Koba Lortkiphanidze

CHEMICAL TANKER MARINE HANDBOOK

PART I

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INTRODUCTION

Present book is written and designed to provide guidelines about the basic work mainly on chemical tanker, which is prepared basically on board, topics are taken from author's personal professional experience and are in consistency with international regulations.

The information provided in this book is mandatory and minimum knowledge of technology, for seafarers work on chemical tanker.

Book consist of practical and theoretical exercises which will assist officers/trainees to learn basic technology to work on chemical tanker.

Book prepare for easy understanding especially for beginner in this field.

Based on author's decision Chemical Tanker Marine Handbook is divided in three parts. This first edition (Part I) covers the procedure of the tank cleaning and wall wash after various grades.

Next two editions will include the calculation of various cargoes, Knowledge of the deeply safety on chemical tanker, pipelines, stress of the vessel during loading of the various grades, Loading computer and documentations.

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1. Definitions of some important points

Chemical Tanker - chemical tanker is the tanker to designed transport the chemical in bulk as there are mention Marpol Annex-II “NLS” any chemical listed in chapter-17 and 18 as well as to carrying petroleum products.

Chemical tanker Type 1 - Tankers designed to transport products with very serious environmental and safety hazards requiring maximum preventive measures to prevent any leakage of cargo.

Chemical tanker Type 2 - Tankers designed to transport products with appreciably severe environmental and safety hazards requiring significant preventive measures to preclude an escape of such cargo.

Chemical tanker Type 3 - Tankers intended to transport products with sufficiently severe environmental and safety hazards to require a moderate degree of containment to increase survival capability in a damaged condition.

MSDS - Material safety data sheet, this is one of the important documents for carrying any cargo, all cargo has its own MSDS which is very important that all crew members deeply read and understood before handling of various cargoes, where clearly pointed all following information; what measures should be taken in case of fire, what environmental and fire hazard and handling procedure as well as all safety precaution, etc.

SOF - Statement of fact/Timesheet, all documented timing during stay in port.

LOP – Latter of Protest (LOP is the document issue by Master in various fact examples; any delays after NOR, less or more of cargo, slow loading or unloading/restricted rate, not provide some information, etc. and holding the other party responsible for any consequences of the matter being complained about.

NOR - Notice of readiness (NOR is documents issue by the master concern to all parties that vessel is ready with every respect for loading / unloading.

IBC Code - International Bulk Chemical Code (IBC code applicable chemical tanker build after 01 July 1986)

BCH Code - Bose Chaudhuri Hochquenghem Code (BCH Code applicable chemical tanker build before 01 July 1986)

COF - Certificate of Fitness, this is one of the main certificate for chemical tanker which is issued by flag administration who is approved that arrangement and materials, structures, equipment, fitting are in compliance with IMO IBC code.

Wall Wash – one of the important method/procedure is correct collection of wall wash from the tank after unloading specific cargo, meaning of wall wash is spraying of specific grade methanol on bulkhead and recovered/collect the liquid from each tank in well clean separate sample bottle for analysis.

PPE - Personal protective equipment, basic Examples are as follows:

Safety Hemet - Head Protection

Safety Ear Muff /Safety Ear Plug - Hearing protection

Safety Goggles - Eye protection

Safety face shield - Face protection

Safety Coverall/Safety Uniform - Body Protection

Safety hand Gloves - Hand Protection
Safety Shoes - Protective footwear
ROB - Remaining on board: The materials remaining In vessel's cargo tanks, void spaces, and pipelines after cargo unloading. That is include any combination of water, oil, slops, oil residue, oil / water emulsions, and sediment.
TCV - Total calculation volume; The total volume of all petroleum liquids and sediment and water.
VEF - Vessel Experience factor; A compilation of the history of the total calculation volume vessel measurements, adjusted for on-board quantity or remaining on board compared with the shore measurements.
Trim - The condition of a vessel with reference to its longitudinal position in the water. It is the difference between forward and aft drafts and is expressed by the head or by the stern.
Trim Correction - The correction applied to the observed gauge or observed volume when a vessel is not on an even keel, provided that the liquid is in contact with all bulkheads in the tank, correction for trim may be made by referencing trim tables for each tank or by mathematic calculation.
Ullage gauge (or outage): - the measured distance from the cargo liquid surface to the reference point.
Slops - Oil, Oil/Water/Sediment, and emulsions contained in slop tank or designated cargo tanks, the mixture usually results from tank stripping, tank washing, or dirty ballast phase separation.
Load on Top - Defined as both a procedure and practice.

-Practice: Load on top is the act of commingling on board quantity with cargo being loaded.
- Procedure: Load on top is the shipboard procedure of collecting and settling water and mixtures, resulting from ballasting and tank cleaning operations (Usually in a special slop tank or tanks), and subsequently loading cargo on top of slops and pumping the mixture ashore at the discharge/Unload port.

First-Foot Sample - if first foot sample is required, it should be taken when approximately 1ft (0.3 m) of cargo has been loaded into the tank, A sample is then drawn from the tank.
The someplace should be examined or tested or determine conformity with cargo specifications, if the sample indicates potential contamination, no additional cargo shall be loaded into the tank until the problem is solved.
Sea Valves - Confirm in the presence of the vessel's personnel that sea valves and overboard discharge valves are in the closed position and sealed before loading commences. Seal valves to the extent possible, so as to be able to determine whether they were used during loading, accordingly, Record the seal number.
Bill of Landing - When the Bill of Landing and vessel volume are compared, any discrepancies among the Gross Standard Volume, Net Standard Volume, Density, Temperatures, and/or any other specification should be investigated and brought to the attention of appropriate interested parties.
Time Log: -Report on a time Log the time and date of the main loading events, Include the time and description of any unusual occurrences in the appropriate column of the time Log.

Letter of Protest -If any problems occur that could affect subsequent procedures at any stage of the transfer, all key persons involved should be notified promptly so that corrective action can be taken, any action of refusal to act contrary to this procedure or specific prior contract agreements must be reported to the persons concerned and may be documented by the issuance of a Letter of protest.

Key Meeting - Before discharge/Load begins, one or more meeting should be held among cargo inspections, vessel representatives, and shore operation personnel who will be involved in the discharge operation, at these meetings, Key operational people are identified, responsibilities and defined, communication procedures are arranged, and everyone concerned reviews discharge procedures and plans to ensure a full understanding of all activities.

Check with the vessel's representative for report of any unusual events that might have occurred during the sea passage or at the previous port and that may require special vigilance during cargo operation, check with shore personal to ensure that no special conditions exit on shore that may adversely affect the cargo operation or measurements, A Letter of Protest should be issued to any party failing to comply with recommended procedures.

Notice of readiness / NOR - Notice of readiness is one of the important documents which is issued by the ship's captain,

As soon as NOR is issued it means that ship is ready with all respect for cargo operation (For Loading and unloading of their Cargo / Goods.

The Notice of readiness is the Master's Notification to the charterer's representative at the port / Ports of loading and unloading that vessel's cargo.

It is important that the Notice of readiness is received by the intended receipt and at the right time.

Notice of readiness is required lay time to start, Lay time is the time that has been agreed and allocated to the charterer for loading and unloading the cargo.

If loading and unloading and otherwise time counting for charterer's account exceeds the lay time, then the vessel is "on demurrage" and "demurrage" is payable from the charterer to the owner under the voyage charter party.

Ready Ship:

(There are main criteria for ready ship as follow)

- Geographically ready
- Formally ready
- Physically ready

Geographically ready (Arrival vessel) - Meaning of the geographically ready an "Arrival ship" vessel must have arrived at loading or unloading port and / or berth, a port means in this case main an area, within which the vessels load at the loading or unloading port whether at the berth, anchorage, buoy, where wait for their turn, are ordered to or obliged to wait.

Formally ready (Arrival vessel) - Meaning of the formally ready being an "arrived ship" vessel should be ready refers to "paperwork" have relevant certificate in good order and have obtain port clearance without fail.

One of the point can considered if free pratique is not granted within six (6) hours after NOR tendered. A Letter of protest should be issued to the port authority or similar for
this delay. Additional one of the important point ship's Management Team "Ship's Captain" should be pay attention charterer instruction in case of the special instruction had received about the Free pratique delay, issue of the LOP, retender of the NOR, accordingly should be follow as per charterer Specification and requirement.

Practically we can meet various charterer with various requirement. Lay time will not commence until free pratique is granted.

Physically ready (Arrival vessel) - Physically or practically ready to load or unload the cargo for which the notice of readiness shall be tendered, Notice of readiness shall be tendered for loading the cargo tank must be empty for inbound cargo and in all respect clean and ready for loading.

CDI / Chemical distribution institute - CDI is one of the inspection which is conducted by external party for chemical tanker every year by CDI inspector, currently consist of 70 international chemical companies.

There are accreditation of inspectors and auditors to provide proper inspection and audit report, which been created in 1994 by the chemical industry for the chemical industry. Purpose for inspection is to improve on chemical tanker security, safety, quality performance, storage of the chemicals, compliance for the ship's crew rest of hours, housekeeping, recordkeeping, food rations on board, knowledge of the crew, etc.

2. Instruction how to plan and prepare stowage plan on chemical tanker, Verification of the IBC Code requirements

Officer in charge should well aware following points / Factors to be prepare effective and safe stowage plan which will be easy to use for cargo operation (Load, Unloading) Etc.
stowage review and final approval done by the Master.
Factors/Main important points should be taken into consideration but not limited as follow:

- P & A Manual / The procedure and arrangement manual to be check and accordingly.
- IBC Code
- Compatibility chart
- Port draft restriction
- Load line restriction
- Ship's Stability
- Certificate of fitness

Each chemical tanker should have approved by administration PROCEDURE AND ARRANGMENT MANUAL
(P & A Manual applicable for chemical tanker only, each chemical tanker should have her designated P & A Manual ship's specific guideline)
You need ship's specific guideline / P & A Manual to load and unload the Chemical (Cargo).
You should be comply in all case Marpol Annex-II.
You can see also in P & A Manual main theory instruction of the Marpol Annex- II and requirement for compliance.

Pipeline diagram with size and maximum allowable pressure.
Capacity of the pump, Limitation if any and restriction, Unloading and stripping procedure.
Ballasting and DE ballasting procedure.
Prewash procedure, tank cleaning machines.
NLS / Noxious Liquid Substances carried in bulk-controlled pollution Annex II cargo NLS.
1987 on 06th April MARPOL Annex II came in force (Control of pollution by noxious liquid substances in bulk).
IBC code is one of the Main Manual / Book where in Chapter 17 listed each product and they carriage requirements.

MARPOL Annex II divided into 4 / Four categories as follows:

1. Category X: Noxious liquid substances which, if discharged into the sea from tank cleaning or DE ballasting operations, are deemed to present a major hazard to either marine resources or human health and, therefore, justify the prohibition of the discharge into the marine environment.
2. Category Y: Noxious liquid substances which, if discharged into the sea from tank cleaning or DE ballasting operations, are deemed to present a hazard to either marine resources or human health or cause harm to amenities or other legitimate uses of the sea and therefore justify a limitation on the quality and quantity of the discharge into the marine environment.
3. Category Z: Noxious liquid substances which, if discharged into the sea from tank cleaning or DE ballasting operations, are deemed to present a minor hazard to either marine resources or human health and therefore justify less

stringent restrictions on the quality and quantity of the discharge into the marine environment.

4. Other substances: Substances indicated as OS (Other substances) in the pollution category column of chapter 18 of the International Bulk Chemical Code which have been evaluated and found to fall outside category X, Y or Z, at present, considered to present no harm to marine resources, human health, amenities or other legitimate uses of the sea when discharged into the sea from tank cleaning or DE ballasting operations. The discharge of bilge or ballast water or other residues or mixtures containing only substances referred to as ‘‘Other Substances’’ shall not be subject to any requirements of the Annex.

We shell discuss parallel with P & A Manual how to read the IBC Code / Manual minimum requirement (Please see IBC Extract on Page 30)

(Column a) Means Product Name

- Full product name.

(Column c) Pollution category

- (Under MARPOL Annex II “X, Y, Z”)

(Column d) Hazard if it is indicating that “S” – Safety hazard.

- Normally safety hazard means unsafe working condition which can cause injury, illness, etc.

Hazard if it is indicating that “P” – Pollution hazard.

- Pollution hazard means an environmental hazard which can be potential hazard for natural environment

Hazard if in column include both “S/P” Means product its Safety and pollution hazard.

(Column e) Ship's Type

1: Ship type 1
2: Ship type 2
3: Ship type 3

Meaning of the Ship type 1

- Ships Type 1 Means chemical tanker intended to transport of the product as per chapter 17 IBC Code which required maximum preventive measures avoid and escape of such cargo.

Meaning of the Ship type 2

- Ships Type 2 Means chemical tanker intended to transport of the product as per chapter 17 IBC Code which required significant preventive measures avoid and escape of such cargo.

Meaning Ship type 3

- Ships Type 2 Means chemical tanker intended to transport of the product as per chapter 17 IBC Code which required moderate degree of containment to increase survival capability in a damaged condition.

(Column f) Tank Type **1: Independent tank**
2: Integral tank
G: Gravity tank
P: Pressure tank

Meaning of the - Independent tank

Independent tank means which not essential to the structural completeness of the ship's hull.

Meaning of the - Integral tank

Integral tank means that tank which tank structural part of the vessel's hull and is influenced in the same manner and by the same loads that stress the adjacent hull structure.

Meaning of the Gravity tank

Gravity tank Means that tank which by design of the tank pressure more than 0.07 MPa gauge at the top of the tank, a gravity tank may be independent or integral.

Meaning of the Pressure tank

A tank in which a liquid or gas is stored under pressure greater than atmospheric.

(Column g) Tank vent Cont.: Control venting

Open: Open venting

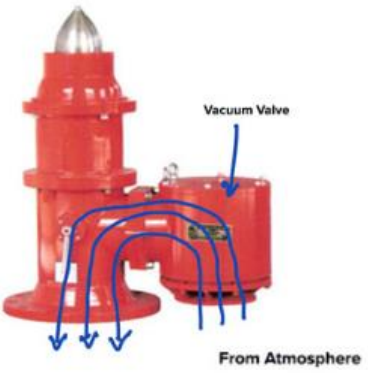
PV Valve – Pressure vacuum Valve

This is the arrangement on tanker which allow to release the pressure from tank or to allow the air to go down into the tank from atmosphere.

For more understanding if we are removing cargo from tank space accordingly should be filled with air or inert gas it is depends of the cargo.

Introduced PV valve and working principle on bellow picture

From Cargo Tank



To Cargo Tank

Cont.: Control Venting

Control venting system is required – Each tank must be fitted control venting system PV Pressure vacuum valve to relive over-pressure or under-pressure.

Open: Open Venting

Open venting system can use where cargoes are very slight / Little or no flammable and no toxic hazard.

(Column h) Tank environmental control

Inert: inerting

Pad: liquid or gas padding

Dry: drying

Vent: natural or forced ventilation

No: no special requirements under this Code (inerting may be required under SOLAS)

Inert: inerting

Inerting is the process to minimize the oxygen level in a given space.

Mainly oxygen level reducing in the tank called inerting.

Any tank reduced the oxygen content less than 8% by volume is inerted condition.

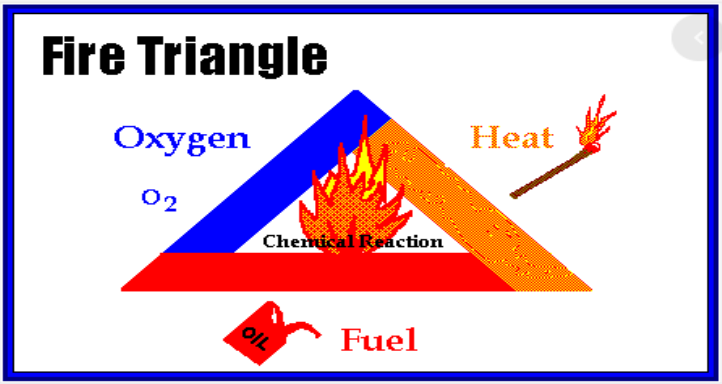
We should know fire triangle three main elements there are Oxygen, Heat and Fuel, additional chemical reaction when all element are present actually we have fire if we remove one of the element fire will be extinguished.

As we know when no enough of the oxygen no fire will take place.

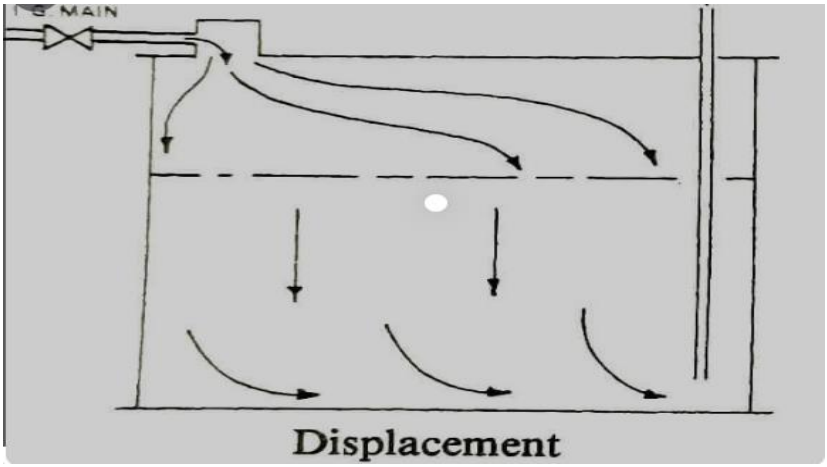
Inert gas is heavier 1.38 times than air.

When planning to load flammable cargo or tank is load by flammable cargo it is required to reduce the oxygen in the tank less than 8% by volume, operators should ensure that inert gas supply in the main line to the tank is not more than 5% by volume.

To conduct the inerting of the cargo tank can use different method of inerting mainly used displacement/Dillution and cascade method.



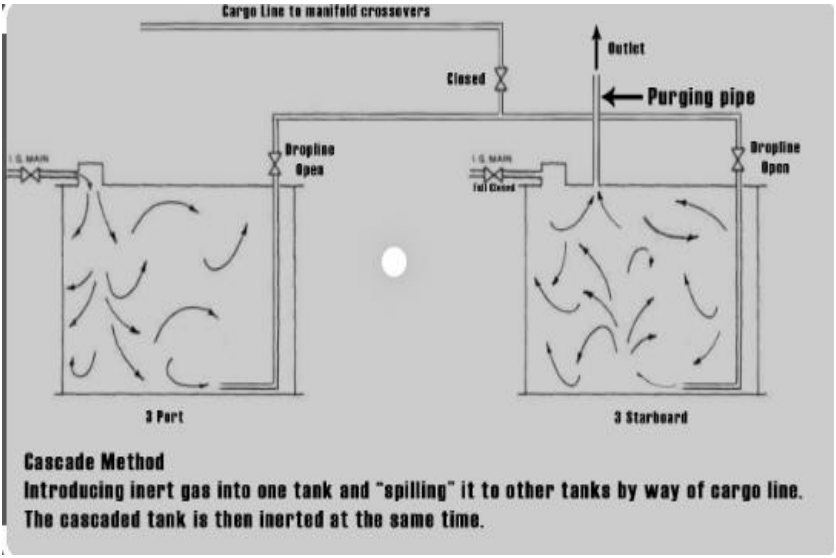
Method No.1 normal method of inerting of the cargo tank displacement / Dilution method.



Displacement

Method No.2 Cascade method used to reduce the time for inerting.

Example as shown on the diagram COT; 3P and by cargo piping flow will go into the COT; 3S and then out, in this case supply IG line will conduct inerting two tanks together / same time so we can save time if our pipe arrangement has set accordingly in advance and correctly.



Pad: liquid or gas padding

For understanding Blanketing and padding is same for Chemical tanker that is used normally to maintain positive pressure in the tank which is loaded (Have cargo) to prevent the ingress of air or water and to prevent dangerous reaction / damage mainly between of cargo and air (to avoid air reaction with cargo, to avoid to damage the cargo. (there is some cargo which can react with air).

Blanketing / padding done by Nitrogen system / N2.

Chemical tanker can fit also only by N2 system (Installed N2 generator only) so N2 system can use for inerting for blanketing for stripping of cargo line and line cleaning.

Dry: drying

Dry: The cargo tank and associated piping systems are filled with moisture-free gas or vapour, with a dew point of -40°C or below at atmospheric pressure, and then maintained at that condition.

There is system which is called dehumidifier on chemical tanker for drying of the cargo tank and associated pipe lines same system and additional portable blowers are used for ventilation of Vent:

Natural or forced ventilation The cargo tanks.

Ventilation: Cargo tank ventilation required to keep into the tank sufficient oxygen for personal entry. Similarly, ventilation may be needed to remove poisonous and flammable gases which could give rise to a dangerous situation.

Electrical equipment (column i)
Temperature classes (i') T1 to T6
-indicates no requirement
blank no information
Apparatus group (i'') IIA, IIB or IIC:
indicates no requirements
blank no information

Flashpoint (i''')
Yes: flashpoint exceeding 60°C (10.1.6)
No: flashpoint not exceeding 60°C (10.1.6)
NF: non-flammable product (10.1.6)
Flashpoint; IMDG Code defined of cargo flashpoint that is the lowest temperature of the liquid at which its vapour to form flammable mixture with air, Flash point is calculated by heating a liquid slowly and then a spark is applied to the surface of the liquid.
Flashpoint: there is regulation under IMDG code and defined liquid with flash point below 60 Celsius digress will be classified as Class 3 dangerous Goods FLAMMABLE Liquids.
By OSHA regulation says materials with flash points below 100 ◦ F (38 ◦ C) are regulated as potential workplace hazard.

Flammable liquid sign

(Column j) Gauging

O: open gauging (13.1.1.1)

R: restricted gauging (13.1.1.2)

C: closed gauging (13.1.1.3)

O: open gauging

Open gauging - Method used for gauge the cargo tank open condition for example gauge by hatch, ullage hole, etc. this is the process to measure liquid height of a storage tank.

R: restricted gauging

Restricted gauging- Method used for gauge the cargo tank through and open but limited size which is restricted opening to prevent the release of cargo vapors from the tank vapor space.

This is the process to measure liquid height of a storage tank.

C: closed gauging

Close gauge; Method used for gauge the tank where does not have any opening through which cargo vapor or liquid can escape. This is the process to measure liquid height of a storage tank.

(Column k) Vapour detection

F: flammable vapours

T: toxic vapours

No: indicates no special requirements under this Code

F; Flammable Vapours

Flammable Vapour; There is device which is can be used to detect combustible, flammable, toxic oxygen etc., A gas detector can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave.

This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals.
Toxic Vapours - Drager Tubes or Gastec Tubes are used for measuring of the toxic gases in space and in different condition. Each tubes have their procedure of the use, for example leak test of the device, tubes braking procedure, his stroke etc, we shall be familiar tubes and device using procedure before use to verify of the correct reading of the toxic vapour if present in different space where required to use.

Example - Drager with tubes

Example - Gastec with tube

As normally planned any toxic cargo to carry the vessel should be request by sip's stuff toxic tubes and to be kept in readiness all measurement equipment and tubes for use whenever required.

(Column I) Fire protection

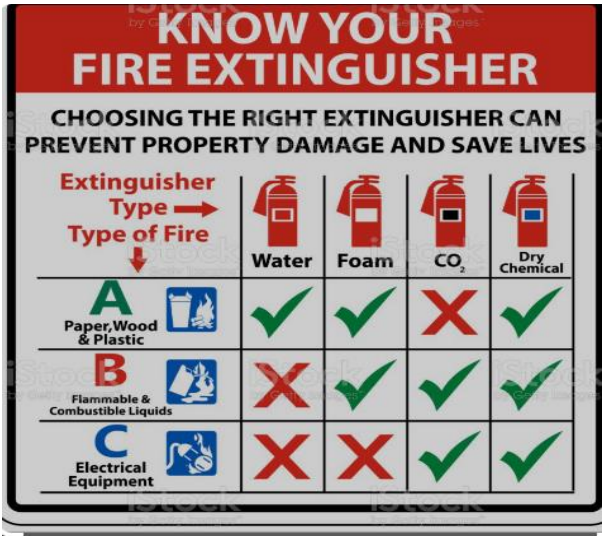
A: alcohol-resistant foam or multi-purpose foam
B: regular foam; encompasses all foams that are not of an alcohol- resistant type, including fluoro-protein and aqueous film-forming foam (AFFF)
C: water-spray
D: dry chemical
No: special requirements under this Code

A: alcohol-resistant foam or multi-purpose foam

Alcohol resistant foam are especially effect for to extinguished flammable hydrocarbon and polar solvent fires.

B: regular foam; encompasses all foams that are not of an alcohol- resistant type, including fluoro-protein and aqueous film-forming foam (AFFF)

AFFF film prevents foam breakdown by alcohols in the burning liquids, the water contained in the foam solution provides a cooling effect for faster fire.



C: water-spray - Water spray fights fire efficiently in multiply way, it is including by cooling the heat, displacing oxygen, and wetting fuel sources, Systems used normally high-pressure water mist have considerable benefits compared to conventional sprinkler systems.

D: dry chemical - Dry chemical fire extinguisher is class D fire extinguisher which is used on combustible metals, such as magnesium, titanium, sodium, etc.,

(Column n) Emergency equipment

Yes: see 14.3.1

No: no special requirements under this Code

Code under emergency equipment definition which equipment are mandatory requirement can find as section will be indicated IBC code.

(Column 0) Specific and operational requirements

When specific reference is made to chapters 15 and/or 16, these requirements shall be additional to the requirements in any other column

This special requirement should be thoroughly find out and accordingly should be complied during stowage planning.

Below is example which is shown for introduction of the IBC code;

Some cargo can have along with product name his footnote in column of the product which we can find in Foonote to product 17 with definition of the each footnote.

IBC Extract

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Glycerol propoxylated	Z	S/P	3	2G	Cont	No	–	–	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6
Glycerol, propoxylated and ethoxylated	Z	P	3	2G	Open	No	–	–	Yes	O	No	ABC	No	
Glycerol/sucrose blend propoxylated and ethoxylated	Z	P	3	2G	Open	No	–	–	Yes	O	No	ABC	No	
Glyceryl triacetate	Z	P	3	2G	Open	No			Yes	O	No	AB	No	
Glycidyl ester of C_{10} trialkylacetic acid	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6
Glycine, sodium salt solution	Z	P	3	2G	Open	No			Yes	O	No	A	No	
Glycolic acid solution (70% or less)	Z	S/P	3	2G	Open	No	–	–	NF	O	No	No	No	15.19.6, 16.2.9
Glyoxal solution (40% or less)	Y	P	3	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9
Glyoxylic acid solution (50% or less)	Y	S/P	3	2G	Open	No	–	–	Yes	O	No	ACD	No	15.11.2, 15.11.3, 15.11.4, 15.11.6, 15.11.7, 15.11.8, 15.19.6, 16.2.9, 16.6.1, 16.6.2, 16.6.3
Glyphosate solution (not containing surfactant)	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6, 16.2.9
Groundnut oil	Y	P	2(k)	2G	Open	No	–	–	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Heptane (all isomers)	X	P	2	2G	Cont	No	T3	IIA	No	R	F	A	No	15.19.6, 16.2.9
n-Heptanoic acid	Z	P	3	2G	Open	No			Yes	O	No	AB	No	
Heptanol (all isomers) (d)	Y	P	3	2G	Cont	No	T3	IIA	No	R	F	A	No	15.19.6
Heptene (all isomers)	Y	P	3	2G	Cont	No	T4	IIA	No	R	F	A	No	15.19.6
Heptyl acetate	Y	P	2	2G	Open	No			Yes	O	No	A	No	15.19.6
1-Hexadecylnaphthalene / 1,4-bis(hexadecyl)naphthalene mixture	Y	P	2	2G	Open	No			Yes	O	No	AB	No	15.19.6, 16.2.6
Hexamethylenediamine (molten)	Y	S/P	2	2G	Cont	No	–	–	Yes	C	T	AC	Yes	15.12, 15.17, 15.18, 15.19, 16.2.9
Hexamethylenediamine adipate (50% in water)	Z	P	3	2G	Open	No			Yes	O	No	A	No	
Hexamethylenediamine solution	Y	S/P	3	2G	Cont	No			Yes	R	T	A	No	15.19.6
Hexamethylene diisocyanate	Y	S/P	2	1G	Cont	Dry	T1	IIB	Yes	C	T	AC(b) D	Yes	15.12, 15.16.2, 15.17, 15.18, 15.19
Hexamethylene glycol	Z	P	3	2G	Open	No			Yes	O	No	A	No	
Hexamethyleneimine	Y	S/P	2	2G	Cont	No	T4	IIB	No	R	FT	AC	No	15.19.6
Hexane (all isomers)	Y	P	2	2G	Cont	No	T3	IIA	No	R	F	A	No	15.19.6

3. Basic preparation for tank cleaning on chemical tanker

It is important and mandatory to be with caution during preparation of tank cleaning and during tank cleaning, Mainly chief officer is in charge to prepare vessel for tank cleaning and get equipment/tools/system ready for tank cleaning and agree plan with master.

There should be carried out as follows;

• Agreed with master and prepare plan

Chief officer should consult with master about the planning of tank cleaning, all necessary details to be reported and get the plan ready/documented and approved by master with sign.

It is very important that without master approved tank cleaning should not be start in any case.

All suggestion/instruction/advice received by master must be write down, include in tank cleaning plan re-checked all of them and follow up accordingly.

• Equipment/Tools/System should be tested before to use.

There are many Equipment/Tools or system which should be check thoroughly and tested before the use,

it can work many years but can be one-day stop working when you need and can get failed with tank cleaning or can get improper result.

• Tool box meeting

A Toolbox Talk/Meeting is discussion that focuses on a particular safety issue with group. safety culture as well as to facilitate health and safety discussions on job sites.

• Risk Assessment

Identify Risk/Hazard – determine appropriate way to eliminate the Hazard or well control the risk.

Main purpose of risk assessment is to minimize the risk to minimum as much as possible.
There are four categories of Risk
Very High Risk (VH): Risk is uncontrollable.
High Risk (H): Need authorization to proceed the job.
Medium Risk (M): Need continue the control the risk during the job.
Low Riks (L); Risk is low, No future action is required.

• Verify vessels location "should be complied with proper Marpol regulation"

There are very important to verify Topic about the Marpol requirement which is mandatory for chemical tanker whether can be carried out or no tank cleaning according vessel's location.

The Marpol Annex-II (NLS-Noxious liquid substances) prohibited to discharge into the sea. Except if various criteria are follow and complied such are:

- The discharge is not done in the special areas specified under the regulation. (Special area for Marpol Annex-II is Antarctic Area South of Latitude 60 Digress of south)
- Speed for self-propelled ships during the discharge must be at least 7 knots and 4 knots for ships that are not-self-propelled.
- The ship must be proceeding en-route.
- A maximum quantity of a noxious substance per tank to be discharged in diluted form (from tank cleaning or de-ballasting operations).
- The minimum distance from the nearest land; at least 12 nautical miles from the nearest land.
- A minimum sea depth 25 Meters needs to be maintained in order to start discharge and any specific need to discharge it below the waterline.

- For ships constructed before 2007, it is not mandatory to discharge the contents of ballast water or tank washing below the waterline for tanks containing the noxious liquid substance of the Z category.

Further before the actual discharge procedure or a prewash is carried out in accordance with this regulation all the tanks needs to be fully emptied. This includes procedure like using dedicated cargo tanks to load ballast water, tank washings etc. For each discharge that is carried in accordance with this regulation all records are to be kept and Procedures and Arrangements Manuals to be properly followed.
Chemical tanker is different with oil have a Procedure and arrangement Manual (P & A manual) and Cargo Record Book. IBC code new amendment in force from January 2021 which include following procedure (Prewash procedure): It is very important to complied prewash procedure whenever carrying NLS cargo in Europe area starting from Gibraltar to north all the way include Norwegian coats, Baltic Sea, UK and Ireland,etc. in advance should be verify specific cargo and agree with port prewash procedure. Amendment for Annex II for IBC code verified and IMO decided that to issue new certificate of fitness with listing the products a tanker is certified to carry.
An international certificate of fitness is issue for a period 5 years, it is important that List of product before loading of NLS cargo to verify if cargo is listed in your List of product and what precaution should be taken prior handling such cargoes.

- Well in advance should be consult with engine department for planning tank cleaning.

Consult with engine department to plan tank cleaning as tank cleaning can be various method, tank cleaning can have carried

out using steam (Heater, Tank cleaning pump) or can be tank cleaning with Ventilation/dehumidifier to dry the tank.

- Verify weather condition in advance.

One of the important point is to verify weather condition prior the tank cleaning, as good seamanship required good weather during tank cleaning and ship's head of department should try accordingly for well stripping of the tank, for good list, trim and especially prior tank man entry for mopping or wall wash etc.

- Verify rest of hours of crew who will involved during tank cleaning,

By head of department each crew member who will be involved during tank cleaning verify rest hours in advance and give sufficient rest each crew members as required, this is not only operation to be plan and complied about the rest of hours upon joining crew member must be controlled that he is well rested prior the any job and well complying with his/her rest of hours as required MLC 2006, ILO. This point is very important on board during the handling the job, any person handling the job must have sufficient time for rest, as physically as mentally he/she should be rested and with fresh brain must be handling the job, there are many incident, accident due to not sufficient rest or stress.

Remember: Be vigilant during preparation or when handling of tank cleaning

Never by-pass any action, Perform all deeply and accurate.
Never deviate from the plan, Complied the plan.
Never ignore any advice if it is helpful in your job, Re-check and be thankful with person.
Never trust equipment/tools/system, recheck with various method as much as possible.

Never ignore any report or advice during tank cleaning, keep good communication with party, make good relationship, get frequently report and act accordingly.
Speak slowly and report clearly, repeat the order/report.
Never short-cut any information during preparation or handling of tank cleaning, verify all safety points on place give clear instruction.
Never be self-confidence, make sure you are doing all well, search at all times in your job what you miss/Not fully complied/Not well done/what missed in your safety aspect.
Never accept the report if not understood by some reason, ask again and verify, if still not reachable clearly go on place and check yourself properly what is going and accept after you are sure.
Be vigilant.
Remember: Good planning, good communication, clear discussion, suggestions, action on time, attention all points in safety aspect, good relationship, motivations, etc. Will save the time and can get the good result.

4. Introduction basic tank Cleaning

One of the critical job on chemical tanker is correct carried out tank cleaning, tank cleaning first off should be carried out by sea water and followed by fresh water, tank cleaning can be carried out by fixed or portable machines. Between of them can be carried out chemical recirculation depends of the cleaning standard.

There are basic following steps for tank cleaning whenever we are doing heavy tank cleaning like after pal-moil or CPP cargo next to load high purity cargo such as Especially Methanol, or various glycols.

First step - Cleaning removed heavy/majority residuals, Pre-Wash.

Before starting main tank cleaning should be carried out mandatory pre-wash this is the first step of cleaning of the tank, prior starting of cleaning should be verify adjacent tanks of temperature, ballast should be remove to maximum in adjacent tank especially when vessel is in cold climate to success your cleaning and to get good result, normally it is done by ambient sea water.

Second step - Main cleaning by sea water

Sea water is used for cleaning of the tank for

cleaning is important of the line pressure and temperature of sea water, recommended of line pressure 8-10 bar, it is important to check ship's specific P & A manual for minimum line pressure for good cleaning and maximum recommended pressure to avoid damage of coating, we should be verify also coating temperature limitation to avoid damage of coating during washing but as much temperature we will be maintaining during washing of the tank it is very important and for successful cleaning but not to exceed limitation (Which we

can find out tank coating manual), washing of the tank can be carried out by fixed or portable machines or combination of both, tank should be cleaned thoroughly with PV valve, manifold, vapor lock, drains, all the vents. etc.

Third Step: Recirculation / Chemical Washing

Recirculation is the tank cleaning/washing by using chemical (Note; Chemical should be IMO approved chemical acceding MEPC-2 important day by day MEPC-2 updating by IMO, so accordingly should be take into consideration that only last edition should be refer and used for tank cleaning chemical) Method of recirculation (if chemical tanker equipped with heater exchanger) is remove elbows connect octopus with flexible hose to the tank cleaning machine inject the chemical mixed with the fresh water into the tank/line start cargo pump and carry

out the recirculation, Chemical used for tank cleaning is more efficient cleaning than only sea/fresh water, should be washed thoroughly all Vents, vent flaps, manifold, vapor lock and discharging overboard should be complied according MARPOL Annex-2.

If vessel next cargo is CPP then sufficient to wash the tank only by sea water and follow the fresh water, but if there is plan to prepare the tanks for high purity chemicals then mainly required to wash the tanks by chemical (Recirculate the tanks by chemicals)

Fourth Step: Washing by sea and fresh water

After completion of the recirculation of the tank by using of chemical should be carried out of the sea water washing again to remove the chemical from tank, (Note; can be done in this step washing out by the fresh water directly but so much amount of fresh water difficult to collect on board to wash out after chemical used all tanks used by fresh water) make sure

tanks are washed by well by sea water and discharging overboard complying the MARPOL Annex-2 at all-time whenever anything are discharging overboard, well should be drain the tank and after few minutes stripped the tank and follow by fresh water, to remove the chloride – sold
from tank it is recommended to heat the fresh water and by hot fresh water rinse the tank drain and well strip.

Fifth Step: Ventilation Drying

After completion of step fourth we can start the tank ventilation, tank ventilation can start by portable fans or by fixed system which is called dehumidifier, after well ventilated of the tank should be check the gasses for man entry and carried out the wall wash test,

Remember: never check the gas in enclose space whenever the ventilation is running because it will give you wrong reading.

Sixth Step: mopping and drying.

After well ventilation of tank and well drying of bulkhead place encloses space procedure and follow it, should be carried out the wall wash if wall wash is accepted for next nomination cargo follow the mopping, all lines should be well blow, drain and completely dry.

if there is range of time before the load of next cargo more then 2 days gaff it is recommended that every two days repeat the wall wash to be sure Load port by surveyor tank will be accepted for
nominated cargo, there is possibility of the change of the result after few days in worst side.

before any entry in any enclose space remember:

Keep for enclose space all opening as many as possible open.

Test the atmosphere in three level:

Top, middle, and bottom.

Follow the enclose space procedure (Enclose space permit).

Be sure what doing, priority is in our work safety, safety of our life.
Any deviation or by pass during handling of the job especially in any enclose space mostly result is fatal.

Important note

We should take into consideration of following prior commencing of tank cleaning; Remember restrictions; after flammable cargo to wash the tank in gas free condition can be carried out when tank capacity is less then 3000 m3 but tank cleaning machines not exceed 17.5 m3/h and any time do not exceed 110 m3/h. otherwise tank should be inerted less then 8.0% by volume and only after that start tank cleaning.

(This is the SOLAS regulation and should be complied)

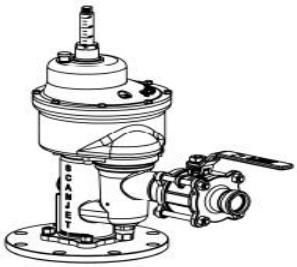
Meaning following terms

Note; During washing of tanks the temperature kept depends of previous unloaded cargoes and next/nomination cargoes to be loaded and standard requirements of next cargoes.

Ambient Temperature means temperature up to 35 Degrees Celsius.

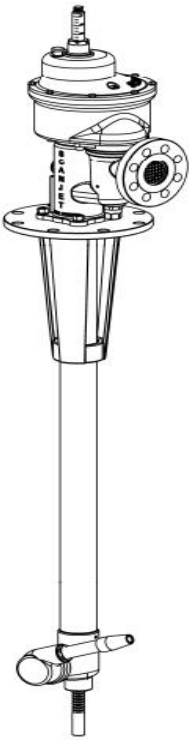
Worm/Moderate temperature means temperature 35 – 60 degrees Celsius.

Hot temperature means temperature exceeding 60 degrees Celsius. Introduced on below picture Scanjet fixed tank cleaning machine.



Instruction Manual

SC 30T



5. Tank cleaning after cargo Methanol and Acetone, Method of the preparation of tanks and important points

This is the common and normal cargo for chemical tanker to carry MEOH/Methyl Alcohol and Acetone, after unloading make sure tanks are ready for next cargo to load.

First of all, as normal we should check MSDS and review properly, normally cargoes Methyl alcohol and Acetone as per MSDS vapour pressure is above 5 Kpa @ 20 Digress so it means that we can proceed tank cleaning by ventilation system. Good ventilation and dry the tanks by ventilation is sufficient to load next cargo, but there is following restrictions which we should take into consideration following factors, check - coating resistant/makers and accordingly follow after unloading those cargoes, it means that in different coating makers required after gas free of the tank (Steady gas free) for recovery of coating few days continue ventilation is required save cargo tank coating for destroy.

Some coating is required 10 days of the ventilation some coating is required 3 day of the ventilation so accordingly we are responsible to follow ventilation and comply of the requirements.

6. Recommended cleaning the tank where remaining stubborn lube additives and petroleum based products

CLEANING THE TANK BY DEAGREASER HD

First of all, we will be discussing by few words about the chemical which is introduced in the drum according the MSDS.

Tank Coating

Recommended for Coating ZINC, Epoxy and Phenolic,

Caution during cleaning; - do not allow to stand for more than 2.0 Hours.

Degreaser HD is one of the heavy duty cleaner

It is emulsifiable cleaner & oil Dispersant.

Clean Liquid, Pale Yellow to dark straw/brown color.

Flash Point ≈ 66 C, SG≈ 0.882

Description of Chemical

A mixed aromatic and aliphatic solvent base of oil and grease solubilized containing 25 %, Non – Ionic and anionic surfactants, Components consist of a mixture of aromatic and paraffinic base petroleum hydrocarbons in the middle distillate range.

Caution: Solvent base products, provide adequate ventilation

Do Not get in eyes, on skin or clothing, when handling.

Use face shield and protective clothing.

In concentrate is splashed into eyes, Flush with copious amounts of water.
Skin absorption may potentially contribute to the overall exposure to the product.
After contact with skin – wash with plenty of water

Recommended to use for tank cleaning

1. Tank to be Butterworth by hot SW for minimum 2 hours, then follow the following procedure.
2. Make a solution of 10% of Degreaser HD with 90% of fresh water.

Recirculation (solution) the tank for maximum 1.0 hours with parallel Heat up solution to max
temperature 50-55 degrees C during recirculation, follow the Butterworth use SW worm max temperature 50-60 degrees C for 3.0 hours, tank should be well rinse out all detergent, flush with fresh water and carry out stripping as required (As per P & A manual). Or can be carried out next step with maximum caution. Take into account that this method during normal tank cleaning to be avoided. Not to be failed to use with PPE, SCBA, chemical protective suit and so on. (Procedure against to avoid direct contact with chemicals).

Additional Recommendation

Tank to be Butterworth by hot SW for minimum 2 hours, then follow the following procedure.
Spray tank with undiluted chemical “Degreaser HD” and let it work for minimum 30-45 minutes, keep tank close after spray, then rinse with warm sea water (Maximum 50-60 degrees Celsius) for maximum 2 to 3 hours, tank should be well rinse out all detergent, flush with fresh water and carry out stripping as required (As per P & A manual). Present of now above the mention of the chemical is as IMO approval chemical so accordingly should be make sure whenever ship’s management team will decide to use the chemical it should be confirming that chemical is IMO approval only.

7. Recommended cleaning the tanks after animal and vegoils cargoes

First of all, we will be discussing by few words about the chemical “AVO Chemicals” according the MSDS.
Tank Coating: Recommended for coating for Zinc, Epoxy and Phenolic.
Caution: Do not allow chemical to stand in the tank more than 2.0 Hours.
Chemical; AVO Cleaner has been especially blended for removing residues of animal and vegoils, it is especially effective for spot cleaning or recirculation after animal and vegoils cargoes.
Description of the chemicals:
AVO Cleaner is mild alkaline cleaning agent containing a combination of 13 % Non – IONIC / Anionic surfactants, 5% Inorganic booster, 4% butyl cello solve, with a water balance.
This blend exhibits a PH of 9 and is, therefore recommended safe to use in Zinc as well as other coating tank surfaces.
Cleaner for removing of vegoil or animal oil from surfaces:

1. Clean Liquid, Colorless
2. Odour- Typical
3. Flash point - None / N/A. S
4. G – 1,02

Caution: Do not get in eyes. On skin or clothing, when handling, use face shield and protective clothing, in concentrate is splashed into Eyes on skin immediately flush with plenty of the fresh water.
Extensive skin – Absorption can result in kidney and liver damage.

Recommended for cleaning

Note: It is recommended that in a Zinc Coated tank not to be use a soap unless the tank has been fresh water washed.

After unloading of the cargo first opportunity should be start the tank cleaning should be avoid residuals to dry on tank bulkhead.

(For Zinc Coated tanks) If fresh water is available and sufficient to make the preclear the tank should be carried out short fresh water rinsing to avoid in the tank white layer.

1) Butterworth sea water hot for minimum 2 – 3 hours (Water should be at least 15 degrees Celsius above melting point of the cargo).

2) Make a solution of 5% of “AVO Chemical” with 95% of fresh water, Recirculate the chemical 2 to 3 hours with parallel heat up solution up to 50 Digress Celsius.

3) Rinsing by sea water warm 2 to 3 hours until all detergent / solution well removed from tank.

4) Short fresh water rinsing and well strip the tank as per P & A Manual.

- Or can be carried out next step with maximum caution. Take into account that this method during normal tank cleaning to be avoided. Not to be failed to use with PPE, SCBA, chemical protective suit and so on. (Procedure against to avoid direct contact with chemicals).

1) Coating; Epoxy Not Resistant for CAUSTIC.

2) Spray on undiluted “AVO Chemicals” and allow to stand for minimum of 30 minutes.

Then wash the tank with warm sea water minimum for 2.0 hours until all detergent are removed. Flush tank.

3) Short fresh water rinsing and well strip the tank as per P & A Manual.

Remark: For Stainless steel or Epoxy coated tanks (Check resistance) use the following procedure.

Present of now above the mention of the chemical is as IMO approval chemical so accordingly should be make sure whenever ship's management team will decide to use the chemical it should be confirming that chemicals IMO approval only.

sample picture for reference during manual tank cleaning

8. Recommended for rust penetrated cargo tank surfaces and rust stains from painted surfaces

First of all we will discussed about the Chemical which is called – Metal Brighter as per MSDS / Manufacture.

Chemical METAL BRIGHTENER is phosphoric acid mixture, 70 % concentrate of phosphoric acid with surfactants and butyl cello solve. Chemical is clean liquid, Colorless with Sweet odor

Flash Point – None / N/A, SG – 1.162

Never use this product undiluted, for today can say widly in use Chemical-Metal Brighter especially on old ships, where tanks are quite rusted and required for treatment.

Tank Coating - Chemical Metal Brighter should be avoid to use in Zinc Coating.

Caution - Do not get in Eyes, on skin or clothing, when handling; Use face shield, Googles and protective clothing, in concentrate is splashed into eyes – Flush with plenty of water and rinse with standard eyewash.

Ingestion - Rinse mouth, give at least two glasses of water to drink (Dilution)

Do not administer direct milk, Give a magnesium hydroxide solution (Milk of Magnesia).

CLEANING WITH FORMULA No. 4 METHAL BRIGHTENER

1. Butterworth SW ambient for minimum 2 to 3 hours.
2. Recirculate for 2 to 3 hours in the tank Solution Methal Brighter 10 / 15 % with fresh water 90 / 85 %.
3. Strength of solution / amount of solution depending on product to be cleaned.
4. (Follow) Rinsing of the tank for minimum 2.0 hours using of the fresh water.

5. (Follow) Rinsing of the tank for minimum 10 / 15 minutes using of the fresh water.
6. (Follow) Strip the tank as per P & A Manual and dry.

Note: Method can be use for stainless steel tanks and organic coated tanks.

Remark: Method never be used on Zinc Silicate coated tanks.

Or can be carried out next step with maximum caution. Take into account that this method during normal tank cleaning to be avoided. Not to be failed to use with PPE, SCBA, chemical protective suit and so on. (Procedure against to avoid direct contact with chemicals).

1. Butterworth SW ambient for minimum 2 to 3 hours.
2. Hand spraying or brushing application for the removal of the rust stains from painted surfaces
3. (Solution Methal Brighter 10 / 15 % with fresh water 90 / 85 %.
4. (Follow) Rinsing of the tank for minimum 2.0 hours using of the fresh water.
5. (Follow) Rinsing of the tank for minimum 10 / 15 minutes using of the fresh water.
6. (Follow) Strip the tank as per P & A Manual and dry.

Picture for reference only it can be in different drums

Present of now above the mention of the chemical is as IMO approval chemical so accordingly should be make sure whenever ship's management team will decide to use the chemical it should be confirming that chemicals IMO approval only.

9. Recommended cleaning for removing of vegoils or animal oil from surface

First of all, we will have to discussed about the Chemical which is called – alkaline degreaser / Sodium Hydroxide Solution as per MSDS / Manufacture.

Heavy duty alkaline degreaser, Cleaner is a very strong caustic product.

Chemical Shipping name: Sodium Hydroxide Solution.

Tank Coating: Safe for Epoxy and phenolic but should not be used on zinc.

Slightly heavy liquid with sweet odor.

Odour – Pungent.

Colour – Brown.

FL Point – None / N/A.

Caution - Do not get in eyes, on skin or clothing, when handling use face shield and protective clothing.

In concentrate is splashed into eyes; - flush with plenty of the water.

Product to be stored at temperature above 10 degrees Celsius to prevent freezing.

Note:

Pre cleaning should be carried out if extra fresh water available and sufficient.

1. Pre cleaning / Rinsing with fresh water 15 degrees Celsius above the melting point of the cargo.
2. Follow with hot sea water as permitted tank coating for minimum 2 to 3 hours.
3. Follow Recirculation with solution parallel with heat up to 50 to 60 ◦ Celsius for 1 hour during recirculation of the chemical (Solution 5 – 10 % of chemical/ Sodium Hydroxide Solution 95 – 90 % of fresh water).

4. Follow with hot sea water as permitted tank coating for minimum 1 to 2 hours all chemicals detergents should be removed.
5. Follow fresh water rinsing, strip the tank according to P & A manual.

Or can be carried out next step with maximum caution. Take into account that this method during normal tank cleaning to be avoided. Not to be failed to use PPE, SCBA, chemical protective suit and so on. (Procedure against to avoid direct contact with chemicals).

1. Pre cleaning / Rinsing with fresh water 15 degrees Celsius above the melting point of the cargo.
2. Follow with hot sea water as permitted tank coating for minimum 2 to 3 hours.
3. Follow - After ventilation - can be sprayed chemical / Solution on bulkhead (Solution 5 – 10 % of chemical/ Sodium Hydroxide Solution 95 – 90 % of fresh water).
4. Keep stand at least 30 minutes in tank, but should not remain on epoxy phenolic more than 60 minutes. (Not suitable for Zinc) (remember never allow chemicals to dry on bulkhead, if it will dry white powder “caustic” will appear on the bulkhead.
5. Follow with hot sea water as permitted tank coating for minimum 1 to 2 hours all chemicals detergents should be removed.
6. Follow fresh water rinsing, strip the tank according to P & A manual.

Pictures for reference only can be in different drums.
present of now above the mention of the chemical is as IMO approval chemical so accordingly should be make sure whenever ship's management team will decide to use the chemical it should be confirming that chemicals IMO approval only.

10. Tank cleaning stearin Monomer to water white standard

1. Butterworth with sea water in ambient temperature for at least 45 minutes in port and transfer/collect into the slops in slop/residual tank In case you can't clean tank in the port.
2. Try to fill up the tank apx-0.5 meters and recirculate with sea water until starting of thenormal tank cleaning/BW and after departure make cleaning at least 45 minutes by sea water method to protect the tank and lines /avoid with polymerisation in the empty tank. After 45 min of cold sea water cleaning,

Make sure during cold sea water all drains are well rinsed with cold sea water, increase temp of water till 50-60 deg C and clean tank for further 2.0 hour.

3. During Warm wash, purge cargo pump and record results.
4. During warm wash, Blow out and check if heating coils are empty. All lines well rinse with warm sea water all flused drains vapour locks set on 45 degrees etc.
5. Steam cargo line/piplines from pump stack to manifold for at last for 30 min each line.
6. Immediately after warm wash finished on tank, connect Fresh Water to the butterworthing machines and rinse tank for 15 min with Fresh Water.
7. Then ventilate, drain tank and mop.

Recommended for tanks:

SUS TANKS AND ZINC ORGANIC COATING

One of the critical point is steaming of the pipelines, steam hose should be check before the use, PPE matrix should be follow at all times RA in place, during the line steaming make sure that pressure is not rising in the tank and in the line, personal knowledge should be verify in advance who will be handling the such job.

Never stand anyone near the steam line, never try to adjust any steam hose during steaming of the pipelines, connect properly steam hoses in advance and crew guide there working only for open close where required and where need it whenever is planned many pipelines for steaming.

11. Remove of the wax from tanks during any washing

Tank cleaning to remove the wax from tank one of the initial and important point we can consider during planning on initial stage, Planned and wash out the tanks and checked visually and remaining of some wax it is dangerous to inject any chemicals, wax is remaining due to some mistakes on initial stage, can be remain due to not sufficient temperature kept during washing or not sufficient pressure on tank cleaning machine as required as per P & A manual.

Temperature during washing (SW) on initial stage should be more than 10°C above the melting point of the ex-cargo, if temperature is less wax will be remaining and make sure tanks should be wash at least 3 to 4 hours by hot water as allowable according coating makers otherwise tank bulkhead wax will be remaining same pressure is required due to tank cleaning machine should be reach with good pressure with sufficient pressure to remove all available ex-cargo and well drain to the bottom.

In case wax is remaining and we will apply some of the chemicals this will be worse during tank cleaning due to chemical will not affect/work for washing and recent our chemical will start sticking on the wax which and we

should be start the washing on initial stage to remove wax with chemicals, it means failed with tank cleaning, never add the chemical solution before visual inspection of the tank.

One of the important point after any vegetable oil make sure before starting of the hot sea water adjacent tank of the tank ballast should be empty, which is helpful for washing and effectiveness.

One of the reference picture as wax

12. Cleaning from VAM (Vinyl Acetate monomer) to following cargo

- Methyl tert-Butyl Ether
- Styrene Monomer (inhibited)
- Ethylene di-Chloride
- Crude Industrial Ethanol
- Benzene
- Xylenes
- Phenol
- Di-Octly Phthalate

Acceptable/sufficient Method for cleaning;

1. Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.
2. Buterwarth sea water warm by fix tank cleaning machine for 2 hours and continue discharging.
3. Rinse the tank by fresh water 15 minutes and continue discharging.
4. Stripping as per P & A manual
5. Ventilation.
6. Mopping.

VAM (Vinyl Acetate monomer) to following cargo

- Methanol
- Mono-Ethylene Glycol
- Di-Ethylene Glycol
- Tri-Ethylene Glycol
- Vinyl Acetate monomer (inhibited)

1. Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.
2. Buterwarth sea water warm by fix tank cleaning machine for 2 hours and continue discharging.
3. Rinse the tank by fresh water 15 minutes and continue discharging.
4. DI / De-ionized water wash spray
5. Stripping as per P & A manual
6. Ventilation.
7. Mopping.

Recommended to remove the easily of the chloride from the tank if there is possibility make at least 60 degrees Celsius of the fresh water and rinse the tank after that, it is very helpful to remove the chloride from tank using worm/hot fresh water during rinsing.

13. Cleaning from DOP (di-Octyl Phthalate) to following cargo

-Methyl tert-Butyl Ether
-Styrene Monomer (inhibited)
-Benzene
-Xylenes
-di-Octly Phthalate
-2-Ethylhexanol
Acceptable/sufficient Method for cleaning:

1. Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.
2. Buterwarth sea water hot by fix tank cleaning machine for 2 hours and continue discharging.
3. Rinse the tank by fresh water 15 minutes and continue discharging.
4. Stripping as per P & A manual
5. Ventilation.
6. Mopping.

DOP (di-Octyl Phthalate) to following cargo
-Methanol
-Mono-Ethylene Glycol
-di-Ethylene Glycol
-tri-Ethylene Glycol
-Ethylene di-Chloride
-Crude Industrial Ethanol
-Vinyl Acetate monomer (inhibited)

1. Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.
2. Buterwarth sea water hot by fix tank cleaning machine for 2 hours and continue discharging.
3. Recirculate with solution of hydrocarbon remover for 1 hours (solution is done with fresh water) one of the common chemical is MarClean SC 5 liter of the Marclean SC with 300 liters of the fresh water.(common Using to remove of the hydrocarbons) / after CPP cargo.
4. Rinse the tank for 2 hours by sea water warm continue discharging.
5. Rinse the tank for 1 hours by sea water hot continue discharging.
6. Rinse the tank by fresh water 15 minutes and continue discharging.
7. DI / De-ionized water wash spray.
8. Stripping as per P & A manual.
9. Ventilation.
10. Mopping.

Recommended to remove the easily of the chloride from the tank if there is possibility make at least 60 degrees Celsius of the fresh water and rinse the tank after that, it is very helpful to remove the chloride from tank using worm/hot fresh water during rinsing.

Present now IMO approval chemical sticker for reference can be available on board in various drums.

14. Cleaning from Phenol (Phenol) to following cargo

- Methyl tert-Butyl Ether
- Styrene Monomer (inhibited)
- Ethylene di-Chloride
- Crude Industrial Ethanol
- Benzene
- Xylenes
- Phenol
- di-Octly Phthalate
- 2-Ethylhexanol

1. Acceptable/sufficient Method for cleaning;
2. Buterwarth sea water ambient by fixed tank cleaning machine at least 15◦ above the malting point of the ex-cargo for 1 hours and continue discharging.
3. Buterwarth sea water hot by fix tank cleaning machine for 2 hours and continue discharging.
4. Rinse the tank by fresh water 15 minutes and continue discharging.
5. Stripping as per P & A manual
6. Ventilation.
7. Mopping.

- Phenol (Phenol) to following cargo
- Methanol
- Mono-Ethylene Glycol
- Di-Ethylene Glycol
- Tri-Ethylene Glycol
- Vinyl Acetate monomer (inhibited)

1. Buterwarth sea water ambient by fixed tank cleaning machine at least 15◦ above the malting point of the ex-cargo for 1 hours and continue discharging.
2. Buterwarth sea water hot by fix tank cleaning machine for 2 hours and continue discharging.
3. Rinse the tank by fresh water 15 minutes and continue discharging.
4. DI / De-ionized water rinse/spray
5. Stripping as per P & A manual
6. Ventilation.
7. Mopping.

Recommended to remove the easily of the chloride from the tank if there is possibility make at least 60 degrees Celsius of the fresh water and rinse the tank after that, it is very helpful to remove the chloride from tank using worm/hot fresh water during rinsing.

Remark: DI Water / Deionized water is water is the water which has dissolved all mineral particles from it.

DI water quality should be 1 to 10 Microsiemens-cm

the recommended DI water quality should be 1 to 10 Microsiemens-cm.

DI/Deionized water filter image for reference only

15. Cleaning from Xylenes (para, meta, mixed-xylene) to following cargo

- Methyl tert-Butyl Ether
- Styrene Monomer (inhibited)
- Ethylene di-Chloride
- Crude Industrial Ethanol
- Benzene
- Xylenes
- Phenol
- Di-Octly Phthalate
- 2-Ethylhexanol

Acceptable/sufficient Method for cleaning;
Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.

1. Buterwarth sea water hot by fix tank cleaning machine for 2 hours and continue discharging.
2. Rinse the tank by fresh water 15 minutes and continue discharging.
3. Stripping as per P & A manual
4. Ventilation.
5. Mopping.

Cleaning from Xylenes (para, meta, mixed-xylene) to following cargo

- Methanol
- Mono-Ethylene Glycol
- Di-Ethylene Glycol

- Tri-Ethylene Glycol
- Vinyl Acetate monomer (inhibited)

Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.

1. Buterwarth sea water hot by fix tank cleaning machine for 2 hours and continue discharging.
2. Rinse the tank by fresh water 15 minutes and continue discharging.
3. DI / Deionized water rinse / Spray
4. Stripping as per P & A manual
5. Ventilation.
6. Mopping.

Recommended to remove the easily of the chloride from the tank if there is possibility make at least 60 degrees Celsius of the fresh water and rinse the tank after that, it is very helpful to remove the chloride from tank using worm/hot fresh water during rinsing.

16. Cleaning from Benzene (Benzene) to following cargo

- Methyl tert-Butyl Ether
- Styrene Monomer (inhibited)
- Ethylene di-Chloride
- Crude Industrial Ethanol
- Benzene
- Xylenes
- Phenol
- Di-Octly Phthalate
- 2-Ethylhexanol

Acceptable/sufficient Method for cleaning;

Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.

1. Buterwarth sea water hot by fix tank cleaning machine for 2 hours and continue discharging.
2. Rinse the tank by fresh water 15 minutes and continue discharging.
3. Stripping as per P & A manual
4. Ventilation.
5. Mopping.

Cleaning from Benzene (Benzene) to following cargo

- Methanol
- Mono-Ethylene Glycol
- Di-Ethylene Glycol
- Tri-Ethylene Glycol
- Vinyl Acetate monomer (inhibited)

Acceptable/sufficient Method for cleaning;

Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.

1. Buterwarth sea water hot by fix tank cleaning machine for 2 hours and continue discharging.
2. Rinse the tank by fresh water 15 minutes and continue discharging. (FW use as recommended)
3. DI / Deionized water rinse / Spray
4. Stripping as per P & A manual
5. Ventilation.
6. Mopping.

17. Cleaning from EDC (Ethylene di-Chloride) to following cargo

- Methyl tert-Butyl Ether
- Styrene Monomer (inhibited)
- Ethylene di-Chloride
- Crude Industrial Ethanol
- Benzene
- Xylenes
- Phenol
- Di-Octly Phthalate
- 2-Ethylhexanol

Acceptable/sufficient Method for cleaning;

1. Fresh water rinsing 15 to 20 minutes by fixed tank cleaning machine and continue discharging.
2. Stripping as per P & A manual
3. Ventilation.
4. Mopping.

Cleaning from EDC (Ethylene di-Chloride) to following cargo

Methanol

Mono-Ethylene Glycol

Di-Ethylene Glycol

Tri-Ethylene Glycol

Vinyl Acetate monomer (inhibited)

Acceptable/sufficient Method for cleaning;

Fresh water rinsing 15 to 20 minutes by fixed tank cleaning machine and continue discharging.

1. Stripping as per P & A manual
2. Ventilation.
3. DI / Dionized water spray
4. Mopping.

18. Cleaning from Styrene Monomer (inhibited) (Styrene Monomer) to following cargo

As we know and pointed about the mention procedure Stearin monomer is polymerized cargo so accordingly tank cleaning should be carried out as soon as possible and washing should be start with ambient sea water only.

Chemical reaction in which two or more molecules combine to form large molecules that contain repeating structure which called polymization, hot water speeds up the reaction and colds / Ambient sea slow down the reaction and not beginning the polymerization.

So accordingly that is important to start the washing only by Sea Water Ambient.

Methyl tert-Butyl Ether

Styrene Monomer (inhibited)

- Ethylene di-Chloride
- Crude Industrial Ethanol
- Benzene
- Xylenes
- Phenol
- Di-Octly Phthalate
- 2-Ethylhexanol

Acceptable/sufficient Method for cleaning;

Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.

1. Buterwarth sea water warm by fix tank cleaning machine for 2 hours and continue discharging.
2. Rinse the tank by fresh water 15 minutes and continue discharging.
3. Stripping as per P & A manual
4. Ventilation
5. Mopping

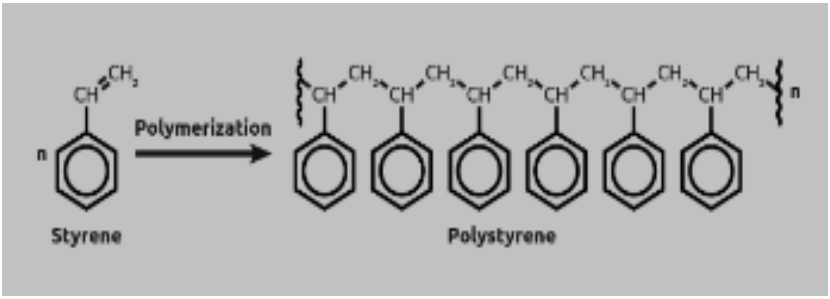
Cleaning from Styrene Monomer (inhibited) (Styrene Monomer) to following cargo

- Methanol
- Mono-Ethyloene Glycol
- Di-Ethylene Glycol
- Tri-Ethylene Glycol

Acceptable/sufficient Method for cleaning:
Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.

1. Buterwarth sea water warm by fix tank cleaning machine for 2 hours and continue discharging.
2. Rinse the tank by fresh water 15 minutes and continue discharging.
3. Stripping as per P & A manual
4. Ventilation
5. DI / Distillate water spray
6. Ventilation
7. Mopping

Simple image for reference of the molecules, as it is Looks



19. Cleaning from TEG (tri-Ethylene Glycol) to following cargo

- Methyl tert-Butyl Ether
- Styrene Monomer (inhibited)
- Ethylene di-Chloride
- Crude Industrial Ethanol
- Benzene
- Xylenes
- Phenol
- Di-Octly Phthalate
- 2-Ethylhexanol

Acceptable/sufficient Method for cleaning

1. Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.
2. Buterwarth sea water hot by fix tank cleaning machine for 2 hours and continue discharging.
3. Rinse the tank by fresh water 15 minutes and continue discharging.
4. Stripping as per P & A manual
5. Ventilation
6. Mopping

Cleaning from TEG (tri-Ethylene Glycol) to following cargo

- Methanol
- Mono-Ethyloene Glycol
- Di-Ethylene Glycol
- Tri-Ethylene Glycol
- Vinyl Acetate monomer (inhibited)

Acceptable/sufficient Method for cleaning;

Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.

Buterwarth sea water hot by fix tank cleaning machine for 2 hours and continue discharging.

1. Rinse the tank by fresh water 15 minutes and continue discharging.
2. Stripping as per P & A manual
3. Ventilation
4. DI / Distillate water spray
5. Mopping

20. Cleaning from DEG (Diethylene Glycol) to following cargo

- Methyl tert-Butyl Ether
- Styrene Monomer (inhibited)
- Ethylene di-Chloride
- Crude Industrial Ethanol
- Benzene
- Xylenes
- Phenol
- Di-Octly Phthalate
- 2-Ethylhexanol

Acceptable/sufficient Method for cleaning:

1. Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.
2. Buterwarth sea water hot by fix tank cleaning machine for 2 hours and continue discharging.
3. Rinse the tank by fresh water 15 minutes and continue discharging.
4. Stripping as per P & A manual
5. Ventilation
6. Mopping

Cleaning from DEG (Diethylene Glycol) to following cargo

- Methanol
- Mono-Ethyloene Glycol
- Di-Ethylene Glycol
- Tri-Ethylene Glycol
- Vinyl Acetate monomer (inhibited)

Acceptable/sufficient Method for cleaning;

1. Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.
2. Buterwarth sea water hot by fix tank cleaning machine for 2 hours and continue discharging.
3. Rinse the tank by fresh water 15 minutes and continue discharging.
4. Stripping as per P & A manual
5. Ventilation
6. DI / Distillate water spray
7. Mopping

21. Cleaning from MEG (mono-Ethylene Glycol) to following cargo

- Methyl tert-Butyl Ether
- Styrene Monomer (inhibited)
- Ethylene di-Chloride
- Crude Industrial Ethanol
- Benzene
- Xylenes
- Phenol
- Di-Octly Phthalate
- 2-Ethylhexanol

Acceptable/sufficient Method for cleaning;

1. Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.
2. Buterwarth sea water hot by fix tank cleaning machine for 2 hours and continue discharging.
3. Rinse the tank by fresh water 15 minutes and continue discharging.
4. Stripping as per P & A manual
5. Ventilation
6. Mopping

Cleaning from MEG (mono-Ethylene Glycol) to following cargo

- Methanol
- Mono-Ethylene Glycol
- Di-Ethylene Glycol
- Tri-Ethylene Glycol
- Vinyl Acetate monomer (inhibited)

Acceptable/sufficient Method for cleaning;

1. Buterwarth sea water ambient by fixed tank cleaning machine for 1 hours and continue discharging.
2. Buterwarth sea water hot by fix tank cleaning machine for 2 hours and continue discharging.
3. Rinse the tank by fresh water 15 minutes and continue discharging.
4. Stripping as per P & A manual
5. Ventilation
6. DI / Distillate water spray
7. Mopping.

22. Procedure of wall wash

One of the important point to work on chemical tanker is correct collection of wall wash whenever it is required, before loading of cargo on chemical tanker charterer should be reported about the tank readiness with specific wall wash results which will be determined on board.

All safety precaution should be taken to collect correct wall wash sample basic following requirement are as mandatory, person entering for wall wash into the tank first of all is safety; Enclose space permit in place and accurate followed take into account well done/wear PPE.

Basically all company have PPE matrix which is include for any job on board person should be wear according PPE matrix and complied.

Be vigilant and deeply pay attention of following points:

- Wall wash to be taken on well dry bulkhead.
- Before using any equipment make sure well clean and dry
- Make sure no any contaminant come from any other tools/equipment or other place whenever taking wall wash and during carrying out wall wash.
- No humidity into the tank well gas freed.
- Put on your shoes shoe cover (Avoid to bring anything from deck into the tank wearing before entry into the tank)

Required following tools to collect wall wash:

- **Clean sample bottle** - (Make sure bottle is washed by laboratory Grade Methanol)
- **Cather** – Cather is the tool which used to Recover/Collect sample from bulkhead into the clean sample bottle (Make sure Cather is washed by laboratory grade Methanol before the use)
- **Clean spray plastic squeeze bottle**
- **Laboratory grade methanol 500 ml**

Well cleaned closed bag (When going down or getting out from the tank collect your instruments into the bag "heave up and lay over the back" to avoid anything falling into the tank and your hands are well free)

- **Latex gloves /Nylex gloves** (Use latex gloves during taking wall wash and during carrying the test of wall wash sample to avoid any contamination from hand into the wall wash)
- **Eye protection goggles**

Collecting of wall wash

Sample are taking from bottom at least 1.5 meter to 2.5 meter of the tank bulkhead and 30 cm in with, Suggestion on each bulkhead two place collect wall wash sample.

- Spray the laboratory grade methanol using spray bottle around 10 cm away nozzle from bulkhead place the clean sample bottle under the spray with Cather 1.0 meter and collect the wall wash sample, total from tank should be collected 200 ml of wall wash sample.

Make sure on bulkhead no any “scorch” to avoid failed the sample during PTT test.

Prepare blank

Blank should be prepared basically in 100 ml well clean test tube which is filled with Laboratory grade methanol, Blank is used for comparison of wall wash sample analysis.

Required following for wall wash test:

- Funnel
- Nessler Tubes
- DI Water / Deionized water (Pure water) - Deionized water is where all ions are removed.
- 2% Silver Nitrate Solution (500 ml / bottle)
- 20% Nitric Acid Solution (500 ml / bottle)
- 0.1 gm permanganate Cristal
- Pipette (5 ml x 4 nos. for Nitric Acid / Silver Nitrate/PTT tests)
- Black colored plate (for testing turbidity of Hydrocarbon / Chloride
- White colored plate (for testing of turbidity of color)
- Flash Light

Spectrometer/Spectrophotometer (This is the instrument available on chemical tanker by which can conduct of wall wash analysis, we can use and verify of wall wash value for PTT, Colour, Chloride and Hydrocarbon on board, Equipment is very sensitive and should be used with extra caution during usage to get the correct result, using procedure should be verify with specific manual of Spectrometer.)

Basic requirement for wall washroom/Space

Chemical tanker should have separate designated space for wall wash test to perform analysis, Room should be well cleaned and tight control should be on all equipment/Tools are available in wall wash room, basically should be available in wall wash Room/Space are as follows:

- Good ventilation / Air Condition
- Fresh Water supply /Sink
- Fire Extinguisher
- Safety Googles
- Pipettes
- Latex Gloves
- Flash Light
- White and black Colored plate
- Wall wash sample bottles

DI /Deionized Water (Sealed before and after used).
Laboratory Grate methanol (Sealed before and after used).
2% Silver Nitrate Solution With Expiry date (Sealed before and after used).
20% Nitric Acid Solution With Expiry date (Sealed before and after used).
0.1 gm permanganate Cristal With Expiry date (at least Main packet Sealed before and after used Normally supply on board in small glass-stoppered flask).

There are basically five type of wall wash test which should be carried out on board very carefully with good seamanship as follows;

- Appearance
- Miscibility or Hydrocarbon test
- Colour test
- Chloride test
- Permanganate time test (PTT) or Permanganate fade test (PFT)

23. Procedure of Wall wash appearance test

Note: Each wall wash should be compared to the blank and make sure that no any sediment are left in wall wash or it is on borderline.

1. Blank should be Laboratory grade methanol this should be very clean and bright no any trace in bottle, no any sheen, no any matter, no any sediment should be observed, this is the meaning that wall wash appearance sample test is passed.
2. Sample is clean and bright as laboratory grade methanol with slight on the bottom of the bottle suspended matters no any trace or sheens this is meaning that wall wash appearance test accepted and it is on borderline.
3. Sample is clean and bright. No trace or sheens but many sediments are appearance on the bottom of the bottle this sample is failed required action (Flushing with DI water and follow with mopping)
4. Sample is clean and bright. No Trace and Sheens but heavy of the sediments on the bottom of the bottle it is worse then sample shown Previous/No.3 appearance test is failed Further action is required
5. (Flushing with DI water and follow with sweeping, Mopping)
6. Sample is not cleaned, there is not any trace or sheen but hazy appearance (Sample is dirty) appearance test is failed, required to Take action tank Again to wash out.
7. Sample colored totally change, (sample is dirty) appearance test is failed, need to re-wash the tank.

As per L & I manual

Important Note

- Appearance test is that No any sediments or matters, fibers should not be remain in the tank.
- Sample should be Clean and bright, No Any Sheen, no any traces, No Coloured, if in case slight
- Bottom matters it should be slight/Minimum on borderline.
- First entry for wall wash checking odour of the tank
- one of the important point during wall wash test should be pay attention of the tank odour, tank odour mainly remaining after good washing only from previous cargo like odour SM/Styrene Monomer odor should be remove by continue well ventilation before loading of next cargo, there is even test of odour, the odour can be characteristic or non-characteristic odour residual or non-residual odour.

24. Procedure of wall wash hydrocarbon or miscibility test

Test an normally should be carried out with requirement that no any other contaminant should be drop during wall wash in sample use the latex gloves goggles etc make sure all tools are well cleaned before use wall wash room well ventilated and all safety equipment are reedy and stand by for use in case it need it..

Requirement following tools for hydrocarbon/Miscibility wall wash test;

- 75/90 ml of Sample collected from tank
- 100 ml of clean nessler tubes 2 Pcs
- DI water
- Laboratory grade methanol
- Torch (To Conduct the test)
- Blacked coloured plate (background for nessler tube during test)

After wall wash and appearance test is accepted we can proceed hydrocarbon test, hydrocarbon test procedure is not same in all load port due to this reason suggested
that on board to carried out worse case of hydrocarbon test analysis, if load port has requirement 10 ml wall wash plus 90 ml of DI water, better on board to carried out wall wash 25 ml of wall
wash plus 75 ml of DI water that in load port to be sure that your Hydrocarbon test result will be passed successfully.

Prepare blank for comparing with wall wash, procedure is same as we will be prepare the sample for test analysis 25 ml of laboratory grade methanol add 75 ml of DI water, finally should be compared the blank with ready sample analysis result to be sure if there how much changes is there.

Method is as follows take 100 ml of well cleaned nessler tube before any action once again tube well cleaned by using laboratory grade methanol, filled with 25 ml of wall wash sample and add of 75 ml of DI water, mixed it carefully by shake of the Nessler tube and keep it 15-20 minutes for well mixed, after 20 minutes of the mixed himself DI water to wall wash, in dark room should be carried out of the test. Blacked coloured plate place on back take of the nessler tube on left hand shine the designated torch from down to up the nessler tube if liquid/Sample of the hydrocarbon is cleaned and bright Hydrocarbon test is passed, if we have noted

there is milky, turbidity or blue hydrocarbon is present and sample is failed.

Important note, meaning of Hydrocarbon/Miscibility test

Hydrocarbon/Miscibility test is water immiscible

contaminants in the wall wash sample, it is the meaning that how soluble sample with water, for more deep understanding we can compare things example; Methanol is soluble with water but if sample is not soluble with water it means there is contaminant and which is not soluble/mixed with water and caused the result as above we have mention change the colour of sample blue or Milky.

PROCEDURE OF COLOUR TEST

Safety procedure is same as above discussed for test;

Colour test is called platinum cobalt color scale.

Required following tool/substance for color test;

- Wall wash Sample (Sample collected from tank)
- Laboratory grade methanol
- White colored plate (for testing of turbidity of color)
- 100 ml of clean nessler tubes 2 Pcs

First of all prepare blank take 100 ml of cleaned nessler tube and filled with laboratory grate methanol and place on white coloured plate.

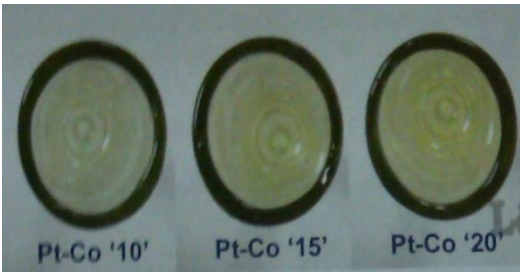
Take the 100 ml of the nessler tube refil it by sample (which is collected from tank) on same level and place on same white coloured plate as blank.

Check wall wash sample looking down (Top to down) and compare against the blank.

Wall wash sample for color test there are range which is calling PT-Co - platinum cobalt color scale this range is as color standard 0,5,10,20, during this test you are working on color standard there do not must be visible discoloration basically yellow color, we should verify according required standard our sample analysis pass or failed, if standard is require less than PT-Co 10 so we can compared bellow pictures and report give them accordingly it is in range on borderline passed or failed after passing color test we can proceed for next test this sample we can use for next test (wall wash chloride test).

Normally standard of next cargo Methanol PT-Co should be less then 10.

As per L & I Manual



Wall wash color test analysis is visual determination of essential light color liquid (yellow scale)

Note: Spectrometer/spectrophotometer do not have function to carried out test for color test of sample.

25. Procedure of chloride test

Safety procedure is same as above discussed for tests;

After successful passed of hydrocarbon and color test can carried out the chloride test.

Required following tool/substance for chloride test;

- 75/90 ml of Sample (Sample collected from tank)
- 100 ml of clean nessler tubes 2 Pcs
- DI water
- Laboratory grade methanol
- Torch (To Conduct the test)
- Blacked coloured plate (background for nessler tube during test)
- 2% Silver Nitrate Solution (500 ml / bottle)
- 20% Nitric Acid Solution (500 ml / bottle)

We can proceed directly for test after color same already prepared of 100 ml of blank and prepared of sample we can use for test.

Take the prepared 100 ml of the blank (which is 25 ml of the laboratory grade methanol plus the 75 ml of di water) nessler tube add 5 drops of silver nitrate and 5 drops of nitric acid.

Same procedure for sample (which is 25 ml of sample taken from tank and 75 ml od di water) should be add 5 drops of nitric acid and 5 drop of silver nitrate.

Allow blank and sample 15 to 20 minutes for mixing, Dark room/Wall washroom should be carried out of the test. Blacked coloured plate place on back take of the nessler tube on left hand shine the designated torch from down to up the nessler

tube if liquid/Sample of the chloride there is not any turbidity, if it is cleaned and bright test is passed and can proceed for next test. If there is turbidity and it is not on borderline than test is failed.

Purpose of the test is to check the cloride of the sample it is the remaining from the mainly from the sea water. (sold in the sample) can be remaining from fresh water also but concentration is different of sold in sea compare with fresh water.

We are looking in range 0 ppm to 10 ppm of chloride concentration in sample.

If sample is less than 0.2 ppm normally sample is accepted for loading.

If more then 0.2 PPM then proceed spray with DI water.

As per L & I Manual

26. Procedure of PTT/Permanganate time/fade test

Safety procedure is same as above discussed for tests;

PTT test is permanganate time or fade test

Required following tool/substances for PTT test as follows;

- Wall wash Sample (Sample collected from tank)
- Laboratory grade methanol
- Cool box with proper cover or proper fridge with is regulated at temperature 15 degrees Celsius
- 50 ml of clean nessler tubes 2 Pcs
- 0.1gm of permanganate crystal
- DI water 500 ml (to make solution with permanganate crystal)
- Pipets
- Clock (to check the time during the test)
- Latex gloves
- Safety googles
- Erlenmeyer flask (To make solution mix the di water with permanganate crystal)

Get the ready dark cool box / fridge, cool should be at 15 degrees Celsius, Take the Erlenmeyer flask and refill with DI water 500 ml and drop in permanganate crystal keep the Erlenmeyer flash in the fridge for cooling.

Prepare the blank; take the nessler tube refill with methanol and allow to cool in dark box/fridge up to 15 degrees Celsius.

Prepare sample; take the nessler tube refill with sample (sample taken from tank) and cool in same dark box/fridge up to 15 degrees Celsius.

After cooling of the cool dark box take the pipet carefully shake the Erlenmeyer flask and pump out 2 ml of solution from Erlenmeyer flask in the pipet and decant in to the blank, we are getting the blank purple/pink colour.

same should be repeat for sample, decant there also 2 ml of solution from Erlenmeyer flash we are getting the sample Purple/Pink colour.

well close the box and start the test notice the time, test should be check against the sample every 10

minutes, this is the visual check/inspection of colour (Purple/Pink) if any changes, sample should be maintain the colour for example methanol load port 60 minutes, for glycol basically 50 minutes.

If there are not changes and colour is same according to the load port requirement than sample is passed if there is changes degrees the colour to yellow/orange/brown the test is failed.
Purpose of the test is to check in the tank remaining residuals from previous cargoes or even the after recirculation of chemical remaining in to the tank.

27. Recommended cleaning to remove the chloride

Normally tank cleaning is done by using the sea water, as we know sea water consist much of the salt / Chlorides.

So ship's stuff have to fights for removing of the chlorides from the tank.

One of the effective method to remove the chloride from tank is fresh water rinsing.

Is time permitted and can we heat the fresh water before rinsing this will be more effective then direct using of fresh water in tank without pre heat.

Recommended to make the fresh water at least 50 degrees Celsius and after that to rinse the tanks at least 10 to 15 minutes each tank.

Normally all vessel is generating of the fresh water by using of the fresh water generator.

By normal and simple word fresh water generator is the equipment / instrument / device which is used to convert seawater to freshwater on ship.

28. Recommended cleaning to remove Hydrocarbons

DI water is mainly use to remove the remaining hydrocarbons on bulkheads we have to make sure that all necessary action is taken into consideration and well done including fresh water rinsing, but slight hydrocarbons still remaining in tank so ship's crew will proceed with spray of the DI water.

Utilized for the removal of traces of hydrocarbons from tank bulkhead, as normally and specification in this case vessel is planned to prepare the vessel for WW standard to load like MEOH, GLYCOLS or other specific cargoes.

DI means distillate water.

Specification: Clean Liquid, Flash Point – None / N/A, SG≈1.02

Coating: Safe for use in Zinc and Epoxy Coating.

On board we can meet distillate water equipment, simple word, if this equipment passing the fresh water generated DI water / Distillate water.

Water distilling apparatus which normally kept on board on chemical tanker and in use whenever it is require.

29. Recommended cleaning to increased time for PTT

vessel is planned to prepare them (Tanks) for WW standard to load like MEOH, GLYCOLS or other specific cargoes.

One of the important point is to pass the wall wash analysis so accordingly tanks should be wash out / tank cleaning should be carried out.

If in case of the after annex-1 cargo vessel is in preparation for wall wash standard and PTT still not passed according time request so need to follow up following method; (According which chemical is available)

Recommended following methods as bellow;

Action to be carried with maximum caution. Take into account that this method during normal tank cleaning to be avoided. Not to be failed to use PPE, SCBA, chemical protective suit and so on. (Procedure against to avoid direct contact with chemicals).

1st method

1. We can make solution 30 liters of the chemical “Care clean Xcellerate VO” in 200 liters of drum with fresh water.
2. Spray reachable as by hand as possible brush the parallel area.
3. After spray keep hold / stand 15 minutes.
4. Follow with Butterworth/Rinsing SW ambient for 3 hours
5. Strip the tank, dry and recheck the wall wash.

Introduction of the chemical Careclean Xcellerate VO from MSDS

Coating: Suitable for SS / Stainless steel & Epoxy Coating.

Note: Time saving for cleaning up to 50%.

Main description:

Initially developed to improve PFAD cleanings, Careclean Xcellerate VO has proven to reduce the amount of cleaning time on other vegoil cargoes as well. This advantage can be up to 50% compared to traditional cleanings. Due to the excellent cleaning properties, the product works on many vegoil cargoes, such as:

- CPO
- Palm Stearin
- CPKO
- PFAD

Vegetable oils and Fatty acids tend to leave white stains when cleaned with the most commonly used cleaning solutions, especially the cargo deriving from palm oil and high melting point vegetable oil cargo can account for challenging cleanings. In most cases a two phase cleaning is performed or suggested with an alkaline cleaning and subsequent acid cleaning to remove the white stains. An alkaline cleaning is preferably performed using fresh water as high alkalinity and seawater will intensify the formation of stains. Hardness salts in combination with high alkalinity and Fatty Acids will precipitate as white stains. Careclean Xcellerate VO prevents formation of

precipitations from hardness salt and removes the vegetable oils in one step, even using seawater.

DOSAGE:

Tank cleaning– PFAD & vegetable oil 2 - 3% solution or;

In case of recirculation at least 30L per 500m3 tank volume Hardness stains 2 % solution.

A rule of thumb is to have for every 500m3 tank volume at least 1m3 of cleaning solution containing 2 - 3% Careclean Xcellerate VO.

So if tank volume is 2000 m3 we will be required ≈ 4 m3 of the (Recommended)-fresh water can be use sea water also, including their total 10 to 12 % of chemical, So at least 100 or 120 liters of chemical/ Care clean Xcellerate VO required for 4 cubic fresh water.

Recirculation method: (After palm oils)

1. Butterworth sea water hot for 3 to 4 hours, make sure adjacent tanks ballast are removed.
2. All cargo pipelines to be well steamed for 2 hours.
3. Visual inspection to be carried out that residuals are well removed and hot wash well done, (if residuals still remaining do not proceed for next step) on this stage if on inspection we have note slippery/residuals are on floor of the tank follow for at least 1 hours hot water rinsing/

Butterworth this residual can be collected from pipelines so we should try that before apply any chemicals/solution for recirculation from tank maximum should be removed the oil that chemical/Solution can work effectively.

1. Recirculate by IMO approval chemical for 3 hours, Solution 120 Liters of the chemicals/Care clean Xcellerate VO in 4 m3 of the fresh water, Heat up solution during circulation up to 60 degrees Celsius.
2. Butterworth/Rinsing sea water ambient for 3 to 4 hours.
3. Check WW – Hydrocarbons & Color for the wall wash (if passing proceed for next step)
4. Rinsing by fresh water for 10 to 15 minutes.
5. Strip the tank, ventilation, Drying and Check for WW (If Passed the WW proceed for next step)
6. If slight of the hydrocarbons is appearing proceed with DI water Spray on WW area.
7. All cargo pipelines should be well blow by air mopping and dry.

2nd method

If planning manual cleaning recommended as per bellow, if by fixed machine so increased Potassium flakes until 200 kg, CTC 5 Litres in 3 Cubic of FW

1. We can make the solution 50 kg of potassium flakes in 200 liters drum fresh water with 1 liters of the CTC.
2. Spray reachable as by hand as possible brush the parallel area.
3. After spray keep hold / stand 15 minutes.
4. Follow with Butterworth SW ambient for 3 hours
5. Strip the tank, dry and recheck the wall wash.

3rd method

1. We can make the solution 50 % of the MB and 50% of the fresh water.
2. Spray reachable as by hand as possible brush the parallel area.
3. After spray keep hold / stand 15 minutes.
4. Follow with Butterworth SW ambient for 3 hours
5. Strip the tank, dry and recheck the wall wash.

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2. Stolt and Bahri marine companies
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Author will be grateful to receive the remarks and comments from the reader to improve the next edition of this book
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