PETROBRAS

N-2673	REV. D	ENGLISH	12 / 2021

Vessels on Terminals - Cleaning of Tanks

Procedure

This Standard replaces and cancels its previous revision.

The CONTEC - Authoring Subcommittee provides guidance on the interpretation of this Standard when questions arise regarding its contents. The Department of PETROBRAS that uses this Standard is responsible for adopting and applying the sections, subsections and enumerates thereof.

Technical Requirement: A provision established as the most adequate and which shall be used strictly in accordance with this Standard. If a decision is taken not to follow the requirement ("non-conformity" to this Standard) it shall be based on well-founded economic and management reasons, and be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by imperative nature.

Recommended Practice: A provision that may be adopted under the conditions of this Standard, but which admits (and draws attention to) the possibility of there being a more adequate alternative (not written in this Standard) to the particular application. The alternative adopted shall be approved and registered by the Department of PETROBRAS that uses this Standard. It is characterized by verbs of a nonmandatory nature. It is indicated by the expression: **[Recommended Practice]**.

Copies of the registered "non-conformities" to this Standard that may contribute to the improvement thereof shall be submitted to the CONTEC - Authoring Subcommittee.

Proposed revisions to this Standard shall be submitted to the CONTEC - Authoring Subcommittee, indicating the alphanumeric identification and revision of the Standard, the section, subsection and enumerate to be revised, the proposed text, and technical/economic justification for revision. The proposals are evaluated during the work for alteration of this Standard.

CONTEC
Comissão de Normalização Técnica

SC - 40
Maritime Transportation of Petroleum, Derivatives, and Biofuels

Introduction

PETROBRAS Technical Standards are prepared by Working Groups - WG (consisting specialized of Technical Collaborators from Company and its Subsidiaries), are commented by Company Units and its Subsidiaries, are approved by the Authoring Subcommittees - SCs (consisting of technicians from the same specialty, representing the various Company Units and its Subsidiaries), and ratified by the Executive Nucleus (consisting of representatives of the Company Units and its Subsidiaries). A PETROBRAS Technical Standard is subject to revision at any time by its Authoring Subcommittee and shall be reviewed every 5 years to be revalidated, revised or cancelled. PETROBRAS Technical Standards are prepared in accordance with PETROBRAS Technical Standard N-1. For complete information about PETROBRAS Technical Standards see PETROBRAS Technical Standards Catalog.

Foreword

This Standard is the English version (issued in 12/2021) of PETROBRAS N-2673 REV. D 12/2021. In case of doubt, the Portuguese version, which is the valid document for all intents and purposes, shall be used.

1 Scope

1.1 This Standard establishes procedures for the cleaning of load tanks on tankers, taking into account the product to be transported in respect to the last one off-loaded.

1.2 This Standard applies to both owned and chartered ships.

1.3 This Standard does not apply to gas tankers and chemical tankers, except for the latter, when transporting ethanol and oil derivatives.

1.4 This Standard applies to procedures initiated as of its date of issuance.

1.5 This Standard contains Technical Requirements and Recommended Practices.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document applies.

IMO - MARPOL 73/78 - Convenção Internacional para a Prevenção da Poluição por Navios;

OCIMF - International Safety Guide for Oil Tanker and Terminals (ISGOTT);

CT COMB 015/14 CENPES/PDAB/COMB - Avaliação do Impacto na Qualidade dos Produtos Transportados por Barcaças.

NOTE For documents referred in this Standard and for which only the Portuguese version is available, the PETROBRAS department that uses this Standard should be consulted for any information required for the specific application.

3 Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

3.1
freshening
additional pouring with fresh water to remove salinity form inside the tank

3.2
pouring
operation consists of washing with water the ship’s tank, using fixed or portable cleaning machines

3.3
COW (“Crude Oil Washing”)
operation consists of washing load tanks with crude oil

3.4
drainage
operation consists of removing as much solid and liquid built-up residue on the bottom of tanks, lines and pumps as possible, minimizing the possibility of contamination of next cargo loaded

3.5
purge
operation consists of introducing inert gas into the tanks in order to reach less than 2% of hydrocarbons by volume in the atmosphere of the tanks

3.6
Aromatic Residue (RARO)
product obtained from the bottom of the catalytic cracking unit’s splitter tower, with high density and with high aromatics content. It is also called “carbon black” or “feed stock”

3.7
Atmospheric Residue (RAT)
product performed by the oil fractions which arise from the process of atmospheric distillation at temperatures higher than 420 °C

3.8
drying
operation which consists of the removal of remaining water or product by forced or natural ventilation/exhaustion

3.9
ragging
operation which consists of the removal of remaining water or product using rags, tow, recyclable industrial towels or similar ones

4 General Conditions

4.1 When scheduling for transport, compatibility of the scheduled cargo with the tank coating, the materials of pumps, grids, valves, coils and elastomers shall be checked.

4.2 During cleaning of tanks, all safety procedures shall follow the OCIMF - International Safety Guide for Oil Tanker and Terminals (ISGOTT).

4.3 In order to dispose of water used in the cleaning of tanks, the rules of Annex I on MARPOL 73/78 and its respective amendments shall be adhered to.

5 Cleaning of Tanks

5.1 The cleaning procedures required to ensure the quality of products are listed on Tables A.1 and A.2 of Annex A, as well as in Annex B.

5.2 The number of operating cycles of the machines shall be enough to ensure that the load tanks are ready to receive the scheduled load.

5.3 The cleaning operation includes, when applicable, the steps as they are described on Table 1.

Table 1 - Tank Cleaning Operations

Code	Operation
F	Pouring with cold salt water
Q (see Note)	Pouring with hot salt water
A	Freshening
D	Drainage
P	Purge
S	Drying
T	Ragging
NOTE Ships which do not have a water heating system for pouring shall use a higher number of cold water cycles in order to compensate the temperature effect on residue removal.	

5.4 Tank cleaning procedures for inter-product loading not predicted in the Tables A.1, A.2 and in Annex B can only be followed under the Programming/Quality´s authorization.

5.5 When cleaning procedures demands the use of water, drainage of tanks, internal lines, pumps shall be carefully done, minimizing the risk of further cargo contamination.

5.6 Barges operated by Transpetro equipped with a stripping system and with access to tanks to inspect them after the discharge of the transported products can transport Gasoline A, Anhydrous Ethanol, Hydrous Ethanol and Diesel (S10 and S500) with no need to comply with the tank cleaning procedures required in this norm, considering that they are endowed with operational resources that allow a good drainage of tanks and cargo lines.

NOTE The CT COMB 015/14 CENPES/PDAB/COMB report has been issued, of which conclusion is that the possible remaining does not jeopardize the quality of the transported products.

5.7 If one needs to transport the products as to Tables A.1, A.2 of this norm without tank cleaning, such operation can be carried out only if the barges or ships have the technical operational conditions predicted in the section 5.6, and after a technical study being done by due organization in order to assure such operations shall not jeopardize the quality of the transported products.

5.8 COW procedures shall be followed under frequency required in MARPOL – ANNEX I.

6 Recovery of Epoxy Paint Hardness

When applicable, the procedure for recovery of tank epoxy paint hardness tank shall be taken into account after discharges of naphtha and ethanol, as follows:

a) drain the load tank as best as possible;
b) open all the tank’s ellipsis and domes;

c) install two portable fans in the tank, one at fore and the other at aft, along with their exhaust ducts, which shall be accordion-shaped; these ducts shall be installed up to a quota of 1,0 m, measured from the bottom of the load tank;
d) exhaust the tank for a minimum of 24 hours, in order to dry out the tank and recover the paint's original hardness;
e) prior to inspecting the load tank, there shall be a measurement in order to check gas content within, in order to allow release of the tank for entry of personnel;
f) inspect the tank after release of gas contents and, if appropriate, repeating the operation described in d) as many times as necessary to ensure tank drying and recovery of the paint's original hardness;
g) inspection to find the hardness of the paint shall be carried out in three spots:
   — as close as possible to the bottom of the tank;
   — in the intermediate area between the bottom and the top;
   — as close as possible to the top of the tank;
h) initiate any loading or pouring operation only after the tank is all dried out and recovery of the paint's original hardness;
i) the need of cleaning the lines shall be emphasized.

Annex A - Tables

Table A.1 – Cleaning Procedure for Clear Products

From \ To	Gasoline	Petrochemical naphta	Natural Gasoline C5+	Aviation gasoline	Aviation kerosne	Marine gasoil	Diesel S500	Diesel S10	Lube Oil	Anhydrous ethanol	Hydrous ethanol
Gasoline	D	FD	D	D	FADT	FDP	FDP	FDP	FDT	D	D
Petrochemical naphtha	D	D	D	FADT	FADT	FDP	FDP	FDT	FDT	FADST	FADST
Natural Gasoline C5+	D	D	D	FADT	FADT	FDP	FDP	FDT	FDT	FADST	FADST
Aviation gasoline	FD	See note 2	See note 2	D	FADT	FDP	FDP	FDT	FDT	D	D
Aviation kerosene (NOTE 5)	FD	FD	D	FADT	D	D	D	FDT	FDT	D	D
Marine gasoil	FD	FD	D	FADT	FADT	D	FD	FDT	FDT	D	D
Diesel S500	D	FD	D	FADT	FADT	D	D	FDT	FDT	D	D
Diesel S10	D	FD	D	FADT	FADT	D	D	D	FDT	D	D
Lube Oil	QD	QD	D	See note 3	See note 3	QD	QD	QADT	See note 4	QADST	QADST
Anhydrous ethanol (NOTE 6)	D (Note 1)	FDT	D	FADT	FADT	FD	FD	FD	FDT	D	D
Hydrous ethanol (NOTE 6)	D (Note 1)	FDT	D	FADT	FADT	FD	FD	FD	FDT	D	D

NOTE 1 For Export Gasoline, FD procedure shall be performed.

NOTE 2 It is recommended to perform intermediate loading using another product to avoid contamination by remaining plumb. In case this is not possible, adopt the “FDST” procedure. **[Recommended Practice]**

NOTE 3 Not recommended.

NOTE 4 Reduced cleaning may be permitted depending on lubricating oil specification. Otherwise QDT.

NOTE 5 QAV may not be transported in tanks coated with inorganic zinc silicate or in contact with plastic, copper, galvanized steel, zinc, cadmium or their alloys.

NOTE 6 Perform the procedure for recovering the hardness of epoxy paint prior to pouring procedure and perform a bulkhead test to detect hydrocarbons.

Table A.2 – Cleaning Procedures for Dark Products

From \ To	Oil	High sulphur fuel oil / HSFO	Low sulphur fuel oil / LSFO	VLSFO	Diesel	"Light Cicle Oil" ATE	"Light Cicle Oil" BTE	Condensate	Marine gasoil	Diesel S500 e S10	Aviation kerosene	Other clear products	RARO
Oil (NOTE 2)	D	QDP	QDP	QDP	QAD	QAD	QAD	QFDST	QFDST	See note 6	See note 1	See note 1	See note 5
High sulphur fuel oil / HSFO	D	D	D	D	QFAD	D	D	QFDST	QDS	See note 6	See note 1	See note 1	See note 5
Low sulphur fuel oil / LSFO	D	D	D	D	QFAD	D	D	QFDST	QDS	See note 6	See note 1	See note 1	QAD
VLSFO	D	D	D	D	QFAD	D	D	QFDST	QDS	See note 6	See note 1	See note 1	See note 5
Diesel	D	D	D	D	D	D	D	QFDST	FDS	FDS	See note 1	See note 1	QAD
"Light Cicle Oil" ATE	D	D	D	D	D	D	D	QFDST	FDS	FDS	See note 1	See note 1	D
"Light Cicle Oil" BTE	D	D	D	D	D	D	D	QFDST	FDS	FDS	See note 1	See note 1	D
Condensate	D	QDP	QDP	QDP	QAD	QAD	QAD	D	QFDST	See note 6	See note 1	See note 1	QAD
Marine gasoil	D	D	D	D	D	D	D	FD	D	See table A1	See table A1	See table A1	D
Diesel S500 e S10	D	D	D	D	D	D	D	FD	D	See table A1	See table A1	See table A1	D
Aviation kerosene	D	D	D	D	D	D	D	FD	See table A1	See table A1	See table A1	See table A1	D
Other clear produts	D (Note 3)	FDP	FDP	FDP	FAD	FAD	FAD	FD (Note 3)	See table A1	See table A1	See table A1	See table A1	FAD
RARO	See notes 2 and 4	D	D	QD	QAD	QAD	QAD	QFDST	QDS	See note 6	See note 1	See note 1	D

NOTE 1 Operation not recommended.
NOTE 2 Perform a COW operation for the tanks, previewing product exchange. For oils with high sodium content, it is also recommended to freshen the tank.
NOTE 3 For a previous ethanol load cargo, perform FD procedure.
NOTE 4 For loading of oil and crackable RAT, perform QD procedure.
NOTE 5 For RARO loading, take into account the chemical nature of the previous cargo. For paraffinic products with high sulfur content and/or high ash content, perform QAD procedure.
NOTE 6 Procedure predicted in Annex B shall be performed.

ANNEX B

CLEANING PLAN FOR EX-OIL OR DPP TANKS FOR DIESEL

For this type of cleaning, it is necessary to appoint a specialized inspector to monitor and guide throughout the process. This appointment must be made via Logistics quality team.

It is also necessary to contract the supply of chemical product and a list of materials that are used in the process. Depending on the characteristics of the ship that will be cleaning (last cargoes, type of cleaning equipment available, heating capacity of washing water, internal arrangement of tanks, lines, etc.) the procedure shall be adjusted considering these particularities.

The general list of materials needed for this type of tank cleaning is in Annex C, and the vessel's Master must be consulted to inform the quantities of each item, as well as if there is any other item that needs to be provided. Upon receiving the list with the quantities and/or complement informed by the vessel's Master, quotations (ideally at least 3) must be requested from the maritime agency of the port where the material will be supplied.

All necessary contracts for this procedure (materials, fresh water, slop removal, chemical, demucking, etc.) must be submitted for approval by the Operations sector manager

In general, the process has these steps:

1) Put 800 to 1200 m3 (depending on the size of the ship) of clean sea water in one of the slop tanks to do the initial wash with sea water at ambient temperature (or slightly heated) at maximum pressure (10 bar), with fixed machines in full cycle, minimum of 4 hours per pair of tanks in closed system. Start heating coils in the slop tank when start the cycle of the last pair of tanks to raise the water temperature to the next stage and to help in clean water /oily separation.

2) Secondary wash with hot water (75°C) using fixed machines on selected programs / cycles (eg 90-0-90 / pitch 1/2) and portable machines (if available) in low position to cover the bottom wash (approx. 4 - 5m above the tank bottom to clear all bottom lines and hard to reach areas). Manifold washing should include sampling points and line drains. Sampling points, “PV risers” must also be included in this cleaning operation. Don't leave that for the end.

3) Purge and ventilate all tanks until they are “gas free” (“free for man”) for internal inspection. At the end of this stage, the tank structures are expected to be virtually free of oily residues and bottom sediments. Next stage depends on the situation of the tanks after inspection.

4) An additional hot water wash may be required on the lower surfaces, with or without chemicals (still with tanks in “gas free” condition). The use of chemical at this stage makes ventilation for access after washing more difficult. However, in more critical cases, with a lot of residues in the tanks, this step is necessary.

5) Probably some manual cleaning may be needed at this stage. Preference should be given to hiring workers specifically for this purpose (demucking), as there are many workers and they have the right equipment and experience to get the job done faster. Slop disposal can also be done at this time.

6) After manual cleaning, enters a wash with chemical products. This cleaning can be done only at the bottom of the tanks as the walls must already be sufficiently clean and, therefore, programs can be defined only for the bottom in fixed machines and even in portable equipment.

NOTE Chemicals already used and with good results are Drew Marine TC-4 and MARCLEAN H60+.

7) After the chemical wash, a new wash with hot water (min 60°C) will be necessary to remove the traces of the chemical and a Fresh Water (FW) flushing is done to remove all deposits from salt that seawater can leave.

8) Drain well all lines and pumps.

9) A final trapping and inspection prior to inertization should complete the job.

NOTE Depending on the reliability and efficiency of the equipment (boilers, water heaters, fixed and portable cleaning machines, line pressure, cargo pumps etc.) and based on previous experiences in this process, including numerous rest stops, equipment change, maintenance of equipment due to failure, etc., the total time of this cleaning operation usually takes between 10 and 14 days to complete.

10) Variations in this procedure must be discussed with the specialist inspector appointed to monitor the process, with the Master, Shipowner and Charterers.

ANNEX C – GENERAL LIST OF MATERIALS

MATERIAL LIST FOR PRICE COTATION		
ITEM	DESCRIPTION	QTTY REQUIRED
1	GLOVES RUBBER NATURAL SHORT ***	
2	GLOVES RUBBER NATURAL LONG ***	
3	RUBBER BOOTS WITH CLOTH LINING ***	
4	BOILER SUITS ***	
5	COTTON RAGS	
6	BUCKET NEOPRENE 20 LTR	
7	SHOVEL SQUARE NON-SPARK SPECIAL ALUM BRONZE 250X970MM	
8	JOINT SHEET SYNTHETIC RUBBER 5.0X1000X1000MM	
9	HEAVY DUTY SLUDGE BAG	
10	EMPTY 44 GALLON DRUMS	
11	COMPRESSED AIR SAFETY LIGHT, IMPA 330637, COMPLETE SET	
12	RESPIRATORS, IMPA 331126	
13	RESPIRATORS FILTERS, IMPA 331129	
14	FULLFACE RESPIRATOR, ADVANTAGE 1000, IMPA 331232	
15	FILTER CARTRIDGES FOR ADVANTAGE 1000 FULLFACE RESPIRATOR	
	IMPA 331244	
16	LALTERN "BRIGHT STAR" SAFETY APPROVED, MODEL 2206, 6V,	
	IMPA 792240	
17	BATTERY LANTERN 6V, IMPA 792435	
18	WATER RUBBER HOSE, O.D. 30mm	
	BRAND : MANDALS ANTISTATICA 980918	
19	VENTILATION TUBES, SPIRAL TYPE, TUBE DIA. 300mm, 20 Mtr	
	IMPA 591484	
20	PORTABLE MANUAL PUMP, 15 Ltr CAPACITY FOR SPRAYING CHEMICAL	
21	DREW MARINE TC-4 OR MARCLEAN H60+ CHEMICAL DETERGENT	
***	PLS INFORM RIGHT SIZES AND QUANTITIES NEEDED	

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