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研究資料　No.05-15

統合ビルジ処理システムのガイドラインに関する調査研究（RIBT）

（2005 年度報告書）

2006 年 3 月

財団法人　日本船舶技術研究協会

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１．　はじめに

本報告書は、日本財団の平成 17 年度助成事業「船舶関係諸基準に関する調査研究」の一環として、統合ビルジ処理プロジェクト(RIBT)において実施した「統合ビルジ処理システムのガイドラインに関する調査研究」の成果をとりまとめたものである。なお、本調査研究は、平成 16 年度末に解散した（社）日本造船研究協会が実施した「統合ビルジ処理システムのガイドライン改正案の作成に関する調査研究(RR-SP10)」に引き続き、本会が実施したものである。

統合ビルジ処理プロジェクト(RIBT) ステアリング・グループ　委員名簿（順不同、敬称略）

ﾌﾟﾛｼﾞｪｸﾄ･ﾏﾈｰｼﾞｬｰ	魚谷　明彦（日本海事協会）
委員	吉田　公一（海上技術安全研究所）
	上田　浩一（海上技術安全研究所）
	池田　靖弘（日本海事協会）
	久野　勝秀（日本舶用品検定協会）
	黒越　　仁（日本船主協会）
	小林　正則（商船三井）
	中谷　博司（日本郵船）
	原田　朋宏（アイ・エイチ・アイ　マリンユナイテッド）
	藤山　一郎（今治造船）
	橋本　善基（兵神機械工業）
関係官庁	今出　秀則（国土交通省海事局安全基準課）
	山口　祥功（国土交通省海事局安全基準課）
事務局	岡部　亮介（日本船舶技術研究協会　IMO 担当）
	井下　　聡（日本船舶技術研究協会）

２．　調査研究の目的・内容及び背景

船舶の機関室で発生した油性ビルジは、「海洋汚染防止条約(MARPOL73/78)」附属書 I「油による汚染の防止のための規則」により、油水分離器で処理して船外に排出することが義務付けられている。　更に、10,000 総トン数以上の船舶では、処理後のビルジは油分濃度計を通して船外に排出することが義務付けられている。

これら油水分離器及び油分濃度計の新しい性能基準が 2003 年 7 月開催の第 49 回海洋環境保護委員会(MEPC49)において、決議 MEPC.107(49) 「船舶の機関室ビルジにおける汚染防止装置の改正指針及び仕様書」として採択され、2005 年 1 月 1 日以降建造開始の船舶から適用されている。

しかしながら、新性能基準により承認された油水分離器を装備しても機関室ビルジの量が減るものでなく、乗組員の大きな負担であることから問題となっているビルジ処理作業の軽減に対して寄与するものではなかった。

我が国では、乗組員のビルジ処理作業の負担を軽減するための方策として、油系ビルジと水系ビルジを発生の段階から分離して処理することにより、油分を含んだビルジの発生量を減少させるシステム、また、これに発生した油性スラッジ、ドレン等を焼却あるいは燃料として再利用するシステムを併せた「機関室統合ビルジ処理システム(Integrated Bilge-water Treatment System (IBTS)」と呼ばれるシステムの調査・検討を進めてきた。これは、本プロジェクトの前身である RR76、RR-E201「油排出管理分科会」、RR-E203「ビルジ管理分科会」及び RR-SP10「統合ビルジ処理システムのガイドライン改正案の作成に関する調査研究」において行われた。

これらの検討結果をまとめ、2004 年 3 月開催の第 51 回海洋環境保護委員会(MEPC51)において、MEPC/CIRC.235「船舶の機関区域における油性廃棄物の処理システムに関する指針」(Guidelines for Systems for Handling Oily Wastes in Machinery Spaces of Ships) に IBTS のコンセプトを取入れて改正することを我が国より提案し、多くの国の支持を受け、MEPC/CIRC.235 の改正を船舶設計設備小委員会(DE)の High Priority 事項として新規作業項目に採り上げることとなり、この改正作業が DE 小委員会に付託された。

2005 年 2 月開催の IMO 第 48 回船舶設計設備小委員会(DE48)に於いて、我が国は、IBTS の概念を組み入れた「船舶の機関区域における油性廃棄物の処理システムに関する指針(MEPC/CIRC.235)」の改正提案である DE48/18 を紹介した。これは各国に概ね支持されたが、多少のコメントがあるため、我が国が IMO 第 49 回船舶設計設備小委員会(DE49)に於いて各国からのコメントを反映した改正版の提案文書を提出することとなった。

本プロジェクトは、上記 DE48 の決定を受けて、各国のコメントを反映した「船舶の機関区域における油性廃棄物の処理システムに関する指針(MEPC/CIRC.235)」の改正提案を IMO に提言し、統合ビルジ処理システム(IBTS)を普及させることにより、造船・海運先進国として国際的な海洋環境の保護に寄与することを目的としたものである。

３．　IMOでの審議状況

3.1　MEPC47

我が国は、2002 年 3 月開催の第 47 回海洋環境保護委員会(MEPC47)において「機関室統合ビルジ処理システム (IBTS)」のコンセプトを紹介し、IBTS に関するガイドラインを策定するよう提言をした。多くの国が IBTS に関心を示し、この作業を進めるよう支持を受けた。

3.2　MEPC 51

2004 年 3 月開催の第 51 回海洋環境保護委員会(MEPC51)において、我が国より、IBTS のコンセプトを普及させるため、MEPC/CIRC.235「船舶の機関区域における油性廃棄物の処理システムに関する指針」(Guidelines for Systems for Handling Oily Wastes in Machinery Spaces of Ships)に IBTS のコンセプトを取入れて改正する提案(MEPC51/20)を IBTS の実績の調査結果(MEPC51/INF.6)と供に提出したところ、独、ノルウェー、パキスタン及びシンガポール等の支持を受けた。委員会は MEPC/CIRC.235 の改正を船舶設計設備小委員会(DE)の High Priority 事項として新規作業項目に採り上げることを承認し、この改正作業が DE 小委員会に付託された。

3.3　DE48

2005 年 2 月開催の IMO 第 48 回船舶設計設備小委員会(DE48)から検討が開始され、我が国は、統合ビルジ処理システム(IBTS)の概念を組み入れた、「船舶の機関区域における油性廃棄物の処理システムに関する指針(MEPC/CIRC.235)」の改正の提案である DE48/18 を紹介した。これに対し、独、スウェーデン、ノルウェー、蘭、ICS より若干のコメントはあるが、本提案は有益な提案であり提案を支持する旨の発言があった。ICS より、クリーンビルジがどの程度油分が混入しているか判断するのは困難であること、また、現状では、燃料油清浄器からのスラッジがタンクに導かれているが、燃料油清浄器からは大量の水がタンク排出されているため、スラッジタンクから頻繁にポンピングアウトする必要がある、との指摘が、パナマより、DE48/18　11 ページのスラッジタンクの先のポンプから受け入れ施設への配管に矢印が必要とのエディトリアルな指摘が、オーストラリアより、2 つの Appendix の構成とせず、1 つの Appendix としその中でセクションを分ける構成とすべきとの発言が、また INTERTANKO より CIMAC にて同様の検討がなされている旨発言があった。

これに対し、日本は次回会合にて各国からのコメントを反映した改正版の提案文書を提出する意図がある旨述べ、（独）海上技術安全研究所吉田氏がコメントの窓口である旨関係国に伝えた。また、ICS からのコメントに対しては、燃料油清浄器からの排出の配管は、現在の船舶の配管であり変更は加えてないこと、また、船外への排出は、MARPOL に従いいかなる場合も油分濃度が 15ppm 以下である旨監視される必要があり、MARPOL 規則を改正する意図は無い旨発言した。

3.4　DE49

今次会合では、前回 DE48 において我が国から提出されたガイドライン改正案(DE48/18)に対して寄せられたコメントを踏まえた「船舶の機関区域における油性廃棄物の処理システムに関する指針(MEPC/Circ.235)」の最終改正案につき検討が行われた。

我が国は、統合ビルジ処理システム(IBTS)の概念を組み入れた MEPC/Circ.235 改正の提案である DE49/9 の紹介を行った。これに対し、ブラジル及び韓国より、クリーンドレンタンクの内部の状態を確認する手

段が必要であるとの指摘があった。またパナマ及びギリシャから、水が大量に含まれるスラッジの処理につき懸念があるとの指摘があった。

スウェーデンからは、ビルジセパレーターと船外排出弁との間に、Clean Water Tank、船外排出用ポンプ及びビルジアラームを追加し、停泊中に油水混合ビルジを処理して Clean Water Tank に貯留し、航海中に Clean Water Tank から処理済のビルジ水を船外排出できる仕様に添付図を変更するよう提案があり、MEPC/Circ.235 の改正案は任意装備として当該提案を添付図に反映させた上、MEPC54 に提出されることとなった。（修正した添付図は添付資料 3.を参照。）

４．　RIBTの活動状況

今年度は以下の日時、議題で統合ビルジ処理プロジェクト（RIBT）ステアリング・グループ会議を行った。

・ 第1回　2005年8月29日（月）13:30～15:00　霞山会館　さつきの間
　議題　(1) 2005年度事業計画（案）について
　　(2) DE49に向けた「統合ビルジ処理システムのガイドライン」(DE48/18)の最終化について

なお、第 1 回会議後から DE49 までの間に、以下の e-mail による提案文書の検討及び DE49 対策会議を行った。

・ 2005 年 10 月 19 日（水） e-mail による DE49 への提案文書の検討　及び　第 1 回議事録の確認
・ 2005 年 11 月 2 日（水） e-mail による DE49 への提案文書の検討
・ 2006 年 1 月 26 日（木） 14:00～16:30　統合ビルジ処理システムに関する DE49 対策会議

５．　統合ビルジ処理システムのガイドラインに関する調査研究

DE48 及びそれ以降に出された各国のコメントを検討した結果、我が国が提案した”Guidelines for the Integrated Bilge Water Treatment System (IBTS)”を変更しなければならないコメントはなく、コメント対応表（添付資料 1.）を DE49 へ提出することによって各国の理解を得ることにした。

但し、DE48 提出文書の中でオリジナル MEPC/CIRC.235 と”Guidelines for the Integrated Bilge Treatment System (IBTS)”でビルジタンクを示す語句に差異があるとの指摘についてはオリジナル MEPC/CIRC.235 に合わせ ”Bilge water holding tank” とすることとし、”Guidelines for the Integrated Bilge Treatment System (IBTS)”の訂正案を作成した。

上述のとおり本プロジェクトの本年度の作業として、”Guidelines for the Integrated Bilge Treatment System (IBTS)”の訂正案及びコメント対応表を作成し、これを取り込んだ MEPC/CIRC.235 ”Guidelines for Systems for Handling Oily Wastes in Machinery Spaces of Ships”の改正案”Revision of the Guidelines for Systems for Handling Oily Wastes in Machinery Spaces of Ships (MEPC/CIRC.235)（添付資料 2.）”を 2006 年 2 月開催の DE49 へ提出した。

６．　まとめ（今後の対応、検討事項）

上述のとおり本プロジェクトの本年度の作業としては、DE48 での審議の内容を踏まえ”Guidelines for the Integrated Bilge Treatment System (IBTS)”を改正し、これを取り込んだ MEPC/CIRC.235 ”Guidelines for Systems for Handling Oily Wastes in Machinery Spaces of Ships”の改正案”Revision of the Guidelines for Systems for Handling Oily Wastes in Machinery Spaces of Ships (MEPC/CIRC.235)”を 2006 年 2 月開催の DE49 へ提出した。

DE49 での審議の内容を踏まえ添付図を訂正し、上記文書は最終案として 2006 年 3 月開催の MEPC54 へ IMO 事務局から提出されることとなった。

添付資料

1. 各国コメントに対する回答
2. DE49/9: Proposal for revision of MEPC/Circ.235 incorporating the design concepts of Integrated Bilge Water Treatment System (IBTS)
3. DE49 の審議結果を受けて修正した DE49/9 Fig. 2

添付資料 1.　各国コメントに対する回答

No.	コメント	回答	Action
1	IBTS で機器がふえれば乗組員の整備作業量が増加する。	IBTS において追加される機器は Bilge Primary Tank、Clean Drain Tank 及び Waste Oil Tank のタンクであり、整備作業を殆ど必要としない。むしろ既存の油水分離器の汚損軽減により整備にかかる負担が軽くなるため総じてみれば作業量は増加しない。	無し
2	Clean Drain Tank には 15ppm を超える油分を含む可能性がある。	従来より Clean Drain Tank を装備している船が多数あり、それらの油分濃度は非常に低いレベルである。 また、各 Clean Drain は貯蔵先として Clean Drain Tank か、Bilge Holding Tank を選択できる配管となっている。	無し
3	図において Sludge Tank、Waste Oil Tank、Purifier Sludge Tank からのドレン抜きがない。	これらのタンクの油分を多く含んだ水分をドレン抜きからビルジに落とすと、ビルジタンクを汚損しビルジセパレーターの負荷が増えるだけある。そこで、これら油分を多く含んだドレンは Waste Oil Tank に移送し、水分は蒸発させ大気に放出し、残った油分を Incinerator 又は Boiler で焼却／燃焼する。	無し
4	Fuel Oil Drain Tank の油をボイラで燃焼できないが、エンジンで 500～700cSt の燃料油を使用する船であれば H.F.O. Settling Tank に移送する方法がある。	FO Filter の逆洗油が Fuel Oil Drain Tank に導かれているのであれば、F.O. Settling Tank に移送しディーゼル機関に使用すると、せっかくフィルタリングした燃料油の混入物を再び系統に戻すことになり混入物により機関に悪影響を及ぼす可能性がある。	無し
5	Appendix 2 の Bilge water tank と Appendix 1 の Bilge water holding tank は違うものか。	同じである。 「Bilge water holding tank」を両 Appendix において使用する。	4.2, 4.3, 5.3.2, Fig.2 を変更

INTERNATIONAL MARITIME ORGANIZATION

IMO

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SUB-COMMITTEE ON SHIP DESIGN AND EQUIPMENT
49th session
Agenda item 9

DE 49/9
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Original: ENGLISH

REVISION OF THE GUIDELINES FOR SYSTEMS FOR HANDLING OILY WASTES IN MACHINERY SPACES OF SHIPS (MEPC/CIRC.235)

Proposal for revision of MEPC/Circ.235 incorporating the design concepts of Integrated Bilge Water Treatment System (IBTS)

Submitted by Japan

SUMMARY

Executive summary:	This document provides a proposal for the revision of MEPC/Circ.235 by incorporating the design concept of Integrated Bilge Water Treatment System (IBTS)
Action to be taken:	Paragraph 12
Related documents:	MEPC 51/22, MEPC 51/WP.1, MEPC 51/20, MEPC 51/INF.6, DE 48/18 and DE 48/25

Background

1 The Marine Environment Protection Committee, at its fifty-first session, agreed to include a high-priority item on the revision of MEPC/Circ.235 (Guidelines for systems for handling oily wastes in machinery spaces of ships) by incorporating the design concepts of the Integrated Bilge Water Treatment System (IBTS) in the work programme of the Sub-Committee and in the agenda of the forty-eighth session, with a target completion date of 2006.

2 The Sub-Committee, at its forty-eighth session, considering the proposed draft revised text of guidelines of MEPC/Circ.235 (DE 48/18 submitted by Japan), which incorporated guidelines for IBTS, agreed to further consider the proposed revised text of circular MEPC/Circ.235 at the next session.

3 The delegation of Japan expressed, at the forty-eighth session of the Sub-Committee, its intention to further develop the draft revised text of circular MEPC/Circ.235 on the basis of the comments and proposals made at that session, and invited Members and observers to submit their comments to the announced contact point.

Scope of the proposal

4 The scope of the Japanese proposal is to revise MEPC/Circ.235 by incorporating the design concept of Integrated Bilge Water Treatment System (IBTS), which is a system that deals with possible leakage of oil or other liquids in machinery spaces in a manner to prevent oil from mixing with water, and is expected to solve, in a holistic manner, the problem of treatment of oily bilge water.

5 As a result of the revision of the Guidelines and Specifications for Pollution Prevention Equipment for Machinery Space Bilge of Ships adopted by resolution MEPC.107(49) at MEPC 49, the capability of bilge filtering equipment has been improved. However, the treatment process of oily bilge water with the improved equipment and the engineers' load has been basically unchanged, and the amount of oily bilge water generated in ships has not been reduced. Consequently, the operation time, maintenance time and probability of the occurrence of failures for bilge filtering equipment under resolution MEPC.107(49) would remain at the same level as that of the current systems.

6 To promote the prevention of oil pollution from machinery spaces of ships and reduce the load of the engineers onboard, it is effective to minimize the amount of the oily bilge water generated in machinery spaces. Drastic reduction of the quantities of bilge water generated in machinery spaces in ships could be obtained by separating the collection of oil and water (i.e. by improvement of the design of piping, fitting and/or collecting tanks).

Revised proposed draft text of circular MEPC/Circ.235

7 Taking into account the comments and suggestions expressed at the last session of the Sub-Committee and those communicated after the session, Japan prepared the second draft text of revised Guidelines for systems for handling oily wastes in machinery spaces of ships of circular MEPC/Circ.235 as set out in annex 1 of this document.

8 The draft revised guidelines (annex 1 of this document) contain, as appendix 1, revised Guidelines for systems for handling oily wastes in machinery spaces of ships, which have been slightly changed from the guidelines in MEPC/Circ.235. The changes are the addition of a reference to IBTS and replacement of "100 ppm" with "15 ppm" according to resolution MEPC.107(49).

9 The draft revised guidelines (annex 1 of this document) also contain, as appendix 2, Guidelines for the Integrated Bilge Water Treatment System (IBTS).

10 The main text of the circular has also been prepared, as in the first page of annex 1, in order to incorporate IBTS into the guidelines.

11 Annex 2 of this document presents our replies to the comments received from some delegations during and after the last session of the Sub-Committee.

Action requested of the Sub-Committee

12 The Sub-Committee is invited to consider the proposed revised text of circular MEPC/Circ.235 as set out in annex 1 of this document, taking into account the comments of delegations and replies to the comments as in annex 2, and take action as appropriate.

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ANNEX 1

DRAFT

REVISION TO THE GUIDELINES FOR SYSTEMS FOR HANDLING OILY WASTES IN MACHINERY SPACES OF SHIPS
AND
THE GUIDELINES FOR THE INTEGRATED BILGE WATER TREATMENT SYSTEM (IBTS)

(For the purpose of drafting, the parts with underline are added, and the parts with deletion line are deleted.)

1 Annex I of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), contains certain regulations and unified interpretations related to equipment for the storage, handling and disposal of oily residues and engine-room oily bilge water.

2 In order to facilitate the work of Administrations on systems for handling oily wastes in machinery spaces of ships, the Marine Environment Protection Committee (MEPC) has continuously reviewed an appropriate technology for fulfilment of the Convention requirements.

3 "Guidelines for systems for handling oily wastes in machinery spaces of ships" appended to ~~this circular~~ MEPC/Circ.235 were developed as ~~are~~ guidance for Administrations, shipowners and shipbuilders for consideration in achieving an efficient and effective system for the handling of oily bilge water and oily residues for ships the keels of which are laid on or after 1 January 1992 and, where practicable, ships already in service.

4 The aforementioned Guidelines have been reviewed in accordance with the current provisions of the Convention and revised as set out in appendix 1 to this circular.

5 For further prevention of oil pollution from machinery spaces of ships, the MEPC considered that the reduction of the generation of oily bilge water generated in machinery spaces is effective and noted the concept of Integrated Bilge Water Treatment System (IBTS) which incorporates the means to reduce the amount of oily bilge water and process the oily bilge water and oil residue (sludge) integratedly.

6 The MEPC recognized the need to disseminate the concept of IBTS and developed the Guidelines for IBTS as set out in appendix 2 to this circular.

APPENDIX 1

REVISED GUIDELINES FOR SYSTEMS FOR HANDLING OILY WASTES IN MACHINERY SPACES OF SHIPS

1 Annex I of the MARPOL 73/78 contains certain regulations and unified interpretations related to equipment for the storage, handling and disposal of oily residues and engine-room oily bilge water.

2 In the continuous review by the MEPC of appropriate technology for fulfilment of the Convention requirements, substantial information has been collected which is valuable in the design, approval and surveying of installations in engine-rooms for systems handling oily bilge water, and oily residues, but does not form part of the Convention regulations or the related interpretations.

3 The MEPC had decided that this information is, nevertheless, of substantial value to Administrations, shipowners and shipbuilders and, accordingly, decided that the dissemination of the information should be in the format of an MEPC circular.

4 The information contained in these Guidelines should be regarded as guidance in achieving an efficient and effective system for the handling of oily bilge water and oily residues for new buildings and, where applicable and reasonable, for ships which are in service. The information should be considered in conjunction with specific conditions and circumstances, shipowners' and shipbuilders' practices, classification society rules, Administration requirements, etc., applicable to specific ship.

5 Definitions for the purpose of the Guidelines in this appendix

5.1 Oily waste means oil residues (sludge) and oily bilge water.

5.2 Oil residue (sludge) means:

.1 separated sludge, which means sludge resulting from purification of fuel and lubricating oil;

.2 drain and leakage oil, which means oil resulting from drainages and leakages in machinery spaces; and

.3 exhausted oils, which means exhausted lubricating oil, hydraulic oil or other hydrocarbon-based liquid which are not suitable for use in machinery due to deterioration and contamination.

5.3 Sludge tanks mean:

.1 tanks for separated sludge;

.2 drain and leakage oil tanks; and

.3 exhausted oil tanks.

5.4 Bilge water holding tanks mean tanks for oily bilge water.

5.5 Regulations referred to in these Guidelines are those contained in Annex I of MARPOL 73/78.

5.6 Oil sludge incinerators are systems serving for incineration of oil sludge generated on board seagoing ships.

Sludge incinerators could be:

- main and auxiliary steam boilers with appropriate oil sludge processing systems;
- heaters of thermal fluid systems with appropriate oil sludge processing systems;
- incinerators with appropriate oil sludge processing systems designed for sludge incineration; or
- inert gas systems with appropriate oil sludge processing systems.

6 Collection and storage of oily wastes

6.1 A sludge tank or tanks are mandatory under regulation 17.

6.2 A bilge water holding tank is arranged to receive the daily generation of bilge water before this water is discharged ashore or discharged through the 15 ppm ~~or 100 ppm~~ equipment overboard. A bilge water holding tank is not mandatory, but will enable ships to operate safely during port visits, during operation in special areas and coastal waters and during periods of maintenance of the 15 ppm ~~or 100 ppm~~ equipment.

6.3 A bilge water holding tank will also provide additional safeguards in the purification of oily bilge water should quick-separating detergents be used for cleaning purposes.

7 Arrangements of oily waste tanks

7.1 Tanks for the purposes mentioned above should be arranged to satisfy the intended service of the ship.

7.2 Sludge tanks may be separate and independent but may also be combined, as suitable, depending on the size and the service of the ship.

7.3 The merits of arranging an independent tank for the collection of separated sludge should be considered, having regard to the smaller tank volume that needs to have cleaning and heating arrangements and the reduced space requirement for tank capacity that should preferably be arranged above the tank top.

7.4 If a bilge water holding tank is arranged, it should be separate and independent from other tanks for the collection of sludge.

7.5 Ships operating with residual fuel oil of a relative density greater than 0.94 at 15°C should be provided with a bilge water holding tank of adequate capacity and fitted with heating facilities to preheat the oily mixture prior to the discharge of the tank's contents to the sea through ~~or 100 ppm~~ or 15 ppm equipment.

8 Size of oily waste tanks

8.1 Tanks for collection of oily waste from various functions in the engine-room should have adequate capacity, having regard to the intended type of service of the ship. The information given below will provide guidance in this respect, but all other aspects applicable to the specific vessel trading pattern and time in port should additionally be taken into account.

8.2 The recommended capacity for oil residue (sludge) tanks is specified in the interpretations to regulation 17.

8.3 If an exhausted oil tank is installed, in addition to the requirement under regulation 17, it should be of sufficient capacity to receive lubricating oil or other oils and hydrocarbon-based liquids from engine-room systems being exhausted due to deterioration, contamination or due to maintenance activities. The oil being discharged from the 15 ppm ~~and 100 ppm~~ equipment may also be discharged to this tank. For main and auxiliary engines, which require a complete change of the lubricating oil at sea, the capacity of the tank should be determined as 1.5 m^3 for each 1,000 kW engine rating.

8.4 If a drain and leakage oil tank is installed, in addition to the requirement under regulation 17 it may be arranged at several locations in the engine-room. The oil being discharged from the 15 ppm ~~and 100 ppm~~ equipment may also be discharged to this tank. The recommended capacity should be as follows:

Main engine rating (kW)	Capacity (m^3)
up to 10,000	$20 \times D \times p/10^6$
above 10,000	$D \times (0.2 + 7 \times (P-10,000)/10^6)$

where, D = days; the same length of the voyage as used in the interpretation to regulation 17.
P = main engine rating in kW.

8.5 Bilge water holding tanks, if fitted, should have a capacity that provides to the ship the flexibility of operation in ports, coastal waters and special areas, without the need to discharge deoiled water overboard. The operational merit of not having to operate the 15 ppm ~~and 100 ppm~~ equipment frequently should also be considered. The capacity of bilge water holding tanks should be as follows:

Main engine rating (kW)	capacity (m^3)
up to 1,000	1.5
Above 1,000 up to 20,000	1.5 + (P-1,000)/1,500
Above 20,000	14.2 + 0.2 (P-20,000)/1,500

where, P = main engine rating in kW

9 Pumping, piping and discharge systems in machinery spaces

9.1 On board ships, the propulsion systems of which are operated by heavy fuel oil, the following guidelines are provided for the piping system comprising the plant components for the treatment and storage of oily bilge water, separated sludge, drain and leakage oil and exhausted oil.

9.2 The effluent from the 15 ppm ~~and 100 ppm~~ equipment should be capable of being recycled to the bilge or bilge water holding tank.

9.3 If an integral pump is fitted, the discharge should not bypass the 15 ppm ~~or 100 ppm~~ equipment.

9.4 The discharge piping system of the 15 ppm ~~and 100 ppm~~ equipment should be completely separate from the bilge pumping and ballast water system except the recycling line referred to in paragraph 9.2.

9.5 The ship's discharge pipeline for oily wastes to the standard discharge connection should be separated from the bunker fuel oil.

9.6 The separated dirty water and exhausted control water of fuel oil purifiers should be discharged into a particular tank for this purpose in order to minimize the influx to the tank for separated sludge. This particular tank should be located above the double bottom for the purpose of facilitating its drain without the need of a drain pump. If dirty water and exhausted control water from purifiers is not discharged to a particular tank, and in lieu of this to a tank for separated sludge, the tank should be located above the double bottom for the purpose of the aforementioned draining facilities.

9.7 Piping to and from sludge tanks shall have no direct connection overboard, other than the standard discharge connection required by regulation 19.

NOTE:

Subparagraph 9.7 will become mandatory when paragraph 3 of regulation 17 of Annex I of MARPOL 73/78 comes into force. In existing ships having piping connections to overboard discharge outlets, compliance with this requirement may be met by the installation of blanks in such pipings.

10 Systems for separated sludge

10.1 Tanks for separated sludge and their pipework

Tanks for separated sludge, their pipework and pumps should be designed as follows:

10.1.1 Size of tanks

See subparagraph 8.

10.1.2 Design of tanks and tank heating systems

The tanks and tank heating systems should be designed to the satisfaction of the Administration.

10.1.3 Tank heating system

Tanks for separated sludge should be equipped with tank heating systems. The heating pipes should be arranged such that, seen from the heating inlet, to start with they are arranged in a way of the boundaries and then across the whole bottom area sufficiently high, in order to avoid being covered totally by sediments in the tank:

The tank heating system should be designed such as to enable heating of the oil sludge up to 60°C.

The suction line from the sludge tank to the pump should be provided with heat tracing.

10.1.4 Pipelines from the heavy fuel oil purifier to the tank

Whenever possible, the sludge tank should be located below the heavy fuel oil purifier. If this is not possible, the sludge tank should be situated close to the heavy fuel oil purifier in such a way that the discharge line to the tank can be installed at the maximum gradient. The pipelines should, wherever possible, be straight or fitted with large radius elbows.

10.1.5 The submersible pump or opening of the suction line should be arranged so that the oil sludge's path to the suction opening is as short as possible, or the sludge tank should be mounted or designed, so that the oil sludge moves down a slope towards the suction opening. The openings should be placed as wide as possible in the frames above the tank bottom in such a way that the oil sludge has free access to the suction line.

10.1.6 Pump and pressure lines

The pump should be suitable for use with high viscosity oil sludge, e.g. "self-priming displacement pump", with suitable means for protection against dry running. It should have a total head of at least 4 bar, and the delivery rate should be determined by applying the formula:

$$Q = v / t \ (m^3/h)$$

where V is the volume of the sludge tank as calculated by the interpretation to regulation 17. Four hours should be substituted for the time t. However, the pumping capacity should be not less than 2.0 m^3/h.

The geodetic suction head of the pump should not exceed 3.0 m for ships with main engine rating up to 15,000 kW and 3.5 m for ships greater than 15,000 kW.

The pressure side of the pump should only be connected to the transfer line on deck, to sludge tanks and to the incineration equipment, if provided.

10.1.7 Sludge tank design to facilitate cleaning

Access holes should be arranged so that all areas of the tank can be cleaned. An access hole should be sited on top of the tank to facilitate the use of a portable pump.

10.1.8 Steaming-out lines

The top of sludge tanks should be fitted with steaming-out lines for cleaning.

11 Example of an on-board system for oil sludge incineration

11.1 General

In addition to the provision of sludge tanks, another means for the disposal of oil residue (sludge) are oil sludge incinerators.

11.2 Oil sludge incinerators

An oil sludge incinerator system is composed of:

- steam boiler or heater of thermal fluid systems or an incinerator;
- oil burner;
- oil sludge processing system; and
- tanks for separated sludge.

11.3 Oil sludge processing systems

The oil sludge processing system consists of:

- tank for mixing oil residues with fuel oil (mixing tank);
- oil sludge preheating system;
- filter; and
- homogenization system.

11.4 Mixing tank

The mixing tank should be provided in addition to the tank for separated sludge. It should be equipped with suitable drainage facilities. With a view to improving combustibility and calorific value, a fuel oil supply connection should be provided.

11.5 Homogenization system

The homogenization system should assure that the entire contents of the mixing tank should be processed into a homogenous and combustible mixture. This system should be put into operation, following adequate draining of the tank. A device for continuous indication and monitoring of the water content of the oil sludge should be provided.

APPENDIX 2

Guidelines for the Integrated Bilge Water Treatment System (IBTS)

1 Introduction

1.1 Bilge is generated by the leakage of water and oil from the equipment and piping or maintenance works resulting from the routine operation in machinery space of ships. Such leaked oil and water are usually mixed and collected on the tank top or bilge wells as oily bilge water.

1.2 Oily bilge water shall be treated in accordance with the requirements of Convention. The operation of such treatment, including the operation and maintenance of bilge filtering equipment, is a heavy load of engineers onboard.

1.3 With the revision of the Guidelines and Specifications for Pollution Prevention Equipment for Machinery Space Bilge of Ships adopted by resolution MEPC.107(49), the capability of bilge filtering equipment has been improved. However, the treatment process of oily bilge water with the improved equipment and the engineers' load will be basically unchanged and the amount of oily bilge water generated in ships has not been reduced.

1.4 To promote the prevention of oil pollution from machinery spaces of ships and reduce the load of the engineers onboard, it is effective to minimize the amount of the oily bilge water generated in machinery spaces.

1.5 The MEPC noted the design with the concept of Integrated Bilge Water Treatment System (IBTS) which incorporates the means to minimize the amount of oily bilge water and proceed the oily bilge water and oil residue (sludge) as a drastic solution to prevent oil pollution from machinery spaces of ships.

1.6 The MEPC recognized the need to disseminate the concept of IBTS and decided to provide the guidelines on IBTS.

1.7 The purpose of these guidelines is to provide shipowners and shipbuilders with information to help the design of the ship incorporating the concept of IBTS.

2 Concept of Integrated Bilge Water Treatment System (IBTS)

Integrated Bilge Water Treatment System (IBTS) is a system to minimize the amount of the oily bilge water generated in machinery spaces by means to treat the leaked water and oil separately and also provides integrated means to process the oily bilge water and oil residue (sludge).

3 Definitions for the purposes of the Guidelines in this appendix

3.1 Clean drains mean drains resulting from the leakage of equipment used for sea water, fresh water, steam etc. which are not contaminated by oil.

3.2 Oily drains mean drains resulting from the leakage of equipment used for oil.

3.3 Oily bilge water means water collected in the bilge wells or the tank top resulting from the unexpected leakage from piping or the maintenance work in machinery spaces, which may be contaminated by oil.

3.4 Oil residue (sludge): refer to 5.2 of appendix 1. It includes oily drains.

3.5 Bilge primary tank means a pre-treatment unit for separation of oily bilge water.

4 Outline of IBTS

4.1 Collection of drains

4.1.1 Oily drains are collected through the fixed drainage arrangements to sludge tanks.

4.1.2 Clean drains are collected through the fixed drainage arrangements to clean drain tanks.

4.1.3 Oily drain and clean drain shall be collected separately so as not to contaminate clean drains with oil.

4.2 Pre-treatment of oily bilge water

To avoid feeding excessive oil to oil filtering equipment, oily bilge water in the bilge wells is transferred to the bilge primary tank for pre-separation of oil. The high oil contained water is transferred to sludge tanks and the low oil contained water is transferred to the bilge water holding tank.

4.3 Discharge of oily bilge water

Oily bilge water in the bilge water holding tank is discharged overboard through the oil filtering equipment in accordance with Regulation 16 of the Convention.

4.4 Discharge of clean drains

Clean drains may be discharged overboard directly through the discharge arrangement independent from the system for oily bilge water or oil.

4.5 Treatment of oil residue (sludge)

4.5.1 Oil residue (sludge) in sludge tanks is transferred to the waste oil tanks.

4.5.2 Water in oil residue (sludge) is vaporized by heating in the waste oil tanks.

4.5.3 Oil residue (sludge) is incinerated by the sludge incinerator or discharged to the reception facilities through the standard shore connection.

4.5.4 Oily drains from fuel oil systems may be burnt by the boiler as re-generative fuel.

5 Additional installations of IBTS

In addition to the installations required by the Conventions, the following installations are required to compose IBTS:

5.1 Drainage system

5.1.1 Drip trays or coamings with sufficient depth provided under the equipment used for oil such as diesel engines, burners, pumps, heaters, coolers, filters and tanks to keep spillage of oil.

5.1.2 Drip trays or coamings with sufficient depth provided under the equipment used for water such as pumps, heaters, coolers, filters, tanks, condensers and boilers to keep spillage of water.

5.1.3 Independent drainage arrangements for oil and water to sludge tanks and the clean drain tank.

5.2 Pre-treatment unit for oil separation

Bilge primary tank with construction of cascade, which is able to separate oil from oily bilge water by gravity with drainage facilities of the oil on the top as primary separation of oily bilge water. Refer to the example of bilge primary tank shown in Fig. 1.

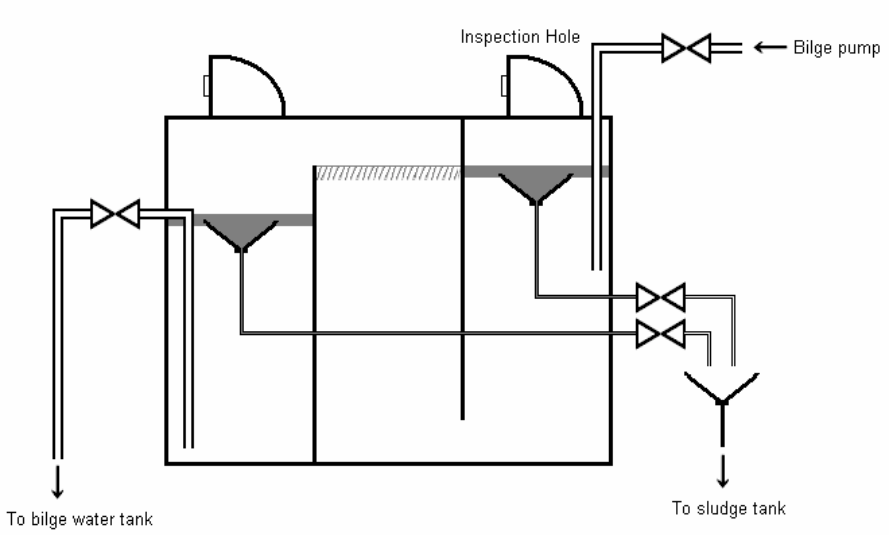

Fig. 1 Example of bilge primary tank

5.3 Storage tanks

5.3.1 Clean drain tank: Tank for the retention of clean drains.

5.3.2 Bilge water holding tank: Tank for the retention of oily bilge water.

5.3.3 Waste oil tank: Tank for preparation of oil residue (sludge) for incineration.

5.4 Discharge arrangement of clean drains

The discharge arrangement of clean drains to overboard should be independent from the system for oily bilge water.

5.5 Exclusive pump for the oil filtering equipment

It is preferable to be provided with an exclusive pump to transfer the pre-treated bilge water from bilge water holding tank to the oil filtering equipment so as not to mix the pre-treated bilge water and untreated oily bilge water.

5.6 Heating arrangement

5.6.1 Heating arrangement of the bilge primary tank to facilitate separation of oil.

5.6.2 Heating arrangement of the waste oil tank to vaporize water and facilitate incineration.

6 Example of IBTS

A typical flow diagram of IBTS is shown in Fig. 2.

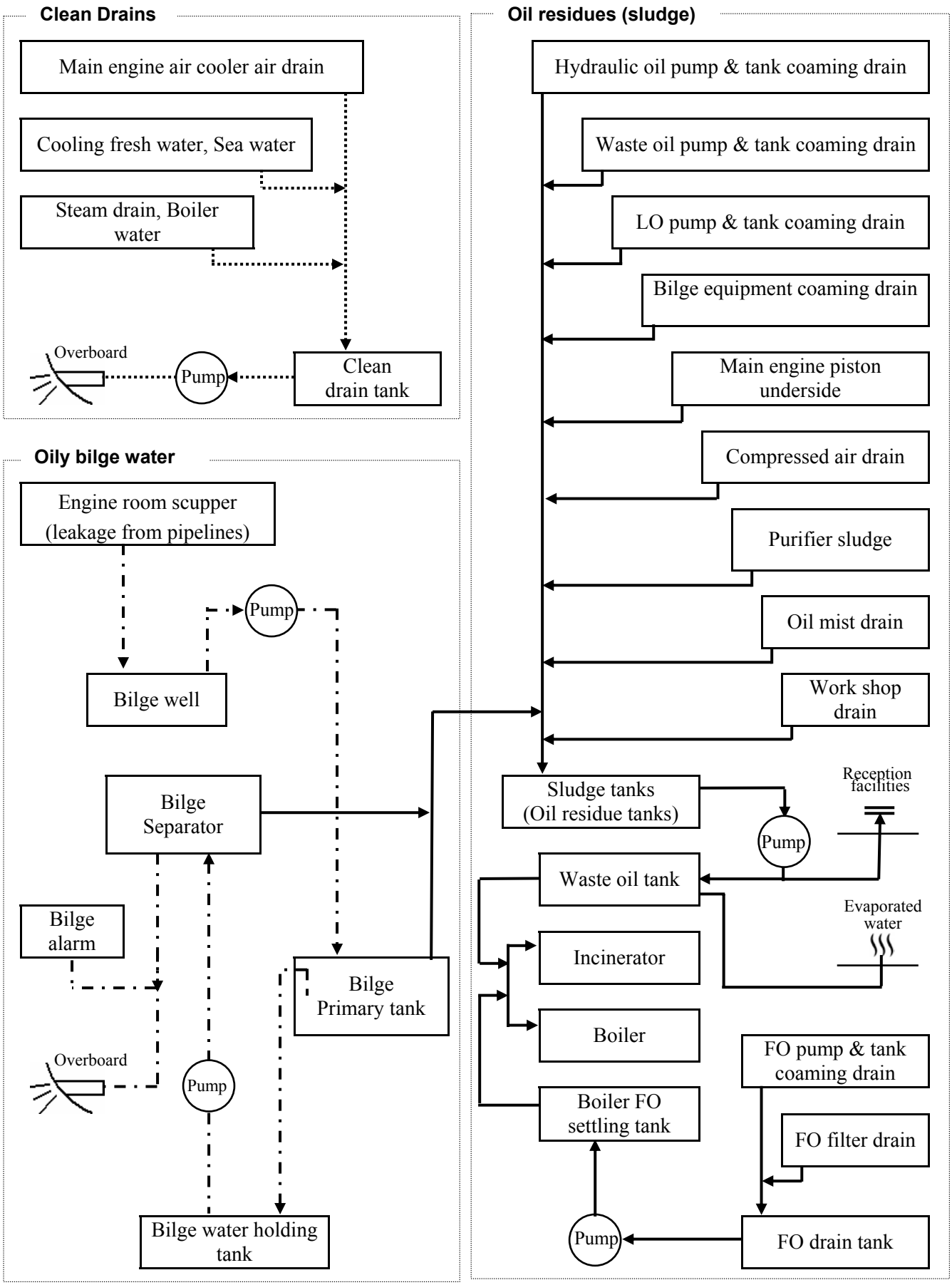

Fig. 2 Flow Diagram of Integrated Bilge Water Treatment System (IBTS)

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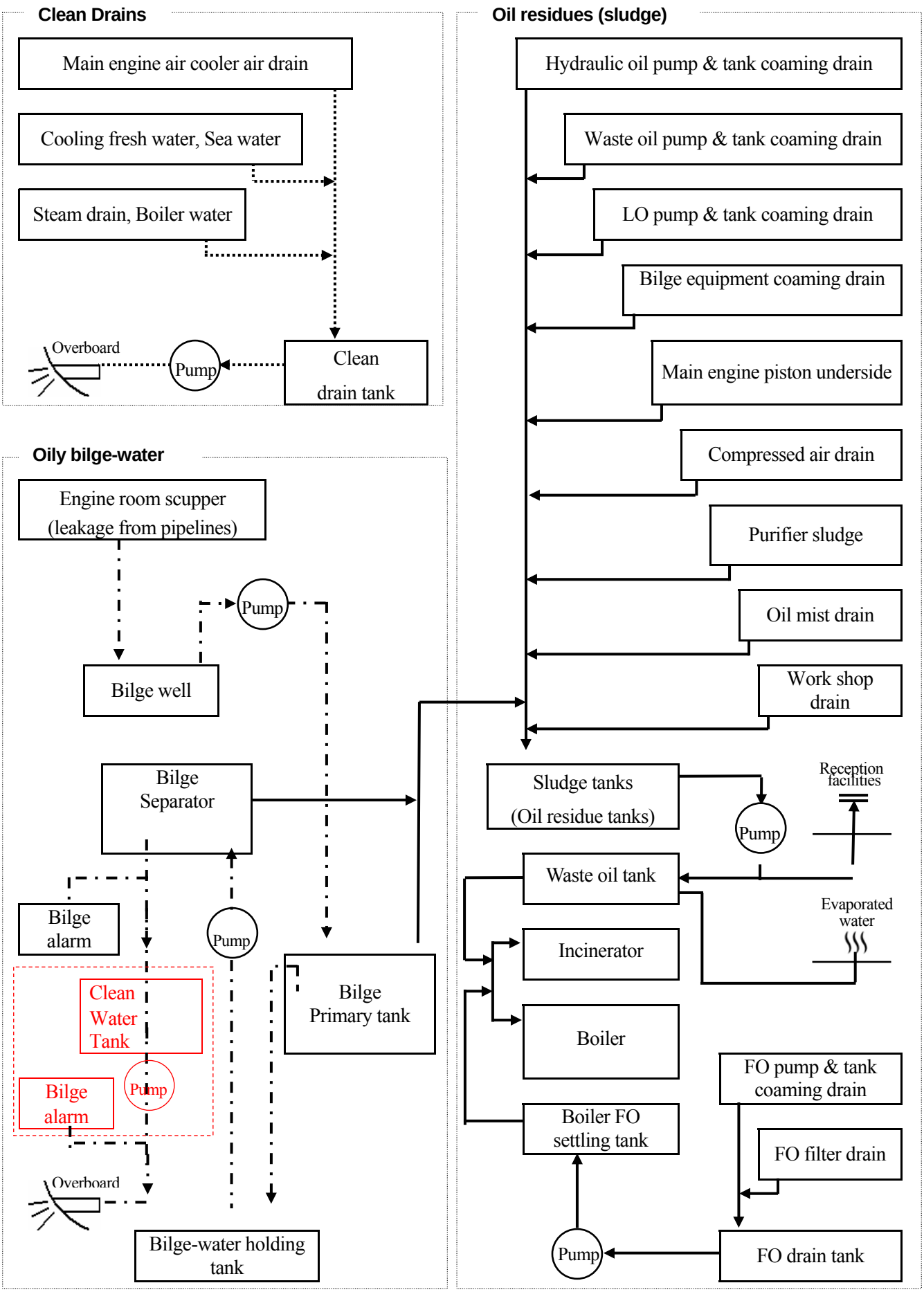
ANNEX 2

REPLIES TO COMMENTS BY ADMINISTRATIONS

No.	Comments	Replies	Action
1	In general the workload of the engineer will be reduced however more equipment gives also more maintenance.	Additional equipment for IBTS is, for example, bilge primary tank, clean drain tank and waste oil tank, for which not much maintenance is necessary. On the contrary, the workload of ship crew is reduced because the bilge separator under the IBTS made cleaner than one under the existing system does not require maintenance work for itself.	None
2	About the clean drains, contamination could occur for example during cleaning works.	It is reported by number of vessels having clean drain tank that the oil content of clean drain tank is very low level. Clean drain may be led to clean drain tank or bilge holding tank, considering the possibility of oil contamination in each clean drain on the vessel.	None
3	In Fig.2, the water drains are missed from the sludge tanks, waste oil tank and the purifier sludge tank.	The drain plug leads oily water drain in the tank to bilge well/bilge water holding tank, those are contaminated with the drain. Furthermore, this would increase the load of bilge separator. Instead under the IBTS, the oil rich drain is led to waste oil tank and burnt by incinerator or boiler after evaporating the water contained in it.	None
4	Fuel oil drain tank is not pumped to the boiler because of technical reasons (reliability) but to the HFO settling tanks especially for engines running at 500 – 700 cSt fuel, which appeared to be a better solution.	It is possible to burn FO drain by the boiler or incinerator in some systems. Because, in case back washed oil from FO Filter is led to fuel oil drain tank, the oil in fuel oil drain tank includes impurities and transferring the oil to FO. Settling tank may cause trouble of the diesel engine because the impurities abstracted at the filter are returned to the FO system.	None
5	Bilge water holding tank in appendix 1 is called (I suppose) bilge water tank in appendix 2.	They are the same tank. “Bilge water holding tank” is used in both appendices in the revised draft.	Amend 4.2, 4.3, 5.3.2 and Fig.2

添付資料 3.　DE49 の審議結果を受けて修正した DE49/9 Fig. 2



: Optional arrangements (not including the IBTS concept)

Fig. 2 Flow Diagram of Integrated Bilge Water Treatment System (IBTS)

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