FAIRMONT SHIPPING SINGAPORE
TAMAR SHIP MANAGEMENT

Cargo Hold Cleaning- Bulk Carrier Operations

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INTRODUCTION

Hold cleaning is one of the most important and critical part of bulk carrier operation. If not carefully planned, executed and monitored it could lead to hold inspection failure which would in turn result in considerable delays/off hires and even very expensive shore cleaning. A lack of proper preparation not only leads to claims related to cargo quality, such as contamination, water ingress or shortage claims, but also contractual claims relating to failed or delayed surveys, off-hire claims and charter party disputes.

Preparation starts well before the cargo first lands on the tank-top and a number of factors must be considered to ensure that the preparation is targeted, effective and correct. Sweeping out the hold and washing it down may be acceptable for one type of cargo, but may not be effective for another. Understanding exactly what is required is essential. It is important everyone involved in the 'cargo chain' from the chartering and operations team ashore, to the Master, Chief Officer and crew on board understand the processes involved.

Preparation of a cargo hold is not just a question of sweeping, cleaning or washing down the hold. There are a number of matters to consider, and failing to adhere to good practice can result in substantial claims. A lack of knowledge, often originating in chartering or commercial departments, can also be the underlying cause of major claims.

The first reference source for the carriage of bulk cargo should be the International Maritime Solid Bulk Cargoes Code (IMSBC), issued by IMO. It was revised and reissued in 2009. It is a requirement that a copy of the Code should be on board a bulk carrier, and the revised Code is mandatory under SOLAS from 1 January 2011. Nothing in this Standard Cargo guide is intended to differ from the advice given in the Code, and the advice given in the Code should always be the first point of reference. It has not been possible to include preparation advice here for all bulk cargo, and the IMSBC should therefore be consulted whenever any question arises.

The commercial and chartering departments are critical in getting the hold cleaning process right. If the problems that the master and ship face are not fully understood and the ship is asked to do the impossible, accidents and claims will result. The operational guidance given in the safety management system should address this issue.

The latest revision of the International Maritime Solid Bulk Cargoes Code (IMSBC Code) must be on board.

SECTION 1

TIME REQUIRED FOR HOLD PREPARATION

The time required to clean the hold and prepare it for cargo will depend upon the dirtiness of the previous cargo, the volume of residues, the size of the hold, the resources available for cleaning, the standard of cleanliness required, the prevailing weather, ambient temperature and the number and experience of the seamen available. A reasonable estimate is that it will take five men one normal working day of 8-10 hours to clean one hold of a handy-sized or Panamax bulk carrier to normal cargo-ready standard from time of first entering the hold. Six men aboard a Cape-sized vessel will require about the same amount of time per hold. Cleaning to grain standard will typically take about 50% longer.

Recommended cargo hold cleaning timesheet: Workbooks can be found under Memo>Cargo operations.[1]

- CARGO HOLD CLEANING WORK PLAN - for clean cargo residues[2]
- CARGO HOLD CLEANING WORK PLAN - for dirty cargo residues[3]
- CARGO HOLD CLEANING WORK PLAN - using DASIC for dirty cargo residues[4]

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CASE STUDY A – KEEP A VIGILANT CARGO WATCH

THIS CANNOT BE OVEREMPHASISED

A ship loaded a full cargo of aluminium hydroxide in Australia for discharge in the USA. The ship was equipped with box holds, which allowed for easier cleaning and inspection before loading.

At the discharge port, at the same time as the ship was being unloaded, seawater ballast was being taken on board. It was later found during the discharge that 500 tonnes of the cargo was water damaged by the ballast, which was confirmed to come from a hole measuring 100mm x 20mm in the hold/ballast tank steel plating. The hole was most likely to have been caused by stevedore grab damage in the discharge port.

The cost of damage to the cargo was put at around $150,000.

LESSONS:

- cargo watch on deck should monitor stevedore grab handling and damage. Crane drivers should be advised to take care not to damage ship structure
- cargo watch on deck should monitor ballast operations
- cargo watch on deck when the ship is carrying water-sensitive cargoes should identify the potential for water to leak from a crack or damage in the hold plating following grab damage
- consider gravitating ballast, to reduce pressure on ballast tank structures
- a rigorous sounding regime should be maintained in port

INSTRUCTIONS TO THE VESSEL

- Ensure carriage, cleaning and preparation instructions are issued in a timely manner to assist the Master and his crew in their on-board preparations;
- Verify that they include cargo fixture details, timings, type, cleanliness requirements and carriage instructions. It is always prudent to request for a confirmation of receipt and understanding of all provided instructions;
- Have Masters and C/O's discuss the voyage instructions, they must seek immediate clarification if any parts of the instructions are unclear;
- Monitor that cleanliness and preparation requirements are planned properly and that a formalized plan is created.

This should detail the method of preparation, the cleanliness standard and the equipment, resources and time required to complete preparations safely and effectively. Once finalized, it should be communicated back to the charterers.

SECTION 2

HOLD INSPECTION

Time should be available after completing the hold cleaning to repair any damage to the hold fittings and coatings, and for paint to cure hard and for paint odours to dissipate after any touch-up repairs.

When holds are inspected, the master or chief officer should accompany the inspector with two or three crew members bringing brushes, shovels, rags and a bucket so that any minor problems that the inspector finds can be immediately remedied while he completes his inspection of that hold.

Residue of previous cargo falling into hold after hatches have been opened a few times.

REASONS FOR FAILING HOLD INSPECTIONS

Most ships fail hold inspections as a consequence of cargo residues, loose paint or rust scale being found in the upper, less accessible parts of the holds, or as a result of previous cargo debris falling from the hatch covers during the ballast voyage. In order to avoid such failures, officers are advised to take every opportunity to clean the upper parts of holds and frames with suitable access equipment such as cherry-pickers. Alternatively, if it is safe to do so grain, fertilisers and similar cargoes can be swept off the underdeck beams before the start of discharge.

This is of particular importance when trading to countries such as Australia, where the Australian Quarantine Inspection Service operates a zero-tolerance policy, under which detection of a single particle of certain previous cargoes or other contaminants will fail a ship, and the consequences of that failure may be significant. The possible sanction for a loaded cargo is that it will be quarantined, and discharge in Australia will not be permitted. Examples of contaminants that may incur such sanctions are the presence

of a single grain of substances such as cereal, peas, beans, stock feed, rice, animal-based contaminants such as faeces and feathers, soil and sand.

If a grain ship fails the survey and the load berth is not required for another ship, then the ship may be allowed to stay alongside. This is more likely in small ports that have restricted wharf grain storage, because only enough cargo for the current ship is held at the wharf. Ports with larger storage will hold cargo for several ships, and if the next ship in line is available, then the failed ship has to leave the berth. Some ports have general purpose or layby berths that can be used for cleaning holds. Shore labour does not usually have to be used to clean a grain ship that is alongside; there are exceptions, for example, in Melbourne. If the ship is a handysize, handymax or panamax, cherry-pickers will be required. There are local ship cleaning companies in most ports.

HOLD CLEANING

Before loading a bulk cargo, the master has usually to declare that the ship is ready to load as per the charterparty requirements and charterer's and owner's instructions. Copies of the charterparty should be placed on board so that the master is able to see exactly what are the ship's obligations. The master can have this declaration accepted only when the holds have been inspected and accepted. For this to happen, the master needs to know how clean the holds have to be to meet the charterer's requirements. This will depend on the previous cargo, the next cargo, local regulations and specific cargo interest requirements.

a) Cargo contamination problems

Whatever the previous cargo, all holds should be swept clean, and loose scale and rust removed. When reloading the same cargo commodity, there is a tendency to leave the holds unswept. In general terms, this is not good practice since the residual cargo can hide damage to the hold or tank top. Traces of previous cargoes, such as sulphur, sulphur traces in coal cargoes and some fertiliser cargoes may corrode bare steel plate.

It is recommended that holds are swept clean after every cargo and the residues removed or, if reloading the same cargo type, placed to one side so that a tank top and hold inspection can be carried out. Large amounts of cargo remaining on board may not only cause outturn problems, but hide damage to the tank top plate.

The level of cleanliness of the hold required will vary from port to port, and shipper to shipper. As a general rule, if nothing specific is stated, a double sweep, with a saltwater wash followed by freshwater wash, is a sensible option.

In order to avoid delays or offhire of the ship, hold cleaning requires proper planning.

b) Problems stemming from previous cargo

The holds will be declared unfit for loading if any residue of the previous cargo, other debris or substances, dunnage residue or a need for repair or hot work is found.

Action: Sweeping and removing all residues, followed by a thorough wash-down using high-pressure air or water cleaning equipment.

Residue of previous ore cargo caught in the frames

c) Cargo stain

Cargo stains are not acceptable if they rub off and risk contaminating the next cargo.
Surveyors give coal and petcoke stains particular attention because these can blister and peel the paint work if the hold starts to sweat.

Action: Coal and petcoke stains can be removed by using spray jet systems for applying chemicals from the tank top. The choice of chemicals must be carefully considered, as odour and caustic effects will affect the next cargo. High-pressure cleaning can be used to access small areas in the lower parts of the holds.

d) Rust, rust scale and paint flaking

All areas affected by rust and flaking paint will be checked by the surveyor. The holds will be declared unfit if loose rust or paint flaking is found.

Action: Loose rust and paint flakes should be removed using high-pressure air or water cleaning equipment. The areas are then to be cleaned and scraped.

Loose rust scale will result in the hold failing the cleanliness survey

e) Unsanitary conditions

If a hold is found to contain animal filth, bird droppings, faeces or sewage, it will be rejected.

There must be no evidence of rats or rat droppings. If this is suspected, specialist assistance and probably fumigation will be required by the local authorities who should be notified accordingly.

Action: Holds must be thoroughly checked and any unsanitary conditions treated appropriately. If any sewage is found, it must be identified and the source found. It should be stored on board properly before being discharged ashore.

a) Wetness

All holds must be dry. If the holds contain water or leaking water, the vessel will be declared unfit. Bilges and bilge wells must be dry.

Action: If water remains in the hold after a wash-down, it must be mopped up or air-dried. If water is leaking into the hold, steps must be taken to repair the leak.

b) Odours

All grain storage areas must be odour-free. This includes odour from paint and cleaning chemicals.

Action: Hatches must be left open, weather permitting, so fresh air can circulate, or ventilation can be used if fitted, in the affected area. Time has to be allowed to remove odours.

c) Infestation

Holds will be declared unfit to load grain if three or more insects, dead or alive, are found in one hold. The holds will also be declared unfit if larvae or unhatched insect eggs are found. Under the Australian Quarantine Inspection Service rules, there must be no bugs: any found will result in the hold failing the cleanliness survey.

Any trace of insect infestation in the hold or in the bilges is unacceptable with an edible cargo. The owners should be consulted as soon as possible for advice about the best way of eliminating the insects without making the hold unusable for the next cargo. Spraying with a suitable spray may be sufficient, or the hold may have to be fumigated.

Loose scale is a favourite hiding place for insects (otherwise known as bugs), and the inspection for them should be very thorough before perishable cargoes are carried. If detected by the inspectors, insect infestation can result in expense, delay and offhire whilst the ship is fumigated. If they are undetected, there is a danger that the cargo will be damaged and massive cargo claims will be experienced.

Action: Holds may need to be fumigated prior to being accepted. This can be a costly and time-consuming operation. Special attention must be given to exposed areas such as under hatch covers, hatch coamings, access ways and bottom areas of the bulkheads, slopes and tank tops.

All adjacent spaces to the holds, (for example, mast houses and storage spaces) should be inspected to ensure that they are also infestation-free.

STANDARDS OF HOLD CLEANLINESS

SURVEYOR'S INSPECTION AND REQUIREMENTS

Prior to loading grain, all ships are usually subject to a survey by an approved independent surveyor. The surveyor will require the ship's particulars, and details of at least the last three cargoes carried. He will then inspect the holds for cleanliness and infestation, and the presence of any material that could lead to infestation or contamination.

When the surveyor is satisfied, he will issue the ship with a certificate to confirm that the holds are clean. However, this is not a guarantee that the holds are perfectly clean and that no cargo claim will result.

The degree of hold cleaning will very much depend on the type of cargo previously carried in the past (cargo history), present cargo being discharged and the next cargo intended to be loaded. Degree of hold cleanliness may fall in either one of the following:

Hospital Clean

- It is the highest and most stringent of standards.
- It requires the holds to have 100% intact paint coatings on all surfaces, including the tank top, all ladder rungs and undersides of hatches.
- These standards are normally required for very specific cargoes and such high standards of cleanliness will only be met by vessels trading exclusively in such cargoes.
- The standard of **hospital clean** is a requirement for certain cargoes, for example kaolin/china clay, mineral sands including zircon, barytes, rutile sand, ilmenite, fluorspar, chrome ore, soda ash, rice in bulk and high grades of wood pulp. Generally, these high standards of cleanliness will be required on vessels trading with high grade cargoes such as Alumina.

Grain Clean

- This is the most common requirement: a ship will often be required to be grain clean for the majority of bulk and break bulk cargoes.
- It is normally defined as: "Holds must be clean, swept and washed down with fresh water. They should be free from insects, odour, residue of previous cargo, lashing material, loose rust scale and paint flakes etc. They must be dried, well ventilated and ready to receive the intended cargo subject to shippers and relevant surveyor's inspection."
- It is important to differentiate loose rust scale from oxidation rust (light atmospheric rusting).
- Generally, loose rust scale will break away when struck with a fist or when light pressure is applied with a knife blade or scraper under the edge of the scale.
- Oxidation rust will typically form on bare metal surfaces but will not flake off when struck or when light pressure from a knife is applied.
- The presence of hard-adhering scale within a hold is normally acceptable; however, the scale should not fall during the voyage or during normal cargo operations.

- Remember that different countries apply different standards to what constitutes an acceptable amount of loose scale or loose paint.
- Special notice for Canada, U.S.A. and Australia, where particularly strict inspections and standards may be applied.

The industry accepted definition of grain clean is provided by the National Cargo Bureau (NCB).

"Compartments are to be completely clean, dry, odour-free, and gas-free. All loose scale is to be removed."

The definition is clear:

a) All past cargo residues and any lashing materials are to be removed from the hold.

b) Any loose paint or rust scale must be removed.

c) If it is necessary to wash the hold, as it generally will be, the hold must be dried after washing.

d) The hold must be well ventilated to ensure that it is odour-free and gas-free.

Flaking paintwork under the hatch coaming can result in a hold failing the grain survey

These holds are unlikely to pass a grain survey, as they are heavily pitted with rust scale and embedded with coal staining

Residue of previous cargo will result in the hold failing the inspection to load grain

Hold of a bulk carrier that is grain clean and ready to load

CASE STUDY B – GRAIN CARGO, WET AND HEAT DAMAGED

A four-year-old bulk carrier loaded a part soya bean meal/ grain cargo at a South American port before proceeding to a second port to complete loading, for discharge in the Mediterranean.

After leaving the first load port, water was found in two of the cargo hold bilges. The ship was not carrying any ballast water. These bilges were pumped out and the following day a similar quantity of water was found in the hold sounding pipes. This continued for a few more days until the bilge lines were blanked off.

At the discharge port, a surveyor investigated the cause of water ingress into the cargo holds and concluded:

- a butterfly valve on the bilge and ballast pump line was faulty and leaking
- all the pressure gauges on the eductor system were defective
- one of the non-return bilge suction hold valves could not close properly because a rag was blocking the valve
- butterfly valves on the bilge line did not seat or close properly
- no non-return valve was fitted to one of the hold suction lines – a defect that presumably stemmed from the time the vessel was built
- there were no bilge high-level alarms fitted

On arrival at the discharge port, a significant amount of cargo was found to be damaged. Not only was the cargo wet damaged, but it was affected by heat. It was then established that in addition to the damaged wet cargo, three of the cargo holds were located above double-bottom heavy fuel oil tanks. The heavy fuel oil was being heated via steam lines in the bunker tanks as is normal, but it was found at the time of the survey that the steel tank top in these holds was at a temperature above 50ºC, which was more than enough to cause damage and even in danger of making the grains self-combust, especially if damp or wet. It was also concluded that some of the steam lines in the fuel oil double bottoms were defective.

The total cost of the claim for the damaged cargo amounted to more than $300,000.

LESSONS:

Bilge and ballast systems

- ship officers should be aware of the way in which the bilge and ballast systems of their ship function. Many incidents are caused by a lack of knowledge of how the bilge and ballast and eductor systems operate or where the bilge and ballast systems are common
- bilge and ballast systems with remotely actuated valves should be routinely checked to ensure that they are operating correctly. Often, mimic boards indicate that valves are closed when they are in fact open or partially open, and vice versa
- test before each loading that high-level bilge alarms are fully operational
- it is recommended that hold bilge high-level alarms are fitted even if this is not mandatory
- regular, daily bilge and ballast sounding is good practice. Always check the watertight integrity of the ship
- bilge and ballast systems, including the effectiveness of bilge non-return valves, must be checked. These items should be included in the ship's planned maintenance system
- when water is found in the holds, systematic investigations must be carried out immediately to identify where it is coming from, and support and advice should be given by shore management
- technical managers should be familiar with the systems onboard
- Management of Change procedures on taking over a new ship should include checking of the bilge and ballast systems

Fuel oil tanks

- masters and officers must be aware of the location of the heated fuel oil tanks
- masters and officers should monitor the tank top temperature above the fuel oil tanks as this can affect the integrity of certain cargoes – particularly grain cargoes
- fuel oil temperatures can be monitored on the fuel oil transfer pumps
- masters and chief engineers should manage the fuel oil onboard to reduce heat damage to cargoes loaded in holds above heated fuel oil tanks
- heat only fuel oil tanks in use

CASE STUDY C – GRAIN CARGO – THE COST OF FAILING AN INSPECTION

A time-chartered, handysize bulk carrier was fixed to load a full cargo of bulk grain. The previous cargoes had been cement clinker, logs, concentrates, wheat, petcoke and sulphate. The hold condition on arrival at load port was required to be:

"clean, swept, washed down by fresh water and free from insects, odour, residue of previous cargo (incl. coal petcoke, clinker.)/loose rust scale/paint flakes etc. dried up and ready to receive charterers' intended cargo subject to shippers'/relevant surveyors' inspection. If the ship fails hold inspection by shipper/relevant surveyor, the ship to be placed off hire until accepted in all holds, and any extra costs/ expenses/time included stevedores' stand-by and/or cancelling charges, therefrom to be for owners' account".

The grain was to be back-loaded at the same port as the clinker was discharged. On completion of the clinker discharge, the vessel went to an anchorage for the holds to be cleaned. After some days, the master sent a message to the voyage charterers advising that the holds were clean and ready for loading. The charterers accepted the notice, took delivery of the ship and hire commenced. After a two-week delay, the ship was brought to the load berth and failed the pre-loading grain inspection. The charterers advised that their grain surveyor had identified loose rust, paint and previous cargo residues in all holds and hatch covers, scale on the tank tops and loose limewash on the bulkheads.

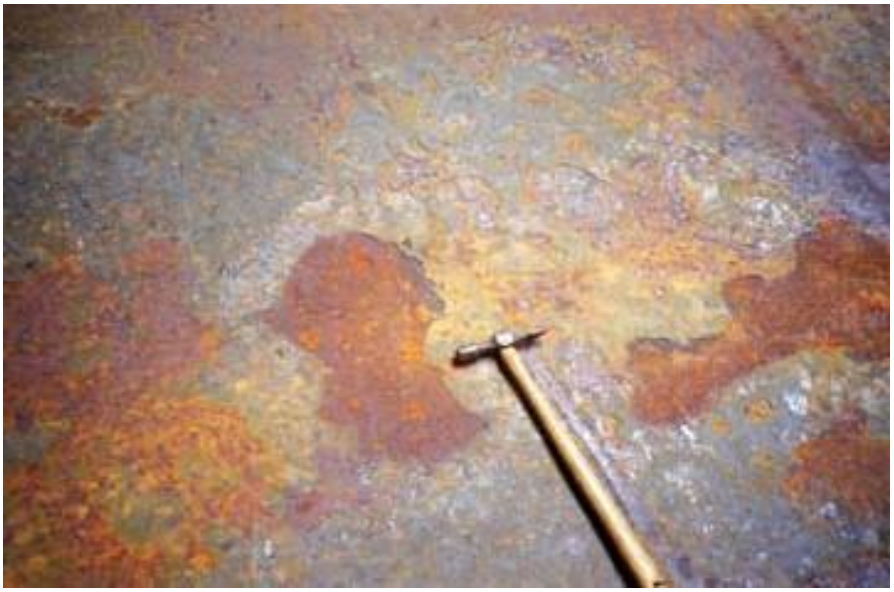
The vessel was placed offhire by the charterers, and the owners were required to arrange hold cleaning. This required the use of shore labour over several days. Equipment used included five cherry-pickers and four water-blasting machines, requiring 18 men.

Cleaning costs were in the region of US$120,000.

There was a dispute between the charterers and owners over the failure to inspect the ship while it was waiting for the berth and over a requirement that the tank tops needed machine scaling to remove all rust scale, including hard scale.

LESSONS:

- management must take a close interest in hold cleaning
- take photographs
- officers must fully understand what level of cleanliness is required for various cargoes
- an independent survey can be useful to confirm if the ship is ready to load – particularly if there is a long waiting time before loading



Loose scale must be removed from the tank top before grain loading

Normal Clean

- This is the standard where holds are swept clean and all residues of the previous cargo are removed.
- The hold is then washed down and dried ready for taking cargoes similar to or compatible with the last shipment

Shovel Clean

- This requires no washing down and the hold must be presented having been shovel cleaned (hand shovel or dozer bucket) and very roughly swept by the stevedores or crew.
- The quantity of cargo residues remaining in a hold at the completion of discharge may vary considerably, for a variety of reasons. The master may have control over some of these; for example, after discharging a steel cargo, it may be possible to persuade the stevedores to remove lashing materials, which will greatly assist the crew in their hold cleaning. Often a charterparty will specify that the ship is to be redelivered 'swept clean' or 'shovel clean'. If it is 'swept clean', the stevedores at the discharge port should sweep the holds before completion of discharge in order to minimise the remaining residues; if it is 'shovel clean', the stevedores need do no more than discharge cargo that can be easily accessed with a mechanical shovel or a Bobcat.
- If a ship is redelivered with holds that are shovel clean, several tonnes of cargo, might remain in each hold. This must all be swept up by the crew and brought on deck for disposal as permitted. Hold cleaning and cargo removal might take weeks, depending on the amount remaining onboard and available resources.

Load on Top

- This is when new cargo is loaded on top of existing cargo residues.

- This is most appropriate in certain long term contracts where a particular vessel
- is transporting the same commodity to and from the same ports.
- Guidance may be necessary for the Master on specific cleaning instructions, as load on top could still require a certain standard of cleanliness as per the provisions under a charter party.
- This will typically occur when a ship is employed under a Contract of Affreightment to carry, for example, a single grade of coal over a period. With such a trade, there is no commercial need for holds to be cleaned between successive cargoes, and each cargo is simply loaded on top of any remaining residues from the previous cargo. With load on top, guidance may be necessary for the master on any cleaning requirements, including the use of bulldozers and cleaning gangs.

The shipper’s requirement which may fall in any of the above should be clearly advised to the master well in advance in order for him to make proper hold cleaning plan and request the necessary cleaning materials and equipment in due time.

SECTION 3

HOLD CLEANING EQUIPMENT

One cannot expect a vessel to clean the holds in accordance with specific cleanliness requirements if complete and proper cleaning materials/equipment is not available on board. It would be prudent for a ship operator to obtain an updated list of cleaning materials/equipment every completion of cleaning. This would enable him to replenish at most convenient port.

The vessel should have on board the necessary cleaning materials; especially if these cannot be sourced locally advance planning is required including advance discussions with local Agents.

EQUIPMENT RECOMMENDATION

The following list of recommended hold cleaning equipment to have on board a handy - sized bulk carrier is for general guidance only: modify as needed and prepare complete inventory lists of all required equipment.

a) One (1) air-assisted water washer (Combi-gun or Water Tobey).

b) One (1) Mini-gun or equivalent (Denjet)

c) One (1) Pressure washer (850 - 1000 bar) Denjet.

d) Two (2) Air diaphragm pumps with flap valves (minimum 150 liters/min: better if one has larger capacity).

e) One (1) Submersible pump (trash pump models are preferable with capacity of about 1,000 liters/minute).

f) Two (2) Air or electric deck scaling machines (about 6 inch width is sufficient)

g) One (1) Set of spray foam/chemical application equipment

Above equipment should include required hoses. cables, nozzles. and fittings.

MISCELLANEOUS TOOLS

a) Six (6) good quality ladders of various lengths

b) Twenty (20) brooms of various types, synthetic bristles preferred Twenty (20) brushes of assorted sizes with stiff synthetic bristles Five (5) squeegees with 1.5 m, or longer handle.

c) Ten (10) shovels suitable for lifting a good amount of light residue

d) Twenty (20) good quality scrapers of different widths

e) Six (6) good quality extension poles or man-helpers. Types that are extendable are most useful.

SAFETY GEAR

Supply complete sets of protective clothing to all crew members that will possibly be working in holds. Include appropriate breathing, eye, and ear protection and a good supply of spares especially for quickly depleted gear such as dust masks. Fall arrest gear for estimated number to be working aloft. Safety gear, such as respirators must be supplied to protect personnel from cargo specific hazard

SECTION 4

CLEANING CHEMICALS, BLOCKING CHEMICALS AND LIMEWASH

It is generally not advisable to carry a large stock of expensive cleaning and blocking chemicals as they are usually subject to decomposition and may have a limited shelf- life if not used. Chemicals are best ordered in a timely, as needed, basis. Any discolouration of the hold coating can easily become permanent if not properly cleaned after each, or every second cargo.

The use of chemicals is becoming more common. Studies have indicated success in protecting the paintwork (and thereby allowing easier cleaning of cargo residue), breaking down the cargo residue, or cleaning and degreasing after cargoes such as petcoke or coal, ahead of a full seawater wash down. The chemicals should be washed off before they can dry.

Lime does not deteriorate if kept dry and is relatively cheap. Having about 2, 500 kg on board can be helpful if loading a salt or sulphur cargo where lime is not readily available at port.

If the holds have been lime washed, the dried lime wash can be difficult to remove. Acid-based cleaners and muriatic acids, citric acid or caustic soda are reported to be useful to remove lime wash. Lime wash (calcium hydroxide) is powdered limestone, predominantly calcite. It is difficult to remove when dry and therefore a thinner dilution of lime wash is preferable - subject to it protecting the steel or paintwork.

PREWASH / PRELOAD[5] CHEMICALS

The use of a prewash can protect the paint coating of the holds and allow for a much easier cleaning after cargoes which are liable to stain. The prewash coating is applied in the same way as the cleaning chemicals (see below) and dries off as a clear protective film. This is then washed off after discharge.

The prewash prevents the cargo adhering to the hold surfaces. Prewash is less effective on rough, uncoated surfaces such as the hold tank top. Application in a handymax ship takes about three hours per hold. Prewash protects the paintwork and can reduce time required for painting in preparation for the next cargo.

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APPLICATION INSTRUCTIONS (for RBM HoldBlock)

Use low-pressure application equipment to spray onto the surface that needs protection. Only a light spray is needed. If there is liquid running down, too much was used. Allow to dry before loading cargo.

Hints for applying

Start at the bottom of the bulkheads and work your way up. Hold the nozzle about ½ meter away from the surface. Do not stand in one spot. Side step along the bulkhead, always moving slowly. Apply to the tanktops before leaving the hold.

Paint should be fully cured before applying RBM HoldBlock. Paint that has not cured properly may absorb RBM HoldBlock and cargo residues, making it very difficult to remove.

Rain water on the tanktop is okay, but large puddles of water should be mopped up or spread out before applying RBM HoldBlock.

Residues from previous cargo and/or Limewash must be removed before applying RBM HoldBlock.

MIXING INSTRUCTIONS (for RBM HoldBlock)

208-Litre Drums:
Premixed. No Mixing Required.

20 Litre Concentrate Pails:
30% HoldBlock Concentrate : 70% Fresh Water (3 pails of Concentrate = 1 drum of Solution)

Fill a clean empty drum half way with FRESH water. Add three pails of RBM HoldBlock Concentrate. Mix Well. Top up with water, stirring occasionally.

REMOVAL INSTRUCTIONS (for RBM Holdblock)

Remove as much remaining loose cargo as possible, as per normal procedures. Rinse down bulkheads with high-pressure water (firehose, etc). Let dry. Use RBM HoldWash to remove all traces of RBM HoldBlock residues.

Cleaning procedures may vary depending on type of cargo. If time permits, test various methods in small areas and use most effective method. For more detailed cleaning instructions, please refer to the instruction sheet for RBM HoldWash.

AVERAGE DRUM COVERAGE	APPROX COVERAGE	RECOMMENDED QTYS	
		HANDYMAX	PANAMAX
Good Paint and/or Clean Metal Surfaces with Little or No Rust	2200 m^2 per drum	½ Drum per hold	¾ Drum per hold
Very Poor Paint and/or Pitted Metal Surfaces with Heavy Rust	1500 m2 per drum	¾ Drum per hold	1 Drum per hold

The above recommendations are based on past experiences. There is no scientific formula to determine the required amount of RBM HoldBlock for each vessel. There are several conditions that can affect the required amount; such as ability, efficiency and past experience of crew, hold conditions, weather conditions, height of application and equipment used.

Applying the prewash

Applying the chemical after discharge and before full wash down. Using a spray wet foam allows the chemicals longer to dry and so has a better cleaning effect.

High-pressure water cleaning of a small bulk carrier hold with a height of 8m, after a cargo of road salt.

Loose rust and scale must be removed

Using the chemical cleaning lance

LIMEWASHING

Hold structures must be protected against aggressively corrosive cargoes, for example salt and sulphur. Limewashing is used as a protective coating before loading such cargoes. Limewashing is a physical barrier application – so the thicker it is, the better the protection, but the more difficult it is to remove.

Effective barriers against corrosive cargoes are:

- paintwork in good condition
- limewashing
- hold block

The more intact the paintwork, the less limewash or hold block is required.

A typical voyage instruction for loading sulphur, for example, will be:

> *"The ship to be presented for loading with holds clean/swept/dry/ limewashed and free from residues of previous cargoes, suitable in all respects to receive bulk sulphur to the satisfaction of shippers and charterers. Hatch covers to be in a satisfactory condition to ensure watertightness."*

Lime (or calcium hydroxide) is manufactured from crushed and powdered limestone. The problem with limewash is that it is difficult to remove, posing a similar problem to a light cement residue. An alternative is 'hold block', which is a transparent and environmentally friendly product.

Lime mixture: First, please mix the Lime with the Milk powder and Sugar. The inclusion of the milk and sugar is because they are both soluble in water and therefore facilitate the removal of the lime coating after discharge. Prepare 200 litre empty drums with about 50/75kg of lime plus 2.5kg of sugar. Fill the drum with hot or warm freshwater and mix thoroughly. A handymax bulk carrier will use about 1,200kg to 1,500kg of lime. The mixing quantities will vary according to the condition of the paintwork and other factors. The master should always ensure that he has sufficient lime onboard.

Lime application: The mixture is to be applied with a roller or a spray to a height as calculated by the stowage factor. A thicker coat is then applied to those parts of the hold lacking good paint covering, such as the tank top. Special attention paid to areas behind frames and to inaccessible places. No bare metal should be visible particularly if long voyage is anticipated. Sometimes a second coat may be applied if, during drying, rusting is visible through the limewash as this may stain certain cargoes. Tank tops are to be limewashed as well when loading aggressive cargoes such as Sulphur, Salt, etc. Using the spray guns and portable pumps onboard, apply a thick layer of lime coating to the sidewalls and bulkhead first.

Upon completion of the hold sides and bulkheads, the limewash should then be applied to the tanktops. The shipper's surveyor is expecting to find holds limewashed like snow with traces of rust / stains / flakes or bare metal visible upon berthing. Failure to do so means that crew will be forced to re-limewash entire vessel again.

Lime coating removal: Use high-pressure water washing and possibly caustic or citric acid cleaning chemicals. The Citric Acid that will be supplied together with the other materials is to be used for the

washing and removing of the limewash after discharge. Recommended mixture of Citric Acid powder solution:

1. Dilute citric acid powder in big drum with fresh water at a ratio of 15 kgs of citric acid to 100 ltrs of fresh water.
2. Apply the diluted mixture onto the holds sides, bulkheads and tanktops where limewash has been previously applied.
3. After 8 to 10 hrs start washing down the citrix mixture with water. By this time the lime coating should come away easily.

If the crew encounter areas where the limewash has been applied so thickly that the above method does not remove the coating completely, repeat the above method until such time that holds sides are clean. The lime coating can become very hard and difficult to remove. In this case crew will have to use high-pressure washer machine.

Hold block: The supplier should be consulted for the application rates, which depend on the hold condition. The hold block is easily removed using the manufacturer's hold wash. The hold block is easily removed using the manufacturer's hold wash. It would be prudent to try the product first by spraying the mixture to a small area on the bulkhead and observe whether or not the mixture dries up to form an effective barrier coat.

PRELOAD 300[6]

APPLICATION INSTRUCTIONS:

1. Residues from previous cargo must be removed before applying PRELOAD 300.
2. The paint on the surface must be cured properly before applying PRELOAD 300.
3. Use suitable low–pressure application equipment to spray onto the cargo hold surface.
4. Start the application of the product at the bottom of bulkheads and then work the way up. The nozzle must be held half a meter away from the surface. Sidestep along the bulkhead and move slowly. After completion of the tank sides, also apply the product to the tank tops. 1 litre of PRELOAD 300 will cover 16–18m2 of surface area.
5. After drying, PRELOAD 300 creates a thin, temporary film on the surfaces of the cargo hold. This film fills the pores in the surface and, at the same time, prevents the small particles being trapped in those pores. Leave the film to dry completely before loading cargo. Depending on air temperature and humidity this will take 1–2 hours.
6. The temperature of the loading cargo must not exceed 140°C.
7. After unloading the cargo, the film can easily be removed even with the use of cold sea water under pressure.

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SECTION 5

BULK CARRIER HOLD CLEANING METHODS, PROCESSES AND PROCEDURES

The hold cleaning methods and equipment to use will vary depending on the previous and next cargo and the standards of cleanliness required by the charterers/shippers. But in general, they will fall in one or more of the following combination:

1. Sweeping the holds

This may be possible when the present cargo is of a loose, dry nature and does not stick or adhere to surfaces. Also, the next cargo must be of a nature that it will not be contaminated by any small amounts of residue that may remain. Cargoes such as logs, dirty cargoes, or sometime steels, may be tolerant of small amounts of previous cargo residue. But, it is always prudent to check with charterers/shippers if sweeping only is acceptable.

Usually if the last cargo is a clean one, permission for sweeping only is granted by the Charterer and other parties involved and this is normally only granted when there are time constraints that do not allow for thorough cleaning.

However, sweep down only should be avoided if possible. Residue can build up and harden and make subsequent removal difficult or possibly result in eventual damage to hold coatings.

During the sweeping operation, care should be taken to ensure that:

a) any residues that may be trapped in places such as accessible pipe guards, access ladder trunkings, behind frames and frame knees, are removed

b) Hatch cover undersides, if not boxed in, are swept to remove any residues that have accumulated under the covers.

c) hatch coamings, hatch trackways, hatch access ladders and internal ladder spaces are cleaned

d) during this sweeping process, the hold bilge wells should be opened and cleaned to remove any residues that may have fallen into them

Need for complete discharge: Cleaning the holds will be much more difficult if quantities of cargo sweepings have been left in the hold, particularly if the cargo is not soluble in water, so the ship's officers will do all that they can to compel or persuade the stevedores and trimmers to discharge all the sweepings. If a bilge cover plate has been displaced and cargo has filled the bilge, the trimmers will be unwilling to remove it. If they cannot be induced to do so it will be worthwhile to send the crew to get all the cargo out of the bilge before the finish of discharge, so that the contents of the bilge can be discharged along with the rest of the cargo.

Stevedores are often willing, if asked, to return to a hold where discharge has been completed to remove sweepings gathered by the crew. They may even be prepared to leave a grab resting in

the hold for a while for sweepings to be shovelled into. Often the stevedores will allow the crew to sweep the cargo holds whilst the last part of the cargo is being discharged and therefore any sweepings can be removed at the same time.

The chief mate will make every effort to ensure that the stevedores complete a good discharge and leave the minimum of sweepings in the hold. Shore labour must be employed for cleaning if there is insufficient time for the crew to complete the work before loading is due to commence.

Nature of cargo residues: Soluble cargoes such as salt will normally present no problem for hold washing, and sweepings of granular cargoes like sand or concentrates can usually be washed away without difficulty provided that the pressure of the washing water is maintained at 7 kg/cm square (1OOpsi) or better. Where cargoes come in the larger lumps, like coal for example, it is particularly important to ensure a complete discharge of the sweeping since remnants cannot be drained from the holds and will have to be lifted out by the crew.

The following areas of the holds are normally air blown to remove cargo residues before sweeping down in the cargo holds:

- Hatch cover/coaming channels,
- Australian and straight ladder
- This will ensure that prior washing, the holds are clean swept.

Sweepings left on deck: if the sweepings have to remained on deck they present problems for the ship, since residues are liable to be blown about the ship by the wind and they may stain the deck and the ship's side. For this reason they should be retained in the hold until such time as it is possible to tip them overboard. When this is not possible the sweepings should be stowed on deck in old drums. On larger vessels where the quantities involved are too great for the use of drums, the sweepings are usually stowed between hatches and slightly dampened down to prevent them from being blown around the ship. Lifting of sweepings from the holds is a labour-intensive and potentially dirty process. It is always preferable for the ship to dispose of residues by washing, and these methods is adopted whenever possible.

Sweepings left in hold: if it is not possible to remove sweeping from the hold before arrival at the loading port because of adverse weather or because of the weight and volume of the sweepings, they should be piled in an accessible part of the hold, in drums or sacks if possible, ready for rapid removal upon arrival. In the rare cases when this is done, it will be necessary to give owners or charterers maximum warning to ensure that facilities are ready on arrival and off hire time and costs are minimized.

When discharging sticky cargoes such as grain, it is often worthwhile to send crew members into the holds to clean positions high under the deck head during interruption in discharging. Whilst standing on the cargo during early stages of the discharge they can reach places that later become inaccessible. Such work must always be carefully supervised to guarantee the safety of crew members.

2. Washing the holds

a. Handheld hoses

The normal method of cleaning holds is by washing with water drawn from the sea. This involves hosing down every part of each hold with a water jet whilst the water is drained from the hold by the eductors or bilge pumps and discharged overboard.

Hand hosing of holds only in sheltered water: Washing of the holds with handhelds hoses is most easily achieved with the hatch covers open and normally commences with a hosing down of the hatch coaming top and the undersides and cross-joints of the open hatch covers. Such washing can only be carried out in a sheltered waters or in a calm sea conditions, since mechanical steel hatch are likely to be damaged if opened or closed when the ships is pitching or rolling.

Precautions when washing within port limits: In an increasing number of ports hold washing within the port limits is prohibited since the port authorities do not want cargo residues discharged into their waters, regardless of whether or not the commodity in question is harmful to marine environment or not. If there is doubt as to whether hold washing can be discharged in port, it is prudent to obtain written permission via the agent. A spoken assurance from a stevedore is no guarantee that the ship will not be penalized later.

Hand hosing of holds at sea: If holds are to be washed at sea with handheld hoses, the process can be carried out most safely by leaving the hatch covers closed and passing the hose down access hatch. Unfortunately, this make manipulation of the hose more difficult and provides poorer lighting. It also interferes with easy communication between the members of the washing party. In these circumstances, there are strong reasons for opening the hatches1 meter, if no more. Since the ship will be in ballast with large freeboard, there is normally no realistic danger of foundering as a result of opening hatches. The danger lies in the hatch covers suffering damage whilst they are unsecured, as a result of the ship working in a seaway.

Hatch covers should never be opened at sea, except in calm conditions, and the hatches when open must be well secured. If conditions start to become rough whilst hatches are open, the vessel must be hove-to to provide a steady platform whilst the hatches are closed.

b. Water cannon:

Water Tobey gun

An alternative to using a handheld hose is to have the hose led to high- pressure sea water cannon, such as the Combi-gun on a tripod place in the hold. The Combi-gun uses compress air from the ship deck line to inject greater pressure into water from the fire main. This system likely to be used on larger bulk carriers, provides more powerful jet water than can be achieved with the handheld hose and results in better cleaning of due high extremities of the holds. This system takes longer to move.

This method employs a special nozzle, or gun, attached to a fire hose or other hose that features an attachment on the nozzle for: an air hose (compressed air from the deck service line). The nozzle is designed to produce an air/venturi system that boosts water pressure: internal vanes focus and concentrate the water jet. This produces an effective cleaning stream of 15-25 meters which is suitable for handy size vessels.

Typical hold cleaning equipment: crew operating a Toby gun and a Toby gun from Stromme.

Because of the recoil generated by compressed air and water washers, the nozzle is usually mounted on a tripod or platform and is operated from the tank top. One man can operate the nozzle. Total weight of such a system is about 50 kg.

Inlet water and air pressure run about 7-10 bar. Water consumption is 18-20 m3/hour. The nozzle may be fitted with a means for adjusting air pressure to maximize the stream to available water pressure. Hot water can be used to increase the cleaning effectiveness for oily or greasy cargo residues such as green delayed petcoke for example.

This equipment is sometimes called a "Combi-gun which is the trade name of Stromme AS, a manufacturer of the gun. Similar versions from other makers are also available such as the "Water Tobey" or Wilhelmsens[7]' "Cleaning Jet."

Smaller, handheld, air-assisted nozzles are also available (Stromme's version is called the "Mini-gun"). These require less water and do not have the heavy recoil of tripod or platform-mounted models. They are especially effective for freshwater rinsing and can also be used for application of chemicals.

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c. High Pressure Machine Washers

Denjet Machine

High-pressure washers can be used to remove persistent residue remaining from low pressure water cleaning.

What are usually supplied to vessels are portable units in the 250-350 bar range. Depending on the tenacity of the residue, these washers can be quite effective. Most incorporate an electric or gasoline-powered pump to generate water pressure. Water consumption is about 25 liters/minute.

They are generally fitted with a 3/8 to 1/2 inch high pressure hose that runs from the pump to the spray gun with nozzle. The spray gun is fitted with a trigger to turn the spray on and off. The nozzle can be adjusted to adjust the pattern of the spray.

The further away the nozzle is held from the surface, the wider the spray pattern (and cleaning path) but the lower title pressure of the water on the surface being cleaned. If the residue is very difficult to remove, it will be necessary to position the nozzle close to the surface to generate sufficient pressure. However, this will reduce the cleaning path significantly and will require more time to clean a given area.

Even with pressure washers, cleaning such residue as cement can be very slow and tedious with these types of washers.

Higher pressure washing, up to 700 bar or more may be required to get the holds cleaned in a timely manner. Denjet 800 and higher machines are supplied to our fleet and these should be used when required.

This type of washing is normally performed by shore based hold cleaning contractors that provide equipment and labour. Some spray guns are fitted with rotary type nozzles that provide a wider cleaning path than a single fixed jet. These pumps and nozzles are quite effective at quickly removing even the most difficult residue. The downside is that hiring shore labour is always expensive.

<u>Water must not be allowed to stand:</u> All of the foregoing systems of washing depend upon the flow of water to wash any dirt and residues down the bulkheads and across the tank top to the bilge suction. If the washing is to be effective, it is preferable that the water is pumped or educted from the holds continuously and that no pool of standing water is allowed to form on the tank top. Whilst in the ballast the ship will normally have a good stem trim, causing the water to flow across the tank top and thereby assisting the washing in the process. On some ships the washing is found to be most effective if the ships is listed 1 degree with the ballast water. If one bilge suction becomes blocked, the ship can be quickly listed the other way, allowing the use of the other suction to pump out water. This will permit access to the blocked suction to clear it.

An exception to the foregoing occurs when it is necessary to wash holds in port because of lack of time, but the washing cannot be pumped overboard in port. In these circumstances the washings can be left in the hold to be pumped out when the vessel reaches the open sea. This procedure is often adopted with the ballast hold and can be followed with another hold, provided that it is safe to do so. It will be safe only provided that the water in the hold remains at a low level say, up to one meter, and provided that calculations show that the ship's stability will remain adequate despite the reduction in metacentric height (GM) from the free surface of the water.

Washing stubborn dirt: When the holds are washed after particularly dirty cargoes such as petroleum coke (petcoke), the washing time will be extended in an attempt to achieve a satisfactory standard of cleanliness. If it is found that the greasy or discoloured patches remain they will be hand scrubbed with detergent or sodium hypochlorite by crew members or washed with a portable high-pressure washing machine before the entire hold is again washed.

3. Chemical Application

Use low-pressure application equipment to spray onto the surface that needs protection. Only a light spray is needed. If there is liquid running down, too much was used. Allow to dry before loading cargo.

Note: Always refer to manufacturers recommendation for proper dilutions, methods and precautions

Cleaning and Hold Block chemicals can be applied in a number of ways:

a) With mops, brooms, or rags.

b) With "homemade" sprayers made from a 200 liter drum, with hose and nozzle attached to the bottom and then suspended to obtain pressure (similar systems are used to apply lime wash).

c) With small hand pump type sprayers (such as might be used to spray an insecticide). These work well when applying acid-based cleaners over small areas.

d) With specially designed chemical application equipment. These work best for tough jobs over large areas such as petcoke and coal residues. Start at the bottom of the bulkheads and work your way up. Hold the nozzle about ½ meter away from the surface. Do not stand in one spot. Side step along the bulkhead, always moving slowly. Apply to the tanktops before leaving the hold.

PAINT should be fully cured before applying RBM HoldBlock. Paint that has not cured properly may absorb RBM HoldBlock and cargo residues, making it very difficult to remove.

RAIN WATER on the tanktop is okay, but large puddles of water should be mopped up or spread out before applying RBM HoldBlock.

RESIDUES from previous cargo and/or Limewash must be removed before applying RBM HoldBlock.

There are a number of systems designed for chemical application. They include nozzles with eductor-type fittings to draw the chemical into the wash water stream, pressurized holding and mixing tanks fitted with hose and spray nozzles: and special foam application nozzles.

Cleaning chemicals usually require a certain amount of time to "work" on the stain or residue for maximum effectiveness (typically about 20 minutes, but check manufacturer's recommendations). The chemical must not be allowed to dry as it will then become difficult to remove.

The most effective method is to apply the chemical as a foam. This might require the addition of a foaming agent to the chemical solution and/or the injection of air during spray application. Special foam application equipment is available from most manufacturers of cleaning equipment.

Foam will help to achieve uniform coverage, will keep the chemical from drying out too quickly, and most importantly, help the chemical to stick to vertical and overhead surfaces so that it can work on the stain.

Sometimes the application of a cleaning chemical, followed by washing is not sufficient to remove the residue or stain. Often, scrubbing the area treated with brushes or rags will be necessary to loosen residue from hold surfaces prior to final washing. Repeat application of chemicals may be necessary.

4. MARICHEM recommended cleaning operation:[8]

Procedure for Spray Method:

a) Remove all deposits and residues.

b) Wash the cargo hold with cold sea or fresh water (using water cannon).

c) Divide the Cargo Holds in smaller cleaning sections (100 – 200m2) in order to control and inspect them better. Alternatively, use the 30-litre plastic jerrican as basis. Once the solution has been sprayed over then that is the area covered by the 30-liter solution.

d) Spray with a suitable equipment directly to the contaminated area and let it soak for 10-30 minutes (Alkaline Chemicals) or 3-5 minutes (Acid Chemicals). Do not allow the surface to dry during this process. For general cleaning application, chemicals may be used by brushing, soaking or any other methods allowing 1 litre per 12 m2 of contaminated surface.

e) Wash thoroughly with cold water (preferably with the use of a High-Pressure Machine) and check the results.

f) Repeat the procedure on any areas that need additional cleaning, if necessary.

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Note: Foam Plus is an additive chemical to be used with Marichem PCS and Alcaclean HD. You add 2-5 ltrs per 210 ltrs of MARICHEM PCS or ALCACLEAN HD in order to make the chemicals foamier.

This has the result for the chemicals to stay longer on hold walls as they are in a foamy form, and this maximises the cleaning effects.

If the repeated cleaning process (twice) produces without improvement, a different chemical is to be used, i.e. Alkaline Chemical to Acid Chemical or vice versa.
If the vessel is carrying the same cargo for an extend period (2 -3 voyages) and the cleaning process was not the ideal one, you have to use directly an Acid Chemical diluted with water.
From Coal to Grain condition or from Cement to Grain condition you have to use high quantities of hot water if available, you must keep on board some Acid Chemicals (for heavy stains) and a small quantity of Alkalinity Control and Allative Liquid.
There is a possibility after the Cleaning process of Sulfur Cargo, white stains appear (there are many reasons for this). The best cleaning process for this, is the application of acid in combination with a high-pressure unit 250 bars.

5. WILHELMSEN recommended cleaning operation:[9]

Procedure for Spray Method for Aquatuff High Foam:

a) Sweep and muck out all residue.

b) Pre-wash the cargo holds with cold sea water.

c) Mix Aquatuff High Foam and fresh water to form a cleaning solution. Recommended mixing ratio is 1 part of Aquatuff High Foam to 3 - 9 parts of fresh water to form a cleaning solution.

   Note: If mixing with seawater, additional 25% of Aquatuff High Foam is required.

d) Try the cleaning solution on a small area first (i.e.1 m2), contact time is around 30 – 45 mins then wash down with fresh water. Adjust the concentration of the cleaning solution according to the cleaning results before start applying on all the cargo holds.

   i.e. If using 1 part of Aquatuff High Foam with 5 part of fresh water is not strong enough, then you may increase to 1 part of Aquatuff High Foam to 3 part of fresh water vice versa.

e) Apply the pre-mix cleaning solution with suitable cleaning equipment. If used with a hand sprayer, apply Aquatuff High Foam undiluted on the surface, allowing 1 litre per 12 m2.

f) Allow the cleaning solution to have some contact time with the contaminants, effective time is depending on the temperature and moisture conditions the contact time can vary from 30 – 45 minutes the surface remain wet.

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g) Wash down with seawater before chemical dry up, should chemical dry up, apply chemical again for 5 mins contact then wash down and check the result.

h) Repeat the procedure if necessary.

i) Final rinse with fresh water.

Procedure for Spray Method for Metal Brite HD:

a) Sweep and muck out all residue.

b) Prepare cleaning solution by mixing Metal Brite HD with water, recommended dilution is 20 – 50%, mixing ratio example:

Dilution	Cleaning Solution QTY Req.	Metal Brite HD QTY	Water QTY
20%	10 ltr	2 ltr	8 ltr
30%	10 ltr	3 ltr	7 ltr
40%	10 ltr	4 ltr	6 ltr
50%	10 ltr	5 ltr	5 ltr

c) Always add chemical to water, never the reverse.

d) Try the cleaning solution on a small area first (i.e.1 m2), let it soak for 15 – 20 mins and wash down with fresh water.

Adjust the concentration of the cleaning solution according to the cleaning results before start applying on all the cargo holds.

i.e. If 20% dilution is not strong enough, then you may increase the dilution to 30%, 40% or 50% until good results is achieved.

a) Apply the final pre-mixed cleaning solution with suitable equipment on the surfaces to be cleaned. (1ltr pre-mixed cleaning solution cover approx. 10 Sq. meter)

b) Let it soak for 15 - 20 mins, but do not let the chemicals dry out, should chemical dry up, apply chemical again for 5 mins contact then wash down.

c) Wash down thoroughly with seawater.

d) Repeat the procedure if necessary.

e) Final rinse with fresh water.

6. Fresh Water Rinse

When holds are washed with sea water and after a chemical wash, traces of salt/chemical remain on all surfaces within the hold. This is unacceptable to some grain surveyors and is liable to contaminate cargoes such as steel products and wood pulp. Salt traces will also encourage corrosion and are to be avoided if possible. For these reasons, holds should be rinsed with fresh water after full washing.

When using this method it is important that the crew members operating the hose understand that they are using fresh water and not the sea water which normally runs through their hoses. The water must be used efficiently and with care to provide a quick rinse of each compartment if all holds are to be properly washed with the available supply of water. On a handy-sized vessel, where the fire pump has a capacity of 200 tonnes /hour, two or three minutes spent rinsing each hold with fresh water will use a total of 50 tonnes for the entire ship and should remove most of the salt from the structure. An alternative method of fresh water rinsing is to use a portable high pressure washing machine. This will use less fresh water, but will take much longer.

Fresh water has a cost in most ports, so if sufficient water hold rinsing cannot be generated aboard ship. Care should be taken to ensure that water for hold washing is obtained where it is cheap or free; the best sources of supply being those few places where the ship floats in clean freshwater. Speak to your vessel operator well in advance about ordering a suitable quantity of fresh water for hold washing at the cheapest possible port.

7. Disposal of bulk cargo – Wash down residues

Care should be taken when disposing of both cargo residues and wash down water to ensure that the requirements of MARPOL 73/78 Annex V are strictly followed. Vessel's Garbage Management Plan is to be consulted in the disposal of cargo residues and wash-down residues.

8. Washings containing hold cleaning chemicals

Such chemicals could in themselves be pollutants. If a substance falls within Annex 1 (Oil) or Annex II (Noxious Liquid Substance), then the washings will have to be disposed of according to the Annex requirements. Check with the suppliers if in doubt.

Cleaning holds within, or close to, port limits may also require local regulations to be followed with respect to the disposal of hold washings. Always check with local agents. It may be necessary to retain the washings on board or dispose of them ashore using road tankers or to approved facilities. Only approved companies should be used for the disposal of hold washings, and the correct paper work and receipts should always be retained for a minimum of two years.

9. Mechanical tools

Mechanical tools are effective in removing hardened residue such as cement. They are not effective on stains. Stains or hardened residue that cannot be removed by washing. Chemicals, or pressure washing (less than 350 bar) will require repeat application of chemicals and scrubbing or higher pressure washing (over 700 bar) by shore contractors. In the most extreme cases, sand blasting and recoating may be necessary.

Hand scrapers and wire brushes are useful over small areas. Scrapers can be very effective depending on the nature of the residue. Long, forceful strokes with wide sharpened scrapers can quickly remove a lot of residue. Such residue may resist the perpendicular forces of washing but be easily removed with scrapers at a low angle. Scrapers also work well behind frame flanges and other structural members.

Electric or pneumatic scalers, needle guns or wire brushes can also be effective. Deck scalers are particularly useful on large flat areas such as tank tops (especially with hardened cement). Needle guns are useful in tight places. Be advised, however, that these tools can damage the coating.

Carbide disc grinders can be used, but these will certainly damage the coating and may gouge steel.

Overall, these tools may be a last resort and generally make for slow and tedious removal of residue.

10. Drying of holds

The charter party frequently requires holds to be presented 'Clean and dry', and the requirement for a dry hold is not always easy to meet if the ballast passage is short and the hold has just been washed, or sweat is forming in the hold. Holds can be dried by ventilating them when weather conditions are favourable. Two steps can still be taken. The crew mop all the puddles which form in the depressions in the tank top when a hold is washed. If the weather is dry the hatches can be opened when the ship reaches smooth waters in the port approaches, and the flow of air over the ship will help to dry the holds.

When commencing the loading of a cargo of grain in winter with holds which are sweating, it may be possible to persuade the operator of the grain elevator to blow some grain dust into the hold, thereby reducing the contact between grain and moisture.

11. Preparation of bilges and testing of fittings

Cleaning bilges

When hold washing has been completed consideration must be given to cleaning of the bilges. Bilges are cleaned to ensure that they continue to function properly and do not become blocked with residues. In addition, they must be meticulously cleaned with every trace of matter removed and mopped dry, if foodstuffs such as grain or sugar are to be carried. When presented for; inspection they must be clean, dry, and free of obnoxious odour.

A bulk carrier bilge well normally consists of one or two bays, of double bottom space, anything from 2m3 to 10m3 in volume. The space is usually cramped and uncomfortable to work in. Any accumulation of cargo should be removed and when hold eductors are fitted some of this can be achieved during the final stages of manual hold washing by a man standing over the bilge well and stirring the contents with a broom, so that the maximum is drawn away through the eductor. Whatever remains in the bilge must be dug out with a hand shovel and lifted out of the hold.

Testing of bilge suction

One of the most important tasks in hold preparation is to ensure that the bilge wells, lines and valves are in a clean and operational condition.

The bilge lines must be tested by a competent person (under the supervision of the cargo officer) to ensure that the non-return valves are functioning correctly and not allowing any flow back of water into the holds. The bilge high-level alarms must also be tested and confirmed as operational.

If the hold has been washed out and the washing water has been discharged by eductors or hold bilge pumps, there will be no need for further testing of the hold bilge suctions. If the hold has only been swept or has not been cleaned at all, it is necessary to test the bilge suction to ensure that the water can be pumped out of the hold during the voyage if that becomes necessary. The testing of the bilge suctions can be combined with the flushing of the sounding pipes. Putting the water down the sounding pipe into the bilge into the bilge well confirms that the pipe is clear, and pumping the water out of the bilge well confirms that the bilge pump or eductor is working satisfactorily.

The correct working of non-return valves fitted in the hold bilge-to-engine room lines (but not in the lines of the hold bilge eductors which discharge directly overboard) can be tested by stopping the bilge pump or bilge eductor in the engine room, allowing water to flood back through the bilge line. If none enters the hold bilge the non-return valve is working correctly. High level bilge alarms, when fitted must be tested by raising the float and obtaining confirmation, usually by walkie-talkie radio, that the alarm has sounded.

12. Internal water ingress

Water ingress into the holds when carrying cargo is a common cause of cargo damage. This can be the result of poor hatch cover integrity, or water ingress back though the bilge and ballast system.

- Check the bilge and ballast/eductor system non-return valves
- Check that high-level alarms are operational
- Consider blanking off bilge and ballast lines if washing-down empty holds when remaining holds contain water-sensitive cargoes
- Check the integrity of ballast and fuel oil tank manhole lids
- Ships with holds that are also used for seawater ballast must have the ballast lines blanked off and tank top manhole lids securely fitted with gaskets in good condition
- Refer to OJT 059 - Cargo Hold Bilge Pumping Operation (GS)

Water ingress via a faulty bilge valve will cause cargo damage.

Check that the bilge suction is operational

Check that bilge wells are clean and dry, and that strainers and strum boxes are cleaned

13. Final hold inspections

Systematic inspection of cargo holds will ensure that all areas of the holds are properly covered during inspection and any area where cargo residues, loose rust, and paint scales still inhibits are cleaned. This method will avoid surprises during official hold inspections

Begin the inspection with the hatch covers

- Check to see if the underside of hatch covers is clean and free of rust and/or cargo residues.
- If the underside of hatch covers has stiffeners, pay special attention to the spaces between the stiffeners.
- Check the rubber packing of hatch covers for gaps, breakdowns and unusual wear.

Next inspect the hatch coaming

- Check the top of the hatch coaming for cleanliness and loose rust formation. Loose rust, although on the top of the hatch coaming, can cause wind-borne contamination of the cargo. A certain amount of thin hard rust is usual on hatch coaming tops, and is not likely to contaminate the cargo
- Check if the compression bars on the top of the hatch coamings are in a satisfactory condition
- Check the channels of the hatch coamings for cleanliness.
- Check the drain holes and non-return valves. Clean if clogged.[10]

Now enter the hold from any one end (for'd or aft)

- When in line with the lower edge of the curtain plate of the hatch coaming, inspect the portion of hatch coaming inside the hold. Cargo residues tend to adhere to these portions in the forward and after part of the holds.
- Check the condition of ladders, landing platforms, ladder casing bulkhead plating, pipes / pipe guards, shedder plates and other structures as you descend into the hold. Also inspect the upper side tanks while you are at the top platform. If you are on a straight-drop vertical ladder, keep personal safety in mind always. Don the chin-strap of your head gear.
- Once you have landed on the tank-top, resume the inspection of the rest of the hold in an orderly manner, so that you do not miss looking at any particular location
- Start from the tank-top. Inspect the entire surface of the tank-top especially around the periphery. Rust build up may be present around the periphery of the tank-top. No rust build up is permitted on the tank-top.
- Places that are likely to harbour contaminants like manhole recesses, manhole cover lifting handle sockets, container fittings, etc., should be thoroughly clean. Additionally, they may also be taped up.
- Ensure the bilges are dry and covered in burlap and properly taped up.
- Then inspect the hoppers
- Check ship sides, including frames and frame brackets. Instruct the ship's crew to rig up a rigid ladder for you to inspect the shipside frames. Rust build up and residue are frequently found behind the cantilevers of shipside frames and associated frame brackets. Corners at the junction of bulkheads and ship sides can also harbour rust, residues and other contaminants. Carry out a visual inspection of ship sides as high as possible from a reasonably sized rigid ladder. Personal safety is of paramount importance
- Some vessels have side ballast tanks that rise from the tank-top, all the way up to the hatch coaming. In these instances, the shipside frames are inside the tank and not of concern.

[10] W 07 / 2021

However, there might be other indentations, like sockets for securing eyes or beam sockets on some smaller vessels. These must be clean and sometimes taped up.

- Once these places are inspected, you can ascend the ladder that is opposite to the ladder that you descend and inspect the opposite bulkhead as described above.

SECTION 6

VARIOUS CARGO CLEANING OPERATIONS

1. CEMENT AND CEMENT CLINKER*:*

The transport of cement and clinker accounts for some 5% of the dry bulk trade. It can require heavy cleaning after carriage. The usual problem with conventional ships is that the areas high above the tank top, which are difficult to reach and clean, get covered with cement dust and cargo residue. Clinker is the main ingredient in cement production. Clinker loading and hold cleaning is similar to cement, except that clinker does not contain a binding agent and thus does not harden to the same degree that cement does.

Cement may have a temperature of 110°C when leaving the production site and can sometimes be loaded at up to 80°C. Temperatures as high as 100°C have been recorded and this can lead to problems with the hold coatings, and potential dangers with the fuel oil double-bottom tanks.

Cement is often exported from regions with low sea temperatures and discharged in warmer areas with high air humidity. After being loaded, the powder volume of cement can contract by as much as 10% once it has settled. In these conditions, water vapour can condense, and solidify the cement, particularly on the surface, not only under the main deck areas but in other parts of the cargo holds.

Often when loading cement, a ship will be fully ballasted when first alongside, and the top side ballast tanks are dropped as loading progresses. This can produce sweating on the top hopper side plating, which allows the cement dust to adhere, and become difficult to remove.

The point at which water vapour condenses in the atmosphere is called the dew point. When the incoming air or the steel has a lower temperature than the cargo in the holds, this allows the surrounding air to cool and produce vapour which condenses. As the wet cement dust dries on the hold frames, it hardens and poses a major cleaning problem. This is often only overcome with determined manpower, efficient wash-down equipment and chemicals. Ballasting of cold water adjacent to (warm) cargo holds can have the same result. The problem can be reduced in some cases by good ventilation, weather permitting.

Cement cargo in bulk can:

a) Solidify when wet

b) Retain heat for a considerable period when loaded warm

c) Easily stick to non-smooth surfaces and be affected or contaminated by residues of previous cargoes. These may reduce the cement's binding capacity and produce considerable dust-causing problems in the upper parts of the holds

Cement cargo (hold preparation and cleaning before loading):

a) The holds (sides and tank top) and bilges must be completely dry. Cargo holds should be clean and odour-free.

b) Residues from previous cargoes such as sugar and fertilizers may cause problems and result in a failed hold inspection. A small amount of sugar can seriously degrade a cement cargo. Ensure that the hold is completely free of previous sugar cargo residue

c) The hold air should be dry ahead of loading; use dehumidifiers if on board for several days before loading.

d) Condensation during the voyage should be avoided. Cold water ballast should be avoided if possible in tanks adjacent to holds being loaded.

e) All holes and indents on the tank top and bulkheads and all scupper holes should be dry and clean. Consider covering manholes and recesses with plastic sheets and masking tape.

f) If the climate is warm and humid, the hatches should be closed once discharging has been completed, so that a dry atmosphere can be maintained inside the holds.

g) The bilge, bilge wells and tank tops should be cleaned thoroughly and dried before loading. Cement getting into damp bilges and bilge wells can build up trouble. Clogged bilge lines with hardened cement can be a major problem. Bilge well strainers and bilge well lids must have clear drain holes, and be clean and free of debris.

h) Non-return valves in the drain and bilge system must be checked and confirmed as operational. Claims have arisen where the non-return valves have allowed water to flow into the holds via the bilge line system. When this occurs with a cement cargo, the result can be extremely expensive and time-consuming. It could be necessary in such cases for the bilge lines to be replaced.

i) The bilge wells must be protected using good-quality hessian that is firmly in place so as to allow water to be drained in an emergency.

j) Good cleaning equipment must be available. Chemicals to dissolve hardened cement may be required and crew should be equipped with personal protective equipment

Remember: After carrying a sugar cargo, the hold must be cleaned to a very high standard. Sugar residue will contaminate a cement cargo.

Paint protection

Use of paint protective chemicals such as prewash products can assist the cleaning after discharge

General precautions against dust:

All accommodation, mast houses/store rooms and vents should be shut. Wire drums and electrical boxes on deck should be covered and closed off. Pilot ladders should be covered. Air conditioning should be on recirculation. Deck scuppers should be blocked

During loading:

The atmosphere in the cargo holds should be kept as dry as possible; hatch cover lids should be closed when the holds are not being loaded or discharged - particularly if there is a possibility of rain. The main deck, hatch covers and any exposed piping should be cleaned with compressed air, this may be forbidden in certain ports by anti- pollution regulations.

After loading - before departure:

If possible, main deck, hatch coamings and covers should be swept and cleaned by compressed air, and given a good sweep before washing down.

Hatch coaming trackways, drainage channels and drain holes should be cleaned and free of cement if possible weather permitting. Blocked drain holes and channel bars will become clogged with hard cement in heavy weather or rain

After discharge:

Cement dust should be dry-cleaned using brushes, removing the majority of cargo residues from the tank top and bulkheads. Crew or stevedores should follow up in the cargo holds when the discharge is almost completed. Cargo residues should be collected and filled into the grabs for landing. 'Shovel clean' means that the stevedores discharge only what they are able to get into the grabs without sweeping. Bilge wells should be dry and free of cement dust. Cargo hold bulkheads, hatch cover undersides and hatch comings should be cleaned by compressed air and covers should be swept clean. Remove all solid residues, sweep clean and flush with seawater, using high-pressure hoses. After dry-cleaning, the holds must be cleaned by high-pressure air, thereafter with water. Chemicals and high-pressure cleaning pumps can be used when necessary if hard residues are not removed by conventional high-pressure hoses using seawater, it may be necessary to call in a professional cleaning company, which can use acids to remove the persistent hardened cement. Hard cement residues, if not removed during the high-pressure wash, can be removed by high-pressure cleaning machines or acid cleaners.

Hydrochloric (muriatic) acids must be handled with care and advice should be sought from the hold paint manufacturers. The acids are harmful to the human body and may eat into hold paint. The recommended dilution with freshwater is 1:5. Stronger dilutions may be necessary, but this may result in pitting the hold steel. Again, always check with manufacturer's recommendations

The chemical mix should be applied using only a stainless-steel lance kit connected to a pressurized mixing tank or an air-driven pump, either made from stainless steel or polypropylene, both with wetted parts made of Teflon. The chemical mix must be removed before it dries, working from the bottom up. This is most easily done from tank top level with Maxi-Gun or Combi-Jet. The cleaning operation is always completed by flushing with freshwater to remove salt residues, working from the top down.

The volume of chemicals used must be monitored and guidance sought from the manufacturers. Chemical splash suits, chemical gloves, boots, helmets with visor and breathing mask must be worn. Material Safety Data Sheets should always be consulted

After cleaning:

a) All areas should be flushed with freshwater to avoid blocking the bilge system, portable diaphragm pumps may be used to remove the washings.

b) The bilges and tank tops should be cleaned thoroughly before washing the holds. The bilges should be flushed for a minimum of 30 minutes before drying the tank top to ensure that they are not clogged by cement. Clogged bilge lines with hardened cement can be a major problem. All valves in the drain/bilge system must be checked.

Only the most powerful cleaning equipment will remove hard layers of cement. Normal ship's cleaning equipment might look adequate but often fails, particularly in terms of completing the work in a timely manner. Practical experience with chemicals has been mixed and there is a danger that they can adversely affect paint systems and ancillary equipment such as bilge pumps.

CASE STUDY D – LOADING CEMENT – MAKE SURE YOU CLEAN UP AFTER LOADING

A handysized bulk carrier loaded a full cargo of cement in the Far East during the northern winter, using an enclosed loading system. This meant that the hatch covers were closed and a loading chute was fed through a manhole in the closed hatch top, with the cargo pumped under pressure into the hold.

En route to the loading port, after the holds had been cleaned, the hatches were watertight-tested using ship's fire hoses and found to have no leaks.

The master noted that the length of the loading chute only just fitted into the hold by 60 cms. This meant that the cement cargo was being fed in from the top of the hold, producing a considerable amount of cement dust onto the top frames, hatch trackways and hatch coaming drain holes.

The hatch cover drain holes were not taped over before the start of loading. It should be the practice – weather permitting – to clean the trackways and hatch cover coamings after loading, using compressed air if port regulations allow. This clears the drain holes and water channels of dirt and cement dust.

During the Pacific voyage, this ship was weather routed, heavy weather (over Beaufort 9) was encountered and seawater entered the hatch trackways. The water mixed with the cement and all the drainage channels to the forward two hatch coamings were blocked with hardened cement. As a result, water entered the holds and damaged the cargo. Sealing tape was ineffective in such heavy seas. Sealing tape should not be considered as a primary barrier to water ingress.

The claim submitted, including the cargo damage, disposal of the cargo and associated costs, was over $650,000.

LESSONS

- Masters should confirm that weather routing advice takes account of the water-sensitive nature of the cargo carried. Masters should let it be known when they have reservations
- Stevedores and charterers should be approached when incorrect loading equipment is used
- Before loading cement or other dusty cargoes, the coaming drain holes should be taped over to prevent the entry of dust. Tape should be removed before blowing down
- After a closed loading operation, the trackways should be cleaned if possible and cleared to free the drain holes, (if the weather allows). Masters should advise their owners and charterers of this requirement

Crew digging out cement from the hold frames

Enclosed loading of cement produces dust throughout the hold

2. SALT

Loading guideline - Precautions & hold preparation

Salt is an aggressive product on steel and paint. It contains about 3% moisture and is very hygroscopic. Common salt or sodium chloride is obtained from sea water, which contains about 3% of it, by a process of evaporation. They are fine white grains.

Moisture variable to 5.5%. With bulk cargoes it is usual to limewash the hold prior to loading. On long voyages the loss of weight is 5 % or more, this being due to evaporation, from which it follows that dry goods liable to take harm from moisture should be stow with salt.

Salt is highly soluble. In the case of ingress of water into holds, there is a risk of loss of stability of the ship through dissolution of this cargo (formation of a wet base and shifting of cargo).

Before loading

To protect the hold steel paint or limewash, the holds can be washed with proprietary products such as hold block. Studies have concluded that 100% paint protection is a good deterrent against the corrosive effects of a salt cargo.

Limewashing

Refer to section 4 of this manual.

Loading

Rust on the surface in the hold will discolour the salt with which it comes into contact. If this is a possibility it will be necessary to limewash the hold - to coat the bulkheads and the tank top with lime to prevent the salt from coming in contact with the rusty surface. It will be necessary to lime wash the bulkhead to whatsoever height the cargo is expected to reach in the holds.

Weather precautions

This cargo shall be kept as dry as practicable. This cargo shall not be handled during precipitation. During handling of this cargo, all non-working hatches of the cargo spaces into which this cargo is loaded or to be loaded shall be closed.

Precautions - Hold preparation

The parts of the cargo space in contact with the cargo such as tank tops, hoppers, side plating and bulkheads shall be lime-washed or coated with paint to prevent corrosion. If the coating is intact then there is minimum risk of hold corrosion. However if the hold coating is damaged in places, then lime wash should be considered especially in case repeated carriage is planned. Please see below for instructions on cleaning the Lime Wash.

After loading

On completion of loading and during carriage, the hatches should be sealed, and excessive condensation avoided. A major ingress of water into the holds can cause a loss of stability. Salt is water-soluble and in the event of water ingress into the hold, there is a risk of loss of ship stability as the salt dissolves and causes the cargo to shift.

Clean up

In the case that the residues of this cargo are to be washed out, the cargo spaces and the other structures and equipment which may have come in contact with this cargo, with fresh water or its dust shall be thoroughly swept prior to washing out. Particular attention shall be paid to bilge wells and framework in the cargo spaces. The fixed bilge pumps shall not be used to pump the cargo spaces, because this cargo may make the bilge system inoperative.

Lime wash require the removal before the carriage of sensitive cargoes such as foodstuffs, fertilizers, mineral sands. A word of caution with the Lime Wash; subsequent removal of the hard lime wash coating may become an issue. Usually the lime wash can be removed by HCL Acid or Citric Acid wash with subsequent rinsing with freshwater.

After discharge

If the holds have been limewashed, the dried limewash can be difficult to remove. Acid- based cleaners and muriatic acids or caustic soda are reported to be useful to remove limewash. Limewash (calcium hydroxide) is powdered limestone, predominantly calcite. It is difficult to remove when dry and therefore a thinner dilution of limewash is preferable - subject to it protecting the steel or paintwork.

3. BAUXITE

Bauxite is one of the world's most abundant minerals and is strip-mined in many places. Nearly all is processed into alumina for aluminium production. Bauxite contains iron- bearing clay or red mud, which often leaves stains on the hold paint that can prove difficult to remove.

Before loading

Remove all solid residues, sweep clean, and high-pressure wash with seawater. Depending on the previous cargo and the condition of the paint coating in the holds, chemical cleaning may be required.

After discharge

Remove all solid residues and sweep clean; the application of chemicals diluted with freshwater may be needed to dry bulkheads. Seawater cleaning before the application of chemicals may reduce the effect of the chemicals and should only be done if heavy cargo deposits are present. Cleaning is completed by flushing with freshwater, working from the top down.

Hold with bauxite stain

4. MANGANESE ORE

Manganese ore is mined on all continents except North America and is often found in combination with iron. Manganese is mainly used in the production of steel, to prevent corrosion. It is also used in various states of oxidation as pigments and may cause discolouration of the hold paint coating and the paintwork on the maindeck and superstructure.

Before loading

Remove all solid residues, sweep clean and flush with high-pressure seawater wash, the use of a prewash to protect the paintwork from staining can be considered.

After discharge

Remove all solid residues and sweep clean; the application of chemicals diluted with freshwater may need to be applied to dry bulkheads. Seawater cleaning before the application of chemicals may reduce the effect of the chemicals and should only be done if heavy cargo deposits are present. Cleaning is completed by flushing with freshwater, working from the top down.

5. SODA ASH

Soda ash is a dry, powdery white, dusty bulk cargo used in several industries, the main one being glass manufacture. It is commonly known as sodium carbonate. The cargo must remain dry at all times.

A hold inspection before a ship is to carry soda ash is stringent, exceeding that required for the carriage of grain. The hold should be hospital clean; it should be watertight, dried, clean in all respects, and free of scale, loose rust and all foreign materials or residue of previous cargo, on tank tops, bulkheads, hatch coamings and undersides of hatch covers. Painting of holds is typically not required, but the paintwork needs to be in good condition. Surveyors will look for cleanliness, paint and rust blistering, cargo residues and potentially loose paint edges. Physical contamination is a primary area of concern. Soda ash is ruined if it comes into contact with oil.

The following is a typical instruction sent to a ship about to load a cargo of soda ash:

“Contamination is a problem when carrying soda ash”.

The ship should not have carried chrome or chrome products, such as ferrochrome, chrome ore, bagged chrome and chrome manganese within the past six months to a year.

No previous cargo residues or staining on any surfaces of the holds to include tank tops, bulkheads, ladders, side pockets, container sockets of the under sides of hatch covers if applicable. No loose or flaking paint on any surfaces of the hold. No bubble rust, loose rust or painted rust that maybe chipped or scraped on any surfaces of the hold. Ventilation ports/fan spaces if applicable must be checked for possible loose rust or paint chips that might fall onto the cargo. Hold may not be chemically washed due to potential contamination and should only be cleaned with fresh water (high pressure)."

It is unacceptable to have:

- loose and flaking paint with cargo residues visible
- paintwork not adhering firmly to the steel bulkheads
- loose flaking paint, paint covering bubble rust
- paintwork stained
- rust scale
- rust spots/surface rust
- residual cargo

It is important for ships to have maintained their cargo holds in good condition before loading soda ash as the requirements of hold preparation are of a high standard.

Any contaminants from the vessel (rust scales, loose paint or residues of previous cargo) found in the cargo at the discharge port will lead to large cargo contamination claims.

Precautions. This cargo is very dusty, and machinery, equipment and accommodation spaces should be protected from the dust. Personnel should wear personal protective equipment on deck, including goggles and dust filter masks.

6. SULPHUR

Bulk sulphur (whether formed solid, crushed lump or coarse grained) can be highly corrosive when in contact with water, and so the hold paint coating needs to be in a good condition. It is usual to limewash the holds to protect the steel structures. There are proprietary products, such as hold block, designed for preparing holds for carrying sulphur.

If the hold steelwork is not protected, contact with wet sulphur can turn the yellow sulphur into a black jelly-like substance, called ferrous sulphide. If this is exposed to air, usually on discharge, it oxidises and can create sufficient exothermal heat to start a fire.

Follow chemical application procedure/recommendation for Hold Block on **page 41**.

The holds should not be washed with seawater, but should be thoroughly cleaned and washed with freshwater. The hold tank top should be rust-free. The holds are usually required to be cleaned to a grain standard, with no previous cargo residues, and no rust scale or flaking paint.

The sulphur is often loaded with a light water spray, which helps to bind the cargo into bigger lumps, or it can be loaded from shore stockpiles, which can be wet from rain, so the bilges need to be monitored during the voyage and pumped out. The bilges need to be protected by being covered with burlap to allow drainage. Some experts suggest a light limewash or hold block of the bilge lines. Hold block the bilge wells with a thicker coat than the tank top. Caustic soda (alkaline solution), to neutralise the acid drain water, can be placed in the bilge well. Use only the eductor for pumping out the bilges and run to sea at least 15 minutes after pumping is completed. During the voyage, monitor the ph value of the bilge well water.

RBM Bilgecoat recommended quantities for bilge lines and wells:

Recommended Quantities:

One jug of RBM BilgeCoat concentrate, when mixed with water, makes 200 litres of BilgeCoat solution.

Approx. 15 litres of BilgeCoat solution is poured down each sounding pipe, in each hold, prior to loading sulphur and after each flushing of the bilges during the voyage.

RBM recommends 1 Jug per hold, per week. Jug Size: 9.5" x 11.5" x 15" Weight: 41 lbs

Cleaning after carriage is important, since residues can create corrosive mixtures (sulphuric acid) and damage the steel structure in the holds.

Some sulphur is prilled before being shipped: that is, it is coated to block its corrosive effects; however, when the commodity is loaded, the prilling breaks down, exposing the raw sulphur. Prilling reduces the risk of corrosion but does not remove it.

Note: the safety precautions associated with the carriage of sulphur as set out in the IMSBC Code, including personal protective equipment and the extinguishing of lighting inside holds. A strict 'no smoking policy' should be in force on deck during carriage.

Although surveyors may check and inspect the holds before loading and comment on the limewash or hold block, it is the master's responsibility to ensure that the ship's structure is adequately protected.

7. FERTILIZERS

Granular fertiliser cargoes have been rejected – particularly in Australia and New Zealand – when even a few remnants of a previous grain cargo have been found on top of the bulk stow.
All fertilizers fall into one of below three categories:

- Oxidisers belonging to Class 5.1 (Type A);
- NPK/NP/NK fertilizers capable of self-sustaining decomposition belonging to Class 9 (Type B);
- Non-hazardous (Type C).

The cargo holds must be completely cleaned, washed, and rinsed with fresh water and be dry and free from previous cargo remnants. The hatches must be kept well maintained in good operating condition without any hydraulic leakages.

Rubber hatch cover seals, compression bars, coaming tables must be in clean and undamaged condition and inspected for their effective water tightness in seaway conditions.

All sources of heat must be kept away from ammonium nitrate-based fertilizers, regardless of their classification. Potential heat sources include heated double bottom bunker tanks, engine room bulkheads, light bulbs/cargo lights, heating systems, steam pipes, electric motors, live electrical cabling and naked flames.

Therefore, all lights and other heat sources in cargo holds should be switched off prior to loading and should remain off throughout the voyage so long as the fertilizer is on board.

Electrical circuits within cargo holds should be properly isolated while the cargo is on board. Welding or any other form of hot work that could affect the cargo should not be permitted while the fertilizer is on board.

Prevention of moisture pick up and caking: This may require covering bulk material with plastic sheets during storage or transportation and keeping storage buildings closed as much as possible to prevent ingress of moist air. Ventilation must be controlled under those conditions to avoid sweating.

8. WOODCHIPS

Woodchips are susceptible to contamination from excessive scale, cellulose material and carbon cargoes, such as coke and coal.

After loading

Certain cargoes, including fine mineral ores, silver sand and andalusite should be covered with plastic sheeting to protect them from any deposits that may not have been removed from the upper hold frames.

Before arrival

Weather and other conditions permitting, it is prudent to inspect the cargo before arrival at the discharge port. Small amounts of residue from the previous cargo can be dislodged from the upper frames.

9. COKE - General

There are various grades of coke. Some of these are not difficult to clean, while others can result in significant discolouring of the hold paint which may mean a failed hold inspection. Coke is a solid carbonaceous residue derived from low-ash, low-sulphur bituminous coal, from which the volatile constituents are removed by baking in an oven without oxygen at high temperature.

Coal-derived pitch coke (pencil pitch) is a high-purity carbon residue manufactured by the distillation (coking) of coal tar pitch from bituminous coal and can produce staining on the hold bulkheads. Calcined coke is a hard, brittle substance, shiny and oily in appearance, and rich in carbon with very low ash content.

Green delayed petcoke Green delayed petroleum coke, commonly known as petcoke, is a carbonaceous solid derived from the refining process of crude oil. This type of coke is high in carbon content and produces persistent staining of cargo holds. It is sometimes called green coke or raw coke.

Calcined petcoke is heated up to 2,000ºC, which removes almost all residual hydrocarbon and moisture. Cleaning after cargoes such as coke and calcined petcoke is less of a problem than pitch coke, which has some characteristics similar to those of green delayed petcoke. If loading petcoke that stains, the loading stevedores should be advised not to aim the coke via the loading chute

directly at the hold bulkheads. This will reduce the impact on the bulkheads and the amount of cleaning required.

Before loading

It should be remembered that in many ports, even petcoke inspections can be stringent. Specifications often require that the holds are clean, dried, and free of scale, loose rust and any other foreign materials or residue of previous cargo, whether on tank tops, bulkheads, hatch coamings or underside of hatch lids. Painting of the holds is typically not required, but surveyors will look for cleanliness, paint and rust blistering, cargo residues and potentially loose paintwork.

Slip coat are usually recommended to be applied on the cargo hold bulkheads as barrier prior loading petcoke. Mixture of which varies from different chemical suppliers.

Onboard cleaning equipment, including chemicals, can usually remove all the staining; however, the staining on the tank top may be more difficult to remove. Additional high-pressure cleaning with chemicals and brushing may be required.

After discharge

a. Sweep and muck out all residue.

b. Pre-wash the cargo hold with cold sea water.

c. Mix Aquatuff High Foam and fresh water to form a cleaning solution.

   Recommended mixing ratio is 1 part of Aquatuff High Foam to 3 - 9 parts of fresh water to form a cleaning solution.

   Note: If mixing with seawater, additional 25% of Aquatuff High Foam is required.

d. Try the cleaning solution on a small area first (i.e.1 m2), contact time is around 30 - 45 mins then wash down with fresh water. Adjust the concentration of the cleaning solution according to the cleaning results before start applying on all the cargo holds.

   i.e. If using 1 part of Aquatuff High Foam with 5 part of fresh water is not strong enough, then you may increase to 1 part of Aquatuff High Foam to 3 part of fresh water vice versa.

e. Apply the pre-mix cleaning solution with suitable cleaning equipment*. If used with a hand sprayer, apply Aquatuff High Foam undiluted on the surface, allowing 1 litre per 12 m2.

f. Allow the cleaning solution to have some contact time with the contaminants, effective time is depending on the temperature and moisture conditions the contact time can vary from 30- 45 minutes the surface remain wet.

g. Wash down with seawater before chemical dry up, should chemical dry up, apply chemical again for 5 mins contact then wash down and check the result.

h. Repeat the procedure if necessary.

i. Final rinse with fresh water.

10. COAL

The main consideration to keep in mind with coal is that it emits methane, an odourless, flammable gas which is less dense than air. This gas is emitted particularly if the coal has been freshly mined or if it is dropped into the hold when loading, causing it to break up. Thus, a risk of fire and explosion is always present on a ship carrying coal.

Coals may be subject to oxidation, leading to depletion of oxygen and an increase in carbo dioxide in the cargo space. Many classes of coal, including anthracite, are liable to spontaneous combustion if allowed to heat excessively.

Flammable and toxic gasses, including carbon monoxide, may be produced. Carbon monoxide is an odourless gas, slightly lighter than air and flammable limits in air of 12% to 75% by volume.

Some coals may be liable to react with water and produce acids which may cause corrosion. Flammable and toxic gases, including hydrogen, may be produced.

Before loading

a. Bilge wells should be cleaned, residual cargoes removed, suction tested and covered with taped down double wrapped burlap.

b. Hatch top wheels and associated equipment should be greased to ensure that no sparks are caused during opening and closing.

c. Electrical cables, cargo hold lights and any other electrical instruments within cargo holds should be checked for insulation damage to ensure that they are safe for use in an atmosphere containing explosive gases. On bulk carriers, as no lighting is needed, the fuses should be pulled to isolate electricity.

d. Ships that carry coal are required to carry instruments to measure:

   i. Methane, oxygen and carbon monoxide levels in cargo holds

   ii. cargo hold temperature (between 0-100°C)

   iii. the pH of bilge water.

Slip coat are usually recommended to be applied on the cargo hold bulkheads as barrier prior loading coal. Mixture of which varies from different chemical suppliers.

After discharge

Follow the same procedure as for the Coke above.

11. ALUMINA

Alumina is an oxide of aluminium, occurring in nature as various minerals such as bauxite, corundum, etc. It is used as an adsorbent, desiccating agent, and catalyst, and in the manufacture of dental cements and refractories. It may also be called aloxide, aloxite, or alundum depending on particular forms or applications. It occurs naturally in its crystalline polymorphic phase α-Al2O3 as the mineral corundum, varieties of which form

the precious gemstones ruby and sapphire. Al2O3 is significant in its use to produce aluminium metal, as an abrasive owing to its hardness, and as a refractory material owing to its high melting point. Synthetically produced aluminium oxide, Al2O3, a white or nearly colourless crystalline substance that is used as a starting material for the smelting of aluminium metal. It also serves as the raw material for a broad range of advanced ceramic products and as an active agent in chemical processing.

Alumina is produced after an expensive refining process and is white in colour. Any impurity in alumina can easily be seen with the naked eye. This impurity can further hamper the process of converting alumina into aluminium. Alumina is converted into aluminium in smelters. Aluminium is used to make your everyday pots and pans and also aircraft. Hence the need for cargo holds carrying alumina, to be very clean and free.

Before Loading

Cargo holds will be subjected to very strict hold cleanliness survey by shippers/charterers. Cargo holds shall be fresh water clean and it is imperative that any loose / blistering / hard rust scale, painted over rust scale, painted over unprepared surfaces, previous cargo residues, transferrable cargo residues staining, flaking / loose paint and / or any other contaminants are not identified or present in the cargo holds and on the undersides of their applicable hatch covers.

In addition, pay special attention within the following areas:

- **Hatch Covers / Trackways / Ledges**
  The leading edges of the hatch cover pontoons, cross-joints, drain channels, around the perimeter of the hatch cover (packing rubber / channel bar), cement loading ports (if any), within the ventilation recesses / inspection doors and on the underside of the hatch covers, all hatch cover track ways to be clean and free of all debris and contaminants.
- **Internal Coamings**
  Surveyor will check all corner ledges, cantilevers and plating, to be free of all / any visible contaminants.
- **Manhole Accessways & Void / Recess Areas (Fore & Aft)**
  Surveyor will check internal ledges, manhole covers and plating and all adjacent void / recess areas.
- **Underdeck Areas (Fore & Aft)**
  When standing on the upper resting platform / upper part of the hold access ladder, all ledges, beams, cantilevers, etc, to be free of all / any visible contaminants.
- **Bulkheads (Fore & Aft)**
  Surveyor will check behind and on the pipes, pipe brackets, protection bars/plates, within the corrugations, access ways / ladders, resting platforms, etc.
- **Lower Stools (Fore & Aft) – if applicable**
  Ensure that the surface plating is free of all flaky paint, loose / blistering rust scale and all other debris / contaminants, as mentioned above (including transferrable staining). Mechanical Score Marks and Blistering Rust Scale to be “Faired Smooth” with scrapers, but preferably with electric angle grinders, prior to any painting.
- **Port & Starboard Side Upper Hoppers**

Ensure that the surface plating is free of all flaky paint, loose / blistering rust scale and all other debris / contaminants (including transferrable staining).

- **Port & Starboard Flushed Side Plating**
  Ensure that the surface plating is free of all flaky paint, loose / blistering rust scale and all other debris / contaminants (including transferrable staining). Mechanical Score Marks and Blistering Rust Scale to be "Faired Smooth" with scrapers, but preferably with electric angle grinders, prior to any painting.
- **Port & Starboard Side Lower Hoppers (Hold Nos.1 & 5)**
  Please ensure that the surface plating is free of all flaky paint, loose / blistering rust scale and all other debris / contaminants (including transferrable staining). Mechanical Score Marks and Blistering Rust Scale to be "Faired Smooth" with scrapers, but preferably with electric angle grinders, prior to any painting.
- **Tank Top**
  Ensure that the surface plating, recessed man-hole covers, etc, are free of all loose and HARD RUST SCALE and all other debris / contaminants (including oils/grease spots and other transferrable staining).
- **Bilge Wells & Covers**
  To be clean, dry and odour free, with bilge well covers wrapped in hessian / similar material and set aside until after the inspection.

NOTE: No painting on unprepared surfaces is acceptable.


Blasting Grit on Cantilever of Hatch Cover Stiffener - Not Allowed

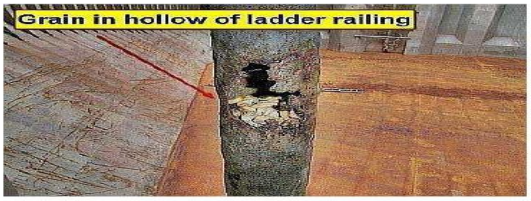

Rust on Hatch Cover

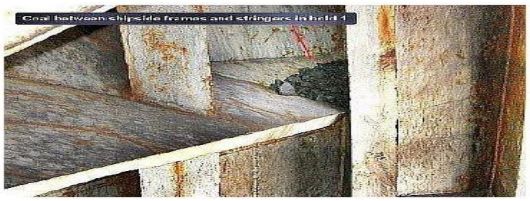

Coal Residue
(Not Allowed)

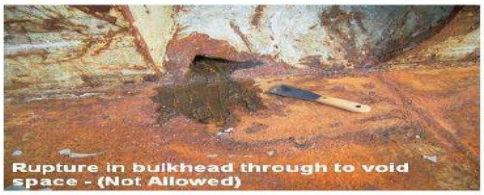

Coal Rub-Off
(Not Allowed)


Air-blowing cavity in siderail of ladder


Water caught in the siderail of ladder







After Discharge:

Normal Clean standard is acceptable.

12. MINERAL SANDS

Mineral sands are old beach sands that contain concentrations of the important minerals, rutile, ilmenite, zircon and monazite. These minerals are heavy and are also called 'heavy minerals'. The relative density of common sand minerals such as quartz is around 2.65. The heavy minerals found in mineral sands have a relative density of between 4 and 5.5.

The different minerals are mined and used for pigmentation in various products including cosmetics, paints, sunscreens, paper, textiles and plastics. Medically they are used in foodstuffs, pharmaceuticals and in pacemakers and hip replacements. This is due to its non-reactive qualities which make it safe for the human body. They are used in jewellery making, sports equipment, engineering applications, aerospace industry, and welding electrodes. The mineral zircon is used in the manufacturing of ceramics, tiles, dinner-ware, and other industrial and chemical industries.

Currently mineral sands are mined in Australia, China, India, South Africa, Namibia and South America. Australia is the largest producer as well as being the most eco-conscious in its operations with many sites devoted to redevelopment and revegetation of mined beaches.

Before loading:

Prior to the commencement of loading, the ship's holds will be surveyed by a qualified marine surveyor experienced in the composition of each type of Mineral Sand and the practical condition that will be encountered during loading, discharge and carriage by sea transport.

Conditions of cleanliness:

It should be clearly recognised that Mineral Sands are refined products and that any form of contamination is harmful to them.

Cargo residues:

The holds, including hatch covers, coamings, deck beams, side frames, frame brackets, horizontal surfaces, ventilator trunkings, ledge, grills, ladder flanges, pipe casings, spar ceiling and wood sheathing shall be free of all residues of previous cargoes.

It is particularly noted that cement, lime, salt, phosphates, sulphur and all ferrous residues are especially undesirable.

It should also be noted that the various types of Mineral Sands can be harmful to each other.

Rust scale:

All loose rust scale must be removed from the hold prior to loading, with particular attention being given to the undersides of the hatch covers, the coaming faces, the underdeck spaces at both ends of the hold, the undersides of the topside tanks, the inner surfaces of the ship's shell plating, the "hidden" flanges and the upper and lower frame brackets, the bulkheads, ladder flanges, ventilator trunkings, ledges, grills and the tank tops. In the case of Zircon, all hard rust scale must also be removed from the tank top, lower hopper sides and bulkhead areas.

Flaking paint:

All flaking paint must be removed from the hold prior to loading with particular attention to the areas mentioned under Rust Scale above.

General:

Where applicable, the outer/upper sides of the hatch covers should be clean and free from flaking paint, residues and/or loose scale which could fall into the hold during sea passage, loading and discharge operations.

The practice of painting over rust, residues and loose/flaking paint is not acceptable. No painting should be carried out within holds for Mineral Sands within 10 days before loading.

Bilge and wells:

Bilges and bilge wells must be covered with two thicknesses of hessian/burlap or similar permeable materials in such a manner as to prevent the entry of Mineral Sands into the bilge well, but to permit the entry of water. The hessian/burlap or permeable material must be sealed around the crown with a good quality marine adhesive tape.

Note: cement is not recommended.

Appendices

APPENDIX 1- HOLD CLEANING: CLEANLINESS GUIDE- CHANGING FROM ONE CARGO TO ANOTHER

Hold Cleaning Matrix for Change of Cargo

(Always check with cargo interest/characters for confirmation, and with IMBSC Code.)

Note: This is only a guide and masters and owners should check the charterers' and shippers' requirements. The end use of the product may require a higher state of cleanliness than normally expected. The list is not exhaustive- check with line IMSBC Code.

Key Y: Required
Key N: Not required

A. Hospital clean, or stringent cleanliness
B. Grain clean, or high cleanliness
C. Normal clean
D. Shovel clean
E. Load on top

Last Cargo	Next Cargo	Hold Cleaning		Remarks
		Washing	Sweeping	Cleanliness level : A:B:C:D:E
Coal	Coal	N	N	C/D. Check with characters
	Iron Ore	N	Y/ N	C. Check with cargo interest depends on amount of remaining cargo
	Bauxite	Y	Y	C. Check with characters
	Petcoke	N	Y	Check with cargo interests. Depends on amount of remaining cargo and the future use of the petcoke.
	Alumina	Y	Y	A. Clean to the highest standards
Mineral sands Ore/Coral/ Coke	Mineral sands	Y	Y	A/B. Clean to a high standard If after different cargo A. (Clean to a high standard)
Alumina	Alumina	Y/N	Y	C. Check with the cargo interests

Last Cargo	Next Cargo	Hold Cleaning		Remarks
		Washing	Sweeping	Cleanliness level: A:B:C:D:E
	Iron Ore	N	Y/N	D. Check with the cargo interests
	Coal	Y/N	Y/N	C. Check with the cargo interests. Depends on characters requirement.
	Bauxite	Y	Y	Check with the cargo interests.
	Petcoke	N	Y	Check with the cargo interests.
	Alumina	Y	Y	Requires careful sweep. A. Hospital clean.
Bauxite	Bauxite	Y	Y	Check with the cargo interests.
	Iron Ore	Y	Y	Needs to be careful swept.
	Coal	N	Y	Check with the cargo interests. Depends on characters requirement.
	Petcoke	Y	Y	
	Alumina	Y	Y	Requires careful sweep. A. Hospital clean.
Petcoke	Petcoke	N	Y/N	Check with the cargo interests.
	Iron Ore	Y/N	Y	D. Shovel clean. Check with the characters.
	Coal	Y/N	Y	
	Bauxite	Y	Y	Check with the cargo interests.
	Alumina	Y	Y	A. Hospital clean, check with cargo interests
Iron Ore	Grain	Y	Y	B. Grain clean
Coal		Y	Y	Character's requirements are important. Clean grain clean.
Bauxite		Y	Y	Character's requirements are important. Clean grain clean.
Petcoke		Y	Y	Character's requirements are important. Clean grain clean.

Last Cargo	Next Cargo	Hold Cleaning		Remarks
		Washing	Sweeping	Cleanliness level : A:B:C:D:E
Grain	Grain	Y	Y	Check with cargo interests.
	Coal	Y/N	Y	B. Check with cargo interests as sweeping and washing may be required.
	Potash	Y	Y	
	Phosphate	Y	Y	
	Sugar	Y	Y	Check with cargo interests. Check with charterers. NB. When loading at Richard's Bay, regardless of previous cargo, washing is needed because of strict hold survey
	Petcoke	Y	Y	Check with cargo interests
	Coal	Y	Y	C. Check with cargo interests
	Clement	Y/N	Y/N	C. Check with cargo interests
	Iron One	Y/N	Y/N	C. Check with cargo interests
	Coal	Y/N	Y/N	C. Check with cargo interests
	Petcoke	Y/N	Y/N	C. Check with cargo interests
	Salt	Y/N	Y	Clean limewash. Check with cargo interests.
Cement	Sugar	Y	Y	B/C. Check with cargo interests
	Fertiliser	Y	Y	B/C. Check with cargo interests
Sugar	Clement	Y	Y	A. Check with cargo interests

Note: The above table IS only a guideline. Masters should always check w1th cargo Interests as there may be commercial reasons why additional cleaning is required.

APPENDIX 2 -HOLD WASH CLEANING MATRIX- NON-GRAIN BULK CARGOES

CLEANING OPERATION	COAL		Coke				Ore		Corrosive		Others		
CHEMICALS	Bituminous	Antracite	Green Delayed Petcoke	Calcined Petcoke	Met Coke	Pitch Coke (pencil pitch)	Bauxite	Manganese	Sulphur	Salt	Lime	Clinkers	Clement
Alkaline cleaners	X	X	X	X	X	X	X	X	X			X	X
Acid cleaners													
Bleaching chemicals	X		X										
Paint Protectors	X		X			X	X	X	X	X		X	X
Equipment													
Chemical applicator	X	X	X	X	X	X	X	X	X		X	X	X
Water jets/Combi	X	X	X	X	X	X	X	X	X	X	X	X	X
Powerful water jets or Maxi-jet	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)	(X)		(X)	(X)	(X)
High pressure	X	(X)	X	(X)	(X)	X	(X)	(X)	(X)		X	X	X
Diaphragm pump	X	X	X	X	X	X	X	X	X	X	X	X	X
Protective equipment	X	X	X	X	X	X	X	X	X	X	X	X	X
Service compressor	X	X	X	X	X	X	X	X	X	X	X	X	X

APPENDIX 3 - CHEMICALS FOR HOLD CLEANING

14. WILHELMSEN[11]

PURE CHEMICALS	SYNONYMS	CLEANING AGENT
Ammonium Sulphate Ammonium Nitrate Barium Nitrate	Diammonium sulphate; Sulfuric acid, diammonium salt Nitric acid ammonium salt Barium dinitrate	Water Water Water
Diammonium Phosphate	Diammonium hydrogen phosphate, DAP, Phosphoric acid diammon iumsalt	Water
Mono Ammonium Phosphate	Ammonium dihydrogen phosphate, ADP, Ammonium phosphate & lliphosphate	Water
Muriate of Potash	Potassium chloride, potash muriate, Potassium monochloride, Sylvite	Water
Potash Salt Soda Ash	Potassium carbonate, Carbonate of potash, Pearl ash Sodium chloride, Rock salt, Saline Sodium carbonate, Soda, Disodiumcarbonate	Water Water Water
Sulphur	Sulphur, Brimstone, Flowers of sulphur, Flour sulphur Superphosphates, concentrated	Aquatuff High FoamO
Triple Superphosphate Urea	Carbamide, Carllonyldiamine	Water
ORES AND MINERALS	**SYNONYMS**	**CLEANING AGENT**
Anthracite	Hard Coal	Aquatuff High FoamO
Bauxite	N/A	Aquatuff High FoamO
Bentonite	Sodium montmorillonite	Aquatuff High FoamO
Chrome Ore	N/A	Aquatuff High FoamO
Clay	Kaolin, China Clay, Calcium magnesium carllonate, Dolostone, Dolomitic	Aquatuff High FoamO
Fluorspar	Calcium fluoride, Fluorite	Aquabreak PX
Iron Ore Pellets	N/A	Metalllrite HD
Iron Ore	N/A	Metalllrite HD
Limesand	N/A	Metalllrile HD
Limestone	Calcium carllonate	Metalllrite HD
Magnesite	Magnesium Carllonate	Metalbrite HD
Magnetite	Iron Black	Aquatuff High FoamO
Manganese Ore	Manganese Ore A	Aquatuff High FoamO
Zinc	N/A	Aquatuff High FoamO
Lead	N/A	Aquatuff High FoamO
Copper	N/A	Aquatuff High FoamO
Pyrite	Iron disulphide, Iron pyrite, Pyrox	Aquatuff High FoamO
Phosphate Rock	N/A	Aquatuff High FoamO
Quartzite	Silicone dioxide, Crushed stone	Aquatuff High FoamO
Talc	Keralite, Magnesium talc., Soapstone	Aquatuff High FoamO
Vanadium Ore	N/A	Aquatuff High FoamO
METAL ALLOYS ETC	**SYNONYMS**	**CLEANING AGENT**

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Luminum Dross	N/A	Aqua break PX
Ferro Alloys	N/A	Metalbrite HD
Granulised Slag	N/A	Metalbrite HD
Hot Briouetted Iron	N/A	Metalbrite HD
Magnesite (Deadburned)	Magnesium oxide	Metalbrite HD
Millscale – Iron Ore	N/A	Metalbrite HD
Pig Iron	N/A	Metalbrite HD
Inc Ashes	N/A	Aquabreak PX
Inc Dross	N/A	Aquabreak PX
Inc Residues	N/A	Aquabreak PX
COAL, PETCOKE AND PENCIL PITCH	**SYNONYMS**	**CLEANING AGENT**
Brown Coal Briquettes	Lignite brown coal briquettes	Aquatuff High FoamO
Calcined Petroleum Coke	N/A	Aquatuff High FoamO
Coal	N/A	Aquatuff High FoamO
Coke	N/A	Aquatuff High FoamO
Pencil Pitch	Coal tat pitch	Aquatuff High FoamO
Petroleum Coke	Petcoke	Aquatuff High FoamO
MISCELLANEOUS	**SYNONYMS**	**CLEANING AGENT**
Castor Beans	N/A	Aquatuff High FoamO
Copra Dry	N/A	Aquatuff High FoamO
Fish Meal	N/A	Aquatuff High FoamO
Peat Moss	N/A	Aquatuff High FoamO
Seed Cake (Solvent Extracted)	N/A	Aquatuff High FoamO
SoyaBeans	N/A	Aquatuff High FoamO
Sunflower Seed	N/A	Aquatuff High FoamO
Wheat	N/A	Aquatuff High FoamO
CEMENT AND FLY ASH	**SYNONYMS**	**CLEANING AGENT**
Cement	N/A	Metal Brite HD or Descaling Liquid
Cement Clinkers	N/A	Metal Brite HD or Descaling Liquid
Fly Ash	N/A	Aquatuff High FoamO

For low-foaming chemicals such as Aquabreak PX we strongly recommend the use of Foam Agent as a foaming additive.

1. Aquatuff High Foam can be replaced with regular Aquatuff and the Foam Agent if needed.
2. for Cement and Cement Clinkers choose Metal Brite HD or Descaling Liquid depending on how solidified the cargo residues are_ When working with acids always use personal protective equipment i_e_ Chemical resistant suite and a Filter mask.

15. MARICHEM

CARGO	SUGGESTED CLEANING PRODUCT		CHEMICAL SOLUTION	
			Butterworth	Sprayer
ANIMAL OIL	ALCACTIVE LIQUID or MARICLEAN DG-25		0,1 - 0,5 %	10 - 25%
AROMATIC EXTRACTS	TANK CLEANER-S or MARICHEM TTC		0,1 - 0,5 %	11 - 25%
ASPHALT	MARICHEM TTC		0,1 - 0,5 %	50 - 100%
BAUXITE	BAUXITE REMOVER			10 - 20%
BROWN COAL BRIQUETTES	ALCACLEAN H.D.			10 - 50%
BUTANOL	ALCACLEAN H.D.		0,1 - 0,5 %	10 - 50%
CEMENT	CEMENT REMOVER			10 - 40%
CEMENT CLINKERS	CEMENT REMOVER			10 - 40%
CHEMICALS & SOLVENTS	MARICLEAN DG-25		0,1 - 0,5 %	10 - 50%
CHLOROFORM	MARICLEAN DG-25		0,1 - 0,5 %	10 - 50%
CHROME ORE	ALCACTIVE LIQUID			10 - 50%
CLAY	ALCACTIVE LIQUID			10 - 50%
CRUDE OIL	MARPER		0,1 - 0,5 %	10 - 50%
COAL	ALCACLEAN H.D.			10 - 50%
CUMENE	TANK CLEANER-S or MARICHEM TTC		0,1 - 0,5 %	10 - 50%
DOLOMITE	LIME CLEANER			10 - 40%
ETHANOL	ALCACTIVE LIQUID		0,1 - 0,5 %	10 - 30%
FATS	ALCACTIVE LIQUID or MARICLEAN DG-25			10 - 30%
FATTY ALCOHOLS	TANK CLEANER or MARICLEAN DG-25		0,1 - 0,5 %	10 - 50%
FISH OIL	ALCACTIVE LIQUID		0,1 - 0,5 %	10 - 30%
FORMALDEHYDE	GENERAL CLEANING & SOLVENT		0,1 - 0,5 %	10 - 50%
FUEL OIL	TANK CLEANER-S or MARICHEM TTC		0,1 - 0,5 %	10 - 50%
GAS OIL	TANK CLEANER or MARICLEAN DG-25		0,1 - 0,5 %	10 - 50%
GREASE	OIL & GREASE REMOVER HD 999		0,1 - 0,5 %	10 - 50%
GYPSUM	LIME CLEANER			10 - 50%
HEAVY MINERAL OIL	ALCACLEAN H.D.			10 - 50%
IRON ORE	RUST REMOVER			10 - 50%
KEROSENE	MARICLEAN DG-25		0,1 - 0,5 %	10 - 50%
LIGHT MINERAL OIL	MARICLEAN DG-25		0,1 - 0,5 %	10 - 30%
LIME	LIME CLEANER			10 - 50%
LIMESTONE	LIME CLEANER			10 - 50%
LUBRICATING OIL	ALCACLEAN H.D.		0,1 - 0,5 %	10 - 50%
MANGANESE ORE	MARICLEAN DG-25			10 - 50%
MINERAL CONCENTRATES	ALCACLEAN H.D.		0,1 - 0,5 %	10 - 50%
ODOR REMOVER	ALCACTIVE LIQUID		0,1 - 0,5 %	2 - 5%
PARAFFINS	MARICHEM TTC		0,1 - 0,5 %	10 - 50%
PETROLEUM COKE (PET COKE)	MARICHEM P.C.S.			50 - 100%
POTASH	WATER			
SALT	WATER			
SOLVENT NAPHTHA	MARICLEAN DG-25		0,1 - 0,5 %	10 - 50%
SOYA BEAN OIL	ALCACTIVE LIQUID			10 - 50%
SULPHURIC ACID	WATER			
SUNFLOWER SEED OIL	MARICLEAN DG-25			10 - 50%
TOLUENE	WATER			
TURPENTINE	MARICLEAN DG-25		0,1 - 0,5 %	10 - 50%
VEGETABLE OIL	ALCACTIVE LIQUID/ALCACLEAN H.D.			10 - 50%

APPENDIX 4 - HOLD PREPARATION CHECKLIST

General

- hold bilge pumping and line arrangements understood
- standard and extent of hold cleanliness and preparation for the next cargo is known from charterers, shippers, owners, charterparty, IMSBC Code
- instructions from charterers are clearly understood
- ensure ship has sufficient water for a freshwater wash-down; additional freshwater can be taken in the fore or aft peak tanks. (A panamax bulk carrier requires about 20/25 tonnes of freshwater per hold for freshwater wash-down).

Pre-washing

- holds swept thoroughly after discharge of previous cargo and residues removed. Residues left on deck are kept covered to reduce dust and pollution risk
- holds and internal structures checked for damages
- bilge wells/strum boxes are cleared of cargo spillage. Bilge cover plate fitted in good order
- hold bilge sounding pipes and temperature pipes are free of debris
- do not wash holds where adjacent holds are not free of cargo, or if the bulkhead in the adjacent hold is not clear of cargo (as there is a potential risk of water damage/ingress)
- the bilge line to be blanked off from the engine room for holds with cargo during washing
- bilges of holds with cargo to be sounded frequently during washing
- before pumping out bilge water, ensure MARPOL and local regulations are not violated
- fixed fire extinguishing lines should be flushed out with air to remove dust and residues

Post-washing

- the non-return valves in the bilge well are to be checked and operational
- bilge wells should be dry. Strum box and bilge cover plate should be clear and secured
- bilge cover plate should be covered with burlap and secured
- open and inspect the valve/seat of each hold bilge valve in engine room and ensure it is free of cargo residues and debris
- open and inspect main bilge line valve in engine room and ensure it is free of cargo residues and debris
- ensure all valves on the hold bilge line are effectively shut to prevent water ingress into holds from fire and general service pump, ballast and eductor pump, etc. Valves should be closed, with measures in place to ensure that they stay closed (visible signs)

- ensure that all manhole lids on the hold tank top and ballast line blanks in ballast hold are watertight and oil-tight
- ensure that ballast well manhole and ballast line blanks are tight
- ensure that high-level bilge alarms are operational
- ensure that the stool spaces are drained of water. (Stool spaces may contain water in ballast hold through cracks in stool bulkhead). Ensure that stool manhole lids are closed tight
- ensure that connection pipe and ballast trunking from top-side tank to double bottom are not leaking into hold
- ensure that the gland packing of extended spindles for double bottom tank valve passing from top-side tank through cargo hold into double bottom are free of leaks

Cleanliness/preparation – specific cargo may require additional measures

- remove all previous cargo residues, loose rust and scale. Ensure that loose rust on under-side of hatch covers is removed
- after salt water washing, final rinse should be with freshwater.
- Wash holds with freshwater alone if required by the charterparty or for the type of cargo
- check for hairline cracks on internals and plating after the holds are washed and cleaned
- ensure that holds are ventilated and dried. The hold should be inspected very closely for infestation, especially when grain and grain products are to be loaded
- carry out a hose test of hatch covers and access hatch covers and vents before loading
- check ventilation systems and their closing arrangements
- on completion, the chief officer should inspect the hold to ensure its condition is satisfactory in all respects for loading
- the master should inspect the holds for confirmation of cleanliness prior to presenting the holds for survey
- hold bilges should be sounded daily at sea, weather permitting – the responsible officer should monitor this
- bilges must be pumped out dry as required
- bilge sounding/temperature pipes must be closed watertight

Prior to loading

- confirm that everything meets the requirements of charterers and shippers

After loading

- avoid carrying ballast in double bottom and top-side tank in way of holds with cargo, unless unavoidable, for example, for stability reasons
- ventilate the cargo hold as necessary. Compare the dew point of the hold and of the outside air to avoid damage from ventilation
- fuel in tanks in way of cargo holds to be managed. Fuel oil heating in tanks in way of cargo holds should not exceed 5ºC above the required transfer temperature
- monitor and record the fuel oil temperature

A clean hold – hospital clean