On the bridge was the Second Officer who was OOW. The passage plan had been approved by the Master and the bridge team and entered into the GPS and radar.

Vessel began vibrating heavily

Suddenly the vessel vibrated heavily and veered strongly to port. The OOW was confused about what had happened. Soon afterwards the bow thruster room high level alarm sounded. The Master came to the bridge and when he asked what had happened the OOW was still confused.

The Master called the Chief Officer and asked him to check the forepeak and bow thruster room. A couple of minutes later the Chief Officer informed him that there was water ingress in both locations.

The Master stopped the engines and the vessel drifted until the situation could be assessed. The Master realised that the vessel had hit the bottom and contacted the nearest JRCC and informed them that the vessel had grounded and was taking on water. The Master asked for assistance as he was unsure what had happened.

Fortunately there was no pollution and no injuries, and the steering gear, engines and bow thruster were all operational. A rescue vessel from the nearest port came out to the vessel but no assistance was needed, and the vessel sailed to the nearest port and berthed without incident to assess the damage.

Waypoint not entered on GPS

The vessel frequently traded in the area, so the voyage was not unusual. It was found that the navigation officer had forgotten to insert a waypoint in the GPS. This meant that the course took the vessel straight over a shallow area where it ran aground.

What can we learn?

- When preparing a passage plan it is suggested that the plan is double-checked by another officer to ensure all waypoints have been entered into the navigation equipment. It is prudent to perform a two-person check of the passage plan and all critical navigational equipment, such as the GPS, before departure. The passage plan needs to be signed by all bridge officers and the Master.

- It is also suggested that every officer taking over the watch ensures that the passage plan is correct and that all the correct parameters are included in the GPS, radar and ECDIS. Any deviation from the passage plan during the watch needs to be reported when handing over to the next watch officer.

- If the passage plan is entered in the ECDIS and the correct safety depth is entered in the system, the software can check that the passage plan is not crossing any area with less depth than the safety depth. If any shallow areas or any other dangers are detected a warning will be triggered, which the navigation officer must check and rectify. In this case the passage plan was not entered into the ECDIS and was only entered into the GPS and radar.

- Once again, we highlight that all navigation equipment should be used and checked during the voyage.

6.4 Grounding in heavy weather

It was an autumn night, and strong winds of Beaufort scale 10 hit a handysize bulk carrier. The vessel was in ballast condition and sailing through an archipelago.

Difficulty in maintaining course

The Third Officer, acting as OOW, and a helmsman were on the bridge. The vessel was in hand steering mode and was only making 2 knots over the ground. It was difficult to maintain course and the wind was blowing in on the port bow. The helmsman had put the rudder hard to port but the vessel began to alter to starboard. The OOW called the Master and informed him that it was difficult to maintain course. The vessel was between two islands, which made the winds even stronger as the islands were creating a wind tunnel.

The Master came up on the bridge and ordered the OOW to go to the emergency steering room. The vessel was classed to have the engine control room constantly manned. The Master called the duty engineer and asked for the engine controls to be transferred to the bridge. When transferring the engine controls the engine had to be put on standby.

Engine controls transferred to the bridge

The Master made an announcement on the PA system and asked all crew to come to the bridge. The Chief Officer was told to prepare the anchors.

The OOW was now in the steering gear room and confirmed that the rudder was hard to port.

Impossible to enter main deck

The Chief Officer informed the Master that it was impossible to enter the main deck as large waves were washing over the deck.

The duty engineer called the Master and informed him that the bridge now had the engine controls. However, the vessel had drifted very close to an island during the engine transfer. Before the Master managed to increase the engine speed the vessel hit rocks.

What can we learn?

- In heavy weather it is important to reduce speed, but this can only be done if the steering can be maintained. To put the engines on standby to transfer the control to the bridge was a poor decision, as the vessel was then drifting between the islands in heavy weather. If the Master wanted the bridge to have the engine controls, it would have been safer to shift the controls when the vessel was in open water and not battling heavy weather.

- The vessel was in ballast condition and if heavy weather is anticipated the vessel should be ballasted in such a way to increase the draft and reduce the wind area.

- The bridge team was not prepared for the heavy weather and did not amend the route. It would have been possible to remain in open waters and not pass between the islands.

- Why the Master sent the OOW to the steering gear room is unclear. It seems that the Master did not trust the rudder indicator and wanted to confirm the angle.

6.5 Grounding at high speed

A suezmax oil tanker loaded with crude oil was transiting the Suez Canal from North Africa to India. On the bridge were the pilot, Master, helmsman and Chief Officer. It was morning and a second set of pilots had just boarded the vessel. The pilots carried out a handover on the bridge – this was carried out in Arabic. After the handover the new pilot ordered the vessel to increase to full speed ahead. The Master asked the pilot if full speed was really necessary as the vessel was fully loaded and had a draught of 14.5 metres. The pilot replied that there were strong currents ahead and that full speed was required. The vessel managed to achieve a speed of 9 knots over the ground.

Vessel listed heavily

About one hour later the vessel had to alter course to port from 171 degrees to 154 degrees. The pilot ordered 'port 20' to the helmsman, and the vessel began to alter at a rate of turn of 15 degrees per minute. It was rapidly closing the distance to the eastern canal bank at full speed. To counteract this the pilot ordered hard to starboard. This caused the vessel to swing to starboard at a 25-degree rate of turn, and the vessel listed heavily.

Master relieved the pilot

The Master asked the pilot if the western branch of the channel was safe. The pilot stated that it was not. At this point the Master took over and relieved the pilot as he determined that the pilot had lost control of the vessel.

The Master ordered hard to port and the vessel just missed the buoys by the centre embankment. The vessel was again heading for the west bank and the Master initially reduced the engine speed to slow ahead, but realised that he needed to turn more quickly, so he ordered full speed ahead to increase the rate of turn.

Vessel made contact with bank

Unfortunately, the Master could not avoid the bank and made contact a couple of times before ending up in the middle of the canal where the vessel finally stopped.

About an hour later the vessel anchored in the Bitter Lakes and informed the Suez Canal Authorities about the incident. There was no pollution and divers inspected the vessel and found several dents in the hull.

The vessel had to dry dock to repair the damage to the hull at a substantial cost. The vessel was out of service for over a month.

What can we learn?

- This was a fully laden tanker, and increasing the speed to full ahead in the Suez Canal caused the stern of the vessel to swing towards the near bank (the Bank effect). Neither the pilot or the bridge team discussed this possibility as the pilot increased the speed. It is obvious that the Master was uncomfortable with the pilot's decision, but he still accepted it.

- The reality was that there were no strong currents at the time. If the bridge team had checked the current this could have been brought to the pilot's attention.

- The pilot's action was not up to the expected standard and to relieve a pilot is an unpleasant and stressful experience. It is essential that managers train their Masters to challenge a pilot who does not comply with the vessel's SMS and company's ISM regulations. However, there should have been a proper pilot briefing where the pilot and the rest of the bridge team discussed the upcoming pilotage and what to expect. This should have included expected environmental conditions, what speed and what rate of turn would be suitable, how the vessel performed when it was fully laden and any upcoming traffic. If these issues are discussed it is likely that all involved parties can give their input on why a suggested action is advisable or not.

6.6 Grounding because of poor cooperation

A 1,000 TEU container vessel departed its berth after loading. During the loading there had been some delay and the gantry cranes had stopped operating because of strong winds, so the Master was eager to depart. The navigation officer had prepared the bridge before departure.

Pilot plan was not discussed

On the bridge were the Master, pilot, lookout and Chief Officer. A tug assisted the vessel during departure. The Master gave the pilot the pilot card and offered him some coffee. After this the Master gave the pilot the conn. The pilot was steering from the port side bridge wing. The berth had a heading of 317 degrees and there were still WSW winds at Beaufort scale 9. The vessel was moored at the end of the berth. The fairway leaving the port had a heading of 230 degrees. The pilot's plan was for the vessel to go astern and swing to port and clear the end of the berth and then follow the fairway. However, he did not explain the plan to the Master and the Master didn't ask the pilot about any plan.

The Master ordered all lines let go. The bow started to fall off quicker than the stern as the wind pushed on the vessel's port side, off the berth. The pilot ordered half astern and the plan was to use the bow thruster to let the vessel's bow swing past the end of the berth and to position the vessel to sail out in the fairway. At this time the vessel had a course of 310 degrees.

Drifting towards buoy

The tug assisted with pushing the vessel on the starboard side. The vessel was now moving astern at 2 knots and towards the opposite side of the fairway, the south side. There were several buoys marking the fairway. The closest buoy was on the starboard quarter about 50 metres away.

The wind continued to push the vessel from the portside causing the vessel to drift SE in the fairway towards the south side of the fairway. The vessel had a stern thruster and it was set full to starboard to assist the vessel in turning to port. The vessel started to slowly come around and had a heading of 291 degrees but was still drifting SE towards the buoy.

Multiple warnings ignored

The Second Officer was on the stern and warned the Chief Officer over the UHF that a buoy was only 30 metres away on the starboard quarter. The vessel now had a heading of 320 degrees which was a 90-degree angle towards the fairway. The Chief Officer informed the pilot and Master but neither of them acknowledged or took any action. The Second Officer now informed the Chief Officer that the buoy was only 10 metres away. The pilot ordered half ahead on the engines. For some reason the stern thruster was stopped. At the same time the pilot received a job-related mobile phone call which he answered. The vessel continued its movement astern and hit the buoy on the starboard quarter. The entire buoy was dragged underneath the vessel and damaged the propeller, rudder and rudder stock. The damage caused the vessel to lose its steering and because of the damage the Master stopped the main engine. This caused the vessel to start drifting even quicker SE towards shallow waters.

The pilot suggested that the anchor should be dropped, and so the Master ordered the port anchor to be dropped. This was delayed as the Second Officer had to cross from the stern to the bow. When he reached the bow and the bosun tried to drop the anchor it became entangled and it took a minute before it was released. At the same time the vessel ran aground.

What can we learn?

- Underestimating natural forces such as strong winds is the third most common reason for vessels running aground.
- A big concern in many navigational claims is that the bridge team does not work efficiently as the different members don't discuss the plan - or sometimes don't even have a plan as in this case.
- It is important for the Master to be polite but assertive when he feels that the vessel's safety might be at risk. To avoid such a situation occurring, the Master's expectations need to be discussed during the pilot briefing. In this case there had not been a pilot briefing. The Master should inform the pilot of any parameters e.g. the rate of turn and speed he is comfortable with, and the pilot should explain to the Master what the plan is to ensure the operation is safe. This is what we would consider as having good situational awareness. This is especially important as there were strong winds.
- During the pilot briefing the Master should ask the pilot about local regulations, concerned traffic, expected currents and winds, passing requirements and how the pilot plans to approach the departure. If the local language is spoken the pilot should be asked to explain the conversation, in English, to the bridge team. If a plan is discussed and agreed, it is easier to amend the plan if there are complications.
- The pilot must be included in the bridge team and anything unclear about the vessel's progress or deviation from the plan needs to be voiced within the bridge team at once. To have efficient communication is one of the most important factors for a functional bridge team. In this case there had not been a pilot briefing.

7

Hatch covers

7.1 Leaking cargo hatch covers caused cargo damage

A bulk carrier had been fully loaded with grains. The vessel had side rolling cargo hatch covers. For six days, the vessel encountered heavy weather at Beaufort scale 9 which caused it to pitch and roll heavily. During the voyage the cargo hatch covers were washed over by seawater.

Hatch covers were opened

When the vessel was at anchor and waiting for an available berth all the hatch covers were opened. This was to ensure the vessel was gas free since fumigation had been carried out in all cargo holds at the loading port.

Whilst opening the cargo hatch covers it was found that cargo in a number of holds had been damaged by water. Most of the water-damaged cargo was below the middle cross joint of the hatch covers and below the aft hatch coaming's corners.

Survey results

According to the Master there had not been any ventilation to the cargo holds during the voyage. A surveyor carried out an inspection and found the following hatch cover parts to be in poor condition:

- Hatch cover panels
- Hatch coamings
- Water drain channels
- Non-return valves
- Quick cleats
- Rubber gaskets

The survey indicated that seawater had leaked through the middle cross joint drain channel and through the corner of the hatch coamings.

What can we learn?

- Before loading, completion of loading and after discharge, the crew should inspect the hatch covers to ensure they are in a weathertight condition. It is essential that cargo hatch covers are inspected and tested at regular intervals to ensure that the weathertight integrity is maintained, and that the vessel is in a cargo worthy and seaworthy condition.

- Ensure that gaskets and coamings are in good condition.

- It is important that records are kept about what maintenance and service has been completed in the PMS.

- Inspection of cargo hatches and coamings, including securing devices, is part of both the annual load line survey and safety construction survey normally carried out by the vessel's classification society. The main purpose of these inspections is to ensure that the vessel is in a seaworthy condition, and not necessarily to confirm that the vessel is in a 'cargo worthy' condition. A few tons of water in the cargo hold will not jeopardise the seaworthiness, but it might completely destroy the cargo.

- Carry out a weathertightness test at least annually and always after repairing or replacing components in the cargo hatch system. When carrying water-sensitive cargo such as grain, soyabeans, paper, etc. it is recommended that weathertightness is tested before each loaded voyage. The most effective method is to use an ultrasonic device, which can pinpoint the area which is leaking, and if the compression of the gasket is sufficient. The advantages of using this type of equipment are evident, since ultrasonic tests can be carried out during any stage of the loading without risking cargo damage. The test can also be completed in sub-zero temperatures.

7.2 Crack in the cargo hatch cover caused wet damage

A bulk carrier had a full cargo of zinc concentrate on board and was sailing from the west coast to the east coast of South America.

When the vessel passed Cape Horn it experienced heavy weather of Beaufort scale 9 with green sea covering the cargo hold covers 1, 2 and 3. This continued for four days as the vessel battled the waves. The vessel had no weather routeing.

Wet damage in hold 1

When the weather had calmed down the Master asked the Chief Officer to inspect the cargo holds. The Chief Officer found that water had entered cargo hold 1 and caused wet damage. No water had leaked into the other holds. The Chief Officer also inspected the hatch coaming and the hatch cover for hold 1, and found a crack on the hatch coaming. The drain pipes for the non-return drain valves were also full of debris and cargo.

Survey results

During discharge the surveyor found that the sounding pipes for the cargo bilges were also blocked by debris. When the vessel was alongside and the cargo hatch covers were removed, puddles could be seen in hold 1. It took several extra days to get the wet cargo off the vessel and most of the cargo was refused by the buyer.

What can we learn?

- The sounding pipes should be clear of any debris or cargo, as they are important for taking soundings before loading and during the voyage.
- It is important to be aware that zinc concentrate may liquefy if shipped with a moisture content in excess of its transportable moisture limit (TML) as per the IMSBC code. Puddles of water will obviously exceed the TML.
- It should be a PMS job to check that the drainpipes and drain valves are not clogged and that the float (ball inside) moves freely.
- Hatch covers, and coaming steel structures are heavily loaded elements. Their condition has a direct effect on the load carrying capacity and the safety of the vessel. The steel construction should always be inspected after an unusual loading case, and there should also be regular checks as per the PMS.
- When repairs are carried out, only steel approved by the classification society should be used. High tensile steel is commonly used for cargo hatches and coamings.
- The classification society should be contacted before making any structural steel repairs.
- Weather routeing should be considered as it provides the vessel with the option of avoiding heavy weather, but also ensures that vessels are provided with a new and updated ETA to the discharge port. This helps the crew on board the vessel, shoreside personnel, and cargo owners, to plan accordingly.

8

Heavy weather

8.1 Containers were lost in heavy weather because of stiff vessel

A large container vessel was sailing on a SE course in the North Atlantic, bound for a European port. During the voyage, heavy weather was encountered from ENE at Beaufort scale 9, with 7 metre waves. This meant that the wind was on the vessel's port side, causing heavy rolling. The maximum recorded roll angle was 30°.

Collapsed containers

During the morning watch, the OOW and the Master were on the bridge. Hearing a loud noise astern of the bridge they looked out of the window and could see that a number of containers had collapsed and some had fallen into empty bays. The collapsed containers were all 20' TEU and were stowed in four bays. The side containers on the starboard side had toppled inboard into an empty space and others had fallen overboard.

After the incident the Master broadcast a safety alert over the VHF. In response to the heavy weather, he then ordered a more easterly course of ESE and reduced speed from 16 knots to 7 knots.

Cause

The CSM required that the bottom containers on deck were secured by manual twistlocks. However, the twistlocks in the container shoes were unlocked. In accordance with the vessel's procedures, the lashings were to be checked prior to every departure, which the Chief Officer stated he had done. At the loading port the Chief Officer had signed the lashing report without noting any deficiencies.

The vessel had a GM of 11 metres which made it very 'stiff'. This means that the vessel would quickly return to the upright position after being inclined by an external force such as wind or waves.

What can we learn?

- The base twistlocks had not been locked as they were found undamaged and still located in the shoe fittings. The combination of unlocked twistlocks and a very stiff vessel sailing through heavy weather led to the collapse of the container stacks.
- The Chief Officer should have ensured that the manual twistlocks were checked before departure.
- The officers should have reduced speed and altered course to ensure the effect of heavy weather was minimised. This was only carried out after the accident had happened.
- A GM of 11 metres was excessive for this vessel. A stiff vessel will affect the top and side containers the most. The top containers collapsed and fell onto other containers which than fell overboard. Principally, the main forces affecting the containers in the lower tiers consisted of:

  (i) The static weight of the upper containers in the stack.

  (ii) Transverse/longitudinal/vertical acceleration forces on the top side containers when the vessel was rolling.

  (iii) Transverse/ longitudinal forces of wind pressure or seas impacting the vessel.

- When the vessel was rolling in heavy weather, the frames and corner posts for the lowest containers were affected by excessive racking forces. The larger the roll, the greater the racking force will be.
- Heavy rolling can impart enormous forces on the container structures and lashings.
- All of the above-mentioned loads will increase the compression and tension forces on the corner posts and to the intermediate twistlocks between them.

9

Injury

9.1 Fatal fall from ladder

Two stevedores were in the cargo hold finishing their job. It was morning, and having started their shift the previous evening, they had been working for more than 12 hours. To exit the cargo hold they had to first climb up a vertical ladder, then ascend a spiral staircase and for the last 2.5 metres climb up another vertical ladder.

The stevedores had brought a thermos and tea cup each. The cup did not fit in the first stevedore's boiler suit pocket so he held it in his hand instead. This wasn't a problem when he ascended the spiral staircase. However, when he reached the last platform there was still the vertical ladder to climb up.

20 metre fall

Climbing up the last ladder he only used one hand as he had the tea cup in the other. He was not wearing a safety harness. When he was almost at the top he slipped and fell down. Unfortunately, he did not hit the platform below but fell more than 20 metres and landed at the bottom of the cargo hold.

The other stevedore shouted for help which the bosun heard. He could see the stevedore lying at the bottom of the cargo hold and instantly called the Chief Officer on the radio and told him about the accident. The Chief Officer assembled a rescue team with a stretcher and gave the stevedore first aid. An ambulance arrived shortly afterwards and he was lifted out of the cargo hold by a crane. Unfortunately, he was declared dead at the hospital.

Damaged ladder

It was later found that a steel bar was missing from one of the lower railings at the beginning of the spiral ladder. The railing was most likely damaged during the loading by one of the crane grabs, or an excavator as it was covered by the cargo when it arrived at the discharge port.

What can we learn?

- The definition of 'working at height' should be addressed in the risk assessment, in addition to details of the safety measures that need to be taken.
- In the risk assessment it should state whether the specific job requires a work permit.
- It is up to every company to define if they consider it an acceptable risk to enter the cargo hold on a vertical ladder without a safety harness attached.
- In this specific case the person climbing the ladder only used one hand and had no safety harness. The problem here is how the stevedore perceived the risk at the time.
- Most of us would agree that it is safer to use both hands when climbing a ladder. However, when climbing ladders is a daily occurrence it is easy to forget that the consequences of slipping can be fatal. Advice from the Code of Safe Working Practices (COSWP) states that when climbing a ladder three points (foot or hands) should always be in contact with the ladder. When the consequences of falling from that ladder are so severe, a harness should really be used.
- It would be beneficial to have a toolbox meeting with the stevedores' supervisors to explain what is required of the stevedores when working on board.
- It is understood that many ports require that stevedores wear a safety harness when climbing the cargo ladder. It is important that the Chief Officer emphasises the importance of complying with this requirement.
- After both loading and discharging, the Chief Officer should inspect the ladders to ensure they have not been damaged during the cargo operation.
- This accident highlights the minimal effort it takes to do a job safely, and the consequences of not making that effort.

9

9.2 Lost balance while washing down caused serious injury

A bulk carrier was in port and one of the ABs was washing the hatch coaming gutter. He had connected a fire hose to a fire hydrant and was spraying water. The cargo hatch covers were open and the AB was wearing a safety harness.

Unclipped safety harness

The harness became tangled with the fire hose and so the AB briefly unhooked it so he could untangle the safety cord. At the same time the pressure in the hose changed causing the AB to lose his balance and fall 16 metres down into the cargo hold.

First aid was given to the AB by the crew and the Master called for an ambulance. Unfortunately, he did not recover and died at the hospital.

What can we learn?

- Working aloft is a high-risk operation and all vessels have procedures on how to do so safely. It is a requirement to fill out both a risk assessment and a work permit for any job in this category. The risk assessment and COSWP requires that all risks should be evaluated and that the harness should be connected at all times.
- The AB in this case was wearing a safety harness, but at the time of the accident had it unhooked at the same time as he lost his balance. This highlights once again that it only takes one second to make a fatal mistake.
- If two persons had been assigned for this job it would have meant that the AB could work on his assigned task by washing down and the other AB could assist with the hose.
- Working at sea is by default a dangerous job and the crew is often involved in high risk operations e.g. working aloft, mooring, securing cargo and other operations. A case like this highlights that a decision to unhook the safety harness when at the same time holding a pressurised fire hose can lead to a fatal fall.
- Everybody looks on risk differently – that is why it is so important that the safety department ensures the crew is trained in evaluating and understanding risks, and the potentially fatal consequences of forgetting this.

9.3 Injury during mooring operation

It was early morning with no wind or currents and a vessel was approaching port. On the stern an AB was preparing the mooring ropes. The stern lines were put partly around a bollard with a bight at a right angle to the normal pull direction. After the AB had prepared the mooring lines, the Third Officer joined him. The spring lines were sent ashore and made fast, and the Master, who was on the bridge, put the engine pitch to zero allowing the vessel a slight forward movement. The rudder was hard to starboard as the vessel was berthing port side alongside. After the spring lines were secured the heaving line was connected to both stern lines.

The Chief Officer, who had been by the manifold, came to the stern to assist and took charge of the mooring winch. The Third Officer walked to the stern railing by the fairlead.

Mooring commences

The linesmen shouted that they were ready to receive the stern lines, so the AB started to lower the stern lines to the water. He was facing the mooring winch and had his back to the Third Officer by the railing. He let the mooring lines run out at a very high speed. Suddenly the Third Officer started to scream and when the AB turned around he could see the Third Officer caught between the mooring line and the fairlead. The mooring line was now coming out very quickly and began cutting into the Third Officer's leg, with such a speed that his leg was cut off just below the knee.

Mooring rope stuck in propeller

The Chief Officer saw that the mooring rope was stuck in the propeller and screamed over the VHF to the Master to stop the engine. The Master pushed the emergency stop and the propeller stopped.

The Third Officer was in severe shock and collapsed. The Chief Officer ran over to give first aid and the gangway was rigged. A first aid team from shoreside came on board, and 30 minutes later an ambulance arrived and took the Third Officer to hospital.

Life changing consequences

The Third Officer survived, but is now disabled and can never work at sea again.

What can we learn?

- The vessel had a risk assessment for the mooring operation, but this did not include the risk of the mooring line getting stuck in the propeller, as the mooring line should be floating in normal circumstances. This time the mooring line was lowered too quickly, ending up under the surface. As the propeller blades were only 2 metres below the surface the lines were sucked into the propeller, which caused the accident.

- In addition the mooring line was partly around the bollard, with a bight and a right angle to the normal pull direction. This arrangement caused the snapback zone to cover the entire area between the bollard and railing. When the rope ran out rapidly and got caught in the propeller it snapped back to where the Third Officer was standing, even though he was not inside the normal snapback zone.

- This shows the importance of everybody involved in the operation being aware of the risks of potential snap back zones. Mooring a vessel is a normal operation, but the risks need to be evaluated every time, as it is a risk operation.

9.4 Fatal fall

The oil tanker was berthed alongside and discharging cargo. The Chief Officer was signing off the same day, and as his replacement had been sailing on the vessel for many years they carried out a quick handover.

Tank cleaning

The following morning the cargo operation was completed around noon and the crew began to clean the cargo tanks. The Chief Officer oversaw the tank cleaning operation and gave orders to the Second Officer in the control room and two ABs who were cleaning the tank on deck. One AB worked in the deck trunk and the other was handling and monitoring the tank cleaning machinery on the tank deck.

Supervision

The Chief Officer's responsibility was to ensure that the tank cleaning was carried out safely and that the tanks were cleaned properly. He visually checked that the tanks were clean. He checked each of the tanks by taking a couple of steps down the tank access ladder and looking down the tank while lighting it up with a flashlight. While doing so, he did not wear a fall arrest harness. As the ABs and the Second Officer were busy carrying out their own tasks, none of them noticed whether the Chief Officer had measured the levels of oxygen and toxic gases in the tank atmosphere before he began to visually check the tanks.

Fall into tank

After a while the OOW in the cargo control room noticed that the Chief Officer was not answering his radio; so he asked one of the ABs to search for him. When the AB looked down into one of the tanks from the hatch opening, he spotted the reflective striping on the Chief Officer's boiler suit at the bottom of the tank near the end of the ladder.

The Master was informed and hurried to the tank, ordering the crew at the scene to fetch a stretcher, oxygen kit, and breathing apparatus. The Master put on the breathing apparatus and entered the tank.

He found the Chief Officer severely injured and unconscious. The Master fastened a harness onto the Chief Officer, and the crew on deck hoisted him up. First aid was immediately given, and the Second Officer contacted the terminal asking them to call the emergency coordination centre.

Tank atmosphere

One hour after the Chief Officer had been evacuated, the Master monitored the atmosphere in the tank. The gas monitor went up to its maximum 100ppm of hydrogen sulphide content. It is unknown if this made the Chief Officer unconscious.

The ambulance arrived and its crew tried to resuscitate the Chief Officer. Ten minutes later he was pronounced dead. He had fallen from a height of 10 metres.

What can we learn?

- The Chief officer was not wearing a fall arrestor while climbing down the ladder. There is a reason this is a requirement as the consequences of failing to wear one can be fatal, as in this tragic case.

- A cargo hold is an enclosed space and it is essential that the company has efficient procedures on the requirements of testing the atmosphere before entry into every tank.

- Chapter 15 of the Code of Safe Working Practices (COSWP) provides excellent advice on how this should be done safely and says:

  'The presence of certain gases and vapours requires specialised equipment and trained personnel to undertake accurate and reliable testing. If this equipment is not available for use, the period of gas freeing should be considerably extended.'

  It seems that the Chief Officer did not follow the testing procedures for the atmosphere, as the tank had the maximum ppm of hydrogen sulphide.

- COSWP Chapter 17 'Work At Height' provides the following definition:

  '17.1.1 Anyone working in a location where there is a risk of falling may be regarded as working at height. In addition to work on ladders, staging and scaffolding, this includes undertaking work inside a tank, near an opening such as a hatch, or on a fixed stairway.'

  '17.1.2 Work at height should be subject to risk assessment, and suitable control measures should be taken to protect those who may be put at risk. Depending on the severity of the risk, a permit to work may be required (e.g. for working aloft).'

- The company should review and see if work permits, and risk assessments must be updated.

- The company should ensure that all crew members understand the importance of using correct PPE, and especially the harness and fall absorber, when entering a tank or cargo hold.

9.5 Rescue boat accident

The vessel was lying alongside at the first port of call since it had left dry dock. The Master wanted to carry out a man overboard drill, as the weather was favourable. He told the Chief Officer to have the rescue boat ready after lunch.

Repairs

The davit wire for the rescue boat had been replaced while in dry dock and the Master wanted to carry out the drill to ensure that all was in order. Before going to dry dock the Chief Officer had ordered a new wire. In fact the wire he received was of a smaller diameter, but he assumed that as it was only 2 mm smaller than the original this would not be a problem. He did not double check this assumption and was unaware that the davit winch motor was too strong for the davit wire.

Whilst in dry dock an electrician had replaced the fuse in the circuit board of the davit winch motor. He had replaced the original fuse with a much higher amperage fuse.

Successful launch

After lunch the rescue boat crew proceeded to the launching area. The Second Officer held a briefing with the rescue boat crew and all others involved. The rescue boat crew included the Second Officer and two ABs. The bosun was in charge of the davit winch and the Chief Officer was monitoring from the deck. The Master was monitoring from the bridge.

The crew boarded the rescue boat in the stowed position. They were wearing the correct safety equipment and safety harnesses, which they secured to the rescue boat to prevent them from falling overboard. The bosun started to lower the boat at slow speed, and when the davit was fully extended he then increased to high speed.

The rescue boat's engine was started just before the rescue boat hit the water and the hook was released when the boat was in the water. The drill was uneventful, and the boat returned to the hook to be hoisted back into position. The bosun raised the boat at high speed and when it was near the main deck he switched to slow speed. The crew did not disembark on the main deck, as the plan was to disembark when the boat was in the stowed position.

Successful launch

The bosun continued to hoist the boat at slow speed to the stowed position, expecting that the proximity switch would shut down the motor before the davit arm made contact with the structure. This did not happen, and the motor applied even more power.

This sudden increase in power caused the wire to break and the boat to fall more than 20 metres into the water, taking the crew members with it.

One of the crew members was stuck in his safety harness underneath the boat and drowned. The other two crew members were seriously injured.

Successful launch

It transpires that the electronic proximity switch was not working because moisture had penetrated the electronics. This happened when the rescue boat was washed down using the high-pressure hose - the proximity switch's electronic cover was also washed down and moisture entered the system causing a short circuit.

According to the vessel's SMS, the crew should always check that the proximity switch is working before they use the rescue boat. The proximity switch was not tested.

What can we learn?

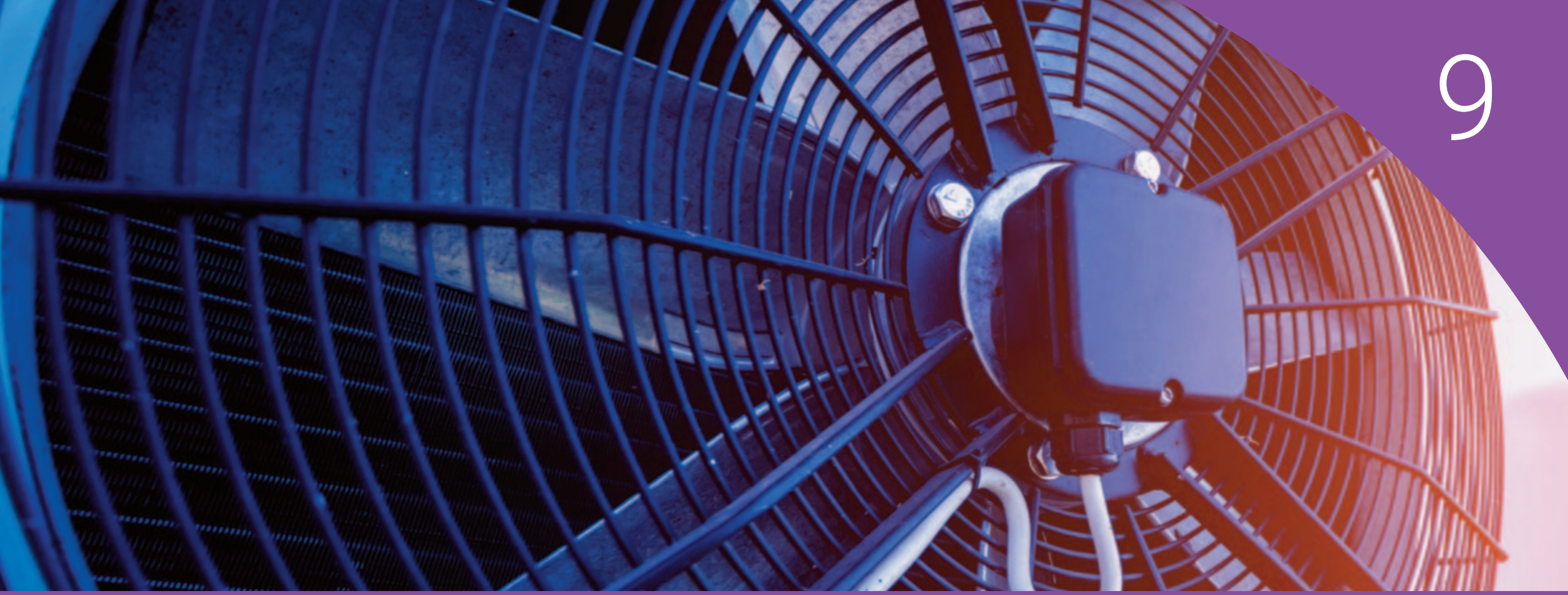
- The proximity switch is intended to cut power to the winch motor when the boat is close to being in the stowed position. This is an emergency device to ensure that the winch motor does not put too much stress on the davit wire. It is essential for preventing possible catastrophic failure. The davit had only one proximity switch so there was no back-up.

- The crew should not embark or disembark the rescue boat when it is in the stowed position. They should board when the rescue boat is in a secured position on deck.

- The amount of people being injured or even suffering fatal injuries is a major concern. To prevent serious injury it is essential that all crew understand how the davit system works and that all equipment is in good condition. Ignoring the correct procedures could lead to fatalities.

- The over-compensation by the winch motor causing the wire to break may have been prevented if the correct fuse had been in place.

- According to the manufacturer's manual, the winch operator should stop the winch before the proximity switch is activated. There were no marks on the davit to indicate to the operator when to stop.



9.6 Severely burned crew member died

The oil tanker was in port loading when it was discovered that a valve was leaking in the pump room, so loading had to be stopped. Because of the leakage the pump room was full of explosive gas. The Master informed the terminal that loading had to be stopped.

Ventilation

The Master updated the Superintendent, who advised the Master to ventilate the pump room. It was decided that the cargo that was still in the lines should be put in the slop tank.

The broken valve was in a difficult position as it was close to the bulkhead. The crew could not fix this with their tools, so a contractor was arranged to come on board and carry out the repairs. The Superintendent decided that the vessel should depart for the next port for loading where the contractor would embark.

The crew began to ventilate the vessel. When the gas in the pump room was below 1% LEL (Lower Explosive Limit) the crew started to wash down the pump room and lowered a portable water pump into the room to pump out the water. When this was completed, a hydraulic water powered fan was put in the pump room to dry it out and the crew started to clean up the leaked cargo.

Later that evening the Chief Officer was resting before arrival in the next port. The Master had taken the Chief Officer's watch to let him rest, as the schedule was tight, and the crew would not get much rest before arrival.

Fans in pump room

The fans in the pump room had to be moved so they could dry out the entire room before arrival. The AB on the watch did not want to wake up the Chief Officer and bosun to move the fans so he went to the engine workshop and found an electric portable fan which was lighter to manoeuvre. He put it in the pump room for ventilation.

Combustion

After an hour or so he came to move the fan into one of the corners which was not completely dry. When he plugged it in there were sparks and these ignited the combustible gas which was in a pocket of the corner. The gases severely burned the AB who managed to run out of the pump room to the emergency shower and extinguished himself. The Master could see this from the bridge and activated the general alarm. The AB was taken into the vessel's hospital and given treatment. The Master contacted medical assistance and proceeded with full speed to the nearest port. The coast guard despatched a large rescue boat cutter to pick up the AB.

The AB was taken to hospital with severe burns. After several months of treatment, unfortunately he died.

What can we learn?

- The Code of Safe Working Practices (COSWP) has excellent information under 'Testing for toxic gases' and states:

  'The presence of certain gases and vapours requires specialised equipment and trained personnel to undertake accurate and reliable testing. If this equipment is not available for use, the period of gas freeing should be considerably extended.'

  It seems that the crew had tested the atmosphere in the pump room but for some reason had missed the pocket of gas that exploded. This emphasises the importance that the company ensures that correct testing equipment is on board and that all crew members involved have been trained correctly.

- There should be proper training on which fans are allowed when toxic gases need to be ventilated. This should be included in the SMS.

- The company should continually review whether any work permits and risk assessments should be updated.

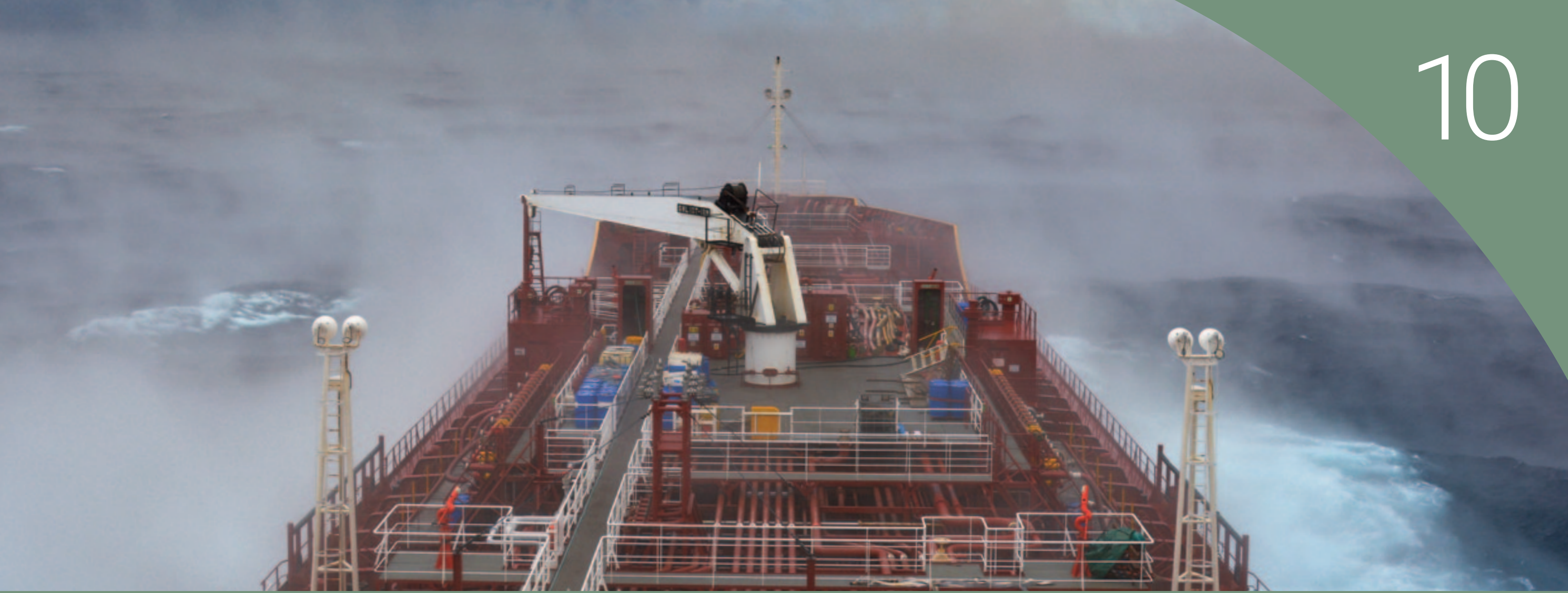
- The pump room had most likely become an enclosed space because of the toxic gas. If we once again refer to COSWP, Chapter 15.1.5 states:

  'A dangerous space may not necessarily be enclosed on all sides, e.g. ships' holds may have open tops but the nature of the cargo makes the atmosphere in the lower hold dangerous. Such places are not usually considered to be dangerous spaces, but the atmosphere may become dangerous because of a change in the condition inside or in the degree of enclosure or confinement. Personnel need to exercise caution before entering any space on board a ship that has not been opened for some time. Examples of such spaces are cargo pump rooms.'

- The company should ensure that the procedures regarding enclosed space entry are up to date and address the issues that led to this tragic accident.

10

Loss of anchor



10.1 Loss of anchor in heavy weather

A vessel was waiting for its berth to become available so the decision was made to anchor. A pre-anchor briefing was held on the bridge where the number of shackles to be used was discussed, and the crew were assigned their tasks for the anchoring operation.

One week earlier the bosun had inspected the windlass including the brake linings and had reported that all was in good condition.

Rough weather forecast

The weather forecast warned of rough weather the following day. The Master informed the bridge team that he would decide what to do later regarding the anticipated heavy weather. The anchoring party consisted of the Chief Officer, Bosun and two ABs. The bosun was controlling the brake, the Chief Officer was reporting what was happening to the bridge and giving orders to the Bosun and ABs. This was the first time the crew had anchored at this anchorage.

The vessel approached the dedicated anchor position as directed by the VTS. When the vessel was fully stationary the Chief Officer ordered the bosun to walk the anchor out using the windlass motor. When the anchor was about half a shackle above the seabed the anchor was let go. All went well and the crew resumed their normal duties when the vessel was safely anchored.

During the night the weather deteriorated. The OOW noticed that the vessel had begun to move and realised that the vessel was dragging. He called the Master who came up on the bridge. The weather was now rapidly deteriorating, and the Master woke up the Chief Officer and told him to assemble the anchor party and heave up the anchor.

Windlass motor fails

The weather had now increased to Beaufort force 8 and the bow was slamming because of the large waves. At that point, while the anchor was being heaved up the windlass motor stopped. The Chief Officer could see smoke coming from it and it was obvious that the motor could not be fixed straight away. At the same time the weather was deteriorating even further so it was decided that the anchor chain should be let go. The bitter end was removed, and the anchor chain was released. The vessel then left the anchorage and drifted in a safer position. The anchor and chain were lost and the vessel was not allowed to continue its journey until the anchor and chain had been replaced. The vessel had a spare anchor but the operation to replace the main anchor and chain took several days.

What can we learn?

- It is imperative that the crew understands the limitations of anchor equipment.
- This case study highlights the fact that the crew were not aware of the classification societies' rules or maybe did not fully understand them.
- Anchor equipment is not designed to endure heavy weather. If heavy weather is anticipated the anchor should be raised.
- Classification societies have unified rules for the design of anchoring equipment, and it is essential that the crew is aware of these limits. When planning to anchor, the following should be considered:

  1 The anchor is designed for temporary mooring in a harbour or sheltered area.

  2 The equipment is therefore not designed to hold a ship off fully exposed coasts in rough weather or to stop a ship which is moving or drifting.

  3 Anchoring equipment is designed to hold a ship in good holding ground in conditions such as to avoid dragging of the anchor. In poor holding ground the holding power of the anchor is significantly reduced.

Anchor equipment

Classification societies assume the following maximum conditions for anchor equipment:

- Current velocity: max 2.5 metres per second (about 4.8 knots).
- Wind velocity: max 25 metres per second (about 48 knots or force 10 on the Beaufort scale).
- No waves.
- Equivalent condition including wave loads:

  1. Current velocity: max 1.5 metres per second.

  2. Wind velocity: max 11 metres per second.

  3. Significant wave height max 2 metres.

- Length of paid out chain: cable: 6-10 shackles

In addition, the following should be noted:

- The design load for the performance of the anchor winch motor is a minimum lifting capacity of 3 lengths of chain, i.e. 82.5 metres plus the anchor.
- The windlass brake is essential to control the pay-out of the chain. The design load for the windlass brake is 45% of chain breaking load when a chain stopper is installed and 80% of chain breaking load when no chain stopper is installed. The conventional design is with brake bands but there are also disc brake systems.
- In heavy weather conditions or strong current, the rudder and engine must be fine-tuned to prevent too high tension in the chain and overload of the windlass motor. Ensure that the chain is kept as vertical as possible.

10.2 At anchor during a typhoon resulting in a grounding and total loss

A laden 45,000 MT deadweight tanker had anchored in a bay outside an Asian port. It was late summer and the vessel was waiting for a berth to discharge its cargo.

Weather warnings forecast

Weather warnings about an approaching typhoon for the area where the tanker was anchored had been broadcast for two days prior to the vessel arriving at the anchorage. The tanker had anchored with 7 shackles of chain in the water. There were some islands around the anchorage and the Master considered the anchorage would be a suitable place to ride out the approaching typhoon, which had been upgraded to a category 2 typhoon.

Around 04:00 the following morning the wind increased to Beaufort scale 9 and the Master told the Chief Officer to pay out 2 more shackles of chain in the water, making a total of 9. During the morning the wind continued to increase to Beaufort scale 12 which caused the anchor to drag.

Wind continued to increase

The Master tried to manouvre the vessel into the wind using the engines. However, two hours later the wind had increased even further, and it was not possible to turn the bow into the wind with the vessel at anchor. The vessel was now turned so that the wind was acting on the broadside of the dragging vessel.

The Master ordered the Chief Officer to heave up the anchor. However, this was not possible as the vessel was dragging. The windlass was not designed for these environmental loads, as it was only designed to lift the weight of the anchor and three shackles of chain (82.5m) in calm water.

Vessel ran aground

At this point there was nothing the crew could do, and the vessel ran aground on one of the islands surrounding the anchorage.

The Master sent a distress signal and the crew abandoned the vessel. Shortly after abandoning the vessel the crew was rescued by a local tug. Fortunately, there was no pollution and no injuries to the crew.

What can we learn?

- It is not uncommon for crews to be unaware of the environmental loads for which anchoring equipment is designed. Classification societies have unified rules for the design of anchoring equipment, and it is essential that the crew is aware of these limits (see below).

- A category 2 typhoon, as in this case, will have a predicted wind velocity of about 45 metres per second (about 87 knots) which is almost twice the load the anchoring equipment is designed for.

- If heavy weather is anticipated, as in this case, it is important that the vessel leaves the port/anchorage as soon as possible. This case highlights the risks and consequences of not leaving in sufficient time.

- It is recommended to use weather routeing which will warn about approaching heavy weather and suggest an alternative route for the vessel.

Anchor equipment

Classification societies assume the following maximum conditions for anchor equipment:

- Current velocity: max 2.5 metres per second (about 4.8 knots).

- Wind velocity: max 25 metres per second (about 48 knots or force 10 on the Beaufort scale).

- No waves.

- Equivalent condition including wave loads:

  1. Current velocity: max 1.5 metres per second.

  2. Wind velocity: max 11 metres per second.

  3. Significant wave height max 2 metres.

- Length of paid out chain: cable: 6-10 shackles

In addition, the following should be noted:

- The design load for the performance of the anchor winch motor is a minimum lifting capacity of 3 lengths of chain, i.e. 82.5 metres plus the anchor.

- The windlass brake is essential to control the pay-out of the chain. The design load for the windlass brake is 45% of chain breaking load when a chain stopper is installed and 80% of chain breaking load when no chain stopper is installed. The conventional design is with brake bands but there are also disc brake systems.

- In heavy weather conditions or strong current, the rudder and engine must be fine-tuned to prevent too high tension in the chain and overload of the windlass motor. Ensure that the chain is kept as vertical as possible.

THE SWEDISH CLUB CASEBOOK

11

Machinery failure

11.1 Machinery failure caused by contamination

A vessel was in ballast and at anchor, awaiting further instructions. After seven days the weather deteriorated and the vessel´s anchor dragged. The anchor was heaved up and the vessel started to slow steam in the area. After about 24 hours the differential pressure alarm of the main engine duplex lubrication oil filter sounded in the engine control room. The crew found aluminium and other metal inside the lubrication filter, and in the crankcase of the main engine, metal particles were found.

Serious damage to the main engine

The subsequent investigation alongside revealed that the metal particles found in the lubrication oil filters emanated from piston rings and piston skirts. Three pistons had almost seized. The main engine, a six-cylinder medium speed type, had severe damage and the following parts had to be renewed: all cylinder liners, three complete pistons, piston rings on all cylinders, all main and connecting rod bearings.

In addition, the turbo charger had to be overhauled as the nozzle ring was broken. The complete lubrication system had to be carefully cleaned and flushed. The vessel was off hire for almost two weeks.

The pistons in cylinder units no.1 and 3 were melted down in certain areas and the skirt in no.4 was torn. Liners were scuffed as a result of the above. The cylinder lubrication channels were found clogged and so cylinder lubrication had been inactive. The lubrication oil pump was found deteriorated due to the hard impurities in the lube oil system.

Lubrication oil contaminated for some time

It was obvious that the engine had been operated on a high thermal load for a long time and that the turbocharger efficiency had been affected by fouling. The lubrication oil had actually been contaminated for some time.

There had been indications that something had gone wrong, for example it was written in the log book that the auto filter had been shooting up to 609 times a day.

- Fuel oil samples before and after purifiers were taken and analysed. The result indicated that the purifiers were working satisfactorily. All fuel oil analyses from bunkering were within specification.
- Several samples of the damaged piston rings were sent to a laboratory. The conclusion was that the excessive wear of liners and pistons was not caused by catalytic fines.
- The cylinder liner lubrication system was tested and was found to work properly.
- At the time of the casualty the main engine, including turbo charger, had been running 7,300 hours since its previous major overhaul. This overhaul had been carried out 18 months previously.
- Investigation of the maintenance records showed that maintenance had been carried out in accordance with manufacturer's instructions.
- When reviewing the monthly main engine reports it became obvious that the main engine exhaust temperatures of all cylinder units had increased 30°C – 40°C for the previous six months.
- The turbo charger revolutions had dropped from about 14,500 rpm to 12,000 rpm at 85% load as had the charge air pressure from 1.7 bar to 1.2 bar. These changes also began to appear in the past six months.
- Due to high exhaust gas temperatures, the engine was under a high thermal load, which finally caused it to break down.

What can we learn?

- A first step to avoiding damage is to have a well implemented and proper management system. This implementation can only be assured with proper training and education for the crew and providing them with the essential knowledge and experience required for ordinary daily work and maintenance according to company procedures.
- Always take engine alarms seriously, for example oil mist detection, and investigate thoroughly. A fully functional alarm system is essential for the safe operation of the main engine.
- Implement robust on board fuel and lubrication oil management systems.
- At regular intervals, carry out system checks of purifiers and filters for both fuel and lubrication oil systems.

The company states that:

- The follow up of all engine logs has now been improved, especially the understanding of the exhaust gas temperatures and their alarm levels.
- The scope of performance reporting between vessel and office will also be intensified in the future.
- The trend logging of reported performance parameters in shore manager's engine performance monitoring system has been implemented.
- Engineers will be sent on four stroke engine training courses.

11.2 Maintenance job lead to flooding of engine room

The engineers on a bulk carrier were carrying out scheduled maintenance on one of the ballast pumps. They had closed all the isolating valves to the ballast pump and put up notices about the job in the engine room and engine control room, but not on the bridge. They didn't finish the job on the first day, so continued the next day.

Preparing for port state inspection

The following day the Master asked an officer to print out the alarm list for the ballast water management system before arriving at the next port, as a port state inspection was expected. To get the list the officer had to start the ballast water management system, which he did.

The bilge high level alarm was suddenly activated in the engine room. An oiler checked the bilges and could see water pouring in, covering the tank top. An engineer turned off the power to the ballast water management system. He also found out that two ballast system valves were open from the main seawater crossover suction line. He closed these valves immediately to stop the ingress of the water. These valves had been opened automatically when the ballast water management system was started. The engineers pumped the water from the tank top into the bilge holding tank.

Water in the lubrication oil

One hour later the main engine bearing wear alarm – 'water level 50%', went off. The main engine system lubrication oil was found to have 0.09% water content. The second lubricating oil purifier was started. A couple of hours later the main engine bearing wear alarm went off once again. A second sample of the lubrication oil was taken, and it was found that the oil had 0.08% water in it.

The Chief Engineer decided to partially change 3,000 litres of lubrication oil in the system.

Afterwards a third sample was taken and the water content was 0.019%. The engine was stopped, and a full change of the lubrication oil was completed. A crosshead bearing was opened for inspection. No damage was found. However, one of the rubber diaphragm seals for draining the crankcase to the system lubricating oil tank was found to be defective. This had caused the water flooding into the engine room to contaminate the lube oil.

Severe engine problems through voyage

The main engine was restarted, and the voyage resumed. The main engine was an electronic controlled model i.e. the exhaust valves and fuel injection system were powered by hydraulics. The system lubrication oil was used as a hydraulic medium. The following day there were problems with some hydraulic components and the main engine had to be stopped. A couple of cylinder units and pumps had to be dismantled, cleaned and reassembled. The main engine could not be restarted because of low hydraulic pressure. It was decided that one of the cylinders had to be blanked off. The main engine was started and stopped several times over a number of days as the hydraulic system was leaking. Because the engine was running on low rpms, the scavenge trunking became fouled with oil deposits, so the engine had to be stopped several times and the trunking had to be cleaned.

Because water contaminated the lubrication oil there was serious damage to several crosshead bearings, crosshead pins, main engine cylinders, hydraulic pumps and main engine turbo charger bearings.

What can we learn?

- A proper risk analysis should always be carried out before any repairs/maintenance, especially if the affected system is complicated and can be controlled from different locations.
- It is also worth considering physically disconnecting power to components so they cannot be activated accidently during the repair/maintenance.
- It is essential that the bridge and engine crew discuss all jobs that can affect each other's department. If a job on the ballast system is planned, the bridge need to be informed and if the job is extended to the following day the OOW needs to be informed. The OOW has to ensure that this information is written clearly and discussed during the watch handover.
- If there are excessive quantities of water on the tank top there is a risk that this will enter the main engine sump tank via a defective diaphragm and subsequently contaminate the main engine lubricating oil system, resulting in severe damage to the main engine components.
- If heavy contamination of water is found in the system:

  (i) the lube oil in the sump tank must be transferred to a settling tank.

  (ii) the sump tank and crank case should be cleaned.

  (iii) a complete fresh oil change filled to the level recommended by the engine manufacturer.
- The design of both Wärtsilä and MAN Diesel lubricating oil outlet diaphragms are quite similar.

  (i) Wärtsilä recommends: Inspection/replace at 40,000 running hours or at dry dock.

  (ii) MAN Diesel recommends: Inspect the diaphragm sealing in the crankcase oil outlet every 32,000 hours of operation, and replace the diaphragm if indicated by the inspection.
- It is recommended that all diaphragms are replaced every five years in connection with the vessel's special survey.
- The exchange of rubber diaphragms should be included in the vessels PMS system.
- It is recommended to owners that spare diaphragms are kept on board at all times, in addition to enough system lubrication oil to completely replenish the system.

11.3 Machinery failure of the CPP caused heavy contact with lock gate

A vessel was berthed alongside the quay, waiting to proceed through a lock to another berth. The pilot called on the radio and asked the Master if it would be possible to depart in half an hour. Pre-departure checks were completed by the OOW, the radar was tuned and the ECDIS set up for departure. The OOW did not check the controllable pitch propeller (CPP) as the vessel had only been alongside for twelve hours and the OOW assumed everything should be OK. He also felt stressed about preparing everything for departure in such a short time. According to the company's SMS, the CPP should always be tested before departure.

Rapid handover

The Master came on the bridge accompanied by the pilot. The OOW carried out a quick handover and then proceeded to the forward mooring station. The Master and pilot had a short pilot briefing and afterwards the Master gave the order to let go all lines.

CPP not responding

The vessel proceeded towards the lock and was in the final approach when the Master realised that the CPP was not responding correctly and the vessel was rapidly approaching the lock. The Master attempted to recover control of the CPP system, but the pitch was stuck at approximately 40% ahead, causing the vessel to accelerate. The Master panicked and was unsure what to do, so he shouted on the radio to the mooring parties to get the lines ashore and stop the vessel. The forward mooring party managed to get the forward spring secured to a bollard but no other lines were attached. The pilot ordered the tug that was standing by beside the vessel, to push the vessel towards the quay. This caused the vessel to make heavy contact with the quay, but unfortunately did not slow it down enough. The vessel continued towards the lock at a speed of about three knots, the forward spring broke with a loud bang, and finally the vessel made heavy contact with the outer lock gate.

Forty seconds after the impact the Master pushed the emergency stop button for propulsion, after which the engine control room took control of propulsion.

Important evidence destroyed

Shortly after the incident the Chief Engineer and First Engineer inspected the CPP system to determine if something was wrong. Before any third party was able to investigate the CPP, the Chief Engineer cleared the system. This destroyed any evidence of what might have caused the failure. The vessel was boarded by port state and class inspectors. The vessel sustained damage to its bulbous bow, the tug sustained minor damage and the lock gates sank. Fortunately there were no injuries or pollution - however there were costly repairs to both the lock and vessel.

It was also discovered that the company had had four similar CPP near misses reported on sister vessels. The company had not made any changes to the PMS or sent any special instructions to the vessels in the fleet.

What can we learn?

- Ensure that the OOW understands why it is important to test all equipment as per the checklist, both for departure and arrival. This highlights the importance of carrying out the checks required by the SMS.

- The Master did not save the vessel's VDR – this was done by a port state inspector two hours after the incident. Always save the VDR, as soon as possible after an accident. It is important to have procedures that ensure that any evidence of what may have caused an accident is not removed or cleared in order to understand and learn why the accident happened.

- Always try to establish why an accident happened so it can be shared with the fleet. The near misses that had been reported to the company were never acted upon – there is no point in having a near miss reporting system if nothing is then done about the reports. Near misses and best practices should be shared within the fleet.

11.4 Routine job in the engine room caused grounding

A vessel was in ballast and sailing about seven miles from land on its way to the loading port in the NW Atlantic. It was early spring with heavy winds blowing and large waves. There was also some ice in the water, so the crew had to clear the lower starboard sea-chest which was blocked with ice. The crew changed to the upper intake and then removed the large cover from the lower sea suction filter, finding it choked with ice slush. While removing the ice the main sea water valve, located on the side shell plate, began to leak.

Excessive force applied

Whilst the crew were replacing the filter cover, one of the engineers applied a large valve wheel key to the actuator valve, in an attempt to stop the leakage. Too much force was applied damaging the gear mechanism that operates the valve spindle and water began leaking into the engine room at high pressure.

The crew made attempts to stop the leakage, but the pressure and volume of water were too great. Attempts to pump out the water entering the engine room were also unsuccessful as electric motors and control gear were splashed with sea water causing short circuits which disabled the bilge pumps.

Vessel began drifting

The vessel blacked out and began drifting in the severe weather conditions approximately 6-7 NM off the coast. The coast guard arrived at the scene and tried to attach a tow line, however the attempts failed. The vessel then dropped both anchors, but this did not stop the vessel from drifting. The vessel eventually grounded, and the crew was evacuated.

The following day a salvage team boarded the vessel by helicopter. They were assisted by two tugs. Wires were connected from the grounded vessel to the tugs. Fortunately the weather improved and the vessel was refloated and towed to the nearest port.

Cleaning operations

An underwater inspection revealed extensive damage to the vessel shell plating. Operations continued over the following days, cleaning the engine room spaces with high pressure hoses and removing the pollutant from the vessel.

What can we learn?

- When carrying out a critical job like cleaning the sea suction, it is important that there are clear procedures on how the job should be done and, as in any critical operation, it is best to have two people check to ensure that mistakes are detected.
- A job like this should require a work permit and risk assessment to be completed.
- It is also important to run drills on how to deal with a salvage operation, so the crew is prepared.

11.5 CPP caused vessel to strike the quay and crane

The container vessel had finished its cargo operation and the pilot had boarded. Two tugs would assist the vessel during departure. It was a clear summer day with no strong winds or currents.

Engine stopped

The two tugs pulled the vessel clear of the berth and the propeller pitch was then set to Stop (Zero). Both tugs were cast off. The pilot ordered dead slow ahead. However, when the Master set the propeller pitch control to dead slow ahead, the main engine stopped. The Master called the engine control room to find out why the main engine had stopped and requested the main engine be restarted.

Movement astern

Shortly afterwards the main engine started. However, the vessel immediately started to move astern. The Master called the engine room again and asked for the main engine to be stopped. It was discovered that the propeller pitch was now at full astern. The pilot called for the tugs to return, and the Chief Officer on the forecastle dropped the starboard anchor. The Chief Engineer was ordered to use the Emergency Stop to stop the main engine, which he did. However, the movement astern of the vessel could not be stopped. Moments later, the starboard quarter of the vessel struck the berth and front leg of a gantry crane.

The impact caused minor damage to the vessel and berth. The front leg of the gantry crane was knocked off the rail, but the crane was still standing. The crane was repaired and back in operation later the next day. However, the damage to the crane resulted in other liner vessels scheduled to call at the berth being delayed.

Faulty CPP

The container vessel needed repairs to the controllable pitch propeller (CPP) hub and temporary repairs to the shell plating before sailing.

It is relevant to note that propulsion of the vessel was controlled by a CPP. The propeller turns in the same direction all the time when the vessel is sailing and only the angle/pitch of the propeller blades is changed to sail forward or go astern.

Inspections on board revealed that the CPP hub was leaking hydraulic oil and the propeller pitch control system had lost oil pressure. A feature of some CPPs is that if the oil pressure of the pitch control system is lost, the system will automatically place the blades at full astern pitch. The rationale for this is that the main engine can be operated in both directions (right- or left-hand turning). With the blades fixed at full astern, the vessel can still be manoeuvred by starting and stopping the main engine in different directions despite the inoperable propeller pitch control.

What can we learn?

- Usually, an alarm should be triggered if there is a loss of oil. A low-level alarm should have been activated. It is important to act on and investigate all alarms that go off.
- It is important to follow the PMS for the CPP and ensure that all jobs are carried out correctly. This is one of the best preventive measures to ensure the equipment is working properly. Do not postpone planned maintenance.
- It is also essential that oil samples are taken to ensure there is no water or other contamination in the oil.
- Before arrival and departure, the engineer of the watch should check that the CPP is working properly.
- Ensure that all the appropriate crew is trained on how the CPP system works. This will include both deck and engine officers

12

Piracy

12.1 Piracy attack while waiting for berth

A laden product tanker was drifting 20 miles outside a West African port where it would discharge its cargo. There had been pirate attacks in the area and so the Master had ordered preventive measures to be implemented as per the SSP.

Two ABs were assigned to the poop deck and forecastle, and they were also assigned to monitor the main deck. The crew prepared the deck and attached a single coil of barbed wire on the poop deck, forecastle and on the railing around the vessel; locked all doors and turned on all the outside lights. The Chief Officer noticed that a couple of lights were broken amidships and told the Bosun to repair them the next day.

Delays in berthing

The agent had called the Master and informed him that the berth would be occupied for another two days and would be in contact when the berth was ready.

After midnight the Second Officer was on watch and monitoring a VHF channel dedicated to local navy broadcasts. The main engine was kept running so the vessel could manoeuvre instantly, and two ABs carried out regular patrols on deck.

Boarded by pirates

Shortly after midnight a small boat slowly approached the vessel. It stopped amidships by the broken lights where the freeboard was only 2 metres. The boat crew put a ladder on the railing, which had a carpet attached to protect them from the barbed wire, and climbed on board.

None of the ABs saw the small boat approaching. The boat did not give a stable echo reading on the radar as it was made of wood and the choppy sea interfered.

The five men who climbed on board were pirates and armed with machine guns. They made their way to the poop deck and surprised the AB on watch.

Death threats made

The pirates demanded that the AB should take them to the bridge or they would kill him. When the pirates had secured the bridge they asked for the Chief Engineer to be brought to the bridge. He was beaten when he arrived and told that he would be killed if he tried to sabotage the engine and that any engineer would be killed if they tampered with the engines.

The Second Officer was told to show two of the pirates to the Master's cabin and the other three remained on the bridge with an AB and the Chief Engineer. The Master was forcefully woken up, beaten and forced to open the safe and give all the money to the pirates. When the Master was taken to the bridge, ten more pirates had arrived. A larger vessel was drifting alongside which looked like a fishing boat.

One of the pirates identified himself as the leader and explained to the Master that all the crew should be summoned to the mess room. If anyone resisted or tried to sabotage anything on the vessel he would be killed.

All the crew, except the Master, were placed in the mess room and their hands were tied. The Master remained on the bridge. One of the SSAS buttons was under a radar console but the Master was not close to it and was too scared to push it.

Ship-to-ship transfer

The pirates took control of the vessel and sailed it for ten hours when they stopped beside another smaller tanker. They started a ship-to-ship operation and when the other tanker had been loaded it sailed off. The other two pirate boats had followed and were drifting alongside the vessel. The pirates took the Master to the mess room and tied him to a chair. He finally freed himself and when he reached the bridge he realised that the pirates had left, because both pirate boats were gone. He called the office and informed them what had happened.

What can we learn?

- Best management practices should be followed and need to be adapted to every different area the vessel is visiting. It is essential that a piracy risk assessment for the trading area has been completed as described in 'Best Management Practices to Deter Piracy 5 (BMP5)' and 'Guidelines for Owners, Operators and Masters for Protection Against Piracy in the Gulf of Guinea'.

- It is not common for pirates in the Gulf of Guinea (GoG) to use ladders, but in this attack, ladders were used to board the vessel, so preventive measures should be analysed and implemented. Physical barriers which increase the height will make it more difficult for the pirates to attach the ladders. A proper risk assessment needs to be completed.

- It is imperative that all required equipment is in working condition. In this case a number of floodlights were broken.

- Ships operating in the GoG area are strongly urged to plan according to the following:

  1. Arrive at the pilot station, port, anchorage or STS area 'just in time'. Plan transit times with consideration to safe speed and maintaining distance offshore or use an offshore waiting area.

  2. Rendezvous - where possible, avoid waiting and slow steaming. Consider offering several alternative rendezvous points and advise rendezvous points at the last minute. If waiting, keep well off the coast (up to 200 NM). Do not give away waiting positions. Do not drift and keep engines ready for immediate manoeuvres.

  3. Vessels should proceed within the 200 NM range at full speed.

  4. Anchoring - where practicable, a prolonged stay at anchorage is to be avoided.

  5. Minimise use of VHF and use e-mail or secure satellite telephone instead. Where possible, answer only known or legitimate callers on the VHF, bearing in mind that imposters are likely, and may even appear in uniform.

  6. The greatest risks of piracy are at night and these need to be factored into all planning. Where possible, operations should start and end during daylight hours.

  7. The use of privately contracted armed guards on board is banned in Nigerian waters.

  8. If using an armed escort, due diligence on the company providing this service must be conducted to ensure strict adherence to the MOU issued by the Nigerian Navy and Nigerian Maritime Administration & Safety Agency (NIMASA).

  9. Shipowners and managers must have a means of verification that hardening measures are available and in place on vessels prior to entering the GoG area.

  10. Spot checks for verification at ports within the GoG area are an additional option to consider.

  11. Nigerian naval armed guards can protect merchant ships utilising patrol boats to escort ships in the region.

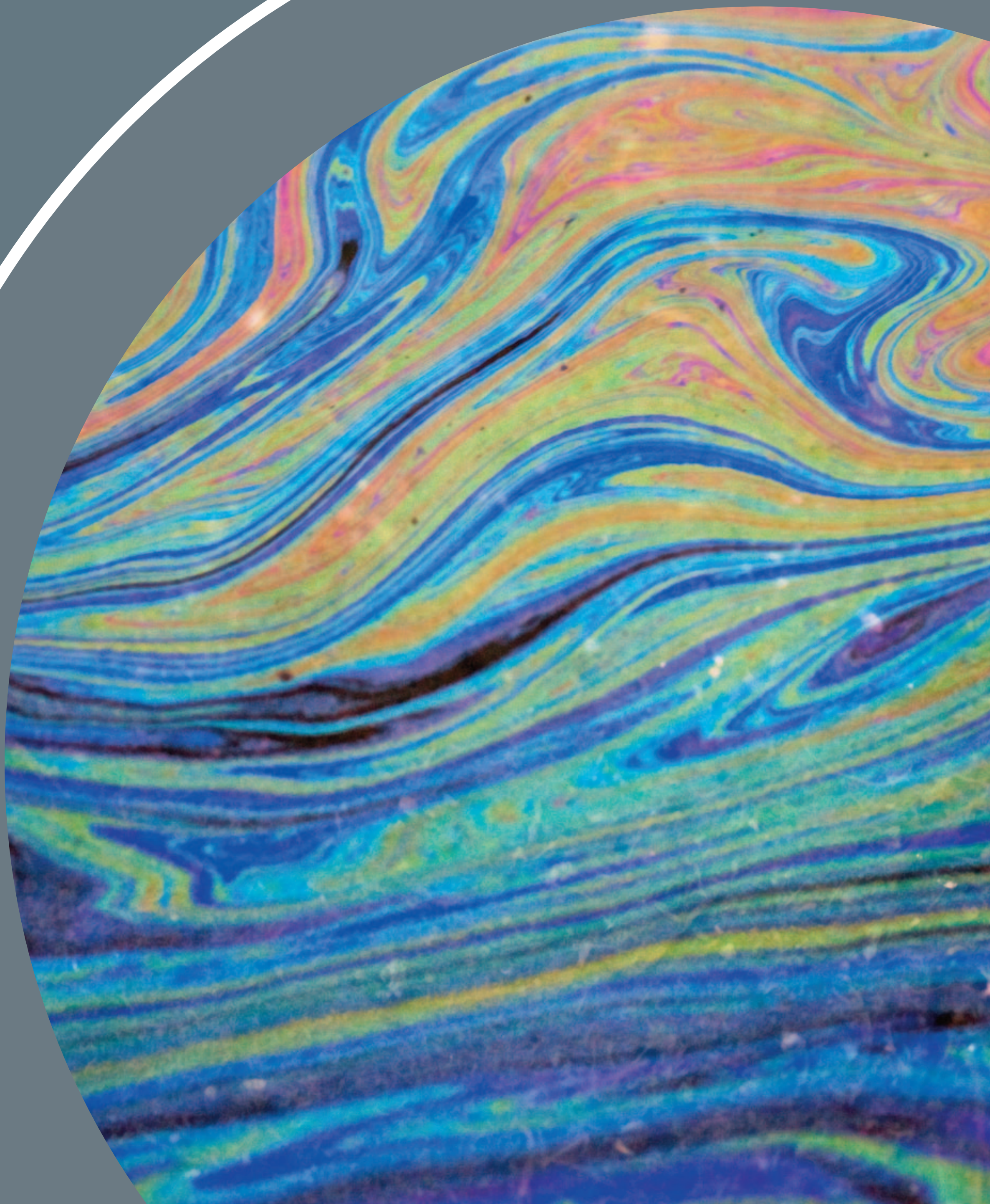
  12. Maintain all-round visual lookouts and good radar watch.

  13. Report to MDAT-GoG (the Maritime Domain Awareness for Trade – Gulf of Guinea, operated jointly by French and UK Navies): watchkeepers@mdat-gog.org/emergency
  tel: +33(0) 298 22 88 88.

  14. The MDAT-GoG will liaise directly with the navies in the region in the event of an attack. If a ship does not report to the centre, then there is likely to be a delay in the response from the regional navy. Alerts and warnings will be issued by MDAT-GoG and they will also contact vessels in the immediate vicinity of an incident.

13

Pollution



13.1 Corroded pipe caused oil spill

The 15 year-old bulk carrier was having its third special survey completed in dry-dock. As usual there were also many other jobs being carried out at the time. One of these jobs was to replace a section of a de-aeration pipe in the cargo hold.

The Chief Officer had discovered during a cargo hold inspection a month earlier, that the de-aeration pipe seemed to be corroded. This pipe led from the sea chest, passing through the cargo hold and then through a heavy fuel oil (HFO) tank and finally out through the vessel's shell plate.

It was decided that the section of the pipe in the cargo hold should be replaced and that crossbars should also be fitted for protection against damage during cargo handling.

The Chief Officer did not think it was necessary to inspect the section of the pipe inside the HFO tank. There was no scheduled inspection of the HFO tanks during dry-docking.

This section of the pipe was replaced by the shipyard without any problems and the vessel left the shipyard after repairs were completed and sailed in ballast condition to the loading port.

At discharge port

The vessel arrived in the morning at the discharge port where it was planned that it would receive bunker. A bunker barge came alongside and the First Engineer completed the bunkering checklist. About an hour later the bunkering began. At this time the cargo operation had also commenced.

At lunchtime, one of the ABs discovered oil in the water, and he advised the OOW.

The OOW, who was in the cargo office, came out on deck to see what was happening. After a couple of minutes the OOW could see oil trickling down the side of the hull.

He went into the cargo office and made a general announcement about the pollution and on what side of the vessel the oil was escaping. Shortly after this he called the Master and informed him about the oil pollution. The Master informed the coast guard, harbour authorities and the DPA about the incident.

At this time the duty engineer also called the OOW and asked what was happening. The OOW told him about the pollution and asked if the bunkering had been stopped, to which the engineer said it had not. The OOW told him to stop bunkering immediately.

HFO tank leaking

Straight after this the OOW ran out on deck again and the Master and Chief Engineer were already there. Oil was still trickling down the side even after bunkering had stopped. The Chief Engineer realised that the oil was escaping from the HFO tank, which was being bunkered and told the duty engineer to transfer all bunker from that tank into another empty HFO tank. When almost the entire bunker had been transferred the trickling ceased.

Shortly afterwards the harbour authorities arrived and placed oil booms and absorption pads around the vessel. The booms unfortunately did not prevent all of the oil from escaping. There were two barriers, with the outer barrier consisting of oil booms, and the inner consisting of absorption pads.

When all the bunker had been transferred and the tank was safe for entry, it was decided to inspect the HFO tank. The crew entered the HFO tank and discovered that the de-aeration pipe was fractured.

The crew made temporary repairs to the pipe, but permanent repairs had to be completed at a shipyard.

Damage during repair work

It was discovered that the pipe in the HFO tank had been fractured when the section in the cargo hold had been replaced causing stress to the section in the HFO tank.

This caused HFO to enter the fractured section causing pollution.

What can we learn?

- All pipes on board the vessel should be included in the PMS and inspected at regular intervals to ensure there is no significant corrosion.
- There is a risk when a section of a pipe is replaced that this will cause fractures on the sections that have not been replaced.
- Pressure testing should be carried out immediately after work has been carried out on any pipework. The thickness of the entire pipe should be measured.
- It is strongly advised that no pipes other than fuel pipes pass through bunker tanks. Other media passing through fuel tanks can lead to contamination of the bunker as well as contamination of other media.
- If a pipe with seawater passes through a HFO tank it should be recognised that this is a pipe that is likely to corrode faster than a pipe that is not passing through a heated tank with HFO.
- If having pipes passing through the HFO tank is unavoidable, then these pipes should have an increased pipe thickness and should also have some kind of surface protection e.g. hot dip galvanizing or coated on the waterside.

THE SWEDISH CLUB CASEBOOK

14

Stowaways

14.1 Stowaways in the steering gear trunk

A container vessel had departed from Lagos and the next port of call was in Malaysia.

Before departure, the crew performed a stowaway search as per the SSP. No stowaways were found.

The vessel departed and after disembarkation another search was carried out. Still no stowaways were found.

Knocking sounds

The following day the Bosun heard knocking sounds coming from the hull in the steering gear room. He informed the Master straight away. The crew started to investigate the sounds and could hear knocking coming from what they believed was the rudder trunk.

There was no access to the rudder trunk as it is space taken up by the rudder stock. The rudder trunk is only accessible from the outside of the vessel. This was a so-called unbalanced rudder, which means that the rudder stock is attached aft of the rudder hinges. The hinges are at the forward end of the rudder. The vessel was in open sea and the Master brought the vessel to a stop. The crew lowered a camera on the stern to see if they could see anything by the rudder. When they recovered the camera and watched what they had filmed they could see three people sitting on the rudder.

Vessel had to divert

The crew lowered the rescue boat and picked up the three men. The stowaways had used a small rowing boat to reach the vessel and had than managed to climb up the rudder and then into the rudder trunk. So that the stowaways could disembark, the vessel had to divert to Cape Town.

There is never access to the rudder trunk from the inside of the vessel as it is just an open void considered part of the hull.

What can we learn?

- It is extremely unlikely that a person would be able to sit on the rudder and not be washed out of the rudder trunk during a sea passage. If people in the rudder trunk are not found before departure or shortly after departure, they will most likely be lost at sea.
- To prevent stowaways achieving access, please consider the following if the vessel is in a port with a high risk of stowaways,

  (i) Inspect the rudder and if possible the rudder trunk with the rescue boat before departure if the rudder is above the waterline.

  (ii) Install protective grating or steel bars onto the steering gear trunk to prevent access from the rudder.

Glossary of common industry abbreviations

Term	Meaning
AB	Able seaman
AIS	Automatic identification system
ARPA	Automatic radar plotting aid
COLREGS	International Regulations for Preventing Collisions at Sea
COSWP	Code of Safe Working Practices for Merchant Seafarers
CPA	Closest point of approach
CSM	Cargo securing manual
ECDIS	Electronic chart display information system
ETA	Estimated time of arrival
GM	Metacentric height
GPS	Global positioning system
IHO	International Hydrographic Organization
IMDG Code	International Maritime Dangerous Goods Code
IMO	International Maritime Organization
IMSBC Code	International Maritime Solid Bulk Cargoes Code
ISM	International Safety Management Code
JRCC	Joint rescue coordination centre
MOU	Memorandum of understanding
NM	Nautical miles
OOW	Officer on watch
PA	Public address system
PMS	Planned maintenance system
SMS	Safety management system
SSAS	Ship security alert system
SSP	Ship security plan
STS	Ship-to-ship (transfer)
TML	Transportable moisture limit
UHF	Ultra high frequency (radio)
VDR	Voyage data recorder
VHF	Very high frequency (radio)
VTS	Vessel traffic serice

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