The Swedish Club

With you at all times

Wet Damage on Bulk Carriers

2018

LOSS PREVENTION
ESSENTIALS

How to avoid wet damage on bulk carriers

Before leaving port, the crew should inspect the hatch covers to ensure they are in a 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.

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, soybeans, paper, etc. it is recommended that weathertightness is tested before each loaded voyage. Ultrasonic methods are suggested.

Cargo hatch covers must be inspected and tested at regular intervals in accordance with vessel-specific procedures e.g. opening, cleaning before closing, closing, cleating etc. These records should be kept in the Planned Maintenance System (PMS). If complicated repairs are required, professional specialists should be employed.

It is strongly recommended that a service engineer from the manufacturer inspects the cargo hatch system regularly in order to determine the condition of the hatch cover system and the repairs needed.

Contents

The Swedish Club would like to thank DNV GL and MacGregor for their assistance in compiling this publication.

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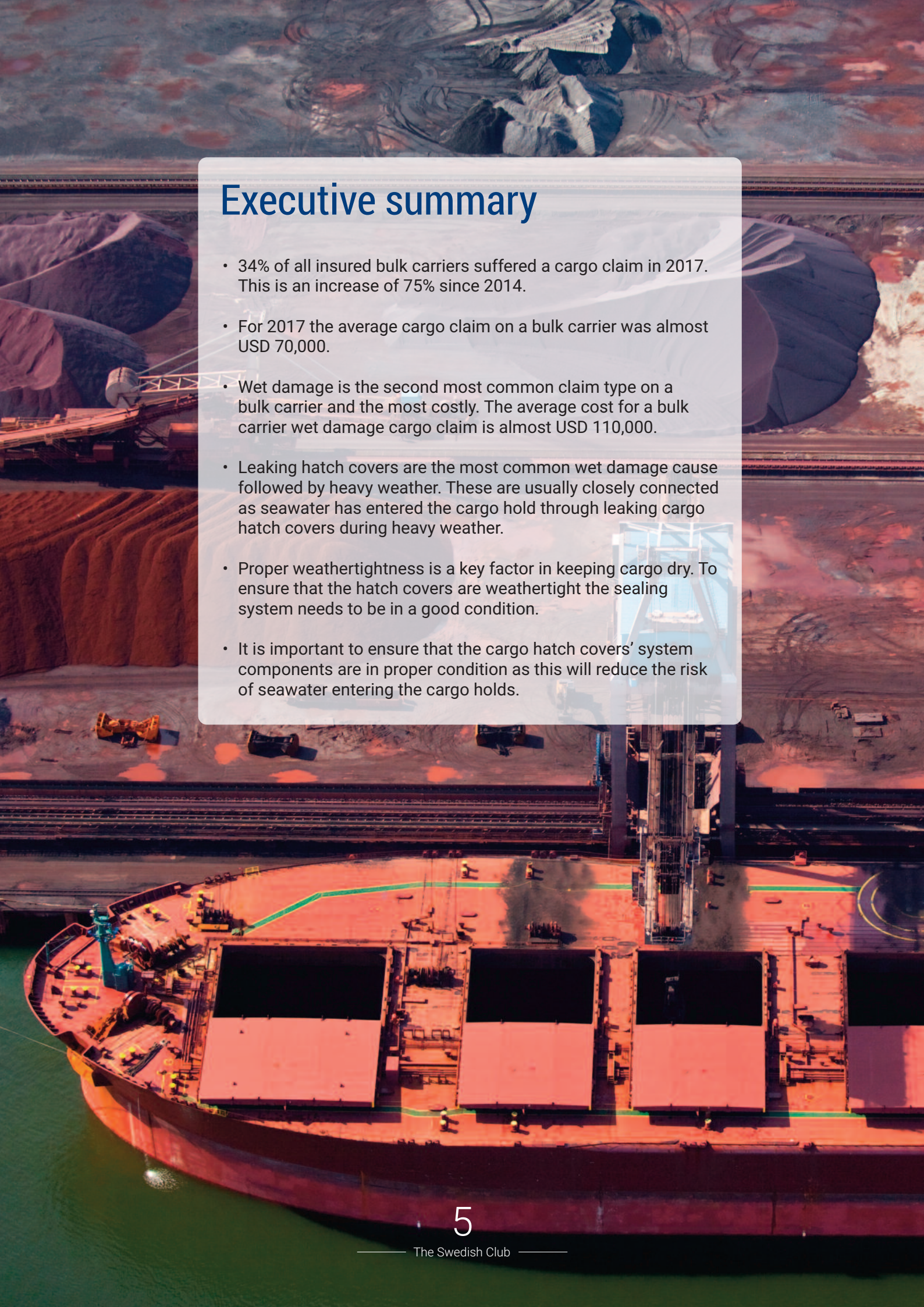
Mikko has spent the last four years in his current role. He and his team are responsible for technical support and training related to all aspects of hatch cover repair and maintenance for MacGregor's service organisation and customers. Prior to that he was involved in a variety of design and R&D tasks at the Hatch Cover New Building division of MacGregor.



Executive summary

- 34% of all insured bulk carriers suffered a cargo claim in 2017. This is an increase of 75% since 2014.
- For 2017 the average cargo claim on a bulk carrier was almost USD 70,000.
- Wet damage is the second most common claim type on a bulk carrier and the most costly. The average cost for a bulk carrier wet damage cargo claim is almost USD 110,000.
- Leaking hatch covers are the most common wet damage cause followed by heavy weather. These are usually closely connected as seawater has entered the cargo hold through leaking cargo hatch covers during heavy weather.
- Proper weathertightness is a key factor in keeping cargo dry. To ensure that the hatch covers are weathertight the sealing system needs to be in a good condition.
- It is important to ensure that the cargo hatch covers' system components are in proper condition as this will reduce the risk of seawater entering the cargo holds.

1. Introduction

Cargo wet damage on bulk carriers is a recurring problem. To identify the root cause of these problems and to identify suitable corrective measures, The Swedish Club has joined forces with the cargo hatch cover experts MacGregor and classification society DNV GL.

In this publication, we identify the main causes of wet damage and share loss prevention advice on how to prevent wet damage from occurring on your vessel.

While most of the challenges and issues discussed in this publication focus on bulk carriers the principles may also be applied to other vessels with cargo hatches.

2. Scope of the report

This publication focuses on cargo claims statistics for wet damage claims relating to bulk carriers. To put these figures in context we have also provided an overview of claims statistics across a range of vessels.

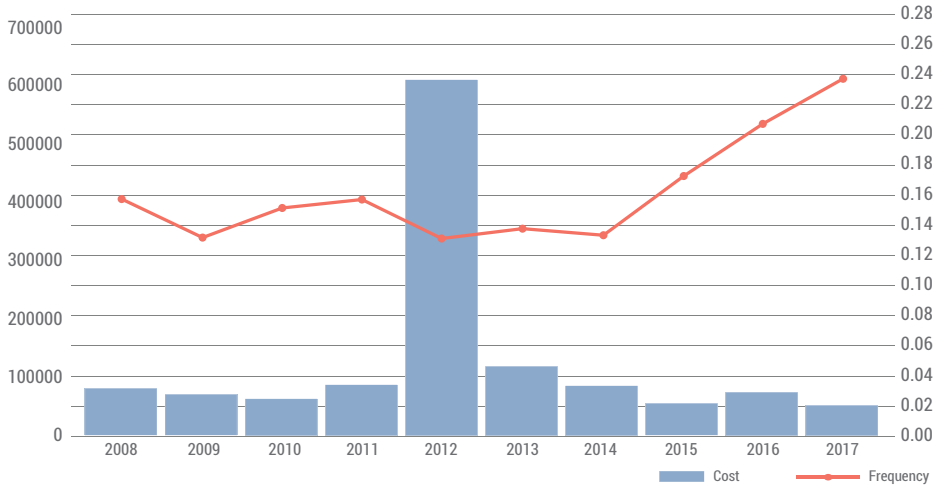
We have based our statistics on more than 600 cargo claims on bulk carriers over the last ten years. The average cost for a bulk carrier cargo claim is almost USD 125,000 and the average cost for a wet damage claim on a bulk carrier is USD 110,000. In this review we highlight the most common issues that contribute to these figures.

3. Statistics

3.1 P&I cargo statistics - all types of vessel 2008–2017

P&I: Cargo, frequency and cost

Claims cost =>USD 5,000 – uncapped



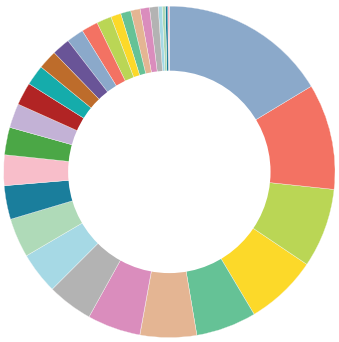
The statistics show that there has been an increase in the frequency of cargo claims in the period between 2014 and 2017, from 0.14 to 0.24. During 2017, 24% of all vessels insured under P&I suffered a cargo claim.

All claims costs, after the deductible and claims included, cost USD 5,000 or more. The high cost for 2012 is affected by some extraordinary large claims.

Important note: *Whilst the graph above appears to show an increase in the number of claims, this is explained by the fact that the average claim has become more expensive. and consequently in recent years has broken the USD 5,000 cap. Reference to Appendix (i), which shows the same graph using* ***Claims cost =>USD 1 – uncapped****, demonstrates that that the number of claims is not increasing. During statistical analysis the Club generally uses* ***USD 5.000 – uncapped*** *figures to ensure that claims which might not have caused cargo damage and only generated cost for services and surveyor reports do not distort the statistics.*

P&I: Cargo, most common causes

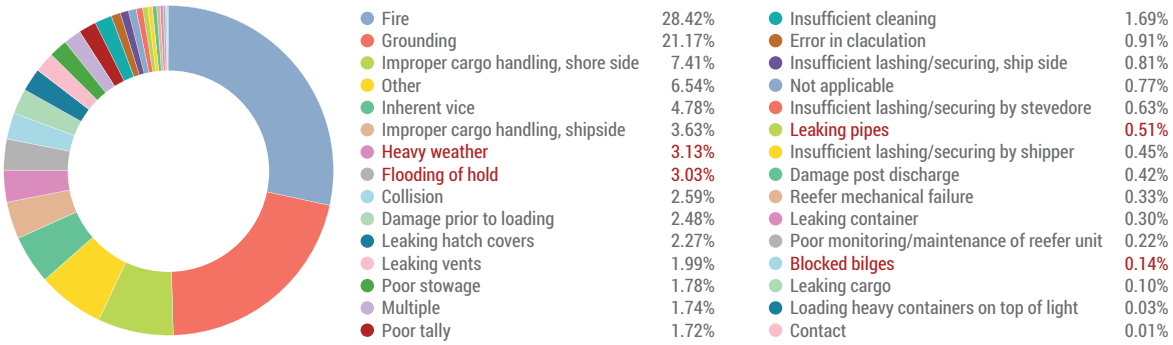
Claims cost =>USD 5,000 – uncapped



Improper cargo handling, shore side	16.37%	Insufficient lashing/securing by stevedore	1.99%
Other	10.33%	Insufficient lashing/securing by shipper	1.84%
Improper cargo handling, shipside	7.73%	Reefer mechanical failure	1.76%
Poor tally	7.04%	Damage post discharge	1.68%
Damage prior to loading	5.89%	Grounding	1.61%
Error in calculation	5.51%	Poor monitoring/maintenance of reefer unit	1.45%
Heavy weather	5.20%	Insufficient lashing/securing, ship side	0.99%
Leaking hatch covers	4.44%	Collision	0.99%
Multiple	4.06%	Fire	0.92%
Flooding of hold	3.83%	Leaking pipes	0.92%
Insufficient cleaning	3.29%	Leaking vents	0.84%
Inherent vice	2.98%	Blocked bilges	0.38%
Not applicable	2.68%	Leaking cargo	0.31%
Poor stowage	2.37%	Loading heavy containers on top of light	0.23%
Leaking container	2.22%	Contact	0.15%

P&I: Cargo, most costly causes

Claims cost =>USD 5,000 – uncapped

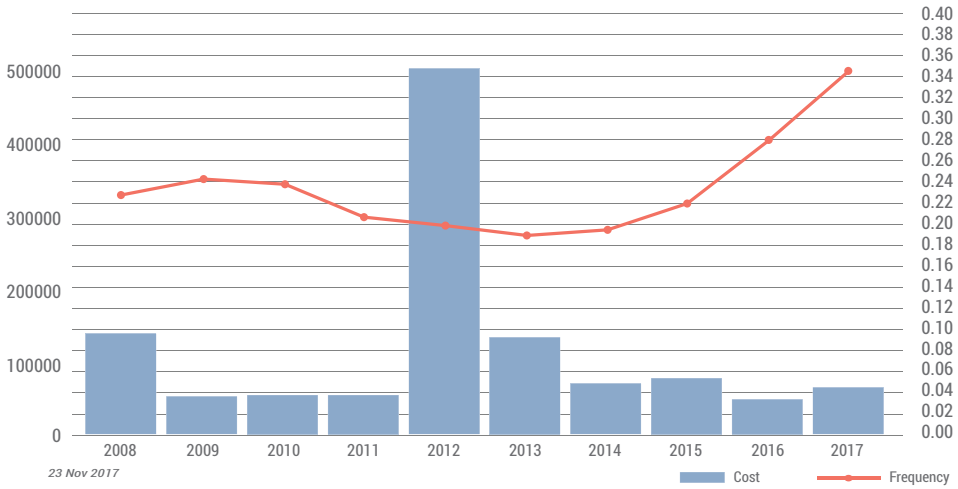


Across all vessels the most common claim experienced by the Club is for improper cargo handling. The costliest cargo claims are caused by fire and grounding. However this picture changes dramatically when we consider bulk carriers.

3.2 P&I cargo statistics - bulk carriers 2008–2017

P&I: Cargo claims on bulk carriers

Claims cost =>USD 5,000 – uncapped



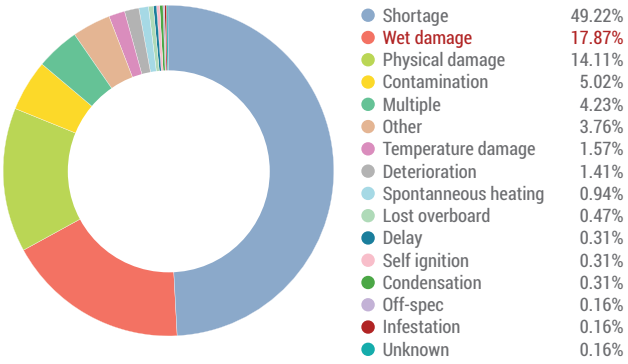
For 2017 the average cargo claim on a bulk carrier was almost USD 70,000 with a frequency of 0.34.

This means that 34% of all insured bulk carriers suffered a cargo claim in 2017.

Important note: *Whilst the graph above appears to show an increase in the number of claims, this is explained by the fact that the average claim has become more expensive. and consequently in recent years has broken the USD 5,000 cap. Reference to Appendix (ii), which shows the same graph using* ***Claims cost =>USD 1 – uncapped****, demonstrates that that the number of claims is not increasing. During statistical analysis the Club generally uses* ***USD 5.000 – uncapped*** *figures to ensure that claims which might not have caused cargo damage and only generated cost for services and surveyor reports do not distort the statistics.*

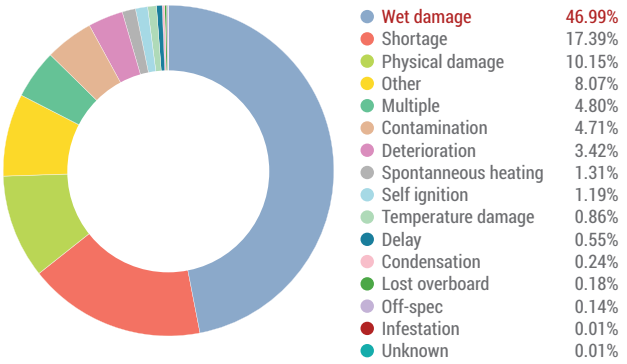
P&I: Most common types of cargo claims on bulk carriers

Claims cost =>USD 5,000 – uncapped



P&I: Most costly types of cargo claims on bulk carriers

Claims cost =>USD 5,000 – uncapped

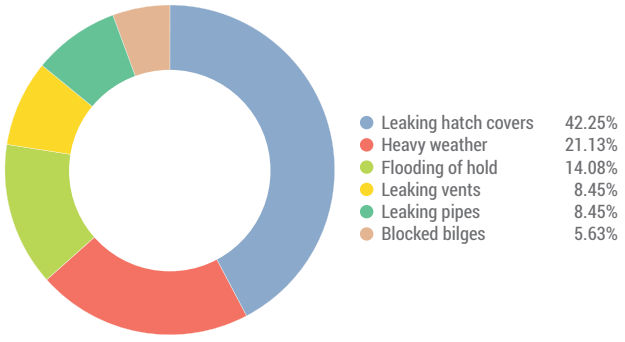


It can be seen from the charts that wet damage is the second most common claim type and the most costly. These figures are based on more than 600 cargo claims on bulk carriers.

The average cost for a bulk carrier cargo claim is almost USD 125,000. Out of these claims the Club has explored more than 70 wet damage claims in detail with an average cost of over USD 110,000. From these claims we have highlighted the most common issues that we find relevant.

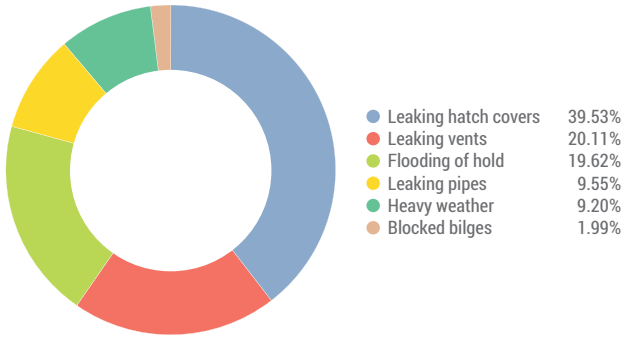
P&I: Most common causes of wet damage on bulk carriers

Claims cost =>USD 5,000 – uncapped



P&I: Most costly causes of wet damage on bulk carriers

Claims cost =>USD 5,000 – uncapped



For wet damage claims, heavy weather and leaking hatch covers are both the most common and the most costly type. Indeed heavy weather and leaking hatch covers are coinciding incidents as the cargo hatch covers may be washed over by green sea on deck when the vessel sails through heavy weather.

4. Causes of wet damage

As shown by the statistics, heavy weather and leaking hatch covers are both the most common and the most costly type of wet damage claim. These are often coinciding incidents as the cargo hatch covers may be washed over by green sea on deck when the vessel sails through heavy weather.

It is important to note that the main concern is not the heavy weather itself, but rather that incorrectly applied and poorly maintained cargo hatch covers and sealing systems significantly increase the risk of the cargo becoming damaged by water. The cargo hatch covers are designed to prevent water from entering the cargo hold when the vessel is sailing through heavy weather.

The cases below are from The Swedish Club's files and are representative of the most common cargo wet damage cases that the Club experiences. All of these cases have some of the common issues mentioned in the list below, the majority of which have their roots in poor maintenance. Recommendations and comments related to maintenance of the cargo hatch covers and sealing systems are further described in the loss prevention section of this publication.

The most common wet cargo issues are related to the following;

- Leaking cross-joints
- Compression bars in poor condition
- Rubber gaskets in poor condition
- Hatch coamings in poor condition
- Leaking transverse packings
- Drain channels in poor condition
- Non-return valves in poor condition
- Cleats in poor condition

Case 1
Limitations of the water hose test

Before loading with grain the cargo hatch covers had passed a water hose test. Once the vessel was fully loaded the cargo hatch covers were then sealed with tape.

During the voyage the vessel encountered heavy weather at Beaufort scale 10 with large waves and a swell which covered the hatch covers in water.

During the voyage the tape by the cross-joints between the forward and aft hatch panels of two holds had peeled off.

At the discharge port it was found that part of the top layer of the cargo in a number of the cargo holds was damaged by seawater. The cargo was mostly damaged underneath the cross-joints.

A visual inspection of the cargo hatch covers, rubber gaskets, securing devices, valves, ventilators and drainage channels found them to be in order.

A chalk test was carried out and this did not show any imprints on the rubber gaskets.

Further investigation revealed that there was no contact between the compression bars and rubber gaskets on the cross-joint panels. In addition, an ultrasonic test identified that the cross-joints between the forward and aft hatch cover were also leaking.

Case 2
Cargo residue

A bulk carrier had loaded a cargo of grain. During discharge, wet damaged cargo was found in one of the cargo holds. A silver nitrate test was carried out, which confirmed that the cargo had been damaged by salt water.

The vessel had side rolling hatch covers which consisted of two panels. They were even and straight with no obvious damage.

During the inspection, it was found that the rubber packing was smooth, pliable and well packed in the channel. No damage, distortions, cracks or over compression were noticed. The ventilator covers were secured and drain channels seemed to be in a sound condition.

However, a small quantity of mouldy cargo residue remained on the cross-joint drain channel of the hatch cover. It had not been removed before securing the cargo hatch cover.

Normally cargo residue should be in a dry and sound condition if the cross-joints are not damaged.

The seawater had leaked into the drain channel through the cross-joint during the voyage and then into the cargo hold causing wet damage to the cargo of peas.

Case 3
The danger of ice

A bulk carrier had loaded grain in all its cargo holds. Before loading began the cargo holds had been inspected by a surveyor and accepted.

The vessel sailed through heavy weather at Beaufort scale 11 and a great deal of ice accumulated on the cargo hatch covers.

During discharge, wet damaged cargo was found in a number of the cargo holds, underneath the hatch coaming.

A silver nitrate test was carried out and the cargo was found positive for saltwater contamination.

Some of the wet damaged cargo under the hatch coaming was frozen. There were also water traces found on the surface of the hatch coaming and the hatch cover.

Case 4
Poor maintenance

A bulk carrier had loaded steel in all holds. During discharge, it was found a that a number of bundles in the cargo holds were in a rusty condition.

A silver nitrate test confirmed that saltwater had caused the damage.

Examination of the cargo hatch covers found that the coamings, gaskets and compression bars were in poor condition.

Case 5
Poor seals

A vessel had loaded wire coils. After loading was complete the crew taped across the transverse beams of all the cargo holds.

The vessel sailed through heavy weather that lasted for about two days. During this time the vessel was pitching and rolling heavily. The cargo hatch covers were covered in water.

When discharging at the destination port it was found that the steel coils in the top tiers were corroded. The coils below the centre line and folding seams were the most affected.

The surveyor tested the water integrity of the cargo hatch covers with an ultrasonic device which detected significant defects to the sealing arrangements.

The surveyor found the following defects:

- The gaskets were in poor condition
- The non-return valves were clogged and the ball inside was not moving
- The transverse packing on the hatch covers was leaking
- There were some cracked corners and leaking
- The ventilation covers were leaking

The following parts had to be repaired:

- Cross-joints
- Ventilation hatches
- Compression bar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VALLETTA

Case 6
Heavy weather

The bulk carrier had fully loaded its cargo holds with grain The vessel had side rolling cargo hatch covers. For six days the vessel encountered heavy weather at Beaufort scale 9 which caused the vessel to pitch and roll heavily.

The cargo hatch covers were washed over by seawater.

All hatch covers were opened when the vessel was at anchor and waiting for a berth to be available. This was to ensure the vessel was gas-free since fumigation of all the cargo holds had been carried out at the loading port.

When removing the cargo hatch covers it was found that cargo in a number of holds had been damaged by water. Most of the wet-damaged cargo was below the middle cross-joint of the hatch covers and below the aft hatch coamings corners.

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

A silver nitrate test was carried out and it confirmed that the cargo had been damaged by seawater.

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

Case 7
Corrosion and deterioration

A bulk carrier was fully loaded with grain in all cargo holds. After loading was completed the cargo hatch covers were sealed with tape.

It was winter and the vessel sailed through heavy weather at Beaufort scale 9. Seawater washed over the hatch covers and the vessel pitched and rolled heavily.

At the discharge port it was found that the cargo in all cargo holds had been wet damaged. A silver nitrate test was carried out on the cargo and it was positive for saltwater contamination.

A surveyor inspected the cargo hatch covers and found some corrosion on the hatch coamings and that the rubber packings and rubber linings were in poor condition.

Case 8
Wet damage to cement

A bulk carrier had loaded solidified cement lumps in all cargo holds. After loading, the cargo hatch covers were sealed with tape and seal-foam for the hinge joints.

The vessel sailed through heavy weather at Beaufort scale 8 and during the voyage seawater covered the cargo hatch covers.

When the vessel arrived at the discharge port, cement in a number of cargo holds had been damaged by seawater.

A surveyor boarded and carried out a water hose test which found that the cargo had been damaged due to leaking cargo hatch covers.

There was water on the inside of the hatch coamings.

The surveyor found the following defects to the hatch cover system:

- Securing cleats were not properly secured
- Securing cleats were missing
- Hatch coamings were heavily corroded
- Compression bars were heavily corroded
- Rubber gaskets were hardened
- Parts of the rubber gaskets were missing

Case 9
Damaged rubber gasket

A bulk carrier was fully loaded with grain. The cargo was fumigated before departure. It had not been raining at the loading port. During the voyage, the vessel sailed through heavy weather at Beaufort scale 9 with seawater covering the cargo hatch covers.

At the discharge port it was found that the cargo had been wet damaged.

A surveyor boarded to investigate the damage. The damaged cargo was below the corners of the cargo hatch cover. It was found that the rubber gasket of the hatch cover was damaged. A silver nitrate test was carried out which was positive for seawater contamination. Water could also be seen on the corners of the inside of the hatch coamings.

5. Loss Prevention

5.1 Weathertightness

From the previous cases, it can be seen that proper weathertightness is an essential key factor in keeping cargo dry. For smooth, stable operation of the hatch covers on board, the panels should be stiff. However, to maintain weathertightness at sea, the steel structure of a hatch cover, as well as the bearing pad, cleats and sealing arrangements, must adapt to the varying shape of the coaming top while the hull is moving and flexing at sea. The best structural stiffness of a hatch cover panel is a compromise between the above issues. The correct stiffness is achieved by selecting the optimal proportion between the open web and box construction, with the double-skin construction being the stiffest design.

The sealing system

To ensure that the hatch covers are weathertight the sealing system needs to be in a good condition.

The function of the sealing system is to protect the cargo from water ingress, and to contribute to the safety of the vessel by:

- Keeping water out by creating a weathertight seal between the hatch covers and the coaming, and in the hatch cover panel joints.
- Allowing for hull and coaming deformations at sea while still maintaining an effective sealing function.
- Keeping cargo dry and protected and/or inert gases inside the hold.

A suitable sealing force is required for the sealing arrangement to function correctly. This is not achieved by the sealing alone, but is a result of the design of the hatch cover/coaming system. It is of paramount importance for the tightness of the covers that the compression bar position in relation to the seal/gasket is correct, and that the support pads, stoppers and locators are arranged in an optimal way. Changes in one part of the arrangement can lead to changes in its other components.

Sealing between the hatch covers and coaming is generally achieved by rubber packing fitted to the panels and tightened against the edge of a compression bar fitted on the hatch coaming. The gasket is made of a solid rubber material with a cross-section of various cavities for producing the desired sealing force for a wide range of deflections.

In many of the cases included in this publication, the crew taped and attached sealing foam to the cargo hatch covers to prevent water from entering the cargo hold. This can give a false sense of protection as the cases have shown. To be able to prevent water from entering the cargo hold the crew and shipowner has to ensure that the cargo hatch system is maintained and in proper condition. The use of tape and sealing foam should not be used as a replacement for proper maintenance.

It is imperative to ensure that the cargo hatch cover system's components are in proper condition, as this will reduce the risk of seawater entering the cargo holds.

Best practice

According to the load line convention, cargo hatches are required to be weathertight.

The main purpose of the International Convention on Load Lines (ICLL), 1966/1988 is to secure sufficient stability of a ship in both intact and damaged conditions by defining the minimum freeboard of a vessel.

In order to ensure the watertight integrity below the freeboard deck, the convention also deals with doors, hatches, ventilators, pipes, scuppers and other openings in the hull. It stipulates basic minimum requirements for cargo hatches, coamings, securing devices and surveys.

It should be noted that the convention makes a distinction between 'weathertight' and 'watertight':

'Regulation 3 - Definitions of terms used in the Annexes
(13) Weathertight.
Weathertight means that in any sea conditions water will not penetrate into the ship.
(14) Watertight.
Watertight means capable of preventing the passage of water through the structure in either direction with a proper margin of resistance under the pressure due to the maximum head of water which it might have to sustain.'

According to the load line convention, cargo hatches are only required to be weathertight.

Normally, the class societies will be delegated by the flag to confirm compliance with the convention. Compliance is documented as part of the vessel's cargo ship safety construction certificate issued by the class on behalf of the flag. The classification societies base their rules for cargo hatch covers and coamings on the convention but have added additional requirements for design loads, structural strength and detailed design.

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.


3P
4P
NO SMOKING
5S
6S

Read more about the Load Line convention in the Appendix (iii)

5.1.1 Testing of weathertightness

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, soybeans, paper, etc. it is recommended that weathertightness is tested before each loaded voyage.

(i) Water hose test

The crew will typically use fire hoses under pressure and spray the cargo hatches. When the hose test is carried out it is important that the inter-panel void spaces are filled with water to ensure that the cross-joints are immersed. The class societies testing method should be followed during the test.

This test will provide an indication if there is a leak but not necessarily the exact location of the leak. It will also give an indication of the condition of the transverse joints, but the transversal gaskets on the coamings are far more difficult to address.

There have been incidents where the cargo hatches have passed a water hose test but failed the ultrasonic test. Unfortunately, these deficiencies were not discovered until after the vessels sailed through heavy weather. It is possible that there would not have been any wet damage if the vessels had not sailed through such heavy weather because the pressure of the sea can hardly be simulated with a fire hose.

The following parameters can be used for a hose test:

- Water pressure 2 bar,
- Nozzle size 15 - 18 mm,
- Spraying distance 1 - 1.5 m

However, it seems that the hose test is of little value for ensuring proper sealing on a vessel at sea and an ultrasonic test should be preferred.

(ii) Ultrasonic test

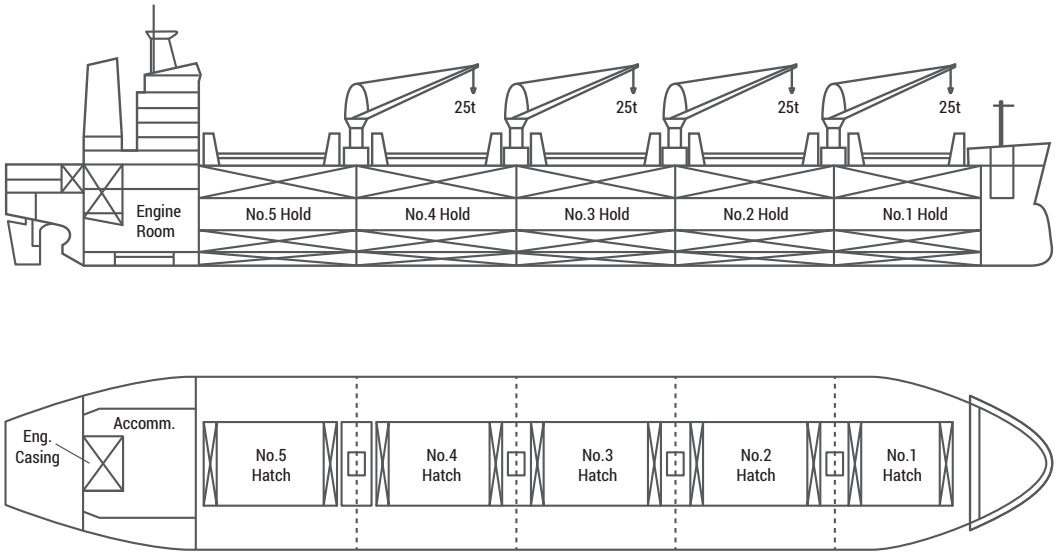
A much more effective method is to use an ultrasonic device, which is designed for this purpose and can pinpoint the area which is leaking, and if the compression of the gasket is sufficient. The advantages of using this type of equipment are evident, since ultrasonic tests can be carried out during any stage of the loading without risking cargo damage. The test can also be completed in sub-zero temperatures.

The ultrasonic test should be carried out as per the class requirements.

5.2 The cargo hatch cover

For vessels operating in heavy weather, green sea on deck may commonly be experienced and cargo hatch covers may be fully immersed in seawater. To minimise the impact of the heavy weather, the likelihood of excessive green sea on deck may be reduced by corrective actions such as reducing speed or altering course. The risk of green sea on deck may however not be eliminated through vessel operations, and poor condition of the cargo hatch covers may lead to water ingress into cargo holds resulting in cargo claims.

Before sailing it is essential that the crew ensures that all cargo hatches and other openings are secured properly, and this is imperative if heavy weather is anticipated.



5.2.1 Preparations before sailing

When preparing for a loaded voyage, the crew should ensure that the following is complied with:

1. Before leaving port, the crew should inspect the hatch covers to ensure they are in a weathertight condition.
2. It is essential that there is no cargo in the drain channels as these should lead the water away and not into the cargo hold.
3. To ensure that the hatch cover is secured properly it should be secured in port as per the manufacturer's instructions.
4. If for some reason a hatch cover was secured when the vessel was at sea, there is a risk that the hatch cover might be misaligned.

5.2.2 Maintenance

What the crew should do:

- Ensure that the paint is intact, which will give good protection against corrosion, as corrosion on the hatch cover might cause holes in the steel construction.
- Ensure that gaskets and coamings are in good 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.
- It is important that records are kept about what maintenance and service has been completed in the PMS.

What the manager should ensure:

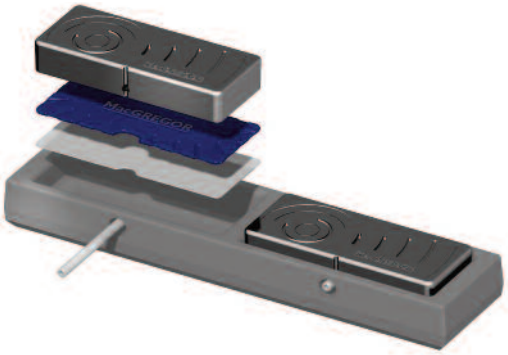
- A prudent shipowner will have vessel-specific procedures for operating the hatch covers e.g. opening, cleaning before closing, closing, cleating etc. and reporting routines when problems are detected.
- All maintenance of the cargo hatch system should be included in the vessel's PMS.
- It is important that the PMS clearly states how the maintenance should be carried out.
- It is essential that records are kept about what maintenance and service has been completed in the PMS.
- Inspections and tests of all cargo hatch components should also be included in the PMS and documented.
- It is essential that cargo hatch covers are inspected and tested at regular intervals to ensure that the watertight integrity is maintained and that the vessel is in a cargo-worthy and seaworthy condition.
- If complicated repairs are required, professional specialists should be employed.
- It is strongly recommended that a service engineer from the manufacturer inspects the cargo hatch system regularly, or at least ahead of an up-coming dry docking, in order to determine the condition of the hatch cover system and necessary repairs needed.

5.2.3 Critical hatch cover system components

When replacing components in the hatch cover system, changes made to the original design features specified for the system may have serious consequences for vessel and cargo safety. For complete information about how to maintain the hatch cover, please refer to the manufacturer's manual. It is also important to always use original spare parts.

The following recommendations are based upon MacGregor hatch covers, so these may vary for a vessel with hatch covers made by another manufacturer. The principles should however be the same.

(i) Bearing pads



The bearing pads:

- Transfer the load from the hatch covers to the coaming structure
- Maintain the hatch cover in the correct sealing position
- Allow the coaming to move during the ship's rolling and pitching

Hatch cover bearing pads transfer the weight of the cover, and any cargo it may be carrying, to the ship's hull while allowing for relative movement between the cover and the hatch coaming caused by hull flexing in a seaway. They must also maintain the correct compression on the hatch cover gasket and avoid wearing damage to the coaming/hatch cover interface.

As bearing pads transfer weight, lateral forces are generated that are then transmitted to the ship's coaming and hatch cover structures. These forces are used in fatigue strength analysis at the newbuilding stage, and subsequently the structures are designed around these calculations. To obtain the required safety margins and to guarantee a trouble-free operational lifetime, the hatch cover system has to be maintained as instructed and critical spare part components, such as the hatch cover bearing pads, have to be of original design. This is because there can be great variations in sliding and wear properties of different bearing materials. This is applicable to both bronze and plastic composites.

General maintenance

Regular lubrication of the bearing pads prevents corrosion and improves wear and sliding properties, thus lengthening the lifetime of the pads and the mating plates.

When repairing the bearing pads it is important to check/replace the gaskets at the same time. If the gasket has lost its original elasticity there will not be enough compression of the gasket to achieve a proper weathertightness of the hatch covers.

After the repair of the bearing pads the weathertightness of the hatch covers should be tested with a hose test or using ultrasonic testing equipment.

Bearing pads need to be repaired when the pad is worn approximately 5 mm, i.e. well before there is steel to steel contact between the coaming and the side plate of the hatch cover panel. Proper function of the hatch cover gaskets and the weathertightness of the hatch covers is risked when the height position of the hatch covers is shifted from the original.

Caution:

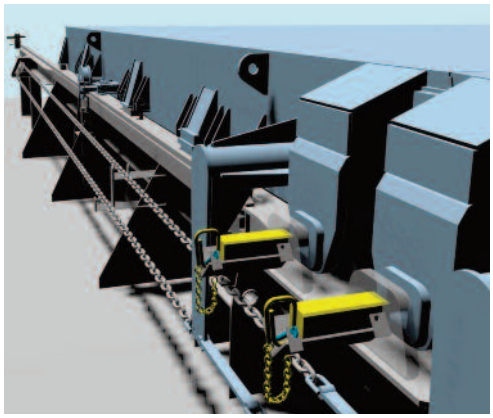
- Do not walk, stand or place any objects on the bearing pads.
- Remove dirt and contaminants on the pad/mating plate, by brushing or by blowing with air.
- Do not scrape the surface. Do not use kerosene, gasoline, acids or solvents of any kind.
- Mating plate wear is caused by corrosion and bearing pad sliding. Wear grooves restrict the sliding but increase friction causing bigger mechanical stresses to the coaming and hatch covers. Finally, cracks might be generated in the steel structures.
- If welding, or any other work is to be done near the bearing pads, the pads should be covered to protect them against any contaminants such as paint, weld splatter, grinding particles, blasting media, etc. When removing the protective covering, please ensure that it is removed completely and that the contact surfaces are free of contaminants.

Routine maintenance tasks

These should be carried out every 3 months as per the PMS:

- Check the bearing pads and contact surfaces for wear, corrosion and mechanical damage.
- When lubricating the bearing pads apply a thin layer of proper grease onto the bearing pad sliding surface.
- Replace the mating plates when the wear grooves are max. 1 - 2 mm deep.

(ii) Cleats and lockings



Cleats prevent the hatch cover panels from being lifted up in heavy weather. The condition of the cleats has a direct effect on the safety of the vessel. Hatch cover cleats:

- Prevent unintentional lift-off of panels at sea
- Keep the panels in position and within the rubber packing's design tolerances
- Must be flexible, to be able to follow the coaming movement
- Must be adjustable to compensate for the wear of bearing pads

General maintenance

All quick-acting cleats must be in good operating shape. Regular greasing prevents corrosion resulting in a smooth operation and longer lifetime.

Caution:

- Over-tightened cleats increase the risk of damage to the cleats when highly stressed, due to hatch cover movements in the seaway.
- Check the condition of the rubber discs regularly and replace the discs when necessary (cracks in the surface, poor elasticity etc.).
- The cleats are NOT designed for tightening the rubber packing.
- Make sure that all cleats are unlocked before operating the hatch covers.
- The cleats must always be in locked position when the vessel is sailing.

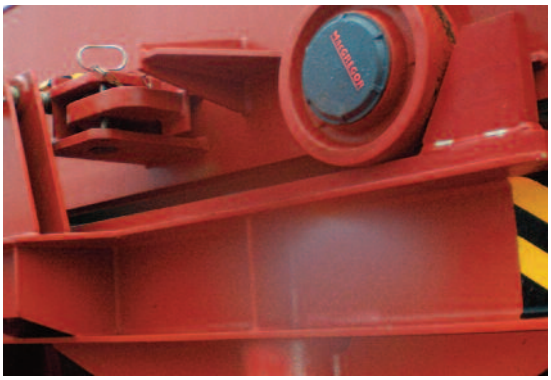
Routine maintenance tasks

These should be carried out every 3 months as per the PMS:

- Check the functioning of the quick-acting cleats & hold-down devices.
- Replace any damaged or heavily corroded quick-acting cleats with original spare parts.
- When lubricating the cleats & hold-down devices, apply a thin layer of proper grease to the contact surfaces and the thread of the quick-acting cleats.
- Check the condition of the rubber discs regularly and replace the discs when necessary (cracks in the surface, poor elasticity etc.).

(iii) Locators and stoppers

The hatch cover panels must follow the hull's movements. When locators/stoppers are within design tolerances, hatch covers are weathertight.



Locators and stoppers:

- Ensure correct positioning of panel both transversal and longitudinal
- Allow coaming deflection
- Control rubber compression in the cross-joints
- Absorb acceleration forces

General maintenance

The correct longitudinal position of the closed hatch covers and the weathertightness of the panel joint is achieved by the correct adjustment of stoppers. Wear and corrosion on locator wedge surfaces on the hatch cover and coaming cause a lack of rubber compression in the cross-joint between the hatch cover panels, as panels move apart from each other. Too large a gap causes leakages, as does improper alignment.
Regular greasing prevents corrosion resulting in smooth operation and longer lifetime.

Caution:

Too much clearance in stoppers leads to uncontrolled movement causing:

- Structural damage due to contact between parts
- Ineffective sealing function in gaskets due to lack of compression
- Impact damage due to higher acceleration
- Bearing pad failures
- Failures of cleats

Routine maintenance tasks

Every 6 months as per the PMS:

- Check the shape of the contact surfaces.
- Replace the worn pieces and / or add shim plates, when the contact surfaces are worn 2-3 mm.
- The weathertightness of the hatch cover joint is at risk when the hatch cover panels are shifted from the original position (apart from each other).

Every 3 months as per the PMS:

- Lubricate the stoppers by applying a thin layer of proper grease to the contact surfaces.

(iv) Drain valves

Drain valves are located close to hatch corners and the joints between the hatch cover panels. In rough sea the ship hull flexes, generating movement between the hatch cover panels and the coaming. This might cause leakage in the hatch cover sealing system. Leak water passing the seals is captured by the drain channels and the water is led to drain pipes on the coaming.
Non-return drain valves are installed to the drain pipes. They allow water to drain out onto the deck but stop water from the deck entering the cargo hold.

Routine maintenance tasks

Every 2 months as per the PMS:

- Check that the drain pipes and drain valves are not clogged and that the float (ball inside) moves freely. Remove blocking items, if any.

(v) Gaskets

Sealing between the hatch covers and the coaming is achieved by means of a weathertight gasket, which is fitted to the panel and tightens between a compression bar on the coaming top.
Typical gaskets may be expected to last for about five years. This short lifespan may be further reduced by over-compression and contact with abrasive materials. If the gasket is damaged, the entire section will need to be replaced.

General maintenance

If gaskets are damaged then they must be replaced immediately, before the next voyage. Ageing of the rubber material has an effect on the mechanical strength and elasticity of the seals. Replace the seals when the permanent set is greater than 5mm. A tightness test is recommended as the change of the seal's geometry might be difficult to verify.
When replacing the gaskets the hatch cover bearing pads should also be checked or repaired as worn bearing pads can cause over-compression of the gaskets resulting in a shortened lifetime.

Routine maintenance tasks

Every month as per the PMS:

- Check the gaskets for wear and mechanical damage.
- Check the gaskets for shape and elasticity.
- The hinge/split joints should be applied with silicon grease to ensure smooth sliding against the compression bars.

(vi) Steel construction

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.

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. Contact the classification society before making any steel structure repairs.

Routine maintenance tasks

Every 12 months as per the PMS:

- Carry out a pressure test of closed box beams annually: apply following pressure inside a box structure and check the structure for leaks.
- In case of leakage, repair the leaking spots and repeat the test. The test plugs are typically located at panel side plates (at the end of a box structure).
- Special inhibitor powders can be used inside box structures to improve the internal corrosion protection.

Every 6 months as per the PMS:

- Check the steel structures of the hatch covers and the coaming for corrosion, deformation and cracks.
- Check the condition of the hatch cover coating: identify the general level of corrosion and the most corroded areas.
- Touch up the locally corroded spots or do a complete re-painting as necessary.
- In case of heavy corrosion (e.g. holes) or cracks in structural joints, carry out repairs as soon as possible. The cause of the cracks should be analysed. The box structures must be air-tight to prevent internal corrosion.

5.3 Weather routeing

We have highlighted that sailing through heavy weather is not a problem in itself, but that incorrectly applied and poorly maintained cargo hatch covers and sealing systems significantly increase the risk of wet damage to cargo.

Heavy weather does however, have implications beyond cargo damage.

In today's competitive market customers demand that their cargo arrives on time. Just-in-time logistics has forced shipowners to ensure their vessels keep to schedule. Running into heavy weather does not only mean that the Estimated Time of Arrival (ETA) is not met, but also that the bunker consumption will be higher to reach the destined port of call.

To enable timely arrival, it is important to plan the most efficient route to avoid heavy weather and ensure that the vessel arrives safely at the discharge port. It is essential that the crew are aware of the weather for the upcoming voyage.

This is best achieved by professional weather routeing services, which provide weather forecasts for the intended route and recommendations on the ocean crossing.

Weather routeing not only provides vessels with the option of how to avoid heavy weather, but also ensures that vessels get new and updated ETA to the discharge port. This helps the crew on board the vessel, shoreside personnel, and cargo owners, to plan accordingly.

There are multiple weather routeing providers, providing a range of services. It is essential that managers chose a provider that can deliver the required service.

6. P&I insurance cover

It follows from the P&I rules that the member is covered in respect of liabilities, costs or expenses incurred by him in his capacity as owner, operator or charterer of the entered ship and rising out of an event during the period of insurance as a direct consequence of the operation of that ship.

Cover for cargo liability is effective during the time before, during or after the contracted carriage by the entered ship. At the same time, even if the P&I insurance provides comprehensive cover for the owner, the member should always 'act as a prudent uninsured', meaning taking reasonable steps to avoid and/or limit the extent of any damage. One basic requirement is the members' obligation to provide a cargo-worthy vessel. Costs to meet the obligation can be considerable, for instance when it is necessary to overhaul hatches to make them tight. Such costs are of an operational nature and not subject to insurance cover.

Hatches leak for a variety of reasons, but mainly because of poor maintenance, or failure to close them properly. Leaking or badly maintained hatch covers can lead to more serious consequences than wet cargo – flooding, accelerated corrosion or even loss of the ship.

Insurance protects the member against unforeseeable liabilities. The deductible leaves the member with a stake in the claim. It gives the member an incentive to prevent the casualty from arising and to co-operate with the club. It should also be noted that there is a risk that P&I cover could be prejudiced in case of the member's intentional or grossly negligent acts or omissions, or for such acts or omissions which the member knew, or ought to have known, would cause liabilities, costs or expenses.

7. Best practice

Looking at our claims history it is apparent that most wet damage claims are caused by lack of maintenance.

Before departure it is important to inspect the specific parts and equipment for the cargo hatch covers as we have highlighted in this publication. The use of tape and sealing foam should not be used as a replacement for proper maintenance.

It is essential that the crew are aware of the weather for the upcoming voyage. This is best achieved by professional weather routeing.

It is important to contact the cargo hatch cover manufacturer if spare parts are needed or for advice on how to repair the hatch cover. For more complicated repairs, experts should be in attendance.

This publication highlights the important areas which need to be focused on. The potential risk of any insurance complication deserves to be considered as well. To ensure that proper maintenance has been completed will save money, headaches and improve safety on board.

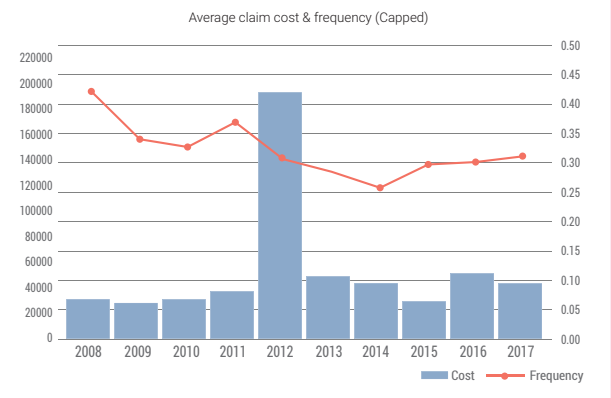
Appendices

Appendix (i)

P&I cargo statistics - all types of vessel 2008–2017

P&I: Cargo, frequency and cost

Claims cost =>USD 1 – uncapped

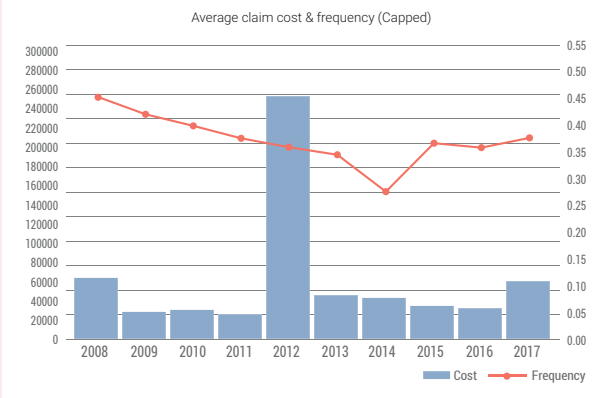


Appendix (ii)

P&I cargo statistics – bulk carriers 2008–2017

P&I: Cargo, frequency and cost

Claims cost =>USD 1 – uncapped



Appendix (iii)

This appendix identifies areas of the Load Line convention that apply specifically to hatch covers. For complete information on the International Convention on Load Lines please visit www.imo.org.

International Convention on Load Lines

The Load Line convention states:

Regulation 3 - Definitions of terms used in the Annexes
(13). Weathertight.
Weathertight means that in any sea conditions water will not penetrate into the ship.

Regulation 16 - Hatchways closed by weathertight covers of steel or other equivalent materials
(1). All hatchways in position 1 and 2 shall be fitted with hatch covers of steel or other equivalent material. Except as provided in regulation 14 (2), such covers shall be weathertight and fitted with gaskets and clamping devices.

The arrangements shall ensure that the tightness can be maintained in any sea conditions, and for this purpose tests for tightness shall be required at the initial survey, and may be required at renewal and annual surveys, or at more frequent intervals.

Securing arrangements
(6). The means for securing and maintaining weathertightness by other means than gaskets and clamping shall be to the satisfaction of the Administration.

(7). Hatch covers which rest on coamings shall be located in their closed position by means capable of withstanding horizontally acting loads in any sea conditions.

IACS interpretation

The International Association of Classification Societies (IACS) Interprets the International Convention on Load Lines as follows:

Regulation 16 - Hatchways closed by weathertight covers of steel or other equivalent material fitted with gaskets and clamping devices (Regulations 16 and 27(7)(c))

Regulation 16:
Where hatchways are fitted with coamings of standard height, no extra strengthening (beyond what is required in the Load Line Convention) shall be required for covers loaded with cargo, even if dense cargo, provided the load does not exceed 1,75 ton/m2 (in position 1) *.

Regulation 27(7)(c):
No extra strengthening is recommended for hatchway covers on vessels* which are assigned freeboards less than those based on Table B, except for flush hatchway covers which are fitted on the freeboard deck forward of the quarter length, in which case the section modulus and the moment of inertia shall be increased 15% over that required by Regulation 16.

For the hatch covers on Bulk Carriers, as defined in UR Z11.2.2, contracted for construction on or after 1 July 1998, the hatch cover load and strength requirements are to be in accordance with IACS Unified Requirement S21, 'Evaluation of Scantlings of Hatch Covers of Bulk Carrier Cargo Holds'.

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