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CLEANING AND DESGASIFICACION OF TANKS NAUTICAL SCIENCES AREA. SECURITY SUBAREA

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ABSTRACT

With the leak in vigour of the international code of step of the operational security of the ship (IGS) the assembly of the maritime international organization passed the A443 (XI) resolution. Also the A680 (17) resolution is passed.

In this one it works exposes to him the methodology to follow in the processes of cleaning and degasification of the tanks in general and the cleaning of the load tanks to carry out a change of cargo.

It is of supreme importance the metallization and the care in all the operations related with the cleaning and the degasification of the load tanks, as well as, for the additional risk of the toxic effects of the gasoline of the petroleum, the adoption of the maxims takes precautions possible in the operations of degasification.

Keywords: Tank, degasification, cleaning, security.

INTRODUCTION

With the leak in vigour of the international code of step of the operational security of the ship (IGS) that thinks object furnish an international norm on step for the operational security of the ship and the prevention of the contamination, the assembly of the maritime international organization passed the A443 (XI) resolution, by means of the who invited to all the rudders to that took the necessary measures to protect to the captain in the proper acting of his functions on the maritime security and the protection of the marine halfback.

Also the A680 (17) resolution is passed in she who moreover recognized to him the primordial importance of the step is duly organized to answers the necessities of the personnel of aboard with object of reaching and keep a high level of security and protection of the halfback gives atmosphere.

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As long as never two shipping or owning companies of ships is identical and that these operate in condition very diverse, the IGS code only establishes principles and objective general datas in wide terms to achieve the maximum application. Fit doubt of the different levels of step, is already on land or at sea, it will require diverse levels of knowledge and dominion of the subjects to that refers to him.

It understands for international code of step of the security (IGS code) to the international code of step of the operational security of the ship and the prevention of the contamination passed for the assembly, in the form that it can be altered for the organization.

The international code of step of the security thinks object guarantee the maritime security and that are avoided so much the personal injuries or losses of human lives like the damages to the halfback it gives atmosphere, concretely to the marine halfback.

One of the primordial objectives to reach to gets the security that tries to get the IGS code, it is carries out a good floor timber of maintenance in the ships, since with this gets to him, in great measure, the operational security and the prevention of the contamination of the marine halfback.

The shipping thing must adopt procedures to guarantee that the maintenance of the ships carry out to him in agreement with the corresponding rules and with the complementary dispositions that it itself establishes, and for it, the shipping will make sure that it is carry out inspections with the proper periodicity, notify to him all the cases of nonfulfillment and, if they know to him, his possible causes, take to him measured corrective appropriate, and keep to him the expedients of those activities

The shipping thing will adopt in the system of step of the security (SGS) procedures fitted to argue which is the elements of the equipment and the technical systems that, in the case of sudden average, can create dangerous situations. They will arbitrate also measured make concrete stationed ships to increase the reliability of this elements or systems. One of those measures will consist in the periodic test realization with the auxiliary devices, as well as with the elements of the equipment or the systems that are in use continually.

The objective is establish the criterions of quality and the precautions to carry out the cleaning and degasification of the load tanks, and other fenced-in gardens spaces, after the discharge of by-proucts products of the petroleum, to carry out change of cargo, it enters a tank or in a closed space, or carry out hardships instantly or in cold.

In this one it works describe to him the followed procedures for the ships (photo 1) operated for maritime distributor Petrogas, S.L.U., when they finds in the circumstances describe.

Photo 1. Ship Mencey, incendiary of new generation and of fold hull that entered service in 2004.

METHODOLOGY TO FOLLOW IN THE PROCESSES OF CLEANING

The procedure of cleaning of the load tanks to carry out a change of cargo, keeping in mind the previous cargo and the next, shows codified in the table 1, while that the description of the procedure of cleaning, identified for a specific code, reflected in the table 2.

POST LAST	NEXT CARGO					
	KERO	GNA	TO GO	DO	FO	NAPHTHA
KEROSENE	-----	1	1	1		
GASOLINE	4	-----	3	3	3	4
GASOLINE-OIL	4	2	-----	-----	1	4
DIESEL-OIL	6	2	1	-----	1	4
FUEL-OIL	NOT	NOT	5	5	-----	NOT
NAPHTHA	4	4	4	4	4	-----

Table 1.- Cleaning of tanks. The last product clewed up in the tank it is related in the column of the left. The next cargo to carry out finds in the superior row. And, the intersection of the horizontal line of the last product clewed up in the tank and the vertical line of the product to load indicates the code (1, 2, 3) of the procedure to follow to carry out the cleaning.

CODE	PROCEDURE OF CLEANING
1	When executing the discharge, it reduces the tanks correctly.
2	It reduces the tanks correctly. It causes something to lean its vertical position lines and dazed. Floor timber cleaning of the tank with jet of salt water. Reducing dazed shafts.
3	It reduces the tanks correctly. It causes something to lean its vertical position lines and dazed to the slop. It airs until a 10% LEL Control of atmosphere Circulating leak of sea for lines and bottom of tanks. Re-bale.
4	It reduces the tanks correctly. It causes something to lean its vertical position lines and dazed to the slop. It airs until a 10% LEL Control of atmosphere Circulating leak of sea for lines, tanks bottom and dazed. Re-bale. Cleaning with Butterworth machine with salt water (1 hour). Degasification. Reducing dazed aspiration shafts. To withering.

5	It reduces the tanks correctly. It causes something to lean its vertical position lines and dazed. Circulating leak of sea for lines and dazed. Re-bale. Cleaning with Butterworth machine with salt water (2 hours). Degasification. Extraction of sediments.
6	It reduces the tanks correctly. It causes something to lean its vertical position lines and dazed. Circulating leak of sea for lines, tanks bottom and dazed. Re-bale. Cleaning with Butterworth machine with salt water (2 hours). Cleaning with Butterworth machine with hot salt water (80ºC) (1 hour). Sweeten. Butterworth with hot fresh water (80ºC) (30 minutes). Reducing dazed aspiration shafts. To withering.

Table 2.- Procedure of cleaning. The code of the procedure to follow is in the column of the left. The procedure of cleaning it finds in the column of the right. The intersection of the horizontal line of the code with the vertical line indicates the procedure of cleaning that it is must follow.

Cleaning of simultaneous tanks with the manipulation of the load

As it rules general, the cleaning of tanks, NOT it must carry out simultaneously with the manipulation of the load. If for some reason this out necessary, must be consulted and move close to a so much accord with the responsible thing of the terminal as of the port authorities.

Must be verified the electric continuity in all the ventilation ducts (in a dry condition) that takes part in the cleaning of tanks, before your use, and in any case the resistance must be main of 6 ohms for meter of longitude.

It doesn't must overhaul nobody to any load tank, less than it have received, of the responsible officer, permission to make it and that have taken all the appropriate precautions, including the emission of a permission of leak in fenced-in gardens spaces, just as remains established in the manual of procedures P9N22, Leak in fenced-in gardens spaces.

In order to keeping an appropriate control of the atmosphere of the load tanks, aboard of the ships of maritime distributor Petrogás, S.L.U., it disposes of the following equipment of measure:

2 analyzers of atmosphere for the measurement of gasoline or evaporate inflammable and oxygen in the air.
1 Test of calibration of the analyzers of atmosphere.
1 Instrument capable of measure poison gas concentrations and of sulphydric acid (Tetraoxosulfate (VI) of hydrogen H2SO4).
All this one provisions will be identified in agreement with it specified in the manual of procedures P11.1 control of the inspection equipments, measurement and rehearse and controlled by means of the test of calibration carried out periodically in agreement with the instructions of the manufacturer and before beginning the operations of cleaning or degasification of the load tanks, and the certificates of routine inspection broadcasted for the authorized manufacturer or workshops each 12 months.

Operations of cleaning of tanks of load

The atmosphere in the tank can be understanded in the following groups:

Inert: A done unable atmosphere of blazing, if introduces you inert gas and it reduce you the total content of oxygen. The content of oxygen of the atmosphere of the tank must surpass of the 8% for volume.
Too much poor: An unable atmosphere of blazing, for the deliberate settlement of converted Indians of the content of hydrocarbons perfectly level for under the inflammable lower limit (LFL).
Too rich: An unable atmosphere of blazing, for keeping deliberately the content of hydrocarbons of the tank above the inflammable superior limit (UFL). See ISGOTT section 9.2.5.
Not controlled: An atmosphere that is not controlled can be for add, for below or in the inflammable rank.
In the section 10.6.8 of ISGOTT it is exposed the requests for the maintenance of an inert atmosphere and the precautions to be observed during the cleaning of tanks.

For the cleaning of tanks in an atmosphere too much poor, in agreement with ISGOTT (9.2.3), must observe to him the following precautions:

Before beginning the operations of cleaning the tank it must air in order to reduce the concentration of the atmosphere to the 10% or less than the inflammable limit inferior (LFL) [atmospheric control]. The samples of gasoline they must take to different levels. During the cleaning it must be continued with the mechanical ventilation and take them of samples of gasoline. The ventilation must, in the possible, supply a free rise of air, from an extreme to the other of the tank.
In agreement with SINGLE (Enm. 2000, Cap. II-2, Rule 16), the inflammable steamer will unload to him first for the orifices of suitable airing in the rule 4.5.3.4 (respiration or valves masts P/V of high speed). When the concentration of inflammable vapours in the orifice of exit has remained reduced to the 30% of the LFL, the degasification is able to continue level with the deck of the load tanks.
Rinsing with waters and rebale the bottom of the tanks. Also it must be rinsed with waters the system of pipes, bridges and dazed of discharge, draining all on the designated tank to receive the dirty waters (slops).
If the tank has a system of sniffing people with those of other tanks, must insulate to him, in order to impede the leak of reasonable gasoline of the other tanks.
If machines are used of portable cleaning, before introducing the machine of cleaning in the tank, must mate to him all the ventilation ducts and verify the electric continuity between all the couplings and the machine. The ventilation ducts must be uncoupled until after having extracted the machine of the tank. To drain the ventilation duct, can be float free partially a coupling and later press again it before withdrawing the machine of the tank.

During the cleaning of tanks it must carry out to him, of regular form, measured of gasoline to different levels. It must be had in counting the possible effect of the leak on the efficiency of the equipment of measure of gasoline. If the concentration of gasoline reaches to the 50% of the LFL, must be stopped the cleaning of the tank and it renews the single when by means of an endless ventilation of the same thing has reduced the concentration of the gasoline to the 20% of the LFL and it is The Hague kept to that level (or in one more below).
During the cleaning the tank must be kept re-baled. It must be stopped the cleaning to eliminate any accumulation of leak.
For the cleaning of tanks is not must be accustomed leak of cleaning recycled.
It must not inject steamer in the tank.
They must take the same precautions, related with the introduction of sounding lines or other similar equipment, that when it is washing in an atmosphere not controlled (see section ISGOTT 9.2.4 (i)).
It can be employ chemical additives as long as the temperature of the leak of cleaning not surpasses of 60º C.
The leak of cleaning can be heat. In the case of the temperature of the leak of cleaning it is of 60º c or smaller, if the concentration of gasoline reaches the 50% of the LFL must interrupt to him the cleaning. If the temperature of the leak is for on the 60º c, the cleaning must interrupt if the concentration of gasoline reaches the 35% of the LFL.
In agreement with ISGOTT (9.2.4), in an atmosphere that is not controlled, the gasoline in the tank can be in the inflammable rank. The only form of guaranteeing that it cannot occur an explosion during the operations of cleaning, it is take all the necessary precautions, to make sure that don't exist sources of ignition.
They must take the following precautions to eliminate the risk of static currents:
They must not use machines of cleaning that have a superior wealth to 60 M3/h.
The of great volume total of leak of cleaning for tank of load, must be kept so below in any way whatever feasible and in any case it must surpass of 180m3/hour.
It must be used leak of cleaning recycled.
It must be used chemical additives.
The leak of cleaning can be heat as long as the temperature not surpasses of the 60ºC.
It doesn't must be injected steamer in the tank.
During the cleaning, the tank must be kept re-baled. The operations of cleaning must be stopped to reduce any accumulation of reasonable leak of the cleaning.
Before introducing the machine of cleaning in the tank it must mate to him and verify the electric continuity of all the connections of the ventilation ducts. The ventilation ducts must be uncoupled until the machine it has been withdrawed of the tank. To drain the ventilation ducts, can be float free partially a coupling and later press again it before withdrawing the machine of cleaning of the inside of the tank.
The introduction of sounding lines and other equipments must be carried out through a tube of sounding line if it is that is installed.
If you had not installed a tube of sounding line, it be indispensable that any component metal worker of the equipment of sounding line or other equipments, it is connected

to earth of a sure form before be introduced in the tank and that it staies set would that, connected to earth, until is withdrawed. This precaution it must keep during all the operations of cleaning and it extends the 5 hours more as of your finalization. However, if the tank is aired mechanically of endless form after the cleaning, this one period can be reduced to 1 hour. During this one period:

It can be use a detector of interface of metallic construction, if it is connected to earth with the ship by means of a nipperses or a metallic ear.

It can be use a metallic rod affirmed to the extreme of a metallic waleses that it is connected to earth (to knead) with the ship.

It must not use a suspended metallic rod of a rope of fiber, although the extreme perfectly level of deck is affirmed to the ship because a rope is not valid as conducting electric from setting to earth.

It can be accustomed, in general, it provisions fabricated completely of not metallic materials, such as a rod of wood it can be suspended of a rope, without that is setting to earth.

To introduce equipment in the load tanks they must not use fabricated ropes with polymerous synthetic.

In the chapter 20 of ISGOTT information more wide is offered on the electrostatic precautions that must observe to him during the operations of cleaning of tanks.

The procedure to make the atmosphere of the tank too rich and afterwards wash it with waters implies contradiction special measures stationed ships to impede the entrance of air. This method of wash of tanks can be carry out only when it is authorized for the assembler and below the supervision of a person that has received special training in this one procedures.

If the content of hydrocarbons of the atmosphere of the tank is lower to the 15% for volume, it must not begin to him the cleaning with waters or must interrupt to him or not re-start in the case of the operations it is in motion.

Portable machines of cleaning of tanks and ventilation ducts

The exterior incendiary bomb of the portable machines must be of a material which in contact with the internal structure of a tank of load it doesn't produce sparkles.

All the ventilation ducts of cleaning of tanks must have incorporated inwardly a wire of interconnection. The couplings of the extremes of the ventilation ducts must be connected to them of form someone that it remains secured, among them, an effective interconnection.

The coupling of the ventilation ducts must be someone that an effective connection is established between the machine of cleaning, the ventilation ducts and the fixed line of supply of leak for the cleaning of the load tanks.

The ventilation ducts they must take a bearing indelibly to permit your identification. Must be taken a register aboard that indicates the date and the result of the proofs of electric continuity.

The machines of cleaning must be electric connected to the ventilation duct, by means of an appropriate connection or for an external interconnected cable.

When the machines of cleaning are suspended in a tank of load, they must maintain by means of a rope and not by means of the ventilation duct that supplies them the leak.

Free drop (ISGOTT, 9.2.7)

It is indispensable avoid free the fall of leak or dirty waters in the receiving tank. The level of the liquid must be always someone that the mouths of the lines of discharge, in the reception tank, is decks at least a meter, to avoid the splashy thing. This is not necessary when the tanks of reception of dirty waters (|slops|) and of load are totally inertized.

Sprinkled with waters (ISGOTT, 9.2.8)

The dewy thing with waters in a tank that contains a substantial quantity of accumulating product of static currents it could cause the generation of static electricity in the liquid surface is already for agitation or for the simple deposit of the leak.

The tanks that contain an accumulating product of static currents must well always re-bale to him, before be washed with waters, to less than the tank it keeps in an inert condition (see section 7.4 of ISGOTT).

Vaporized of tanks

Due to the risks of static electricity, the introduction of steamer in a tank of load must be permitted if exist the risk of the presence of an inflammable atmosphere.

Discharge of blunder, cascarillas of oxidize and deposit as sediment

Before the manual discharge of blunder, cascarillas of oxidize and deposit as sediment, the atmosphere of the tank must be sure to carry out the leak and must broadcast to him a permission of leak in fenced-in gardens spaces. They must keep during the whole storm that lasts the work the precautions describe in the section 11.6.5 of ISGOTT and in the P9N22 Leak procedure in a closed space.

The equipment to be used in operations of cleaning of tanks, just as the discharge of solid remainders or products in tanks that it have been desgasificadoed, must be designed and built, and the used materials in the construction are so, that your use doesn't add no risk of ignition.

In agreement with the rule 20 of the annex I of the international agreement to prevent the contamination for the ships, 1973, in your modified form for the protocol of 1978, Marpol 73/78, the operations of cleaning of tanks of the incendiaries of brute equal or superior gauging to 150 tons, must be consigned in the book it registers of hydrocarbons (departs II).

to this one printed paper of book it registers of hydrocarbons (second revision) (departs II) adopted by means of the resolution MEPC.47 (31), you are assigned in the system of quality, security and intercede environment of maritime distributor Petrogás, S.L.U., the codification Doc.9N6.3 and the registers will be carried out following the established instructions in the referenced document.

The captain will inform to the department of security and intercede environment, monthly, of the amount of dirty waters (water of wash of tanks) and oleaginous remainders of bilges surrendered in receiving installations, specifying date and port, by means of the Doc.9N16.1 denominate Marpol action.

DESGASIFICATION OF TANKS

The additional risk of the toxic effects of the gasoline of the petroleum during this one period must be inculcated to all the implied contradiction in the operations.
It is indispensable that the possible care major is had in all the operations related with the cleaning and the degasification of the load tanks.

General procedure

Then the applicable recommendations are detailed to the degasification of tanks in general. In the agree 10 of ISGOTT it exposes to him additional considerations that apply to him when the tank is inertized.
The stramoniums of all the apertures of the tanks of load must keep to him closed until the ventilation of the tank is on the point of begin.
The portable ventilators of must only use if are driven hydraulics or pneumatic. His material of construction must be someone that doesn't anchor no risk of sparkles if for any reason the impeller blows the inside side of the incendiary bomb.
The capacitance and effectiveness of the portable ventilators must be someone, that all the atmosphere of the tank on she who employs to him the ventilator can be don't inflammable in the smaller possible storm.
In agreement with SINGLE (Enm. 2000, Cap. II-2, Rule 16), during the degasification, the blow of the inflammable gasoline carries out for the fixed system pass of the ship, flowing first for the orifices of suitable airing in the rule 4.5.3.4 (respiration or valves masts P/V of high speed). When the concentration of inflammable vapours in the orifice of exit has remained reduced to the 30% of the LFL, the degasification is able to continue level with the deck of the load tanks.
It takes him/her/it of the central system of air conditioning or those of those of mechanical ventilation it must fit to prevent the leak of the petroleum in the inside of the qualification, if it are possible recycling the air in the inside spaces of the ship.
If in any moment be suspicious that the gasoline is being dragged to the inside of the qualification of the ship, must stop to him the central system of air conditioning and those of mechanical ventilation and cover or close his aspirations.
The units of window type air conditioning that be certified as sure to be accustomed in the presence of inflammable gasoline or that it suck in air from the exterior side of the superstructure must be detached electric and close any external exit or aspiration.
In the where ships they are installed permanent ventilators to desgasificate the load tanks, must wrap up to him with blind flanges all the connections between the system of load and the ventilators except when the ventilators are in use.
Before putting in service such a system, must clean out to him totally with leak of sea the system of pipeses of load and re-bale the tanks. The valves of the system that are not the strictly used to carry out the operations of degasification, must close to him and secure.
The apertures of tanks in fenced-in gardens or partially fenced-in gardens spaces not they must float free until the tank has aired sufficiently by means of apertures of the tank that are outside of this one spaces.

When the level of the gasoline in the tank has gone down to the 25% of the LFL or less, it can be open the apertures in the fenced-in gardens or partially fenced-in gardens spaces, to complete the ventilation. In someone fenced-in gardens or partially fenced-in gardens spaces must also verify to him the existence of gasoline during this subsequent ventilation.

If the tanks are connected to a system of sniff people, each tank must be insulated to impede the transference of gasoline from or towards other tanks.

When be accustomed to him portable ventilators, must place to him in positions someone, and the apertures of ventilation of someone form, that all the abilities of the tank that are becoming aired are equal and in effect desgasificadassed. In general, the apertures of ventilation must be distant all the possible thing of the ventilators.

When they are accustomed to him portable ventilators must connect to the deck of form someone that exist an electric effective interconnection between the ventilator and the deck.

The fixed equipment to desgasificate can be use to free of gasoline simultaneously besides a tank, but is not must be accustomed with this one aim if the system it is using to air other tank is washing to him.

To the feign finalization of the degasification of any tank, before taking the final measures of gasoline, it is must leave pass a period of a few 10 minutes. This permits that develop to him condition relatively regular guest in the space of the tank. The measures of gasoline to different levels and, where the tank is subdivided for a transversal bulkhead of reinforcement, in every one of the compartments of the tank. In big compartments the measures they must carry out in positions amply separate.

If they don't obtain to him satisfactory readings of the not existence of gasoline, must renew to him the ventilation.

To the finalization of the degasification they must close all the apertures except those of the stramoniums of the tank.

when executing the degasification and cleaning of the load tanks, must carefully verify to him the system of blow, giving special attention to the efficient functioning of the P/V valves, including the valves of blow of high speed. If the valves or billiard pins of blow are provisioned with dispositives designed to impede the step of the flames, this one also must recognize to him and clean out.

The drainages of the tubes of blow must, if it conduct, clean out of leak, oxide and deposit as sediment and any connection is must satisfactorily try of suffocation of the tank.

Degasification for the reception of a cargo

A tank of the one which requires to him that it is gives birth of gasoline to receive a cargo, must air to him until the measures it confirm that the concentration of gasoline of hydrocarbons of an extreme to the other of that tank surpass of the 40% of the LFL.

Degasification for meddling and work in cold without get ready respiratory

to the end of a tank or space out is gives birth of gasoline for leak without get ready respiratory, you are must air until the proofs confirm that the concentration of gasoline

of hydrocarbons, of an extreme to the other of the compartment, surpass the 1% of the LFL, and have carried out the additional proofs to verify the content of oxygenate and the presence of poison gases according to corresponds. It sees ISGOTT section 11.3 and P9N22 Leak procedures in fenced-in gardens spaces and P9N31 hardships in cold.

Degasification to work instantly

Besides collecting the requirements of section ISGOTT 9.3.4 and section 2.8, must them fulfill one's obligations to him specified in the manual of procedures of the system of step integrated (SGI) of the shipping, Procedure P9N30 hardships instantly.
The responsible thing of fulfilling and make fulfill this one procedures is the captain as responsible of the security of the ship whose gives the orders has knight-commander's assistant and the officers in the measure in which everyone of them/it has assigned functions in the procedures or arrange permanent waves of the captain.
Likewise, the registers that are must carry out are the floor timber of Charge/discharge of the ship, the log book of the ship, the book registers of hydrocarbons (departs II) operations of Charge/ballasted (Doc.9N6.3), the register of the proofs of electric continuity of the ventilation ducts of cleaning of tanks, the certificates of routine inspection of the equipments of measurement of gasoline, the register of the test of carried out calibration to the equipments of measurement of gasoline and the maintenance of the ship and provision (maintenance of the P/V valves).

CONCLUSIONS

Gradually it been gone increasing the interest for the labour security and for the protection of the halfback gives atmosphere, not remaining the maritime sector exempts of this common general. With the leak in vigour, of the 1 of July of 1998 of the international code of step of the Operational security of the ship and the prevention of the contamination (international code of step of the security (IGS) (A.741. (18)) an international norm is furnished on step for the operational security of the ship and the prevention of the contamination.

The IGS code only establishes principles and objective general datas, since never two shipping or owning companies of ships is identical nor it operate upon in the same conditions, for that motive, corresponds to each shipping establish a series of protocols or of procedures to carry out daily operations, among them those of cleaning and degasification of tanks of load and other spaces closed after the discharge of by-proucts products of the petroleum.

It is fundamental the metallization and preparation of the whole involved personnel in these operations, fundamentally when it deals with of degasification, for the additional risk of the toxic effects of the gasoline of petroleum.

REFERENCES

Gómez Gómez, J.I., Solagaistua, J.L. & Mingorance, M.C., (En Prensa). Evolución de la flota de "Distribuidora Marítima Petrogas, S.L.U." desde su fundación hasta 2004.

International Safety Guide for Oil Tankers and Terminals (ISGOTT). Convenio Internacional para prevenir la contaminación por los buques Marpol 73/78.

Tank Cleaning Guide (Dr. Verwey's). Convenio Internacional para la seguridad de la vida humana en el mar, 1974, y su correspondiente Protocolo de 1988 (SOLAS 74/88). Enmiendas de 2000. Capítulo II-2.

CLEANING AND DESGASIFICACION OF TANKS NAUTICAL SCIENCES AREA. SECURITY SUBAREA.

RESUMEN

Con la entrada en vigor del Código Internacional de Gestión de la Seguridad operacional del buque (IGS) la Asamblea de la Organización Marítima Internacional aprobó la resolución A443 (XI). También se aprobó la resolución A680 (17).

En éste trabajo se expone la metodología a seguir en los procesos de limpieza y desgasificación de los tanques en general y la limpieza de los tanques de carga para efectuar un cambio de cargamento.

Es de suma importancia la mentalización y el cuidado en todas las operaciones relacionadas con la limpieza y la desgasificación de los tanques de carga, así como, por el riesgo adicional de los efectos tóxicos del gas del petróleo, la adopción de las máximas precauciones posibles en las operaciones de desgasificación.

METODOLOGÍA

Con la entrada en vigor del Código Internacional de Gestión de la Seguridad operacional del buque (IGS) que tiene por objeto proporcionar una norma internacional sobre gestión para la seguridad operacional del buque y la prevención de la contaminación, la Asamblea de la Organización Marítima Internacional aprobó la resolución A443 (XI), mediante la cual invitó a todos los gobiernos a que tomaran las medidas necesarias para proteger al capitán en el debido desempeño de sus funciones sobre la seguridad marítima y la protección del medio marino.

También se aprobó la resolución A680 (17) en la que además se reconocía la importancia primordial de que la gestión esté debidamente organizada para responder a las necesidades del personal de a bordo con objeto de alcanzar y mantener un elevado nivel de seguridad y protección del medio ambiente.

Dado que nunca dos compañías navieras o propietarias de buques son idénticas y que éstas operan en condiciones muy diversas, el Código IGS sólo establece principios y objetivos generales en términos amplios para lograr la máxima aplicación. No cabe duda de que los distintos niveles de gestión, ya sea en tierra o en el mar, requerirán diversos niveles de conocimiento y dominio de los temas a que se hace referencia.

El Código Internacional de Gestión de la Seguridad tiene por objeto garantizar la seguridad marítima y que se eviten tanto las lesiones personales o pérdidas de vidas humanas como los daños al medio ambiente, concretamente al medio marino.

Uno de los objetivos primordiales para llegar a conseguir la seguridad que pretende el Código IGS, es llevar a cabo un buen Plan de Mantenimiento en los buques.

Las navieras deberán adoptar procedimientos para garantizar que el mantenimiento de los buques se efectúe de conformidad con los reglamentos correspondientes y para ello, las navieras se asegurarán de que se efectúen inspecciones con la debida periodicidad.

El objetivo es establecer los criterios de calidad y las precauciones para efectuar la limpieza y desgasificación de los tanques de carga, y otros espacios cerrados, después de la descarga de productos derivados del petróleo, para efectuar cambio de cargamento, entrar en un tanque o en un espacio cerrado, o efectuar trabajos en caliente o en frío.

METODOLOGÍA A SEGUIR EN LOS PROCESOS DE LIMPIEZA

El procedimiento de limpieza de los tanques de carga para efectuar un cambio de cargamento, teniendo en cuenta el cargamento anterior y el próximo, se muestra codificado en la Tabla 1, mientras que la descripción del procedimiento de limpieza, identificado por un código específico, se refleja en la Tabla 2.

ÚLTIMO CARGAMENTO	PRÓXIMO CARGAMENTO					
	KERO	GNA	GO	DO	FO	NAFTA
KEROSENO	-----	1	1	1		
GASOLINA	4	-----	3	3	3	4
GAS-OIL	4	2	-----	-----	1	4
DIESEL-OIL	6	2	1	-----	1	4
FUEL-OIL	NO	NO	5	5	-----	NO
NAFTA	4	4	4	4	4	-----

Tabla 1.- Limpieza de tanques. El último producto cargado en el tanque se relaciona en la columna de la izquierda. El próximo cargamento a efectuar se encuentra en la fila superior. Y, la intersección de la línea horizontal del último producto cargado en el tanque y la línea vertical del producto a cargar indica el código (1, 2, 3, …) del procedimiento a seguir para efectuar la limpieza.

CÓDIGO	PROCEDIMIENTO DE LIMPIEZA
1	1. Al finalizar la descarga, achicar los tanques adecuadamente.
2	1. Achicar los tanques adecuadamente. 2. Desplomar líneas y bombas. 3. Limpieza plan del tanque con chorro de agua salada. 4. Achicar pocetos bombas.

3	1. Achicar los tanques adecuadamente. 2. Desplomar líneas y bombas al slop. 3. Ventilar hasta un 10% LEL 4. Control de atmósfera 5. Circular agua de mar por líneas y fondo de tanques. Reachicar.
4	1. Achicar los tanques adecuadamente. 2. Desplomar líneas y bombas al slop. 3. Ventilar hasta un 10% LEL 4. Control de atmósfera 5. Circular agua de mar por líneas, fondo tanques y bombas. Reachicar. 6. Limpieza con máquina butterworth con agua salada (1 hora). 7. Desgasificación. 8. Achicar pocetos aspiración bomba. 9. Secar.
5	1. Achicar los tanques adecuadamente. 2. Desplomar líneas y bombas. 3. Circular agua de mar por líneas y bombas. Reachicar. 4. Limpieza con máquina butterworth con agua salada (2 horas). 5. Desgasificación. 6. Extracción de sedimentos.
6	1. Achicar los tanques adecuadamente. 2. Desplomar líneas y bombas. 3. Circular agua de mar por líneas, fondo tanques y bombas. Reachicar. 4. Limpieza con máquina butterworth con agua salada (2 horas). 5. Limpieza con máquina butterworth con agua salada caliente (80ºC) (1 hora). 6. Endulzar. Butterworth con agua dulce caliente (80ºC) (30 minutos). 7. Achicar pocetos aspiración bomba. 8. Secar.

Tabla 2.- Procedimiento de limpieza. El código del procedimiento a seguir está en la columna de la izquierda. El procedimiento de limpieza se encuentra en la columna de la derecha. La intersección de la línea horizontal del código con la línea vertical indica el procedimiento de limpieza que se debe seguir.

Limpieza de tanques simultáneo con la manipulación de la carga

Como regla general, la limpieza de tanques, **NO SE DEBERÁ REALIZAR SIMULTÁNEAMENTE** con la manipulación de la carga.

CONCLUSIONES

Paulatinamente se ha ido incrementando el interés por la seguridad laboral y por la protección del medio ambiente, no quedando el sector marítimo exento de ésta corriente general. Con la entrada en vigor, del 1 de julio de 1998 del Código Internacional de Gestión de la Seguridad Operacional del Buque y la Prevención de la Contaminación (Código Internacional de Gestión de la Seguridad (IGS) (A.741.(18)) se proporciona una norma internacional sobre gestión para la seguridad operacional del buque y la prevención de la contaminación.

El Código IGS sólo establece principios y objetivos generales, ya que nunca dos compañías navieras o propietarias de buques son idénticas ni operan en las mismas condiciones, por ese motivo, corresponde a cada naviera establecer una serie de protocolos o de procedimientos para realizar operaciones cotidianas, entre ellas las de limpieza y desgasificación de tanques de carga y otros espacios cerrados después de la descarga de productos derivados del petróleo.

Es fundamental la mentalización y preparación de todo el personal implicado en estas operaciones, fundamentalmente cuando se trata de desgasificación, por el riesgo adicional de los efectos tóxicos del gas de petróleo.