INTERNATIONAL MARITIME ORGANIZATION

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MARINE ENVIRONMENT PROTECTION COMMITTEE
81st session
Agenda item 6

MEPC 81/INF.4
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ENERGY EFFICIENCY OF SHIPS

Carriage of biofuels for supply to a ship for use as fuel oil on board that ship

Submitted by IBIA

SUMMARY

Executive summary:	MEPC 78 in June 2022 agreed that biofuel blends up to 30% biofuel (B30) could be regarded in the same way as regular oil-based fuels and also that engines certified to do so could use biofuels from B30 to B100 i.e. 100% biofuel. However, IBIA notes that ships engaged in bunkering operations and certified under MARPOL Annex I cannot carry biofuel blends with >25% biofuel even within port waters. Member States when agreeing at MEPC 78 to allow the use of fuels containing up to and including 100% biofuel as "fuel oil" under MARPOL Annex VI may not have foreseen this issue but it now presents a potential impediment to the global adoption of biofuels as fuel oil for ships and the ambition for the decarbonization of international shipping in the short term as set out in the 2023 IMO GHG Strategy.
Strategic direction, if applicable:	3
Output:	3.2
Action to be taken:	Paragraph 12
Related documents:	MEPC 77/7/7; MEPC 78/17/Add.1; MSC-MEPC.2/Circ.17; MEPC.1/Circ.795/Rev.8, MEPC.1/Circ.879; MEPC.2/Circ.28 and resolution MEPC.377(80)

Introduction

1 Biofuels recognized under the *2019 Guidelines for the carriage of blends of biofuels and MARPOL Annex I cargoes* (MSC-MEPC.2/Circ.17) and *Guidelines for the carriage of energy-rich fuels and their blends* (MEPC.1/Circ.879) are set out in annexes 11 and 12 to the *Provisional categorisation of liquid substances in accordance with MARPOL Annex II and the IBC Code* (MEPC.2/Circ.28).

2 With increased use of biofuels by ships due to their enhanced environmental performance, concerns were raised that high biofuel blends could increase NO_x emissions in contravention of regulation 18.3 of MARPOL Annex VI. To address these concerns, IACS submitted document MEPC 77/7/7 proposing a draft unified interpretation of regulation 18.3 of MARPOL Annex VI. Following consideration, MEPC 78 in June 2022 agreed that biofuel blends up to 30% (B30) could be regarded in the same way as regular oil-based fuels and also that engines certified to do so could use biofuels from B30 to B100 i.e. 100% biofuel and approved the unified interpretation of regulation 18.3 of MARPOL Annex VI (MEPC.1/Circ.795/Rev.8).

3 IBIA considers that biofuels can play a significant role in enabling international shipping to achieve its decarbonization goals, especially in the short-term, a view supported by the Global Centre for Maritime Decarbonization (GCMD) in Singapore and Boston Consulting Group[1]:

> "As the transition to future fuels will be gradual, drop-in fuels – especially biofuels – are crucial interim solutions. Even then, cost constraints and limited availability impede adoption."

4 However, IBIA has identified another significant issue that may impede adoption. This is with respect to the carriage of biofuels for supply to ships as fuel oil, that is, fuel delivered to and intended for use on board a ship.

Carriage of biofuel as cargo for international trade

5 Current international provisions for the carriage of biofuels on ships require ships carrying biofuels as cargo to be certified in accordance with MARPOL Annex II when the content of the fuel oil is greater than 25% biofuel[2]. This is because the cargo is then categorized as a "noxious liquid substance"[3] under MARPOL Annex II requiring additional design and operational features to mitigate risks and a need to be carried on a chemical tanker. An analysis of these additional requirements by GCMD is set out in the annex to this document.

6 The ships used for bunkering are primarily operated within port waters and over relatively short voyage distances. As such by far the majority of bunker vessels operating in port waters globally are currently certified under the requirements for oil tankers, that is, MARPOL Annex I.

7 Whilst IBIA recognizes that the regulatory requirements for biofuels have been developed and reaffirmed several times including those set out in the *2019 Guidelines for the carriage of blends of MARPOL Annex I cargoes and biofuels* (MSC-MEPC.2/Circ.17), those requirements have been prepared primarily to address risks associated with the carriage of cargoes carried on ships engaged in international trade.

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1 GCMD & Boston Consulting Group (2023) *Voyaging toward a greener future: Insights from the GCMD-BCG Global Maritime Decarbonization Survey*, September 2023.

2 MSC-MEPC.2/Circ.17 refers to “biofuel blends containing >1% but <75% of a MARPOL Annex I cargo.”

3 Regulation 1.10 of MARPOL Annex II reads as follows: “*Noxious liquid substance* means any substance indicated in the Pollution Category column of chapter 17 or 18 of the International Bulk chemical Code or provisionally assessed under the provisions of regulation 6.3 as falling into category X, Y or Z.”

8 Furthermore, owing to the nature and geographic characteristics of some bunkering operations, some bunker vessels supplying fuel oil to ships fall under national jurisdictional requirements[4] that do not require compliance with MARPOL Annex II and so may be able to supply biofuel blends having greater than 25% biofuel as fuel oil to internationally trading ships.

9 IBIA also notes that ships that have been supplied with fuel oil having >25% biofuel blends for use on board as permitted under MARPOL Annex VI, can carry that fuel oil in the ship's fuel tanks whilst not being required to comply with MARPOL Annex II.

Conclusion

10 MEPC 78 in June 2022 agreed that biofuel blends up to 30% biofuel (B30) could be regarded in the same way as regular oil-based fuels and also that engines certified to do so could use biofuels from B30 to B100 i.e. 100% biofuel. However, IBIA notes that ships engaged in bunkering operations and certified under MARPOL Annex I cannot carry biofuel blends having >25% biofuel even within port waters.

11 Member States when agreeing at MEPC 78 to allow the use of fuels containing up to and including 100% biofuel as "fuel oil" under MARPOL Annex VI may not have foreseen this issue but it now presents a potential impediment to the global adoption of biofuels as fuel oil for ships and the ambition for the decarbonization of international shipping in the short term as set out in the *2023 IMO Strategy on reduction of GHG emissions from ships* (resolution MEPC.377(80)).

Action requested of the Committee

12 The Committee is invited to note the information provided in this document.

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[4] For example, *European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways* https://unece.org/about-adn

ANNEX

IMO MARPOL ANNEX II – CARRIAGE OF BIOFUELS AND THEIR BLENDS BY SHIPS
(source: Global Centre for Maritime Decarbonisation, Singapore)

Global Centre for
MARITIME DECARBONISATION

IMO MARPOL Annex II
Carriage of biofuels and their blends by ships
14th July 2023

IMO MARPOL Annex II

Regulations for the control of pollution by noxious liquid substances in bulk

- The bulk carriage of any liquid product other than those defined as oil (subject to MARPOL Annex I) is prohibited unless the product has been evaluated and categorised for inclusion in Chapter 17 or 18 of the IBC code
- If cargo is not in IBC code, provisional classification is given using tripartite agreement initiated between
  - Port state of the shipper
  - Flag state of the carrier
  - Port state receiving the cargo
- Provisional categorisation of liquid substances -> three year deadline by initiator for full details of product for classification (not acceptable for repeated tripartite agreement)
- Liquid substances: Range from noxious/ hazardous chemicals to edible oils and fats
- Categorised based on pollution categories using GESAMP procedure
- Name of liquid substances and pollution categories will link to the minimum requirements, etc.
- Liquid substances listed in Chapter 17 will need to follow the minimum requirement (ship type, tank type, tank vent, tank environment control, vapour detection, fire protection, etc.
- Liquid substances listed in Chapter 18 will not have any requirement.

IBC code = International Code for the Construction and Equipment of ships carrying dangerous chemical in bulk (IBC code)

1

IBC code

List of liquid substances

Chapter 17 | Summary of minimum requirement

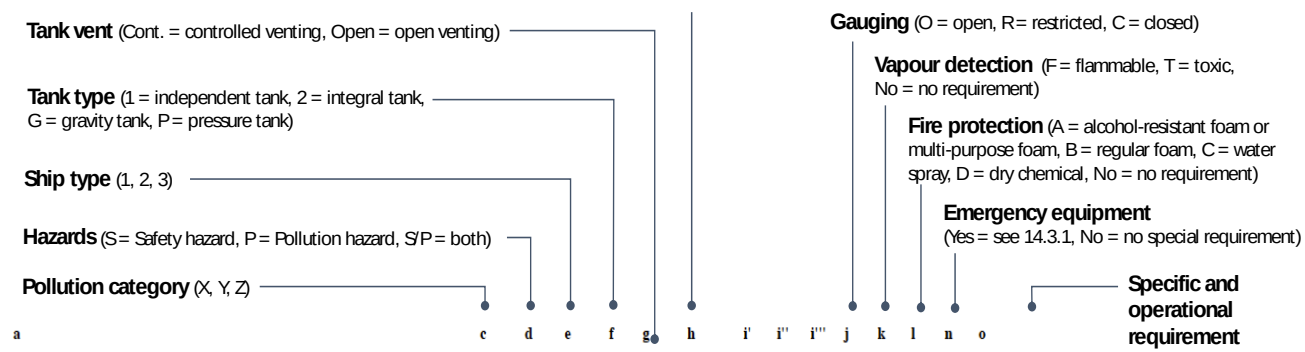
Names of the products required to be carried under requirement of IBC code and the summary of the minimum requirement
[Pollution category X, Y and Z]

Chapter 18 | List of products to which the code does not apply

Names of the products, which have been reviewed for their safety and pollution hazards and determined not to present hazards to such an extent as to warrant application of the Code.
[Pollution category Z and OS]

Chapter 17 of IBC code [MEPC 64/WP.12 (2012)]

Bio-fuel blends



a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
Bio-fuel blends of Diesel/gas oil and Alkanes (C10-C26), linear and branched with a flashpoint >60°C (>25% but <99% by volume)	X	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	No	15.12, 15.17, 15.19.6
Bio-fuel blends of Diesel/gas oil and Alkanes (C10-C26), linear and branched with a flashpoint ≤ 60°C (>25% but <99% by volume)	X	S/P	2	2G	Cont	No	T3	IIA	No	C	FT	ABC	No	15.12, 15.17, 15.19.6
Bio-fuel blends of Diesel/gas oil and FAME (>25% but <99% by volume)	X	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	No	15.12, 15.17, 15.19.6
Bio-fuel blends of Diesel/gas oil and vegetable oil (>25% but <99% by volume)	X	S/P	2	2G	Cont	No	-	-	Yes	C	T	ABC	No	15.12, 15.17, 15.19.6
Bio-fuel blends of Gasoline and Ethyl alcohol (>25% but <99% by volume)	X	S/P	2	2G	Cont	No	T3	IIA	No	C	FT	A	No	15.12, 15.17, 15.19.6

Electrical equipment
i' = temp class,
i'' = apparatus group
i''' = flashpoint

Material of construction
(m) deleted

3

Chapter 17 of IBC code [MEPC 64/WP.12 (2012)]

Neat FAMEs

a	c	d	e	f	g	h	i'	i''	i'''	j	k	l	n	o
⋮														
Cocoa butter	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Coconut oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Coconut oil fatty acid	Y	S/P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Coconut oil fatty acid methyl ester	Y	P	2	2G	Open	No	-	-	Yes	O	No	A	No	15.19.6
⋮														
Fatty acid methyl esters (m)	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Fatty acids, (C8-C10)	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19, 16.2.6, 16.2.9
Fatty acids, (C12+)	Y	S/P	2	2G	Cont	No	-	-	Yes	R	T	ABC	No	15.12.3, 15.12.4, 15.19.6, 16.2.6, 16.2.9
Fatty acids, (C16+)	Y	P	2	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6
⋮														
Palm oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Palm oil fatty acid methyl ester	Y	P	2	2G	Open	No	-	-	Yes	O	No	A	No	15.19.6, 16.2.9
⋮														
Rapeseed oil	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Rapeseed oil (low erucic acid containing less than 4% free fatty acids)	Y	S/P	2(k)	2G	Open	No	-	-	Yes	O	No	ABC	No	15.19.6, 16.2.6, 16.2.9
Rape seed oil fatty acid methyl esters	Y	P	2	2G	Open	No	-	-	Yes	O	No	A	No	15.19.6
⋮														
Methyl alcohol	Y	P	3	2G	Cont	No	T1	IIA	No	R	F	A	No	15.19.6

MEPC.1/Circ.879 (2018)

Guidelines for the carriage of energy-rich fuels and their blends

2 SCOPE

2.1 These Guidelines have been developed to clarify how energy-rich fuels are shipped under the correct Annex of MARPOL.

3 DEFINITIONS

For the purpose of these Guidelines:

3.1 *Energy-rich fuels* are identified by the PPR Working Group on the Evaluation of Safety and Pollution Hazards of Chemicals (ESPH), based on an appropriate proposal, as products falling under the scope of these Guidelines. Energy-rich fuels will be recorded in annex 12 of the MEPC.2/Circular on *Provisional categorization of liquid substances in accordance with MARPOL Annex II and the IBC Code*. Energy-rich fuels are wholly or partly derived from non-petroleum feedstock and they can be produced either without blending as such or by blending with petroleum products.

4 DESCRIPTION OF ENERGY-RICH FUELS

4.1 An energy-rich fuel is obtained from biological origin or non-petroleum sources (e.g. algae, vegetable oils) or is a blend of petroleum-based fuel and a product obtained from biological origin or non-petroleum sources (e.g. algae, Gas-to-Liquid (GTL) process, Hydrotreated Vegetable Oil (HVO), co-processing).

4.2 An energy-rich fuel is comprised only of constituents that can be expressed as individual chemicals of the hydrocarbon family, for example alkanes with straight or branched chain and cycloalkanes, etc.

4.3 An energy-rich fuel is a complex mixture that is characterized as UVCB,* is formed of a relatively large amount of constituents, cannot be represented by a simple chemical structure and has a composition that may vary from batch to batch.

5 CARRIAGE OF ENERGY-RICH FUELS

5.1 When carrying energy-rich fuels listed in annex 12 of the MEPC.2/Circular, the requirements of Annex I of MARPOL should apply.

5.2 When carrying energy-rich fuels, the Oil Discharge Monitoring Equipment (ODME) shall be in compliance with regulation 31 of Annex I of MARPOL.

6 CARRIAGE OF BLENDS OF ENERGY-RICH FUELS AND BIOFUELS

The carriage provision for blends of biofuels that are recorded in annex 11 of the MEPC.2/Circular is based on the volumetric composition of the blends as follows:

6.1 Biofuel blends containing 75% or more of energy-rich fuel

6.1.1 When containing 75% or more of energy-rich fuel, the blend is subject to Annex I of MARPOL.

6.1.2 When carrying such biofuel blends, ODME shall be in compliance with regulation 31 of Annex I of MARPOL and should be approved for the mixture being transported.

6.1.3 When considering the deck fire-fighting system requirements of SOLAS chapter II-2, regulations 1.6.1 and 1.6.2, when carrying biofuel blends containing ethyl alcohol, then alcohol resistant foams should be used.

6.2 Biofuel blends containing less than 75% of energy-rich fuel

6.2.1 When containing less than 75% of energy-rich fuel, the biofuel blends are subject to Annex II of MARPOL.

6.2.2 With respect to biofuels identified as falling under the scope of these Guidelines, carriage requirements for specific biofuel/energy-rich fuel blends to be shipped as MARPOL Annex II cargoes will be incorporated into list 1 of the MEPC.2/Circular, as appropriate.

MSC-MEPC.2/Circ.17 (2019)

2019 guidelines for the carriage of blends of biofuels and MARPOL Annex I cargoes

2 SCOPE

2.1 These Guidelines have been developed to clarify how biofuels subject to MARPOL Annex II, when blended with MARPOL Annex I cargoes, can be shipped in bulk.

3 DEFINITIONS

For the purpose of these Guidelines:

3.1 *Biofuels* are ethyl alcohol, fatty acid methyl esters (FAME) and vegetable oils (triglycerides), as identified in chapters 17 and 18 of the IBC Code or the MEPC.2/Circular. Following circulation of these Guidelines, further biofuels identified as falling under the scope of the Guidelines will be recorded in annex 11 of the MEPC.2/Circular.

3.2 *Biofuel blends* are mixtures resulting from the blending of those biofuels identified in paragraph 3.1 above with a MARPOL Annex I cargo.

4 CARRIAGE OF BIOFUEL BLENDS

The carriage requirements for biofuel blends are assigned based on their volumetric composition, as follows:

4.1 Biofuel blends containing ≥75% of a MARPOL Annex I cargo

4.1.1 When the biofuel blend contains ≥75% of a MARPOL Annex I cargo, it is subject to MARPOL Annex I.

4.1.2 When carrying biofuel blends as described in paragraph 4.1.1, Oil Discharge Monitoring Equipment (ODME – see resolution MEPC.108(49)) shall be in compliance with regulation 31 of MARPOL Annex I and approved for the mixture being transported.

4.1.3 When considering the deck fire-fighting system requirements of SOLAS chapter II-2, regulations 1.6.1 and 1.6.2, when carrying biofuel blends containing more than 5% ethyl alcohol, then alcohol resistant foams should be used.

4.2 Biofuel blends containing >1% but <75% of a MARPOL Annex I cargo

4.2.1 Biofuel blends containing >1% but <75% of a MARPOL Annex I cargo are subject to MARPOL Annex II, with the carriage requirements set out in chapter 17 of the IBC Code.

4.2.2 With respect to any new biofuels identified as falling under the scope of these guidelines, carriage requirements for specific blends of biofuels and MARPOL Annex I cargoes to be shipped in accordance with MARPOL Annex II will be incorporated into list 1 of the MEPC.2/Circular, as appropriate.

4.3 Biofuels blended with ≤1% of a MARPOL Annex I cargo

Biofuels blended with ≤1% of a MARPOL Annex I cargo are not considered as blends and are therefore to be shipped in accordance with MARPOL Annex II, under the appropriate product entry in the IBC Code.

5 BLENDING OF MARPOL ANNEX I CARGOES AND BIOFUELS ON BOARD

5.1 Blending on board describes the mixing of two products resulting in one single product (a blended mixture) and reflects only physical mixing as distinct from any chemical processing. Such mixing operations should only be undertaken whilst the ship is within port limits.

5.2 The physical blending on board of biofuels and MARPOL Annex I cargoes during a sea voyage to create new products is prohibited, in accordance with regulation 5.2 of SOLAS chapter VI.

6 CERTIFICATION REQUIREMENTS

The certification for the biofuel blend to be shipped should be in compliance with MARPOL Annex II, where appropriate. If the biofuel blend, based on its composition, is shipped in accordance with MARPOL Annex I, no certification is required.

6

MEPC.2/Circ.27 (2021)

Provisional categorisation of liquid substances in accordance with MARPOL Annex II and the IBC code

ANNEX 11

Biofuels recognized under the 2019 Guidelines for the carriage of blends of biofuels and MARPOL Annex I cargoes

The following have been agreed as recognized bio-fuels in accordance with the *2019 Guidelines for the carriage of blends of biofuels and MARPOL Annex I cargoes* (MSC-MEPC.2/Circ.17):

.1 tert-Amyl ethyl ether*

.2 Ethyl alcohol

.3 Fatty acid methyl esters (FAME) † (m)

.4 Vegetable fatty acid distillates (m)

ANNEX 12

ENERGY-RICH FUELS SUBJECT TO ANNEX I OF MARPOL

The following have been agreed as recognized energy-rich fuels in accordance with the *Guidelines for the carriage of energy-rich fuels and their blends* (MEPC.1/Circ.879):

.1 Alkanes (C4-C12) linear, branched and cyclic (containing benzene up to 1%)

.2 Alkanes (C5-C7), linear and branched

.3 Alkanes (C9-C24) linear, branched and cyclic with a flashpoint ≤60°C

.4 Alkanes (C9-C24) linear, branched and cyclic with a flashpoint >60°C

.5 Alkanes (C10-C17), linear and branched

.6 Alkanes (C10-C26), linear and branched with a flashpoint ≤60°C

.7 Alkanes (C10-C26), linear and branched with a flashpoint >60°C

7

IMO MARPOL Annex II

Chapter 2 | Categorisation of noxious liquid substances

Products are assigned to pollution categories based on evaluation of their prosperities as reflected in the resultant GESAMP hazard profile as shown in table below:

Rule	A1 Bio-accumu-lation	A2 Bio-degrada-tion	B1 Acute toxicity	B2 Chronic toxicity	D3 Long-term health effects	E2 Effects on marine wildlife and on benthic habitats	Cat
1			⩾5				X
2	⩾4		4				
3		NR	4				
4	⩾4	NR			CMRTNI		
5			4				Y
6			3				
7			2				
8	⩾4	NR		Not 0			
9				⩾1			
10						Fp, F or S If not Inorganic	
11					CMRTNI		
12	Any product not meeting the criteria of rules 1 to 11 and 13						Z
13	All products identified as: ⩽2 in column A1; R in column A2; blank in column D3; not Fp, F or S (if not organic) in column E2; and 0 (zero) in all other columns of the GESAMP Hazard Profile						OS

OS–> Other substances: Substances that have been evaluated and found to fall outside category X, Y or Z because they are, 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 deballasting 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. [Apple juice, clay slurry, coal slurry, glucose solution, molasses and water]

Noxious liquid substances which, if discharged into the sea from tank cleaning or deballasting 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

Noxious liquid substances which, if discharged into the sea from tank cleaning or deballasting 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 [FAME, vegetable oil, methanol]

Noxious liquid substances which, if discharged into the sea from tank cleaning or deballasting 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

GESAMP = Joint group of experts on the scientific aspects of marine environmental protection

8

IMO MARPOL Annex II

Chapter 2 | Categorisation of noxious liquid substances – GESAMP hazard evaluation

Aquatic environment:

Columns A and B – Aquatic environment					
Numerical rating	A			B	
	Bioaccumulation and biodegradation			Aquatic toxicity	
	A1* Bioaccumulation		A2* Biodegradation	B1* Acute toxicity	B2* Chronic toxicity
	log P_{OW}	BCF		LC/EC/IC_{50} (mg/l)	NOEC (mg/l)
0	< 1 or > ca. 7	not measurable	R: readily biodegradable	> 1000	> 1
1	⩾ 1 – < 2	⩾ 1 – < 10		> 100 – ⩽ 1000	> 0.1 – ⩽ 1
2	⩾ 2 – < 3	⩾ 10 – < 100	NR: not readily biodegradable	> 10 – ⩽ 100	> 0.01 – ⩽ 0.1
3	⩾ 3 – < 4	⩾ 100 – < 500		> 1 – ⩽ 10	> 0.001 – ⩽ 0.01
4	⩾ 4 – < 5	⩾ 500 – < 4000	inorg: inorganic substance	> 0.1 – ⩽ 1	⩽ 0.001
5	⩾ 5 – < ca. 7	⩾ 4000		> 0.01 – ⩽ 0.1	
6				⩽ 0.01	

Human health:

Columns C and D – Human health (Toxic effects to mammals)						
Numerical rating	C			D		
	Acute mammalian toxicity			Irritation, corrosion & long-term health effects		
	C1 Oral toxicity LD_{50} (mg/kg)	C2 Percutaneous toxicity LD_{50} (mg/kg)	C3 Inhalation toxicity LC_{50} (mg/l)	D1 Skin irritation & corrosion	D2 Eye irritation & corrosion	D3* Long-term health effects
0	> 2000	> 2000	> 20	not irritating	not irritating	C – Carcinogen M – Mutagenic R – Reprotoxic S – Sensitizing A – Aspiration hazard T – Target organ systemic toxicity L – Lung injury N – Neurotoxic I – Immuno-toxic
1	> 300 – ⩽ 2000	> 1000 – ⩽ 2000	> 10 – ⩽ 20	mildly irritating	mildly irritating	
2	> 50 – ⩽ 300	> 200 – ⩽ 1000	> 2 – ⩽ 10	irritating	irritating	
3	> 5 – ⩽ 50	> 50 – ⩽ 200	> 0.5 – ⩽ 2	severely irritating or corrosive 3A Corr. (⩽ 4 h) 3B Corr. (⩽ 1 h) 3C Corr. (⩽ 3 min)	severely irritating	
4	⩽ 5	⩽ 50	⩽ 0.5			

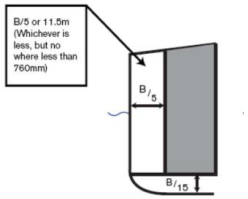
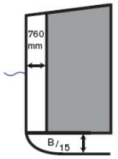
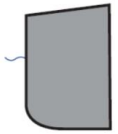
Interferences with other users of the sea:

Column E Interferences with other uses of the sea			
E1 Tainting	E2* Physical effects on wildlife & benthic habitats	E3 Interference with coastal amenities	
		Numerical rating	Description & action
NT: not tainting (tested) T: tainting test positive	Fp: Persistent floater F: Floater S: Sinking substances	0	no interference no warning
		1	slightly objectionable warning, no closure of amenity
		2	moderately objectionable possible closure of amenity
		3	highly objectionable closure of amenity

9

IMO MARPOL Annex II

Ship types

	Type 1	Type 2	Type 3
Product to be transported	Products considered to present the greatest overall hazardous.	Products with appreciably severe environmental and safety hazards which require significant preventive measures to preclude escape of such cargo.	Products with sufficiently severe environmental and safety hazards. These products require a moderate degree of containment to increase survival capability in a damage condition.
Filling restriction	The quantity of cargo required to be carried in a Type 1 ship should not exceed 1,250m^3 in any one tank.	The quantity of cargo required to be carried in a Type 2 ship should not exceed 3,000 m^3 in any one tank.	There is no filling restriction for chemicals assigned to Ship Type 3.
Tank location & configuration			

Cargo

10

Potential ways forward

Not to removed from IMO MARPOL Annex II

Blanket exemption for existing bunker barge to carry the blend >25%

+ Gap analysis between the design (and operation) of oil tankers and chemical tanker type 2
+ Identify/investigate properties of biofuel relating to the above item
+ Paper provide evidence for B25 and above to be also carried by existing bunker barge

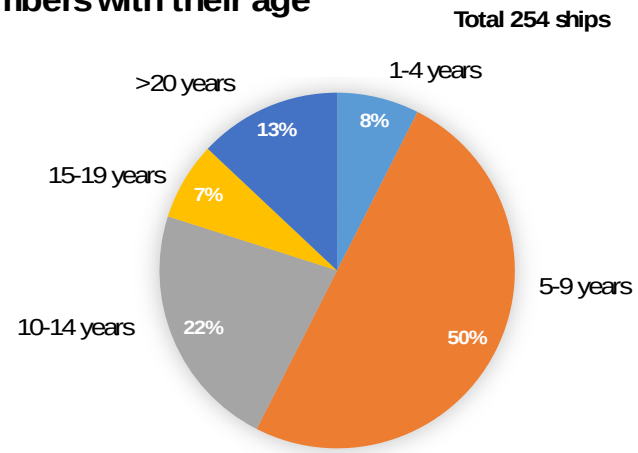
Moving FAME from Chapter 17 to Chapter 18

+ Unlikely to be possible

11

Bunker barge in Singapore

Numbers with their age



Source: MESD (2020), A Study on the Future Energy Options of Singapore Harbour Craft, https://ebook.ntu.edu.sg/a-study-on-the-future-energy-options-of-singapore-harbour-craft.html

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