Procedures to Monitor Regional and International Servicing of RAC systems of Jamaican Flagged vessels/ships with regard to use of HCFC refrigerants

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General Requirements for Refrigeration and Air Conditioning Systems onboard Ships:

Refrigeration and Air Conditioning equipment employed onboard Jamaican flagged ships and vessels should be labelled in accordance with the JS 1: Part 29: 2015, “The Labelling of Commodities Part 29: Labelling of products and equipment containing or manufactured using ozone depleting substances and/or their substitutes”. The refrigerants carried onboard these vessels should be transported, handled and stored in accordance to Draft Standard DJS 339: 2017, Transportation, handling and storage of refrigerants and labelled in accordance with JS 1: Part 29: 2015.

A Refrigerant Management Plan should be developed for each vessel depending on Type, Class, tonnage and uses. A list of all RAC systems onboard shall be included in the Management Plan.

Safe handling of refrigerants would require that the compartment or flat in which RAC machineries are fitted should be adequately ventilated and illuminated. Where fitted, both the supply and exhaust fans to and from compartments in which refrigeration machinery is situated should be kept running at all times. Inlets and outlets should be kept unobstructed. When there is any doubt as to the adequacy of the ventilation, a portable fan or other suitable means should be used to assist in the removal of toxic gases from the immediate vicinity of the machine.

Procedures to Monitor Regional and International Servicing of RAC:

Purchase of Refrigerants:

The Trade (Montreal Protocol) (Trade in Ozone Depleting Controlled Substances) Order 2014, outlines a quota system and name the companies that are licence to import and trade in HCFC refrigerants, starting January 2013.

1. Hydro-Chlorofluorocarbon (HCFC) refrigerants should only be purchased locally from companies with quota allocation as outlined in the Trade Order 2014 [3].
2. The quantity of refrigerants purchased and stored onboard vessel should not exceed 70 kg or the average amount of refrigerant used to service the largest unit onboard the vessel, whichever is more. However, depending on the Refrigerant Management Plan (RMP) developed, that amount might be less.
3. In cases of emergencies, vessels are allowed to purchase refrigerants in foreign ports to make repairs to RAC systems. Refrigerants purchased should be limited to the quantity of refrigerants required to conduct repairs and make systems operational to preserve cargo and supply for crew. In case of a reefer ships, the owners of the reefer containers will purchase and supply refrigerants to the vessels in case repair and maintenance is required during the voyage.
4. Refrigerants purchased in foreign ports should be recorded as export from country of purchase and imports to Jamaica. Also, refrigerants stored onboard vessels by owners of reefer containers to service their containers should be recorded as import to Jamaica.
5. On return to Jamaica, owners and operators of the vessel should file applications for a permit to import HCFC refrigerant with the MOH and for

licence to import HCFC refrigerants with the Trade Board. Vessels owners and operators would not have been granted import quotas, therefore, the quantity of refrigerants imported (taken onboard the vessels) should be deducted from the quantity of refrigerants held in custody (Abeyance) by the NEPA. Also, so as not to create a breach of the Trade Order 2014, NEPA could take responsibility for the importation of this amount of HCFC refrigerants.

Handling, Transportation and Storage of Refrigerants:

This section deals with the handling, transportation and storage of virgin, recovered, recycled or contaminated refrigerants. Refrigerants and their blends are gases that serve their useful purpose in a refrigeration system and are extremely dangerous outside the system, therefore, they require careful transportation, handling and storage. All persons handling, transporting, and storing refrigerants shall be appropriately trained. The following principles should be followed.

1. Virgin refrigerants used on ships are available in colour coded marine refillable refrigerant cylinders or in colour coded no refillable cylinders that are also available for land based use.
2. Refrigerant should be transported, handled and stored in accordance to Draft Standard DJS 339: 2017.
3. Recovered refrigerants should be identified and tested for contamination before storing.
4. Recovered refrigerants awaiting reuse must be stored separately in properly labelled recovery cylinders using the refrigerant recovery label shown in Appendix A or any other approved label.

5. Contaminated refrigerants awaiting disposal must also be stored in properly labelled cylinder using the refrigerant recovery label in Appendix A or any other approved label.
6. The recovery label must indicate data to include type and quantity of refrigerant recovered, contamination state, date recovered, system recovered from, type of refrigerant and condition of the refrigerant.
7. Contaminated refrigerants stored in separate cylinders for disposal must be removed from the vessels once it docks in port in Jamaica.
8. Recovered refrigerants (contaminated or uncontaminated) should never be stored in refillable cylinders but in DOT or ASHRAE approved recovery cylinders.
9. Always install the protective cap on the cylinders when they are being transported and stored. If the cylinders were not designed to accept a protective cap over the valve, special care shall be taken to prevent the valve from damage or opening during transportation.
10. In the marine industry, stored cylinders will experience motion if the vessels are stationary or moving. The constant motion of the cylinders would require that they are firmly strapped and properly secured. The protective cap should be checked and re-tightened periodically to prevent loosening during the constant motion of the vessels.
11. Cylinders containing refrigerants should be stored upright in original container or other approved container with a combined liquid / vapour valve located at the top.

12. Cylinders should be stored indoors above ground level in dry well ventilated areas. Refrigerants vapour are heavier than air, therefore, refrigerant detectors should be installed near ground level.
13. When moving cylinders 23 kg (50 lbs) or heavier within the work site, they shall be firmly strapped onto an appropriate wheeled device. Cylinders shall never be rolled on its base or laid down to roll on its side.
14. Cylinders shall not be strapped or lifted by the valve or valve cover

Labelling of Refrigerants:

Refrigerants transported onboard Jamaican flagged vessels should be labelled in accordance with JS 1: Part 29: 2015.

Products and equipment, including retrofitted equipment, using ozone depleting substances and/or their substitutes shall be labelled with the name of the specific substance either present in the product or used in its manufacture. Labels for retrofitted equipment shall be in conformance with the template provided in Appendix A.

Refrigerant recovered onboard vessels should be stored in approved DOT or ASHRAE recovery cylinders and properly labelled. A copy of the label is presented in Appendix A**.**

Equipment Maintenance:

The original Manufacturers' information should be consulted when developing maintenance schedule for RAC equipment onboard Jamaican flagged vessels.

1) Personnel charging or repairing refrigeration systems should be trained and familiar with the precautions to be observed when handling refrigerants.
2) Refrigerant systems shall have suitable means of isolation to allow maintenance without releasing any bulk quantity of the refrigerant to the atmosphere [1].
3) Isolating valves should be provided to permit compressor removal and replacement without losing the refrigerant charge. A suitable permanent valve for a recovery connection should be provided on all appliances. Unavoidable minimum releases associated with recapture or recycling are acceptable provided recovery units are installed for the evacuation of the system [1].
4) When refrigerant plants are being charged through a charging connection in the compressor suction line, it is sometimes the practice to heat the cylinder to evaporate the last of the liquid refrigerant. This should be done only by placing the cylinder in hot water or some similar indirect method and never by heating the cylinder directly with a blow lamp or other flame. If it is necessary for repair or maintenance to apply heat to vessels containing refrigerant, appropriate valves should be opened to prevent build- up of pressure within the vessels [1].
1) For refrigerant recovery, compressors shall be capable of evacuating a system charge into a liquid receiver. When the condenser itself shall be repaired, the refrigerant must be transferred to:
    - other condenser(s) inside the system:
        - if the system has two or more condensers, when one of them shall be repaired, the others shall have enough capacity to hold the entire charge of the refrigerant system [1].
    - outside of the refrigerant system:

- a dedicated container of sufficient volume is used to house the largest refrigerant circuit of the unit. This container shall be available and permanently located close to the unit. The procedure for how to use the recovery unit shall also be provided onboard [1].

- Additionally, recovery units and associated equipment shall be provided to facilitate evacuation of the system, either into existing liquid receivers or into suitable reservoirs [1].

Leak Checking and Leak Detection:

1) Mandatory leak checks are required above a certain size threshold onboard all vessels. A leak check must be carried out with an appropriate leak detection device (e.g. a hand-held electronic leak detector) in all parts of the systems that might leak. For small systems, the mandatory leak checks are annual and for larger systems the checks must be done bi-annually.
2) For systems containing more than 100 kg charge, an automatic leak detection system should be installed in the compartment or flat in which refrigeration machinery is fitted.
3) Should it be known or suspected that the refrigerant has leaked into any compartment, no attempt should be made to enter those compartments until a responsible officer has been advised of the situation. If it is necessary to enter the space, it should be ventilated to the fullest extent practicable and the personnel entering should wear approved breathing apparatus. A person should be stationed in constant attendance outside the space, also with breathing apparatus.

4) Annual refrigerant leakage shall be as small as possible but not more than 10% of the total refrigerant charge for each system. The leakage shall be documented through recorded consumption figures. A copy of a refrigerant log sheet is presented in Appendix B. The figures shall include topping up due to leakage, as well as renewal of refrigerant during repairs or overhauls. The refrigerant log shall at least include:
    - date
    - system type
    - refrigerant type
    - type of failure
    - initial system charge
    - refrigerant recovered
    - refrigerant added
    - type of inspection performed
    - corrective actions
    - signature

If leakage is observed, corrective measures as detailed in the refrigerant management procedure shall be implemented.

5) Where different types of refrigerants are used, measures shall be taken in order to avoid mixing of these substances.
6) Refrigerants in refrigeration systems shall be controlled in a manner suitable for detection of all types of leakage. Methods of detection to be used:

- Logging refrigerant volumes at regular intervals. As a minimum once per week or
- Weekly control of leakages by portable refrigerant detector.

7) The chosen method for detecting leakage shall be submitted. A refrigerant management procedure must be implemented, covering the following:
   - how to monitor the refrigerant system with respect to possible leaks
   - how often any such monitoring shall take place
   - limits for when corrective actions shall be initiated
   - procedures detailing the means to control, leakage, venting and disposal of refrigerants
   - log sheet for logging refrigerant volumes.

Scrap and recycling equipment:

- Equipment which has outlived their useful life and are non-functioning or obsolete should be dismantled onboard vessels before disposal. The refrigerant charge of this equipment must be recovered before it is scrapped, dismantled or removed from the vessels. The technician responsible for the recovery of refrigerants from obsolete equipment must complete a refrigerant used during servicing log sheet (Appendix B).

Recording of Refrigerants used onboard Jamaican Flagged Vessels:

All refrigerant consumed onboard Jamaican Flagged vessels should be recorded in the “Refrigerant and refrigerant oil consumed onboard Jamaican Flagged vessels” Log Sheet, Appendix B.

For each piece of RAC equipment, operators must keep an updated equipment log book that is available for checks by representatives of NEPA upon request. The records should include the following:

- Quantity and type of HCFC original charged
- Quantities and type of HCFC added during installation, maintenance or when repairing a leak
- Whether the HCFC used have been recycled or reclaimed
- Quantity of any HCFC recovered
- the names and address of the technician who recycled or reclaimed the refrigerant
- date of service
- For equipment decommissioned, the measures taken to recover and dispose of the F-Gases.

A signed copy of the refrigerant and refrigerant oil consumption log sheet should be forwarded to NEPA every three months so that the consumption can be recorded. A copy of the log sheet should be kept on the vessels for at least three years.

Reference:

[1] DET NORSKE VERITAS AS, Rules for Classification of Ships, Part 6, Chapter 12. New Buildings Special Requirement and System – Additional Class, Environmental Class, January 2014.

[2] Which Refrigerant? “Environmentally friendly refrigerant alternatives for reefer ships are discussed by Hervé Lohéac, Engineering Manager with YORK Marine”, www.siwertell.com/?id=1329.

[3] Ministry of Industry Investment and Commerce. The Trade (Montreal Protocol) (Trade in Ozone Depleting Controlled Substances) Order 2014.

[4] Bureau of Standard, Jamaica. JS 1: Part 29: 2015, “The Labelling of Commodities Part 29: Labelling of products and equipment containing or manufactured using ozone depleting substances and/or their substitutes”.

[5] Bureau of Standard, Jamaica, DJS 339: 2017, “Draft Jamaica Standard specification for the Transportation, Handling and Storage of Refrigerants”.

APPENDIX A

Labels

HCFC Refrigerant Recovered

Vessel:…….……..... Owners:…….……..

Flag:…….…… Date Recovered:…….……

Service Technician:…….……..

System Type:……...

Type of Refrigerant or blend: □ **R-22 Quantity(kg)……..……**

□ **R-409 Quantity(kg)…….**

□ **R-408 Quantity(kg)…….**

□ **R-406 Quantity(kg)…….**

Condition of Refrigerant Removed from system:……

……

Signature…… Date:……...

Figure 1 HCFC Refrigerant Recovery Label

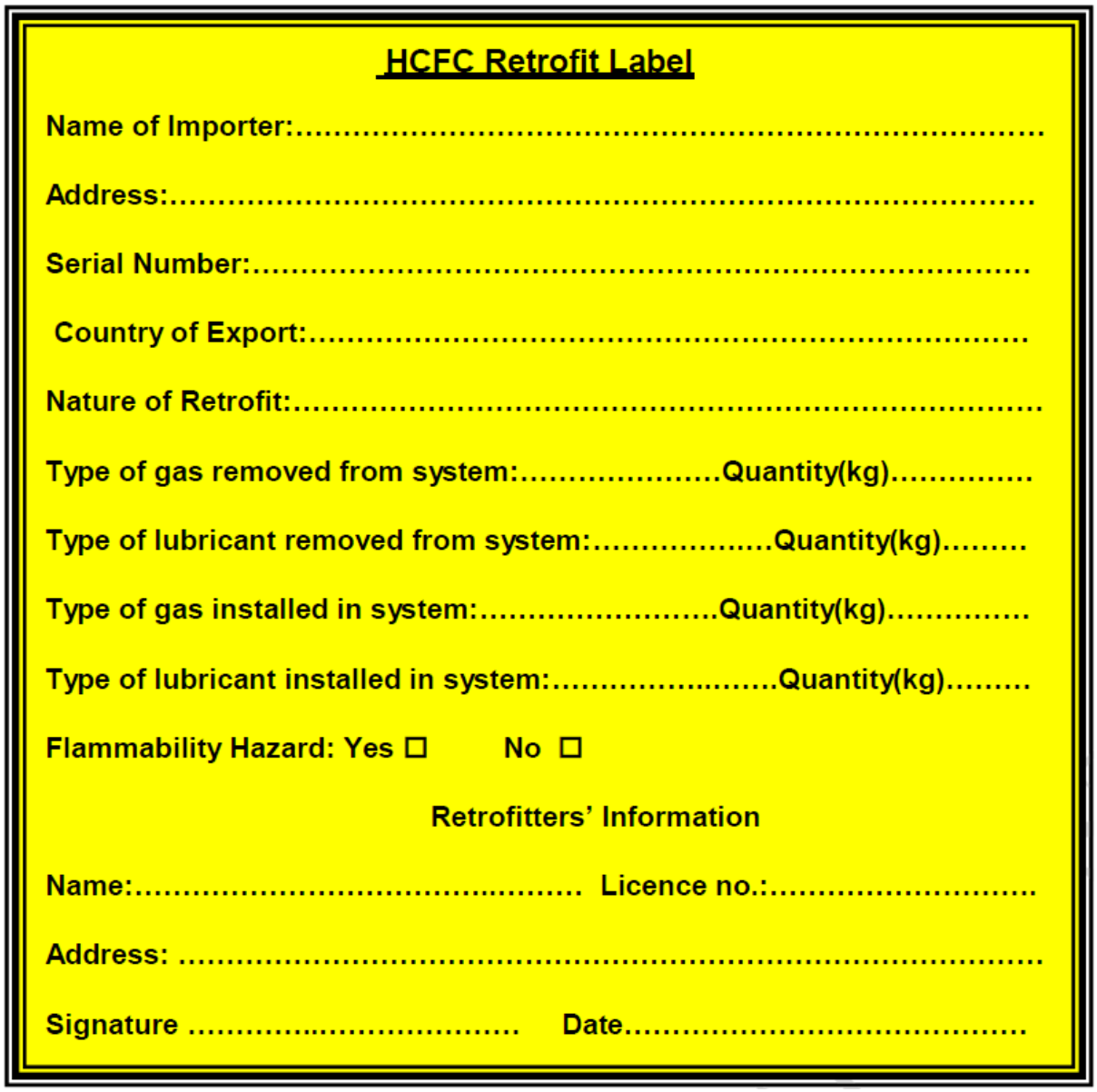

Figure 2 HCFC Retrofit Label

APPENDIX B

Refrigerant Log Sheet

Table 1 Refrigerant and Refrigerant oil used during servicing

Vessel Name:				**Flag:**				**Owner:**			
Date	**System Type**	**Refrigerant Type**	**Initial system charge (kg)**	**Type of inspection performed**	**Type of failure**	**Refrigerant recovered (kg)**	**Corrective action**	**Refrigerant added (kg)**	**Original oil type and filling (ltr)**	**System Oil (ltr) Added/ Changed**	**Signature**

Table 2 Refrigerant and refrigerant oil consumed onboard Jamaican Flagged vessels

Vessel Name:				**Flag:**			**Owner:**			
Date	**Country of purchase**	**Supplier**	**Type of Refrigerant Purchased**	**Quantity of Refrigerant purchased (kg)**	**Quantity of Refrigerant recovered (kg)**	**Location of recovered refrigerant (recovery cylinder)**	**Original oil type and filling (ltr)**	**Quantity of Refrigerant oil purchase (ltr)**	**System Oil (ltr)** Added/ Changed	**Signature**

APPENDIX C

Ship Registered in Jamaica

Table 3 Ship Registry in Jamaica

Name of Ship	Type Ship	Gross Tonnage	When Built	Owner's Name	Owner's Email:	Ship Manager (SM)	SM's Email:
A.E.FULLER	TUG	147	1971	PORTSIDE TOWING LIMITED	portsidetugboat@yahoo.com	DERRICK BRANDT	debran@cwjamaica.com
ANTHONY BOY II	FISHING TRAWLER	143	1995	MADDOX SEAFOODS LIMITED	egrant@rainforestseafoods.com	MADDOX SEAFOODS LIMITED	egrant@rainforestseafoods.com
BLUE ANGEL	FISHING	145	1997	NORMAN SPENCE	N/A	KURT SPENCE	N/A
BRYCE	FISHING	120	1996	STANLEY MOHAMMED	'clarendonseafood@yahoo.com'	STANLEY MOHAMMED	clarendonseafood@yahoo.com
CAPTAIN BRODY	FISHING TRAWLER	153	1999	CAPTAIN JOHN FISHERIES LIMITED	ANDREWLEWIS6@GMAIL.COM	COURTNEY CARNEGIE	court2607@yahoo.com
CARIBBEAN QUEEN	PASSENGER	260	1979	B & D TRAWLING LIMITED	bdtrawling@yahoo.com	B & D TRAWLING LIMITED	sf@bdtrawling.com
ELIZABETH	TUG	195	1952	COASTAL TOWAGE LIMITED	charles@cwjamaica.com	JAMAICA FREIGHT AND SHIPPING COMPANY LIMITED	JFSOPS@GMAIL.COM
G.F. MUNRO	TUG	146	1981	PORTSIDE TOWING LIMITED	portsidetugboat@yahoo.com	PORTSIDE TOWING LIMITED	portsidetugboat@yahoo.com
H.B. LONG	TUG	276	1993	PORTSIDE TOWING LIMITED	portsidetugboat@yahoo.com	TYRONE WEBSTER	portsidetugboat@yahoo.com
JAMAICA II	CARGO	231	1982	PORT AUTHORITY OF JAMAICA	hhelps@portjam.com	CAPT. HELPS	hhelps@portjam.com
JSS. TAMMY LYNN	PASSENGER SUBMERSIBLE	39	1994	THE JAMAICAN SUBMARINE COMPANY LIMITED	Robin Rush <robinrush59@gmail.com>	DOUGLAS OXBORROW	Robin Rush <robinrush59@gmail.com>

LAWFUL	TUG	128	1967	PORTSIDE TOWING LIMITED	portsidetugboat@yahoo.com	PORTSIDE TOWING LIMITED	Michael Dobson portsideoperations@yahoo.com
LONE STAR	FISHING	115	1987	SEAFOOD ONE COMPANY LIMITED		SEAFOOD ONE CO. LTD	Courtney carnegie court2607@yahoo.com
MISS MARCANNE	FISHING TRAWLER	139	1979	RALSTON FRAY	N/A	RALSTON FRAY	N/A
OCHO RIOS	TUG	305	1997	PORT AUTHORITY OF JAMAICA	hhelps@portjam.com	PORT AUTHORITY OF JAMAICA	hhelps@portjam.com
PORT MARIA	TUG	307	1995	PORT AUTHORITY OF JAMAICA	hhelps@portjam.com	CAPT. HELPS	hhelps@portjam.com
ROUGH RIDER	FISHING	110	1985	SEAFOOD ONE COMPANY LTD	R. FRANCIS	HoJaUs Limited	sf.bdtrawling@gmail.com
S.H. KING	TUG	194	1973	PORTSIDE TOWING LIMITED	portsideoperation@yahoo.com	PORTSIDE TOWING LIMITED	portsidetugboat@yahoo.com
SAVANNAH II	DREDGE	729	1966	CON/DREDGE (ST. LUCIA) LTD	constanddredge@yahoo.com	CONSTRUCTION AND DREDGING LIMITED	constanddredge@yahoo.com
SHILOH	COMMERCIAL FISHING TRAWLER	165	1979	DWIGHT M. HARRISON	chizzlerider@yahoo.com	DWIGHT M. HARRISON	chizzlerider@yahoo.com
W.I.P DEPENDABLE	TUG	341	1973	WEST INDIES PETROLEUM LIMITED	sales@westindiespetroleum.com	WEST INDIES PETROLEUM LIMITED	sales@westindiespetroleum.com
WIP SPIRIT	TUG	426	1982	WEST INDIES PETROLEUM LIMITED	sales@westindiespetroleum.com	WEST INDIES PETROLEUM LIMITED (Tel. 9290093)	sales@westindiespetroleum.com