MEPC.107 (49)决议
（2003 年 7 月 18 日通过）

修订的船舶机器处所舱底水防污染设备指南和技术条件

海上环境保护委员会，

忆及国际海事组织公约关于本委员会职能的第 38(a)**条，**

注意到 1992 **年** 10 **月** 30 **日通过的** MEPC.60 (33)**决议，海上环境保护委员会在其第三十三届会议上以此决议通过了经修订的《船舶机器处所舱底水防污染设备指南和技术条件》，并提请各国政府在其认为合理可行的最大可能范围内予以采纳和执行，将执行结果报告本组织，**

还注意到《经 1978 **年议定书修订的** 1973 **年国际防止船舶造成污染公约》（《**73/78 **防污公约》）附则** I **第** 16(5)**条的规定，其中提到上述技术条件，**

认识到技术的进步，以及海上环境保护委员会于 1992 **年通过并于** 1993 **年** 7 **月** 6 **日生效的关于《**73/78 **防污公约》附则** I **操作排放要求的修正案，**

在其第四十九届会议上审议了船舶设计和设备分委员会根据《73/78 **防污公约》附则** I **的要求制定的《修订的指南和技术条件》，**

1. **通过《修订的船舶机器处所舱底水防污染设备指南和技术条件》，其文本载于本决议附件中，取代** MEPC.60 (33)**决议中的建议；**

2. **提请各国政府：**

(a) **实施该《修订的指南和技术条件》并予以执行，使** 2005 **年** 1 **月** 1 **日或以后装船的设备在合理可行范围内符合该《修订的指南和技术条件》；和**

(b) **向本组织提供关于其在执行中所获经验，尤其是关于对照该《技术条件》所作设备试验获得成功的信息；**

3. **要求秘书处根据收到的信息，保持和更新一份认可设备清单并每年一次将其分发至各国政府；和**

4. **并提请各国政府签发如该《技术条件》**5.2.1 **所述的合适的《型式认可证书》，并将他国政府授权签发的此类证书视为与其签发的证书具有同等效力。**

附件

修订的船舶机器处所舱底水防污染设备指南和技术条件

目录

修订的船舶机器处所舱底水防污染设备指南和技术条件

1 引言

1.1 概述

1.1.1 15 ppm 舱底水分离器的技术条件被认为适于结合油性舱底水和来自燃油舱的压载水使用，这是由于燃油舱容量较小或中等，且受制于需避免排放含油量超过 15 ppm 的油性混合物。

1.1.2 认识到为处理液货船的液货舱流出物而设计的大容量分离设备的开发和试验有特殊的问题，该设备不需按本技术条件试验。不应妨碍此类设备的开发和试验，各国主管机关应有所准备，当在此情况下认为有必要时同意偏离本技术条件。

1.1.3 应意识到，15 ppm 舱底水分离器须能处理来自机器处所舱底的一切油性混合物，并要其对船上可能携载的各种油都有效，令人满意地处理相对密度极高的油或以乳状液形式出现的混合物。清洁工作所用的清洁剂、乳化剂、溶剂或表面活性剂可能会使舱底水乳化。应采取适当措施尽量减少这些物质在船舶舱底水中的存在。由于乳化舱底水始终有可能存在，15 ppm 舱底水分离器须能分离乳状液中的油，使其流出物的含油量不超过 15 ppm。

1.1.4 若有一个类别的 15 ppm 舱底水分离器需要按照本技术条件认证，其设计相同，但容量各不相同，主管机关可接受对该类别中的两种容量进行试验，不用对每种规格均作试验，但实际所作的这两次试验应针对该类别中最小和最大的型号。

培训

1.1.5 船舶员工的培训应包括熟悉该设备的操作和保养。

保养

1.1.6 15 ppm 舱底水分离器和 15 ppm 舱底水报警装置这套系统的常规保养应由制造厂在配套的操作和保养手册中作出明确规定。所有常规保养和修理保养均应作记录。

1.1.7 本《指南和技术条件》中所指规则系指《73/78 防污公约》附则 I 中的规定。

1.2 目的

1.2.1 本《指南和技术条件》包括第 16 条所要求的防污染设备的设计、安装、性能和试验要求。

1.2.2 本《指南和技术条件》的目的是：

.1 对第 16 条的要求作出统一解释；

.2 协助各国主管机关对悬挂其国旗的船舶装设的防污染设备，确定合适的设计、结构和操作参数；

.3 规定防污染设备的试验和性能要求；和

.4 为安装要求提供导则。

1.3 适用范围

1.3.1 本《指南和技术条件》适用于：

.1 在 2005 年 1 月 1 日或以后安放龙骨或处于类似建造阶段的船舶所设装置；和

.2 按合理可行的范围，在 2005 年 1 月 1 日以前安放龙骨或处于类似建造阶段的船舶于 2005 年 1 月 1 日或以后所设的新装置。

1.3.2 A.393 (X)和 MEPC.60 (33)决议通过的《指南和技术条件》不适用于新的本《指南和技术条件》所适用的船舶。

1.3.3 在 2005 年 1 月 1 日以前安放龙骨或处于类似建造阶段的船舶所设装置应：

.1 符合 A.393 (X)决议通过的《关于油水分离设备和油分计国际性能和试验技术条件的建议》，此系针对在 1978 年 11 月 14 日或以后安装的设备（如适用）；或

.2 符合 MEPC.60 (33)决议通过的《指南和技术条件》，此系针对在 1994 年 4 月 30 日或以后装船的防污染设备（如适用）；或

符合本《指南和技术条件》的要求。

1.4 各种要求的概括

1.4.1 本《指南和技术条件》规定的防污染设备的认可要求概括如下：

.1 15 ppm 舱底水分离器的型式认可，应按附件第 1 部分所述程序进行试验，并按附件第 3 部分的规定进行环境试验；和

.2 15 ppm 舱底水分离器排出物的油分计（下文称为 15 ppm 舱底水报警装置）的型式认可，应按附件第 2 部分进行试验，并按附件第 3 部分的规定进行环境试验。

2 背景

2.1 《73/78 防污公约》附则 I 关于船舶防污染设备的要求载于第 16 条，该条规定 400 总吨及以上的船舶应安装经认可的设备。

2.2 第 16(5)条规定，15 ppm 舱底水分离器流出物的含油量不得超过 15 ppm。当不能保持这一水准时，15 ppm 舱底水报警装置应启动显示并在适用情况下自动关停油性混合物的舷外排放。

3 定义

3.1 防污染设备

就本《指南和技术条件》而言，船舶根据第 16 条安装的防污染设备包括以

下部分：

.1　15 ppm 舱底水分离器；

.2　15 ppm 舱底水报警装置；和

.3　自动关停装置。

3.2　15 ppm 舱底水分离器

“15 ppm 舱底水分离器”可以是一个分离器，一个过滤器，一个凝聚过滤器或其他装置的任意组合，也可以是按流出物含油量不超过 15 ppm 设计的单一装置。

3.3　15 ppm 舱底水报警装置

第 16(5)条规定的报警布置在本《指南和技术条件》中称为“ 15 ppm 舱底水报警装置 ”。

3.4　ppm

“ppm”系指水所含油量的百万分比，按体积计。

3.5　ppm 显示器

“ppm 显示器”系 15 ppm 舱底水报警装置的数字标示显示器。

3.6　自动关停装置

在适用情况下，自动关停装置系当流出物含油量超过 15 ppm 时用于自动关停油性混合物任何舷外排放的装置。该自动关停装置应为一种阀门装置，装于 15 ppm 舱底水分离器的流出物出口线处，当流出物含油量超过 15 ppm 时自动将排向舷外的混合流出物引回船舶舱底或污水舱。

4　技术条件

4.1　15 ppm 舱底水分离器

4.1.1　15 ppm 舱底水分离器应有牢固的结构，适于船上使用，并要注意在船上的预定位置。

4.1.2　若预定将其设在可能有易燃空气的位置，则应符合此类处所的相关安全规定。作为 15 ppm 舱底水分离器一部分的任何电气设备应设在非危险区域，或应由主管机关认证为可在危险区域安全使用。设在危险区域的所有活动部件的布置应避免形成静电。

4.1.3　15 ppm 舱底水分离器应设计为自动运转，但应有故障保护布置来避免在出现故障时有任何排放。

4.1.4　向 15 ppm 舱底水分离器送舱底水改为送油，送舱底水改为送乳化舱底水，或送油和/或水改为送空气，不得导致排向舷外的任何混合物的含油量超过 15 ppm。

4.1.5　开动该系统应不需费神。对用于机舱舱底水的设备，该系统的开动应

不需对阀和其他设备作任何调整。该设备应能在不予照应情况下，以正常功能运行至少 24 小时。

4.1.6　15 ppm 舱底水分离器所有易损易坏的活动部件应易于接触，以便维修。

4.2　15 ppm 舱底水报警装置

4.2.1　本技术条件适用于 15 ppm 舱底水报警装置。

4.2.2　15 ppm 舱底水报警装置应能在海洋环境条件下抗腐蚀。

4.2.3　15 ppm 舱底水报警装置若预定设在可能有易燃空气的位置，则应符合此类处所的相关安全规定。作为 15 ppm 舱底水报警装置一部分的任何电气设备应设在非危险区域，或应由主管机关认证为可在危险区域安全使用。设在危险区域的所有活动部件的布置应避免形成静电。

4.2.4　15 ppm 舱底水报警装置不得含有或使用任何危险性质的物质，除非有主管机关可以接受的合适布置来消除由此引起的所有危险。

4.2.5　应设有 ppm 显示器。鉴于附件第 1 部份 1.2.4 详述的试验液体被认为可代表一种预料会在船舶机器处所舱底水中出现的混合物，ppm 显示器不应受到乳状液和/或任何一种油的影响。应无必要在船上校验 15 ppm 舱底水报警装置，但应允许按制造厂的说明书做试验。读数精度应始终保持在附件第 2 部分 2.2.1 规定的限度内。

4.2.6　15 ppm 舱底水报警装置的响应时间，即从送至 15 ppm 舱底水报警装置的样品发生变化至 ppm 显示器显出正确的响应所化时间应不超过 5 秒。

4.2.7　15 ppm 舱底水报警装置应设有一种电气/电子装置，该装置应由制造厂预先设定为当流出物含油量超过 15 ppm 时启动。无论何时 15 ppm 舱底水报警装置失效，需要预热时间或由于其他原因停止工作，该装置也应自动运行。

4.2.8　建议在船上设一简单装置，用以核查仪表的零点漂移、读数的重复性和零位恢复能力。

4.2.9　15 ppm 舱底水报警装置应纪录日期、时间和报警状态以及 15 ppm 舱底水分离器的运行状态。记录装置还应储存数据至少 18 个月，并应能显示或打印官方检查所要求的报告书。若更换 15 ppm 舱底水报警装置，应有办法确保所记录的数据可留在船上使用 18 个月。

4.2.10　为防备蓄意操控 15 ppm 舱底水报警装置，应做到以下两点：

.1　在 4.2.8 的基本要求范围以外，每次接触 15 ppm 舱底水报警装置均需拆去封条；和

.2　15 ppm 舱底水报警装置的结构应是每当为做清洁工作或恢复零位而使用清水时，均启动警报。

4.2.11　15 ppm 舱底水报警装置的精度应在 IOPP 证书换证检验时，按制造厂说明书予以核查。也可用经校验的 15 ppm 舱底水报警装置替换。证明上次校验检定日期的 15 ppm 舱底水报警装置校验证书，应保存在船上以备检查。精度

检定只可由制造厂或制造厂授权的人员进行。

5 防污染设备型式认可试验技术条件

5.1 试验要求

型式认可所适用的防污染设备的生产型号，应与按本《指南和技术条件》附件第 1 或 2 部分的试验和性能技术条件作了型式试验的设备保持一致。该设备还应按附件第 3 部分的环境试验技术条件作型式试验。

5.2 认可和发证程序

5.2.1 各方面均达到本《指南和技术条件》要求的防污染设备可由主管机关批准装船。批准的形式应为《型式认可证书》，用该证书规定该设备的主要参数和为确保其正常工作而必要的所有限制使用条件。该证书应按附件第 5 部分所示格式签发。设有防污染设备的船舶应始终携有该设备型式认可证书的一份副本。

5.2.2 应签发 15 ppm 舱底水报警装置型式认可证书并将其保存在船上。

5.2.3 其他国家可根据首次试运行情况或在其本国代表监督下进行新的试验后，接受经认可的防污染设备用于其船舶。如果设备在一国通过试验，但在另一国没有通过同样性质的试验，有关两国应相互协商达成双方均可接受的协议。

6 安装要求

6.1 15 ppm 舱底水分离器

6.1.1 为以后在船上检查起见，应按实际可行程度在尽量靠近 15 ppm 舱底水分离器出口的排液管垂直部分设一取样点。应在关停装置舷外出口后面及附近装有再循环设备，使包括 15 ppm 舱底水报警装置和自动关停装置在内的 15 ppm 舱底水分离系统能在舷外排放停止的情况下进行试验（见图 **1**）。

再循环设备的安装应能防止在所有工作条件下出现任何绕过油水分离器的情况。

6.1.2 给送泵的排量不应超过 15 ppm 舱底水分离器额定容量的 110%，泵和电机的规格应记在型式认可证书上。

6.1.3 15 ppm 舱底水分离器应固定装有一个标牌，用以说明制造厂或主管机关认为必要的所有运行或安装限制。

6.1.4 设有 15 ppm 舱底水分离器的船舶应始终携有一份操作和保养手册。

6.2 15 ppm 舱底水报警装置

6.2.1 安装格局的布置应使总的响应时间（包括 15 ppm 舱底水报警装置的响应时间），即从 15 ppm 舱底水分离器排出物含油量超过 15 ppm 起至阻止舷外排放的自动关停装置开动所需时间尽可能短，在任何情况下不多于 20 s。

6.2.2 从 15 ppm 舱底水分离器通向 15 ppm 舱底水报警装置的排放管路提取样品的船上布置应以足够的压力和流量，提供有真实代表性的流出物样品。

6.2.3 设有 15 ppm 舱底水报警装置的船舶应始终携有一份操作和保养手

册。

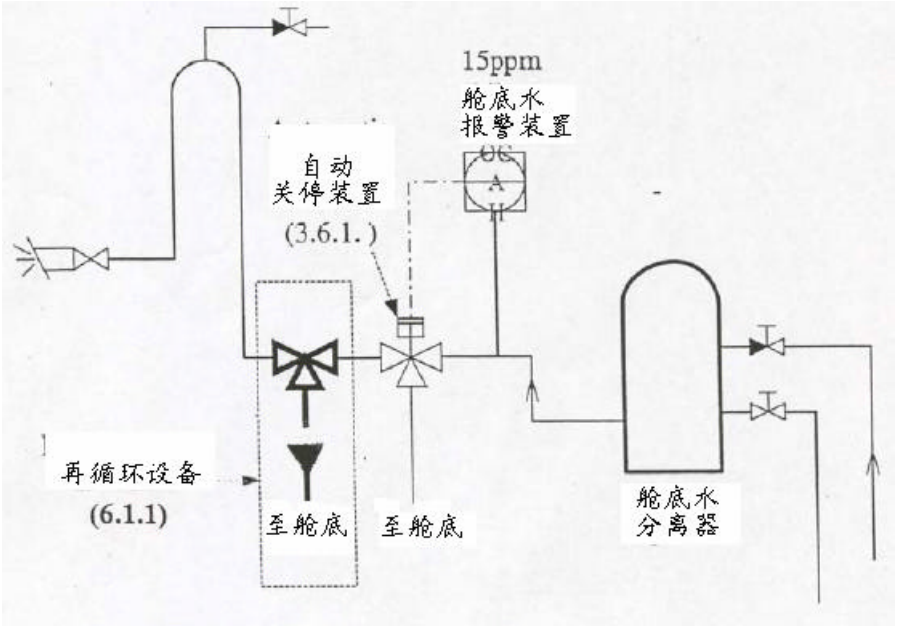

图 1

附件

本附件提供防污染设备的详细试验和性能技术条件，包括：

第 1 部分 – 15 ppm 舱底水分离器型式认可试验和性能技术条件；

第 2 部分 – 15 ppm 舱底水报警装置型式认可试验和性能技术条件；

第 3 部分 – 防污染设备型式认可环境试验技术条件；

第 4 部分 – 含油量测定法；和

第 5 部分 – 书面认可证明。

第 1 部分 – 15 ppm 舱底水分离器型式认可试验和性能技术条件

1.1 概述

1.1.1 本《型式认可试验和性能技术条件》适用于 15 ppm 舱底水分离器。此外，15 ppm 舱底水分离器的电气和电子系统应按本附件第 3 部分《环境试验技术条件》进行试验。

1.1.2 所试验的 15 ppm 舱底水分离器应符合本《指南和技术条件》4.1 中的技术条件的相关要求。

1.2 试验技术条件

1.2.1 本技术条件适用于 15 ppm 舱底水分离器。不论送进 15 ppm 舱底水分离器的废液含油量为多少，它应能产生含油量不多于 15 ppm 的流出物排入海中。

1.2.2 该系统实际所须处理的流入物无论乳化或未乳化，其情况取决于：

.1 泵吸处所内相对于吸入点的油/水界面位置；

.2 所用泵型；

.3 循环路径内任何控制阀的关闭类型和程度；和

.4 该系统的总体尺度和结构。

因此，试验装置的结构必须不仅容纳 15 ppm 舱底水分离器，还须容纳如图 2 所示的各种泵、阀、管件和配件。应将其设计为可试验附装或不附装给送泵的 15 ppm 舱底水分离器。

- 试验不附装给送泵的 15 ppm 舱底水分离器，要用离心泵“ A ”（图 2）向 15 ppm 舱底水分离器送液，阀 4 和 6 打开，筏 5 关闭。调节离心泵“ A ”的排出阀可使该离心泵的流速适应 15 ppm 舱底水分离器的设计通量。
- 若 15 ppm 舱底水分离器附装给送泵，不需使用离心泵“ A ”。
- 应设有离心泵“ B ”来使柜内的试验液体 C 再循环，确保试验液体 C 在整个试验期间保持稳定状态。试验液体 A 和 B 不需再循环。
- 为确保试验液体与水充分混合，应紧邻 15 ppm 舱底水分离器前部装设

一个本附件第 1 部分 1.2.5 规定的调节管。

— 应按图 2 所示，给试验装置装设其他阀、流量计和取样点。

— 管道应按最大液体流速为 3 米/秒设计。

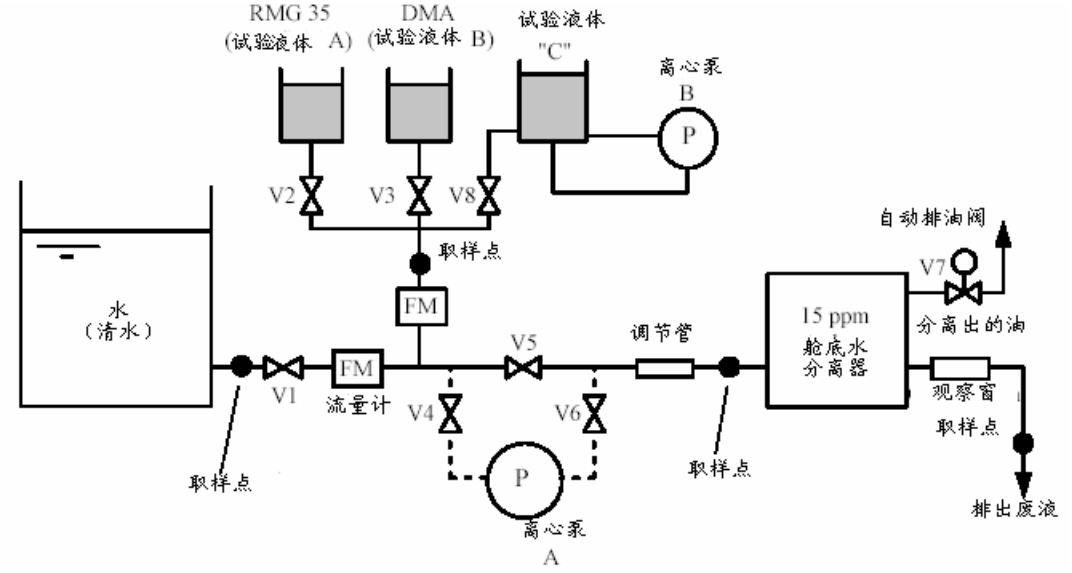

图 2 — 试验装置

1.2.3 试验时的送液速度应相当于 15 ppm 舱底水分离器的最大设计通量。

1.2.4 试验应用三种等级的试验液体进行。

.1 试验液体“A”是一种符合 ISO 8217 的残余船用燃油，型号 RGM35（密度在 15℃下不小于 980 kg/m^3）

.2 试验液体“B”是一种符合 ISO 8217 的船用蒸馏燃油，型号 DMA（密度在 15℃下不小于 830 kg/m^3）

.3 试验液体“C”是一种油和淡水的乳化混合液，混合比例为 1 kg 该液体由以下成分组成：

— 947.8 g 淡水；

— 25.0 g 试验液体“A”；

— 25.0 g 试验液体“B”；

— 0.5 g 干型表面活性剂（十二烷基苯磺酸钠盐）；

— 1.7 g“氧化铁”(“氧化铁”一词用以描述黑色氧化正亚铁（Fe_3O_4），其粒度分布状况为 90%小于 10 微米，其余的最大粒度为 100 微米）

注：试验液体 C 的制备程序：（见计算示例）[1]

— 制备

(1) **按** 1.2.11 **所述，量出“用试验液体** C **进行试验”所需表面活性剂量的** 1.2 **倍；和**

(2) **将其在一个小容器（例如烧杯或水桶）内与淡水混合并充分搅拌至表面活性剂彻底溶解，制成混合液（“混合液** D **”）。**

— 在试验液体柜内制成试验液体 C **（图** 3**）**

(3) **以** 1.2.11 **所述试验所需试验液体“** C **”内总水量之体积的** 1.2 **倍向试验液体柜注入淡水。**

(4) **开动运行速度（额定转速）不小于** 3,000 rpm **的离心泵，流速为每分钟至少更换全部试验液体一次。**

(5) **先向柜内淡水添加“混合液** D **”，然后按要求数量的** 1.2 **倍分别添加油和悬浮固体（氧化铁）。**

(6) **为使乳化状态稳定下来，让离心泵** B **运行一小时，确认试验液体表面无浮油。**

(7) **在以上**(6)**所述一小时之后，让离心泵** B **减速运行，流速约为原来的** 10%**，直至试验结束。**

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[1] **试验液体“** C **”的成分计算（示例：**2 m^3/h **舱底水分离器）**
用试验液体“ C **”进行试验的运转时间按** 1.2.11**：**2.5 **小时加上调节时间（约** 0.5 **小时）=** 3 **小时**
试验所需体积净值：试验用水体积：2 m^3 × 3 **小时** = 6 m^3
试验液体“ C **”体积：**6%**试验用水** = 0.06 × 6 m^3 = 0.36 m^3
实际制备体积：
试验液体“ C **”制备体积：试验液体“** C **”体积净值的** 1.2 **倍** = 1.2 × 0.36 = 0.432 m^3
试验液体“ C **”中的淡水体积：试验液体“** C **”的（**947.8 g/1000 g**）** = 0.9478 × 0.432 = 0.4094 m^3
试验液体“ A **”重量：试验液体“** C **”的（**25 g/1000 g**）** = 25/1000 × 0.432 × 1000 = 10.8 kg
试验液体“ B **”重量：试验液体“** C **”的（**25 g/1000 g**）** = 25/1000 × 0.432 × 1000 = 10.8 kg
表面活性剂重量：试验液体“ C **”的（**0.5 g/1000 g**）** = 0.5/1000 × 0.432 × 1000 = 0.216 kg
氧化铁重量：试验液体“ C **”的（**1.7 g/1000 g**）** = 1.7/1000 × 0.432 × 1000 = 0.734 kg

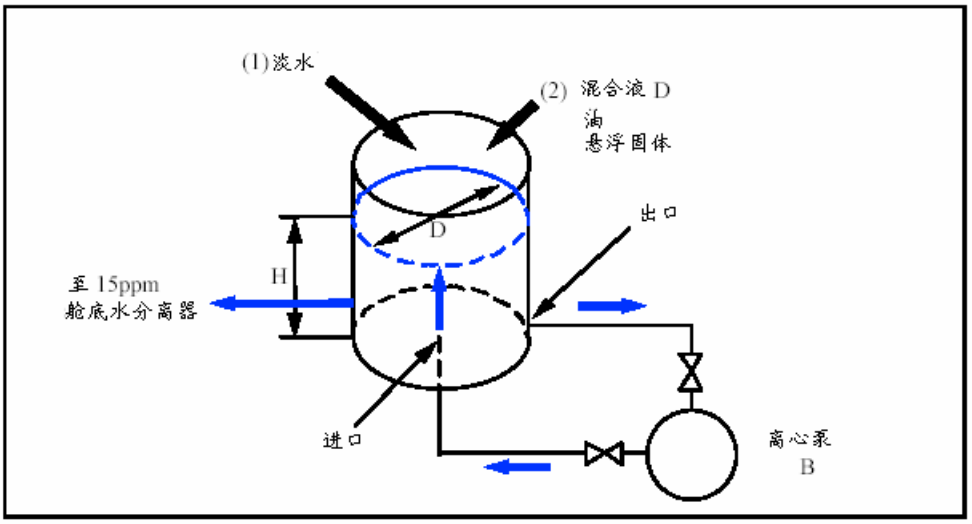

图 3 — 试验液体“C”柜

注：

(1) **该柜应为圆柱形。水位应为：**

$$2D = H = 0.5D$$

，在制备试验液体“C”时。

(2) **通向离心泵 B 的出口应尽量设在该柜的低位。**

(3) **该柜的进口应设在柜底的中心位置，使混合液向上流动形成均匀的乳化液。**

如果 15 ppm 舱底水分离器设有加热设备，用以在自动排出阀启动时排放留在分离器内的油，则应在型式认可证书上的“所附限制条件”栏签署如下声明：

“该 15 ppm 舱底水分离器设有加热设备。”

1.2.5 **如果 15 ppm 舱底水分离器包括一个附装的给送泵，应用该泵对该 15 ppm 舱底水分离器进行试验，按该 15 ppm 舱底水分离器额定容量并按所要求的数量向其给送试验液体和水。**

如果 15 ppm 舱底水分离器要用船舶的舱底水泵送液，则对其所作试验为向一个运行速度不小于 1，000 rpm 的离心泵的进口按所要求的数量给送试验液体和水的混合液（见图 2 的虚线）。该离心泵的排量在试验所要求的排出压力下，应不小于 15 ppm 舱底水分离器额定容量的 1.1 倍。调节邻近离心泵吸口的试验液体和水抽吸管上的阀，可改变试验液体和水的比例，对试验液体和水的流速或向 15 ppm 舱底水分离器给送的试验液体含量应予监控。如果使用离心泵，该泵的剩余排量应用该泵排放试验液体一侧的节流阀予以控制。

在所有情况下，为确保达到一致的条件，紧邻 15 ppm 舱底水分离器前部的管系布置应使 15 ppm 舱底水分离器流入物的雷诺数按淡水计算不小于 10,000，流速不小于每秒 1 米，从试验液体注入点至 15 ppm 舱底水分离器的给送管长度不小于其直径的 20 倍。应在 15 ppm 舱底水分离器进口近旁设一混合液进口取样点和一个温度计插孔，并应在其排放管上设一出口取样点和一个观察窗。

1.2.6 为大致做到等动能取样（即样品以流速进入取样管），取样布置应如图 4 所示，若设有管塞，在取样之前应让液体自由流动至少一分钟。取样点应位于管道垂直部分。

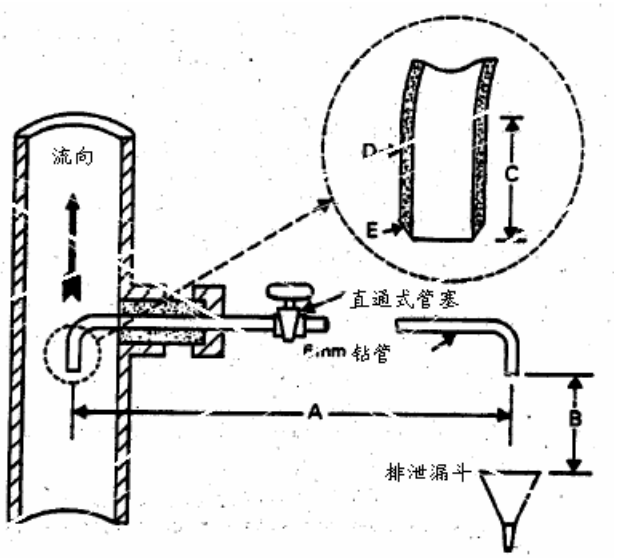

图 4 — 取样布置示图

A 间距 A，不大于 400 mm
B 间距 B，足以插入取样瓶
C 尺寸 C，直线长度应不小于 60 mm
D 尺寸 D，管壁厚度应不大于 2 mm
E 细部 E，锐边斜面（30°）

1.2.7 对于主要依靠重力作用的 15 ppm 舱底水分离器，向该系统给送的试验用水和试验液体的混合液应保持不大于 40℃的温度，如有必要，应装有加热和冷却盘管。水的密度在 20℃下应不大于 1,015。在其他分离方式的分离效率对温度的依存性没有确定的情况下，应在一定温度范围内对流入物进行试验，该温度范围要能代表船上正常的 10℃至 40℃工作温度范围，或按此范围内已知对分离效率最为不利的温度进行试验。

1.2.8 在有必要为 15 ppm 舱底水分离器将水加热至规定温度并供热保持该温度的情况下，应在该规定温度下进行试验。

1.2.9 使用试验液体“A”的试验应按以下方式进行：

.1 确保在试验开始时，15 ppm 舱底水分离器的注油部分注满试验液体且给送管充满试验液体，在 15 ppm 舱底水分离器注水（密度在 20℃下不大于 1,015）以后和运行工况下，向其给送纯试验液体不少于 5 分钟。

.2 应向 15 ppm 舱底水分离器给送试验液体和水的混合液，试验液体在其中的含量为 5,000 至 10,000 ppm，直至确立稳定工况。稳定工况设为在泵送不少于 15 ppm 舱底水分离器容量两倍的试验液体和水的混合液流经 15 ppm 舱底水分离器之后确立的工况。然后试验 30 min。应在自这段时间开始起的第 10 min 和第 20 min，在流出物出口取样。在试验结

束时，应打开泵的抽吸一侧的气塞，如有必要，应缓慢地一起关闭油阀和水阀，并在停流时（可从观察窗查看）对排出物取样。

.3 应按 1.2.9.2 所述，用约 25%*试验液体和 75%*水组成的混合液进行同样试验，包括打开气塞。

.4 应向 15 ppm 舱底水分离器给送 100%*试验液体至少 5 min，在此期间应从观察窗查看是否有油排出。应向 15 ppm 舱底水分离器给送充足的试验液体，以开动自动排油阀。排油阀开动后，应继续试验 5 min，给送 100%*试验液体以核查排油系统的效能。

.5 应向 15 ppm 舱底水分离器送水（密度在 20℃下不大于 1,015）15 min。在试验开始以及第一个 10 min 以后对分离出来的流水取样。

.6 实验应至少持续 2 h，以核查 15 ppm 舱底水分离器能否连续和自动运行。该试验应以 15 分钟周期循环进行，每次均逐渐由送水变为送试验液体含量约 25*的油性混合液，再恢复送水，并应充分试验所设任何自动装置。整个试验序列应安排为连续进行。试验结束时，应在向 15 ppm 舱底水分离器给送含 25%*试验液体的混合液情况下对流出的水取样作分析。

1.2.10 使用试验液体“B”的试验应按以下方式进行：

.1 应向 15 ppm 舱底水分离器给送试验液体和水的混合液，试验液体在其中的含量为 5,000 至 10,000 ppm，直至确立稳定工况。稳定工况设为在泵送不少于 15 ppm 舱底水分离器容量两倍的试验液体和水的混合液流经 15 ppm 舱底水分离器之后确立的工况。然后试验 30 min。应在自这段时间开始起的第 10 min 和第 20 min，在流出物出口取样。在试验结束时，应打开泵的抽吸一侧的气塞，如有必要，应缓慢地一起关闭油阀和水阀，并在停流时（可从观察窗查看）对排出物取样。

.2 应按 1.2.10.1 所述，用约 25%*试验液体和 75%*水组成的混合液进行同样试验，包括打开气塞。

1.2.11 使用试验液体“C”的试验应按以下方式进行：

.1 应向 15 ppm 舱底水分离器给送 6%试验液体“C”和 94%水组成的混合液，使试验用水的乳化油含量达 3,000 ppm，直至确立稳定工况。稳定工况设为在泵送不少于 15 ppm 舱底水分离器容量两倍的试验液体“C”和水的混合液流经 15 ppm 舱底水分离器之后确立的工况。

.2 然后试验 2.5 h。应在调节以后的第 50 min 和第 100 min，在流出物出口取样。在试验结束时，应打开泵的抽吸一侧的气塞，如有必要，应缓慢地一起关闭试验液体“C”阀和水阀，并在停流时（可从观察窗查看）对排出物取样。

1.2.12 应按图 4 所示方式取样，使所取样品能恰当地代表从 15 ppm 舱底水分离器流出物出口出来的液体。

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* 体积百分比。

1.2.13　应按照 ISO 9377-2:2000 取样。样品应在采集的当天提取，当着一名国家授权代表的面密封和贴上标签，并应安排尽快且无论如何要在七天之内进行分析，但样品须保存在经主管机关认可的试验室，温度保持在 2°C和 6°C之间。

1.2.14　样品的含油量应按本附件第 4 部分测定。

1.2.15　当 15 ppm 舱底水分离器的进口和出口设有精确可靠的油分计时，若其证实同一瞬间所显读数的精度在±10%之内，则每次试验在进口和出口各取一样品可视为足够。

1.2.16　在提交试验结果时，应报告以下数据测试方法和读数：

.1　试验液体 A 和 B 的特性:

- 15℃下的密度；
- 运动粘度（厘斯@100℃/40℃）；
- 闪点;
- 灰末；和
- 水分；

.2　试验液体 C 的特性:

- 表面活性剂类型；
- 不溶性悬浮固体的粒度百分比；和
- 表面活性剂和氧化铁质量验证;

.3　水柜内的水的特性：

- 水在 20℃下的密度；和
- 其中任何固体物质的细节;

.4　15 ppm 舱底水分离器进口的温度

.5　试验装置示意图

.6　取样布置示意图；和

.7　所取全部样品的分析方法和分析结果，根据情况附上油分计读数。

第 2 部分 – 15 ppm 舱底水报警装置型式认可试验和性能技术条件

2.1　概述

2.1.1　本《试验和性能技术条件》适用于 15 ppm 舱底水报警装置。此外，这些装置的电气和电子部分应符合本附件第 3 部分《环境试验技术条件》。

2.1.2　所试验的 15 ppm 舱底水报警装置应符合本《指南和技术条件》4.2 中的技术条件的所有相关要求。

2.2 试验技术条件

2.2.1 15 ppm舱底水报警装置的精度范围应在± 5 ppm以内。尽管有除油以外的污染物存在以及动力（指电、压缩空气等）与设计值相差10%，15 ppm舱底水报警装置的精度仍应保持在上述限度内。

2.2.2 试验装置的取样布置应是在所有运行条件下和在运行中出现的所有各种含油量下，都可取得有代表性的匀质样品。应在15 ppm舱底水报警装置满流情况下取样，但在无法做到时，应使用第1部分图4所示取样布置。应特别注意过程中的这一阶段及由此产生的结果。

2.2.3 在各种不同的试验中，应核查15 ppm舱底水报警装置的响应时间，并应注意当超过某一规定阈值时，报警装置是否适时开动。

2.2.4 图5是用以评价15 ppm舱底水报警装置性能的测试设备布置示图。将已知流量的试验液体注入已知流量的水，再来比较15 ppm舱底水报警装置的读数，即可测定其精度。随意抽取的样品在实验室用本附件第4部分所述方法进行分析。实验室的分析结果可用于校正，并表明取样和试验设备的变率。可调节水的流速，除了间歇抽取的液样以外，使试验液体和水全都流过15 ppm舱底水报警装置。应特别注意使流入15 ppm舱底水报警装置的水所含试验液体量保持恒定。应调节计量泵，使试验液体的给送量大体上有连续性。如果试验液体的注入在浓度低时成为间歇性的，可将试验液体与水预先混合使其连续流动。试验液体注入点应在15 ppm舱底水报警装置进口上游的紧邻位置，以将时间滞后减至最低限度。

校验试验

2.2.5 15 ppm舱底水报警装置应按制造厂的说明书校验和恢复零位。然后用本附件第1部分1.2.4规定的“A”、“B”和“C”三种试验液体，按以下百万分比含油浓度进行试验：0，15，以及仪表的满值。每种浓度的试验时间为15 min。在每次浓度试验之后，15 ppm报警装置用无油的水运行15 min并将读数记下。如果在该试验中表明有必要使15 ppm舱底水报警装置重新恢复零位或对其重新校验，须记下这一事实。

污染物和显色试验

2.2.6 15 ppm舱底水报警装置应作如下污染物和显色试验：

.1 15 ppm舱底水报警装置应用清水和10 ppm试验液体“B”的混合液运行，记下读数；

.2 供水应从10 ppm试验液体“B”和清水改为10 ppm试验液体“B”和受到10 ppm浓度氧化铁污染的水；

.3 15 ppm舱底水报警装置读数的任何改变均应记下。读数精度应在2.2.1规定的限度内；

.4 应分别用50 ppm和100 ppm浓度的氧化铁重复以上.2和.3规定的程序；

.5 15 ppm舱底水报警装置应用清水和10 ppm试验液体“B” 的混合液运行，记下读数；

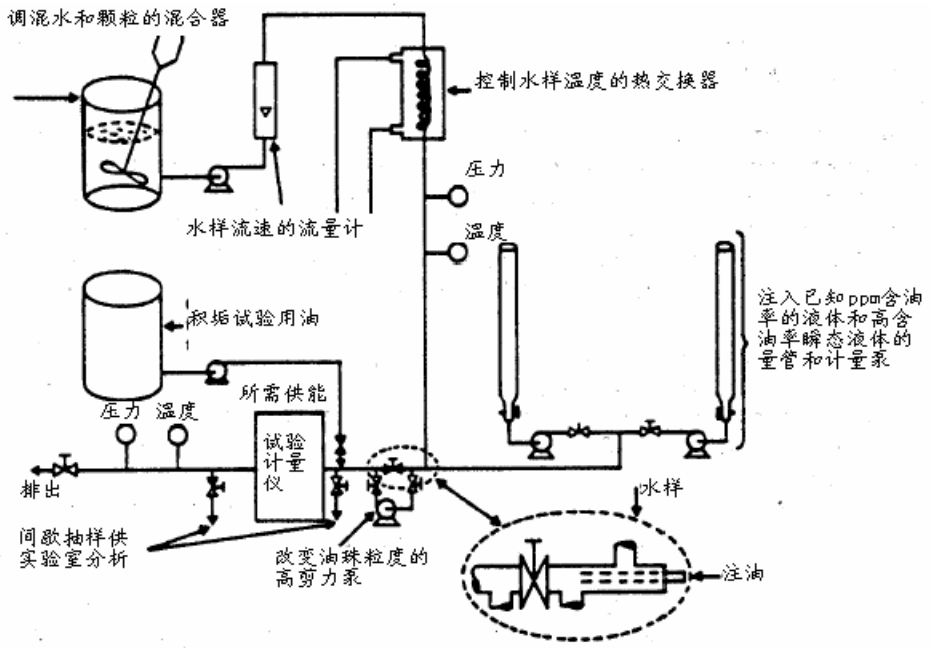


图 5 — 试验设备示图

.6 **供水应从清水改为高盐分水（清水加** 6%**食盐制成的溶液）；**

.7 15 ppm **舱底水报警装置读数的任何改变均应记下。读数精度应在** 2.2.1 **规定的限度内；和**

.8 **混合柜内应有充足的水，确保进行不少于** 15 min **的有效试验。**

样品压力或流量试验

2.2.7 15 ppm**舱底水报警装置应用** 15 ppm**试验液体“** B**”样品运行。混合液的水压或流速应从一半正常值、正常值和双倍正常值调节。应记下这些变动对** 15 ppm**舱底水报警装置** ppm **显示器读数的任何影响，并记到证书上。该试验可要求改换** 15 ppm**舱底水报警装置的流量或压力调节器，或改用设计为向压力围槽排液的** 15 ppm**舱底水报警装置。**

关闭试验

2.2.8 15 ppm**舱底水报警装置应用** 15 ppm**试验液体“** B**”样品运行。水和试验液体注入泵应关闭。**15 ppm**舱底水报警装置保持开启状态，不作其他变动。**8 **小时之后，开动水和试验液体注入泵并将其设为泵送** 15 ppm **混合液。应记下** 15 ppm**舱底水报警装置** ppm**显示器在每次试验前后的读数以及** 15 ppm**报警装置** ppm **显示器的任何损坏，并记到证书上。**

供能变率试验

2.2.9 **如果** 15 ppm**舱底水报警装置除电以外还需有其他供能，应按设计值的** 110%**和** 90%**对这些供能进行试验。**

校验和零位偏移试验

2.2.10 15 ppm **舱底水报警装置应予校验和恢复零位。**15 ppm**试验液体“** B**”**

样品连续通过 15 ppm 舱底水报警装置八小时，记下任何校验偏移。在此之后，15 ppm 舱底水报警装置应用无油的水运行，记下任何零位偏移并记到证书上。在该试验中，应按试验时间进度的 0 时、2 时、4 时、6 时和 8 时作随意抽样，以验证任何校验偏移。

响应时间

2.2.11 应测定在向 15 ppm 舱底水报警装置给送清水改为给送油浓度大于 15 ppm的油性水之后，15 ppm舱底水报警装置对 15 ppm油浓度报警的响应时间。

2.2.12 应对有关仪器作出规定，用示图说明试验布置，并应报告以下数据：

.1 试验所用试验液体类型和特性（参见本附件第 1 部分 1.2.4 和 1.2.16）；

.2 所用污染物详情，例如以供货商证书或实验室试验大纲的形式；和

.3 试验结果和对抽样的分析。

第 3 部分 – 防污染设备型式认可环境试验技术条件

3.1 概述

本型式认可环境试验技术条件适用于以下设备的电气和电子部分：

.1 15 ppm 舱底水分离器；和

.2 15 ppm 舱底水报警装置。

以上各项在下文称为“ 设备 ”，其在试验时应符合本《指南和技术条件》第 5 节的相关要求。

3.2 试验技术条件

3.2.1 *试验要求*

设备的电气和电子部分应以其标准产品结构，按本技术条件列出的环境试验纲要，在主管机关或制造厂所在国主管当局为此批准的实验室进行试验。格式与本附件第 5 部分第 2 节规定的格式相似的环境试验文件的一份副本，应由厂家连同型式认可申请书提交主管机关。

3.2.2 *试验的详细技术条件*

设备在完成以下每一环境试验后的运行均应令人满意：

.1 振动试验：

.1.1 应在以下频率范围和加速幅度内搜寻共振现象：

.1.1.1 2 至 13.2 Hz，幅度为± 1 mm；和

.1.1.2 13.2 至 80 Hz，加速度为± 0.7 g。

此搜寻应在三个平面的每一个进行，搜寻速度要低到足以发现共振；

.1.2 应使设备在各平面以每一主要共振频率振动 2 小时；

.1.3 若无共振频率，应使设备在各平面以 30 Hz 和± 0.7 g 加速度振动 2 小时；

.1.4 在完成以上.1.2 或.1.3 规定的试验之后，应再次搜寻共振现象，振动方式不应有大的变化。

.2 温度试验

.2.1 安装在封闭处所内受控环境下的设备，包括机舱内的设备，作以下试验的时间应不少于 2 h：

.2.1.1 0℃低温试验；和

.2.1.2 55℃高温试验。

在上述每一试验结束时，应开启设备，且设备应在试验条件下正常运转。

.3 湿度试验：

设备应在相对湿度为 90%的空气中，在 55℃温度下关停 2 h。在这段时间结束时应开启设备，且设备应运行 1 h 并令人满意。

.4 倾斜试验：

设备应在任一平面从正常工作位置倾斜至最大达 22.5°的各个角度下运行并令人满意。

.5 电气和电子设备可靠性：

设备的电气和电子部件的质量应由制造厂担保并适合其预定用途。

第 4 部分 – 含油量测定法

适用范围

国际标准 ISO 9377-2:2000《水质 — 烃油指数的测定 — 第 2 部分：溶剂萃取法和气相色谱法》规定了一种利用溶剂和气相色谱法对水取样并随后测定其烃油指数的方法。应使用该方法按本《指南和技术条件》的要求测定含油量。

第 5 部分 – 书面认可证明

5.1 防污染设备型式认可证书

5.1.1 主管机关按以下 5.1.2 规定的格式签发的《型式认可证书》，应表明已满足本附件第 1 和 2 部分所列全部试验要求。主管机关签发《型式认可证书》的依据可为单独所作的试验或在他国主管机关监督下已作的试验。

5.1.2 《型式认可证书》应使用本附件附录 1 或 2 所示格式。该证书应界定其所适用的防污染设备的类型和型号并界定设备的装配图纸，还应确切注明日期。每张图纸均应有机型规格编号或用以识别的同等细节。该证书应包括其所依据的完整的性能试验报告。若主管机关系依据他国主管机关原先签发的证书而签发《型式认可证书》，则该证书应界定曾对该防污染设备作了试验的主管机关，并应附有原试验结果的一份副本。

5.2 环境试验记录格式

5.2.1 **在适用情况下, 应以进行试验的实验室签发的环境试验大纲来表明满足了本《指南和技术条件》规定的环境试验要求。该大纲应至少包括以下细节：**

.1 **用机型和图纸编号界定设备，并确切注明日期；和**

.2 **关于设备试验的陈述，包括试验结果。**

5.2.2 **环境试验大纲应由主管机关或制造厂所在国主管当局签署, 以确认实验室进行这类试验系经过认可。该大纲还应由实验室负责人签名并注明日期。**

徽记
或
拼合字

附录 1

主管机关名称

15 ppm 舱底水分离器型式认可证书

兹证明，已按 IMO **决议** MEPC.107(49)**中的指南和技术条件的附件第** 1 **部分中的技术条件要求，对下述** 15 ppm **舱底水分离器作了检查和试验。本证书仅对以下所述** 15 ppm **舱底水分离器有效。**

15 ppm **舱底水分离器供货者为**

…….

机型和型号为 ……...
包括：

[*]15 ppm **舱底水分离器，由**
按照……..**号技术/装配图纸制造** **日期**

[*]**凝聚过滤器，由**

按照……..……..**号技术/装配图纸制造**

[*]**过滤器，以其他方式**
按照……..……..**号技术/装配图纸制造**

[*]**其他装置** ……..……..…….
按照……..……..**号技术/装配图纸**

控制设备，由
按照……..**号技术/装配图纸制造**

给送泵容量……..m^3/h.…….**电机** kW
额定功率…….. kW…….

系统最大通量……..…….. m^3/h…….

若未附装给送泵，说明为确保不超过系统最大通量而建议使用的方法

…….

设有此分离器的船舶应始终携有本证书的一份副本。

所附限制条件……..……..…….

试验日期和结果见附录。

公章 **签名**
（国名）……..……..**主管机关**
日期 20……**年**……..**月**……..**日**

[*] **不适用者划去**

附录

按 IMO 决议 MEPC.107(49)中的指南和技术条件的附件第 1 部分对 15 ppm 舱底水分离器所作试验的试验数据和结果

15 ppm 舱底水分离器提交者为

…….

试验地点 ……..…

样品分析方法 ……..…

…….

…….

…….

样品分析者为 ……..…

已按 IMO **决议** MEPC.107(49)**中的指南和技术条件的附件第** 3 **部分对** 15 ppm **舱底水分离器的电气和电子部分作了环境试验。在环境试验大纲规定的每一试验完成之后，该设备运转状况均令人满意。**

…….

…….

…….

试验液体“ A ”

密度	**在 15℃下**
黏度	**在 100℃下以厘斯计**
闪点	**℃**
含灰量	%
试验开始时的水分	%

试验液体“ B ”

密度	**在 15℃下**
黏度	**在 40℃下以厘斯计**
闪点	**℃**
含灰量	%
试验开始时的水分	%

试验液体“ C ”

表面活性剂 — 书面证据*

氧化铁 — 书面证据*

试验用水

密度	**在 20℃下**
存在固体物质	

试验温度

环境	**℃**
试验液体“ A ”	**℃**
试验液体“ B ”	**℃**
试验液体“ C ”	**℃**
试验用水	**℃**

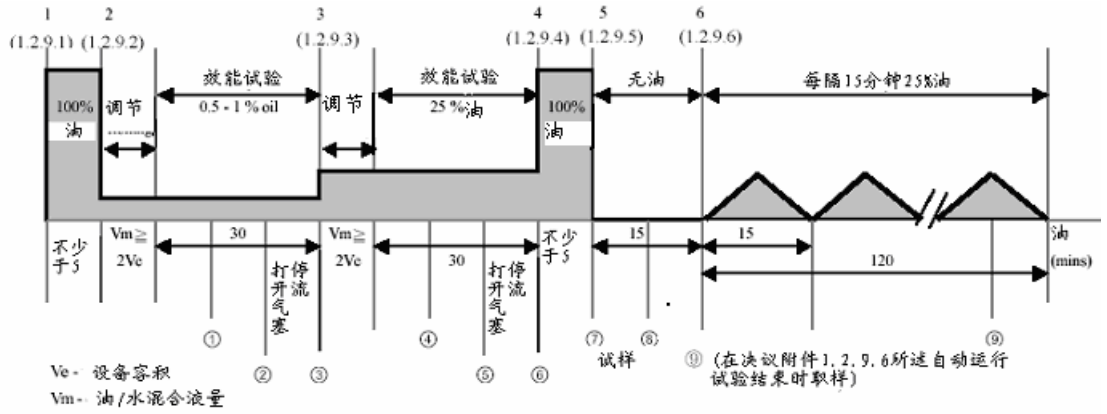
附有试验装置示图

附有取样布置示图

* **证书或实验室分析报告**

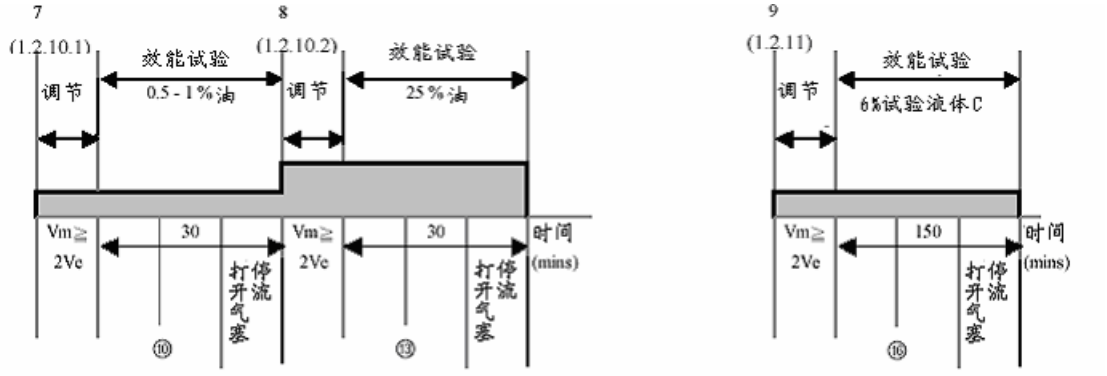
试验结果（ppm）和试验程序

试验液体 A



	1	2	3	4	5	6	7	8	9
流入物									
流出物									

试验液体 B



	10	11	12	13	14	15	16	17	18
流入物									
流出物									

1 — 9 **指段落编号** ① - ⑱ **指取样点**

签名 …… **日期** …… **公章**

（试验大纲各页均应盖有公章或同等标识和认可日期）

徽记
或
拼合字

附录 2

主管机关名称

15 ppm 舱底水报警装置型式认可证书

兹证明，已按 IMO **决议** MEPC.107(49)**中的指南和技术条件的附件第** 2 **部分中的技术条件要求，对下述设备组成的** 15 ppm **舱底水报警装置作了检查和试验。本证书仅对以下所述** 15 ppm **舱底水报警装置有效。**

15 ppm **舱底水报警装置供货者为**……

机型和型号为 ……...

包括：

15 ppm **舱底水报警装置分析组件，由**……....
按照……..……**号技术/装配图纸制造　日期**……..

15 ppm **舱底水报警装置电子部分，由**……....

按照……..……**号技术/装配图纸制造　日期**……..

[*]**样品给送泵，由**…….....
按照……..……**号技术/装配图纸制造　日期**……..

[*]**样品调节组件，由**…….....
按照……..……**号技术/装配图纸制造　日期**……..

可接受该 15 ppm **舱底水报警装置按第** 16(5)**条使用。**

设有此 15 ppm **舱底水报警装置的船舶应始终携有本证书的一份副本。**

试验日期和结果见附录。

公章　　**签名**

（国名）……..……..**主管机关**

日期　20…..**年**……..**月**……**日**

[*] **不适用者划去。**

附录

按 IMO 决议 MEPC.107(49)中的指南和技术条件的附件第 2 部分
对 15 ppm 舱底水报警装置所作试验的试验数据和结果

15 ppm **舱底水报警装置提交者为**……

试验地点 ……..…

样品分析方法 ……..…

样品分析者为 ……..…

已按 IMO **决议** MEPC.107(49)**中的指南和技术条件的附件第** 3 **部分对** 15 ppm **舱底水报警装置的电子部分作了环境试验。在环境试验大纲规定的每一试验完成之后，该设备运转状况均令人满意。**

…….

…….

…….

…….

校验试验和响应时间

试验液体	A		B		C	
	测量值	抽样	测量值	抽样	测量值	抽样
0 ppm						
15 ppm						
满值（ppm）						
水温	℃		℃		℃	
恢复零位	**是/否**		**是/否**		**是/否**	
重新校验	**是/否**		**是/否**		**是/否**	
响应时间	sec		sec		sec	

污染物和显色试验
非油颗粒物质 **仪表读数随非油颗粒污染物 ppm 含量和随高盐分水的变动**

		油分计读数
清水和 10 ppm **试验液体“** B **”**		ppm
高盐分水		ppm
氧化铁	10 ppm	ppm
氧化铁	50 ppm	ppm
氧化铁	100 ppm	ppm

样品压力或流量试验

15 ppm **舱底水报警装置读数在** 50%**正常量时的变动** … ppm
15 ppm **舱底水报警装置读数在** 200%**正常量时的变动** … ppm
如有必要，应说明偏离该试验的情况

关闭试验

15 ppm **舱底水报警装置在关闭之前的读数** … ppm
15 ppm **舱底水报警装置在启动之后的读数**
（干燥时间最少为 8 **小时）** … ppm

15 ppm **舱底水报警装置有如下损坏：**

……...
……...
……...
……...

供能变率试验

110%**电压效应** ……..

90%**电压效应** ……..

110%**气压效应** ……..

90%**气压效应** ……..

110%**水压效应** ……..

90%**水压效应** ……..

其他意见

……

……

……

……

……

……

校验和零位偏移试验

校验偏移 … ppm

零位偏移 … ppm

签名 …….…….…… **日期** …….…….…… **公章**

（试验大纲各页均应盖有公章或同等标识和认可日期）

***

ANNEX 13

RESOLUTION MEPC.107(49)

Adopted on 18 July 2003

REVISED GUIDELINES AND SPECIFICATIONS FOR POLLUTION PREVENTION EQUIPMENT FOR MACHINERY SPACE BILGES OF SHIPS

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Committee,

NOTING resolution MEPC.60(33) adopted on 30 October 1992 by which the Marine Environment Protection Committee adopted, at its thirty-third session, the revised Guidelines and Specifications for Pollution Prevention Equipment for Machinery Space Bilges of Ships and invited Governments to adopt and apply them to the maximum possible extent which they found reasonable and practicable and to report to the Organization the results of such application,

NOTING FURTHER the provisions of regulation 16(5) of Annex I of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 thereto (MARPOL 73/78), in which reference is made to the above-mentioned specifications,

RECOGNIZING the advancement of technology, as well as the amendments to Annex I of MARPOL 73/78 on its operational discharge requirements which were adopted by the Marine Environment Protection Committee in 1992 and which entered into force on 6 July 1993,

HAVING CONSIDERED, at its forty-ninth session, the Revised Guidelines and Specifications developed by the Sub-Committee on Ship Design and Equipment in the light of the requirements of Annex I of MARPOL 73/78,

1. ADOPTS the Revised Guidelines and Specifications for Pollution Prevention Equipment for Machinery Space Bilges of Ships, the text of which is set out in the annex to this resolution, which supersedes the recommendations contained in resolution MEPC.60(33);

2. INVITES Governments to:

(a) implement the Revised Guidelines and Specifications and apply them so that all equipment installed on board on or after 1 January 2005 meets these Revised Guidelines and Specifications in so far as is reasonable and practicable; and

(b) provide the Organization with information on experiences gained from their application and, in particular, on successful testing of equipment against the Specifications;

3. REQUESTS the Secretariat, on the basis of information received, to maintain and update a list of approved equipment and to circulate it once a year to Governments; and

4. FURTHER INVITES Governments to issue an appropriate "Certificate of type approval" as referred to in paragraph 5.2.1 of the Specifications and to recognize such certificates issued under the authority of other Governments as having the same validity as certificates issued by them.

ANNEX

REVISED GUIDELINES AND SPECIFICATIONS FOR POLLUTION PREVENTION EQUIPMENT FOR MACHINERY SPACES OF SHIPS

TABLE OF CONTENTS

REVISED GUIDELINES AND SPECIFICATIONS FOR POLLUTION PREVENTION EQUIPMENT FOR MACHINERY SPACE BILGES OF SHIPS

1 INTRODUCTION

1.1 General

1.1.1 The specifications in respect of 15 ppm Bilge Separators are considered to be applicable for use in conjunction with oily bilge-water and ballast water from fuel oil tanks, as these are of a low or medium capacity, and are conditioned by the need to avoid discharging oil mixtures with an oil content more than 15 ppm of the mixture.

1.1.2 It is recognized that the development and testing of high capacity separating equipment designed for dealing with effluent from cargo tanks on tankers pose special problems and such equipment does not require to be tested under these specifications. Such development and tests should not be hindered and Administrations should be prepared to accept deviations from these specifications when they are considered necessary in this context.

1.1.3 It should be understood that a 15 ppm Bilge Separator must be capable of handling any oily mixtures from the machinery space bilges and be expected to be effective over the complete range of oils which might be carried on board ship**,** and deal satisfactorily with oil of very high relative density**,** or with a mixture presented to it as an emulsion. Cleansing agents, emulsifiers, solvents or surfactants used for cleaning purposes may cause the bilge water to emulsify. Proper measures should be taken to minimize the presence of these substances in the bilges of a ship. With the possibility of emulsified bilge water always present the 15 ppm Bilge Separator must be capable of separating the oil from the emulsion to produce an effluent with an oil content not exceeding 15 ppm.

1.1.4 Where a range of 15 ppm Bilge Separators of the same design, but of different capacities, requires certification in accordance with these specifications, the Administration may accept tests in two capacities within the range, in lieu of tests on every size, providing that the two tests actually performed are from the lowest quarter and highest quarter of the range.

Training

1.1.5 Ship staff training should include familiarization in the operation and maintenance of the equipment.

Maintenance

1.1.6 The routine maintenance of the 15 ppm Bilge Separator and the 15 ppm Bilge Alarm system should be clearly defined by the manufacturer in the associated Operating and Maintenance Manuals. All routine and repair maintenance to be recorded.

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

1.2 Purpose

1.2.1 These Guidelines and Specifications contain requirements regarding the design, installation, performance and testing of pollution prevention equipment required by regulation 16.

1.2.2 The purpose of these Guidelines and Specifications is:

.1 to provide a uniform interpretation of the requirements of regulation 16;

.2 to assist Administrations in determining appropriate design, construction and operational parameters for pollution prevention equipment when such equipment is fitted in ships flying the flag of their State;

.3 to define test and performance requirements for pollution prevention equipment; and

.4 to provide guidance for installation requirements.

1.3 Applicability

1.3.1 These Guidelines and Specifications apply:

.1 to installations fitted to ships, the keel of which are laid or which are at a similar stage of construction on or after 1 January 2005; and

.2 to new installations fitted on or after 1 January 2005 to ships, the keel of which were laid or which were at a similar stage construction before 1 January 2005 in so far as is reasonable and practicable.

1.3.2 The Guidelines and Specifications adopted under resolutions A.393(X) and MEPC.60(33) are not applicable to ships to which these new Guidelines and Specifications apply.

1.3.3 Installations fitted to ships the keel of which were laid or which were at a similar stage of construction before 1 January 2005 should comply either:

.1 with the Recommendation on International Performance and Test Specifications for Oily-Water Separating Equipment and Oil Content Meters adopted under resolution A.393(X), for equipment installed on board on or after 14 November 1978, as applicable; or

.2 with the Guidelines and Specifications adopted under resolution MEPC.60(33), for pollution prevention equipment installed on board on or after 30 April 1994, as applicable; or

with the requirements contained in these Guidelines and Specifications.

1.4 Summary of requirements

1.4.1 The approval requirements for pollution prevention equipment specified in these Guidelines and Specifications are summarized below:

.1 the 15 ppm Bilge Separator should be tested for type approval in accordance with the procedures described in part 1 of the annex, subject to environmental tests specified in part 3 of the annex; and

.2 the oil content meter for the 15 ppm Bilge Separator effluent discharge, hereinafter referred to as the 15 ppm Bilge Alarm should be tested for type approval in accordance with part 2 of the annex, subject to the environmental tests specified in part 3 of the annex.

2 BACKGROUND

2.1 The requirements of Annex I of MARPOL 73/78 relating to pollution prevention equipment for ships are set out in regulation 16, which stipulates that ships of 400 gross tonnage and above should be installed with approved equipment.

2.2 Regulation 16(5) stipulates that the oil content of the effluent from 15 ppm Bilge Separators should not exceed 15 ppm. The 15 ppm Bilge Alarm shall activate to indicate when this level cannot be maintained, and initiate automatic stop of overboard discharge of oily mixtures where applicable.

3 DEFINITIONS

3.1 Pollution prevention equipment

For the purpose of these Guidelines and Specifications pollution prevention equipment installed in a ship in compliance with regulation 16 comprises:

.1 15 ppm Bilge Separator;

.2 15 ppm Bilge Alarm; and

.3 automatic stopping device

3.2 15 ppm Bilge Separator

"15 ppm Bilge Separator" may include any combinations of a separator, filter, coalescer or other means, and also a single unit designed to produce an effluent with oil content not exceeding 15 ppm.

3.3 15 ppm Bilge Alarm

The alarm arrangements specified in regulation 16(5) are referred to in these Guidelines and Specifications as a "15 ppm Bilge Alarm".

3.4 ppm

"ppm" means parts of oil per million parts of water by volume.

3.5 ppm display

"ppm display" is a numerical scale display of the 15 ppm Bilge Alarm.

3.6 Automatic Stopping Device

The automatic stopping device is a device used, where applicable, to automatically stop any discharge overboard of oily mixture when the oil content of the effluent exceeds 15 ppm. The automatic stopping device should consist of a valve arrangement installed in the effluent outlet line of the 15 ppm Bilge Separator which automatically diverts the effluent mixture from being discharged overboard back to the ship's bilges or bilge tank when the oil content of the effluent exceeds 15 ppm.

4 TECHNICAL SPECIFICATIONS

4.1 15 ppm Bilge Separator

4.1.1 The 15 ppm Bilge Separator should be strongly constructed and suitable for shipboard use, bearing in mind its intended location on the ship.

4.1.2 It should, if intended to be fitted in locations where flammable atmospheres may be present, comply with the relevant safety regulations for such spaces. Any electrical equipment which is part of the 15 ppm Bilge Separator should be based in a non-hazardous area, or should be certified by the Administration as safe for use in a hazardous area. Any moving parts which are fitted in hazardous areas should be arranged so as to avoid the formation of static electricity.

4.1.3 The 15 ppm Bilge Separator should be so designed that it functions automatically. However, fail-safe arrangements to avoid any discharge in case of malfunction should be provided.

4.1.4 Changing the feed to the 15 ppm Bilge Separator from bilge water to oil, bilge water to emulsified bilge water, or from oil and/or water to air should not result in the discharge overboard of any mixture containing more than 15 ppm of oil.

4.1.5 The system should require the minimum of attention to bring it into operation. In the case of equipment used for engine room bilges, there should be no need for any adjustment to valves and other equipment to bring the system into operation. The equipment should be capable of operating for at least 24 hours of normal duty without attention.

4.1.6 All working parts of the 15 ppm Bilge Separator which are liable to wear or to damage should be easily accessible for maintenance.

4.2 15 ppm Bilge Alarm

4.2.1 These Specifications relate to 15 ppm Bilge Alarms.

4.2.2 The 15 ppm Bilge Alarm should resist corrosion in conditions of the marine environment.

4.2.3 The 15 ppm Bilge Alarm should, if intended to be fitted in locations where flammable atmosphere may be present, comply with the relevant safety regulations for such spaces. Any electrical equipment which is part of the 15 ppm Bilge Alarm should be placed in a

non-hazardous area, or should be certified by the Administration as safe for use in a hazardous atmosphere. Any moving parts which are fitted in hazardous areas should be arranged so as to avoid the formation of static electricity.

4.2.4 The 15 ppm Bilge Alarm should not contain or use any substance of a dangerous nature, unless adequate arrangements, acceptable to the Administration, are provided to eliminate any hazards introduced thereby.

4.2.5 A ppm display should be provided. The ppm display should not be affected by emulsions and/or the type of oil given that the test fluid detailed in paragraph 1.2.4 of part 1 of the annex is deemed to represent a mixture that may be expected in the machinery space bilges of a ship. It should not be necessary to calibrate the 15 ppm Bilge Alarm on board ship, but onboard testing according to the manufacturers instructions shall be permitted. The accuracy of the readings should at all times remain within the limit specified in paragraph 2.2.1 of part 2 of the annex.

4.2.6 The response time of the 15 ppm Bilge Alarm, that is, the time which elapses between an alteration in the sample being supplied to the 15 ppm Bilge Alarm and the ppm display showing the correct response, should not exceed 5 seconds.

4.2.7 The 15 ppm Bilge Alarm should be fitted with an electrical/electronic device which should be pre-set by the manufacturer to activate when the effluent exceeds 15 ppm. This should also operate automatically if at any time the 15 ppm Bilge Alarm should fail to function, require a warm-up period or otherwise be de-energized.

4.2.8 It is recommended that a simple means be provided aboard ship to check on instrument drift, repeatability of the instrument reading, and the ability to re-zero the instrument.

4.2.9 The 15 ppm Bilge Alarm should record date, time and alarm status, and operating status of the 15 ppm Bilge Separator. The recording device should also store data for at least eighteen months and should be able to display or print a protocol for official inspections as required. In the event the 15 ppm Bilge Alarm is replaced, means should be provided to ensure the data recorded remains available on board for 18 months.

4.2.10 To avoid wilful manipulation of 15 ppm Bilge Alarms, the following items should be included:

.1 every access of the 15 ppm Bilge Alarm beyond the essential requirements of paragraph 4.2.8 requires the breaking of a seal; and

.2 the 15 ppm Bilge Alarm should be so constructed that the alarm is always activated whenever clean water is used for cleaning or zeroing purposes.

4.2.11 The accuracy of the 15 ppm Bilge Alarms should be checked at IOPP Certificate renewal surveys according to the manufacturers instructions. Alternatively the unit may be replaced by a calibrated 15 ppm Bilge Alarm. The calibration certificate for the 15 ppm Bilge Alarm, certifying date of last calibration check, should be retained onboard for inspection purposes. The accuracy checks can only be done by the manufacturer or persons authorized by the manufacturer.

5 SPECIFICATION FOR TYPE APPROVAL TESTING OF POLLUTION PREVENTION EQUIPMENT

5.1 Testing requirements

The production model of pollution prevention equipment, for which the approval will apply, should be identical to the equipment, type-tested in accordance with the test and performance specifications contained in part 1 or 2 of the annex to these Guidelines and Specifications. The equipment should also be type-tested in accordance with the specifications for environmental testing contained in part 3 of the annex.

5.2 Approval and certification procedures

5.2.1 Pollution prevention equipment which in every respect fulfils the requirements of these Guidelines and Specifications may be approved by the Administration for fitting on board ships. The approval should take the form of a certificate of type approval specifying the main particulars of the apparatus and any limiting conditions on its usage necessary to ensure its proper performance. Such certificate should be issued in the format shown in part 5 of the annex. A copy of the certificate of type approval for pollution prevention should be carried on board ships fitted with such equipment at all times.

5.2.2 A certificate of type approval for a 15 ppm Bilge Alarm should be issued and retained on board.

5.2.3 Approved pollution prevention equipment may be accepted by other countries for use on their vessels on the basis of the first trials, or after new tests carried out under the supervision of their own representatives. Should equipment pass a test in one country but fail a test of a similar nature in another country, then the two countries concerned should consult one another with a view to reaching a mutually acceptable agreement.

6 INSTALLATION REQUIREMENTS

6.1 15 ppm Bilge Separator

6.1.1 For future inspection purposes on board ship, a sampling point should be provided in a vertical section of the water effluent piping as close as is practicable to the 15 ppm Bilge Separator outlet. Re-circulating facilities should be provided, after and adjacent to the overboard outlet of the stopping device to enable the 15 ppm Bilge Separator system, including the 15 ppm Bilge Alarm and the automatic stopping device, to be tested with the overboard discharge closed (see figure 1).

The re-circulating facility should be so configured as to prevent under all operating conditions any by-pass of the oily-water-separator.

6.1.2 The capacity of the supply pump should not exceed 110% of the rated capacity of the 15 ppm Bilge Separator with size of pump and motor to be stated on the Certificate of Type Approval.

6.1.3 The 15 ppm Bilge Separator should be fitted with a permanently attached plate giving any operational or installation limits considered necessary by the manufacturer or the Administration.

6.1.4 A vessel fitted with a 15 ppm Bilge Separator should, at all times, have on board a copy of the Operating and Maintenance manuals.

6.2 15 ppm Bilge Alarm

6.2.1 The layout of the installation should be arranged so that the overall response time (including the response time of the 15 ppm Bilge Alarm) between an effluent discharge from the 15 ppm Bilge Separator exceeding 15 ppm, and the operation of the Automatic Stopping Device preventing overboard discharge, should be as short as possible and in any case not more than 20 s.

6.2.2 The arrangement on board ship for the extraction of samples from the 15 ppm Bilge Separator discharge line to the 15 ppm Bilge Alarm should give a truly representative sample of the effluent with an adequate pressure and flow.

6.2.3 A vessel fitted with a 15 ppm Bilge Alarm should, at all times, have on board a copy of the Operating and Maintenance manuals.

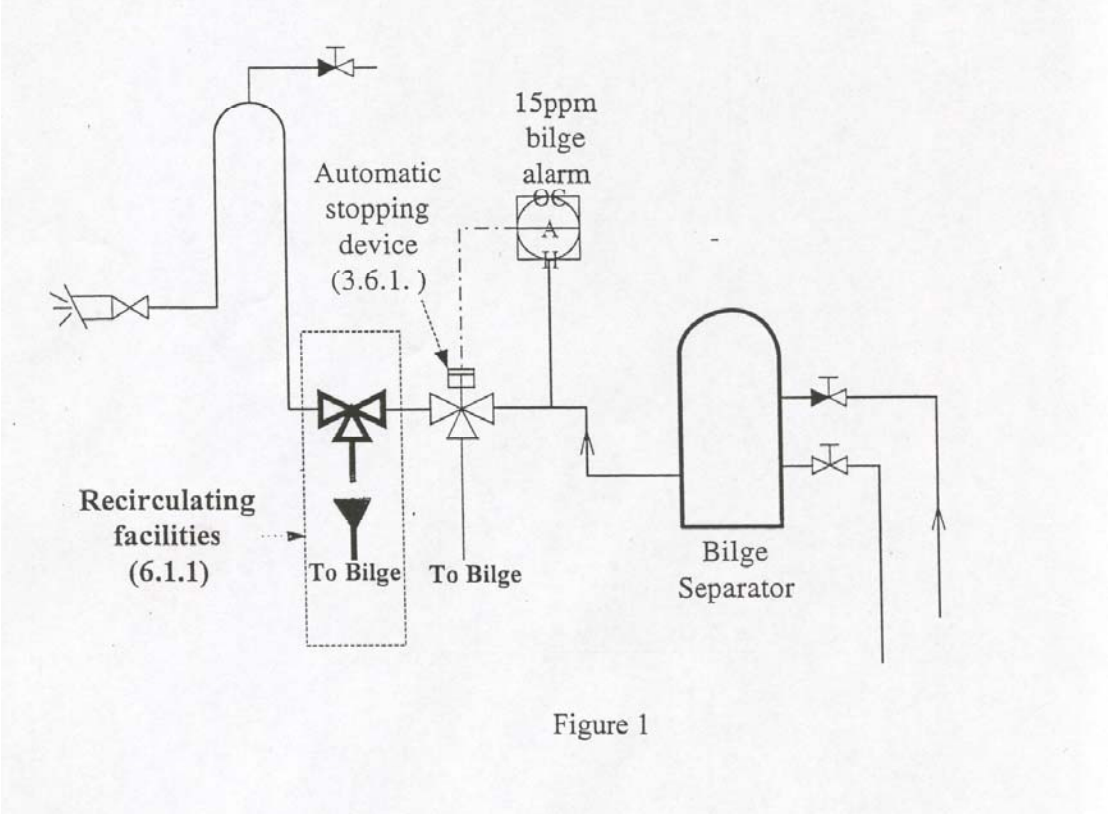


Figure 1

ANNEX

The annex provides detailed Test and Performance Specifications for pollution prevention equipment and contains:

Part 1 - Test and Performance Specifications for Type Approval of 15 ppm Bilge Separators;

Part 2 - Test and Performance Specifications for Type Approval of 15 ppm Bilge Alarms;

Part 3 - Specification for Environmental Testing for Type Approval of pollution prevention equipment;

Part 4 - Method for the Determination of Oil Content; and

Part 5 - Documentation of Approval.

PART 1 – TEST AND PERFORMANCE SPECIFICATIONS FOR TYPE APPROVAL OF 15 PPM BILGE SEPARATORS

1.1 General

1.1.1 These Test and Performance Specifications for Type Approval relate to 15 ppm Bilge Separators. In addition, the electrical and electronic systems of the 15 ppm Bilge Separator should be tested in accordance with the Specifications for Environmental Testing contained in part 3 of this annex.

1.1.2 The 15 ppm Bilge Separator being tested should comply with the relevant requirements of the technical specifications contained in section 4.1 of these Guidelines and Specifications.

1.2 Test Specifications

1.2.1 These Specifications relate to 15 ppm Bilge Separators. 15 ppm Bilge Separators should be capable of producing an effluent for discharge to the sea containing not more than 15 ppm of oil irrespective of the oil content of the feed supplied to it.

1.2.2 The influent, whether emulsified or non-emulsified, which the system has in practice to deal with, depends on:

.1 the position of the oil/water interface, with respect to the suction point, in the space being pumped;

.2 the type of pump used;

.3 the type and degree of closure of any control valve in the circuit; and

.4 the general size and configuration of the system.

Therefore the test rig must be so constructed as to include not only the 15 ppm Bilge Separator, but also the pumps, valves, pipes and fittings as shown in figure 2. It is to be so designed for testing 15 ppm Bilge Separators with and without an integral supply pump.

- For the testing of 15 ppm Bilge Separators having no integral pump, the centrifugal pump "A" (figure 2) is used to feed the 15 ppm Bilge Separator with valves 4 and 6 open, and valve 5 closed. The rate of flow from the centrifugal pump "A" is matched to the design throughput of the 15 ppm Bilge Separator by the adjustment of the centrifugal pump's discharge valve.

- Where the 15 ppm Bilge Separator is fitted with an integral pump, the centrifugal pump "A" is not required.

- A centrifugal pump "B" should be fitted to re-circulate the Test Fluid C in the tank to ensure that the Test Fluid C is maintained in a stable condition throughout the testing. Re-circulation is not required for Test Fluids A and B.

- To ensure a good mix of the Test Fluid and the water, a conditioning pipe as specified in paragraph 1.2.5 of part 1 of this annex shall be fitted immediately before the 15 ppm Bilge Separator.

- Other valves, flow meters and sample points should be fitted to the test rig as shown in figure 2.

- The pipe work should be designed for a maximum liquid velocity of 3 metres/second.

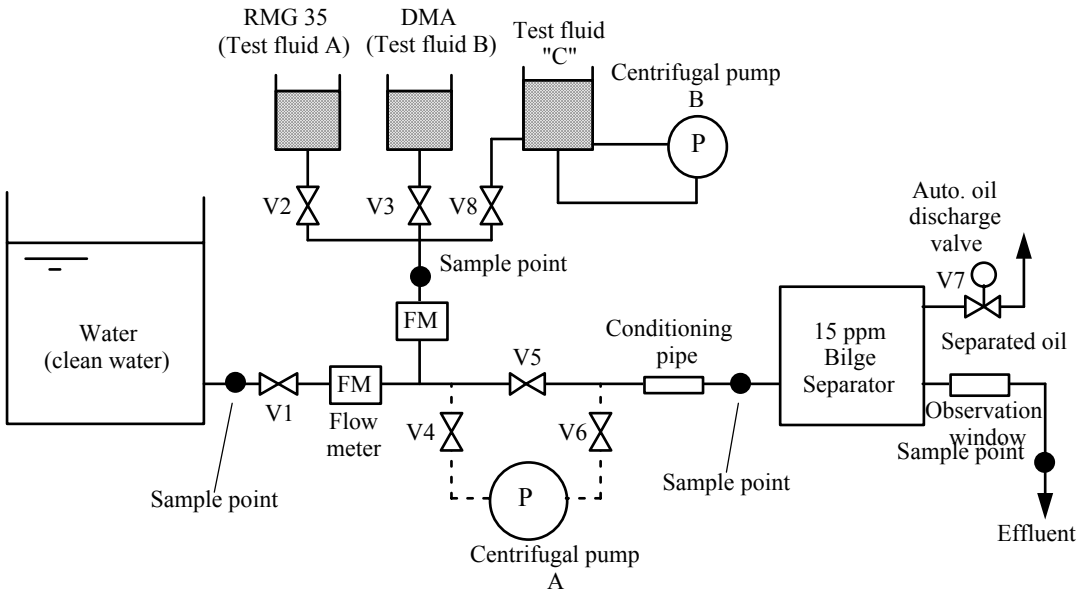


Figure 2 - Test rig

1.2.3 The tests should be carried out with a supply rate equal to the full throughput for which the 15 ppm Bilge Separator is designed.

1.2.4 Tests should be performed using three grades of test fluids

.1 **Test Fluid "A"** which is a marine residual fuel oil in accordance with ISO 8217, type RMG 35 (density at 15°C not less than 980 kg/m^3)

.2 **Test Fluid "B"** which is a marine distillate fuel oil in accordance with ISO 8217, type DMA (density at 15°C not less than 830 kg/m^3).

.3 **Test Fluid "C"** which is a mixture of an oil-in-fresh water emulsion, in the ratio whereby 1 kg of the mixture consists of

- 947.8 g of fresh water;
- 25.0 g of Test Fluid "A"
- 25.0 g of Test Fluid "B";
- 0.5 g surfactant (sodium salt of dodecylbenzene sulfonic acid) in the dry form;
- 1.7 g "iron oxides" (The term "iron oxide" is used to describe black ferrosoferric oxide ($Fe_3 O_4$) with a particle size distribution of which 90% is less than 10 microns, the remainder having a maximum particle size of 100 microns);

Note: Procedure for preparing Test Fluid C: (see example calculation)[1]

- Preparation

(1) measure out 1.2 times the quantity of surfactant required for the "Test with Test Fluid C" as described in 1.2.11; and

(2) mix it with fresh water and stir well in a small container (e.g., a beaker or bucket) to make a mixture ("Mixture D") until the surfactant has been thoroughly dissolved.

- To make Test Fluid C in the test fluid tank (figure 3),

(3) Fill test fluid tank with fresh water with a quantity 1.2 times the volume of the total quantity of water in the test fluid "C" needed for the test described in 1.2.11.

[1] Calculation of ingredients of Test Fluid" C" (Example: 2m^3/h Bilge Separator).
Operating period for the Test with Test Fluid "C" as per 1.2.11: 2.5 hours plus conditioning time (say 0.5hour) = 3 hours
Net volume needed for the Test: Volume of test water: 2m^3x 3 hours = 6m^3
Volume Test Fluid "C": 6% of test water = 0.06 x 6m^3 = 0.36m^3
Actual Volume to be prepared:
Volume of Test Fluid "C" to be prepared: 1.2 times of the net volume of Test Fluid "C" = 1.2 x 0.36 = 0.432m^3
Volume of fresh water in Test Fluid "C": (947.8g/1000g) of Test Fluid "C" =0.9478 x 0.432 = 0.4094m^3
Weight of Test Fluid "A": (25g/1000g) of Test Fluid "C" =25/1000 x 0.432 x 1000 = 10.8kg
Weight of Test Fluid "B": (25g/1000g) of Test Fluid "C" = 25/1000 x 0.432 x 1000 = 10.8kg
Weight of surfactant: (0.5g/1000g) of Test Fluid "C" = 0.5/1000 x 0.432 x 1000 = 0.216kg
Weight of iron oxide: (1.7g/1000g) of Test Fluid "C")=1.7/1000 x 0.432 x 1000 x 0.734kg

(4) Operate centrifugal pump B running at a speed of not less than 3,000 rpm (nominal) with a flow rate at which the volume of the test fluid has been changed out at least once per minute.

(5) Add "Mixture D" first, followed by oil and suspended solids (iron oxides) respectively, both 1.2 times of the required amounts, to the fresh water in the tank,

(6) To establish a stable emulsion keep running the centrifugal pump B for one hour and confirm no oil floats on the surface of the test fluid.

(7) After the one hour stated in paragraph (6) above keep running the centrifugal pump B at reduced speed to approximately 10% of original flow rate, until the end of the test.

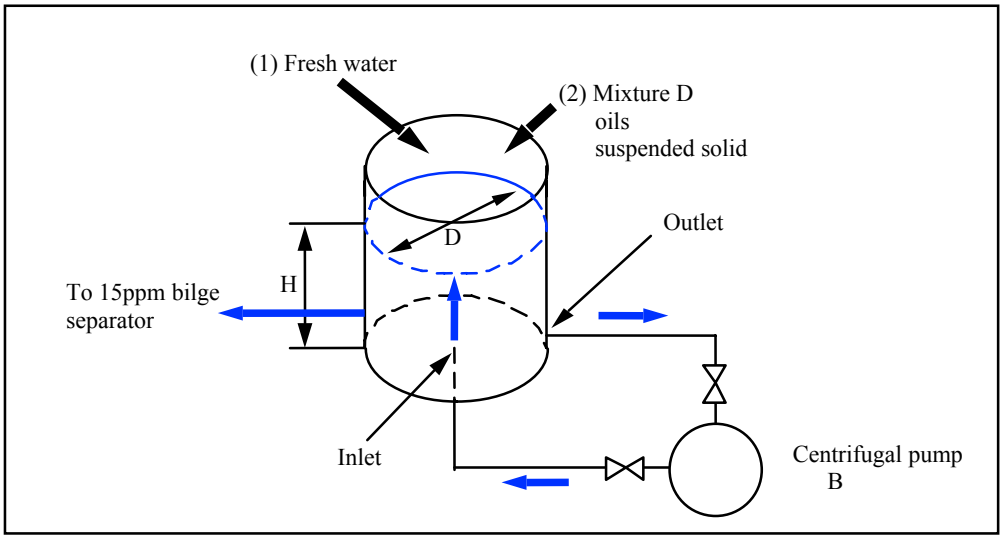


Figure 3 - Tank of Test Fluid "C"

Note:

(1) The tank should be of a cylindrical shape. The level of the water should be:

$$2D \geqq H \geqq 0.5D, \text{ when preparing Test Fluid "C".}$$

(2) Outlet going to centrifugal pump B should be placed at as low a position to the tank as possible.

(3) Inlet to the tank should be fitted at the center of tank bottom so that the mixture flows upward to obtain uniform and stable emulsion.

If the 15 ppm Bilge Separator is fitted with heating facilities to allow the separated oil retained in it to be discharged when the automatic discharge valve is activated, the Certificate of Type Approval should be endorsed under the heading "Limiting Conditions Imposed" with the following statement:

"The 15 ppm separator is fitted with heating facility."

1.2.5 If the 15 ppm Bilge Separator includes an integrated feed pump, this 15 ppm Bilge Separator should be tested with that pump supplying the required quantity of Test Fluid and water to the 15 ppm Bilge Separator at its rated capacity.

If the 15 ppm Bilge Separator is to be fed by the ship's bilge pumps, then the unit will be tested by supplying the required quantity of Test Fluid and water mixture to the inlet of a centrifugal pump operating at not less that 1,000 rpm (see dotted line in figure 2). This pump should have a delivery capacity of not less than 1.1 times the rated capacity of the 15 ppm Bilge Separator at the delivery pressure required for the test. The variation in Test Fluid/water ratio will be obtained by adjusting valves on the Test Fluid and water suction pipes adjacent to the pump suction, and the flow rate of Test Fluid and water or the Test Fluid content of the supply to the 15 ppm Bilge Separator should be monitored. If a centrifugal pump is used, the excess pump capacity should be controlled by a throttle valve on the discharge side of the pump.

In all cases, to ensure uniform conditions, the piping arrangements immediately prior to the 15 ppm Bilge Separator should be such that the influent to the 15 ppm Bilge Separator should have a Reynolds Number of not less than 10,000 as calculated in fresh water, a liquid velocity of not less than 1 metre per second and the length of the supply pipe from the point of Test Fluid injection to the 15 ppm Bilge Separator should have a length not less than 20 times its diameter. A mixture inlet sampling point and a thermometer pocket should be provided near the 15 ppm Bilge Separator inlet and an outlet sampling point and observation window should be provided on the discharge pipe.

1.2.6 In order to approach isokinetic sampling – i.e. the sample enters the sampling pipe at stream velocity – the sampling arrangement should be as shown in figure 4 and, if a cock is fitted, free flow should be effected for at least one minute before any sample is taken. The sampling points should be in pipes running vertically.

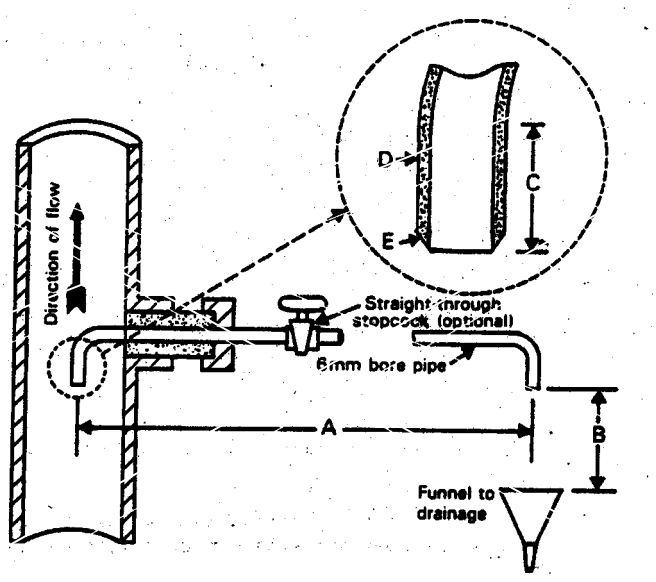


Figure 4 – Diagram of sampling arrangements

A Distance A, not greater than 400 mm
B Distance B, sufficient to insert sampling bottle
C Dimension C, straight length should not be less than 60 mm
D Dimension D, pipe thickness should not be greater than 2mm
E Detail E, chisel-edged chamfer (30^{o})

1.2.7 In the case of the 15 ppm Bilge Separator depending essentially on gravity, the feed to the system of the test water and Test Fluid mixture should be maintained at a temperature not greater than 40°C, and heating and cooling coils should be provided where necessary. The water shall have a density of not more than 1,015 at 20°C. In other forms of separation where the dependence of separation efficiency on temperature is not established, tests should be carried out over a range of influent temperatures representing the normal shipboard operating range of 10°C to 40°C or should be taken at a temperature in this range where the separation efficiency is known to be worst.

1.2.8 In those cases where, for the 15 ppm Bilge Separator, it is necessary to heat water up to a given temperature and to supply heat to maintain that temperature, the tests should be carried out at the given temperature.

1.2.9 The tests with Test Fluid "A" should be carried out as follows:

.1 To ensure that the 15 ppm Bilge Separator commences the test with the oil section full of Test Fluid and with the supply line impregnated with Test Fluid, the 15 ppm Bilge Separator should, after filling with water (density at 20°C not more than 1,015) and while in the operating condition, be fed with pure Test Fluid for not less than 5 min.

.2 The 15 ppm Bilge Separator should be fed with a mixture composed of between 5,000 and 10,000ppm of Test Fluid in water until steady conditions have been established. Steady conditions are assumed to be the conditions established after pumping through the 15 ppm Bilge Separator a quantity of Test Fluid/water mixture not less than twice the volume of the 15 ppm Bilge Separator. The test should then proceed for 30 min. Samples should be taken at the effluent outlet at 10 min and 20 min from the start of this period. At the end of this test, an air cock should be opened on the suction side of the pump and, if necessary, the oil and water valves should be slowly closed together, and a sample taken at the effluent discharge as the flow ceases (this point can be checked from the observation window).

.3 A test identical to that described in 1.2.9.2, including the opening of the air cock, should be carried out with a mixture composed of approximately 25%* Test Fluid and 75%* water.

.4 The 15 ppm Bilge Separator should be fed with 100%* of Test Fluid for at least 5 min during which time the observation window should be checked for any oil discharge. Sufficient Test Fluid should be fed into the 15 ppm Bilge Separator to operate the automatic oil discharge valve. After the operation of the oil discharge valve, the test should be continued for 5 min using a 100%* Test Fluid supply in order to check the sufficiency of the oil discharge system.

.5 The 15 ppm Bilge Separator should be fed with water (density at 20°C not more than 1,015) for 15 min. Samples of the separated water effluent are taken at the beginning of the test and after the first 10 min.

.6 A test lasting a minimum of 2 h should be carried out to check that the 15 ppm Bilge Separator will operate continuously and automatically. This trial should use a cycle varying progressively from water to oily mixture with approximately 25%*

* Percentage of volume.

Test Fluid content and back to water every 15 minutes, and should test adequately any automatic device which is fitted. The whole test sequence should be performed as a continuous programme. At the end of the test, while the 15 ppm Bilge Separator is being fed with 25%* Test Fluid, a water effluent sample should be taken for analysis.

1.2.10 The tests with Test Fluid "B" should be carried out as follows:

.1 The 15 ppm Bilge Separator should be fed with a mixture composed of between 5,000 and 10,000ppm of Test Fluid in water until steady conditions have been established. Steady conditions are assumed to be the conditions established after pumping through the 15 ppm Bilge Separator a quantity of Test Fluid/water mixture not less than twice the volume of the 15 ppm Bilge Separator. The test should then proceed for 30 min. Samples should be taken at the effluent outlet at 10 min and 20 min from the start of this period. At the end of this test, an air cock should be opened on the suction side of the pump and, if necessary, the oil and water valves should be slowly closed together, and a sample taken at the effluent discharge as the flow ceases (this point can be checked from the observation window).

.2 A test identical to that described in 1.2.10.1, including the opening of the air cock, should be carried out with a mixture composed of approximately 25%* Test Fluid and 75%* water.

1.2.11 The tests with Test Fluid "C" should be carried out as follows:

.1 The 15 ppm Bilge Separator should be fed with a mixture composed of 6% Test Fluid "C" and 94% water to have emulsified oil content of 3,000 ppm in the test water until steady conditions have been established. Steady conditions are assumed to be the conditions established after pumping through the 15 ppm Bilge Separator a quantity of Test Fluid "C"/water mixture not less than twice the volume of the 15 ppm Bilge Separator.

.2 The test should then proceed for 2.5 h. Samples should be taken at the effluent outlet at 50 minutes and 100 minutes after conditioning. At the end of this test, an air cock should be opened on the suction side of the pump and, if necessary, the Test Fluid "C" and water valves should be slowly closed together, and a sample taken at the effluent discharge as the flow ceases (this point can be checked from the observation window).

1.2.12 Sampling should be carried out as shown in figure 4 so that the sample taken will suitably represent the fluid issuing from the effluent outlet of the 15 ppm Bilge Separator.

1.2.13 Samples should be taken in accordance with ISO 9377-2:2000. The sample is to be extracted on the same day of collection, and be sealed and labelled in the presence of a representative of the national authority and arrangements should be made for analysis as soon as possible and in any case within seven days provided the samples are being kept between 2ºC and 6ºC at laboratories approved by the Administration.

1.2.14 The oil content of the samples should be determined in accordance with part 4 of the annex.

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* Percentage of volume.

1.2.15 When accurate and reliable oil content meters are fitted at inlet and outlet of the 15 ppm Bilge Separator, one sample at inlet and outlet taken during each test will be considered sufficient if they verify, to within ± 10%, the meter readings noted at the same instant.

1.2.16 In the presentation of the results, the following data testing methods and readings should be reported:

.1 Properties of test fluids A and B:

- density at 15°C;
- kinematic viscosity (centistokes @ 100°C /40°C);
- flashpoint;
- ash; and
- water content;

.2 Properties of test fluid C:

- type of surfactant;
- particle size percentage of the non soluble suspended solids; and
- surfactant and iron oxide quality verification;

.3 Properties of the water in the water tank:

- density of water at 20ºC; and
- details of any solid matter present;

.4 Temperature at the inlet to the 15 ppm Bilge Separator;

.5 A diagram of the test rig;

.6 A diagram of the sampling arrangement; and

.7 The method used in analysis of all samples taken and the results thereof, together with oil content meter readings, where appropriate.

PART 2 - TEST AND PERFORMANCE SPECIFICATIONS FOR TYPE APPROVAL OF 15 PPM BILGE ALARMS

2.1 General

2.1.1 These Test and Performance Specifications relate to 15 ppm Bilge Alarms. In addition, the electrical and electronic section of these systems should be in accordance with the Specifications for Environmental Testing contained in part 3 of this annex.

2.1.2 The 15 ppm Bilge Alarm being tested should comply with all the relevant requirements of the technical specifications contained in section 4.2 of these Guidelines and Specifications.

2.2 Test specifications

2.2.1 For a 15 ppm Bilge Alarm, the accuracy should be within $\pm$ 5 ppm. The accuracy of a 15 ppm Bilge Alarm should remain within the above limits despite the presence of contaminants other than oil, and the power supply varying by 10% from the design value – i.e. in respect of electricity, compressed air, etc.

2.2.2 The sampling arrangement for the test rig should be such that a representative homogeneous sample is obtained under all conditions of operation and under all operational proportions of oil content. The sample should be obtained from the full flow through the 15 ppm Bilge Alarm, but when this is impracticable the sampling arrangements shown in figure 4 in part 1 should be used. Special care should be given to this stage of the process and the validity of the resultant findings.

2.2.3 During the various tests, the response time of the 15 ppm Bilge Alarm should be checked and it should be noted whether alarms operate adequately when a pre-stated threshold is exceeded.

2.2.4 A diagrammatic arrangement of a test facility for evaluating the performance of the 15 ppm Bilge Alarm is given in figure 5. The accuracy of the 15 ppm Bilge Alarm will be determined by comparing its readings against a known flow of Test Fluid injected into a known flow of water. The grab samples taken will be analysed in a laboratory by the methods specified in part 4 of this annex. The results of the laboratory analysis will be used for correction and to indicate sampling and test equipment variability. The water flow rate will be adjusted so that the entire Test Fluid-water flow passes through the 15 ppm Bilge Alarm, except the intermittent grab sample stream. Special care should be given to keep, continuously, a constant Test Fluid content in the water that flows into the 15 ppm Bilge Alarm. The metering pumps should be adjusted to deliver a nearly continuous quantity of Test Fluid. If Test Fluid injection becomes intermittent at low concentrations, the Test Fluid may be pre-mixed with water to provide continuous flow. The Test Fluid injection point should be immediately up-stream of the 15 ppm Bilge Alarm inlet to minimize time lags.

Calibration test

2.2.5 The 15 ppm Bilge Alarm will be calibrated and zeroed as per the manufacturer's instructions. It will then be tested with the three test fluids "A", "B" and "C", as specified in paragraph 1.2.4 of part 1 of the annex, at the following oil concentrations in parts per million: 0, 15, and at the full scale of the meter. Each concentration test will last for 15 min. Following each concentration test, the 15 ppm Alarm will be run on oil-free water for 15 min and the reading noted. If it proves necessary to re-zero or re-calibrate the 15 ppm Bilge Alarm during this test, this fact will be noted.

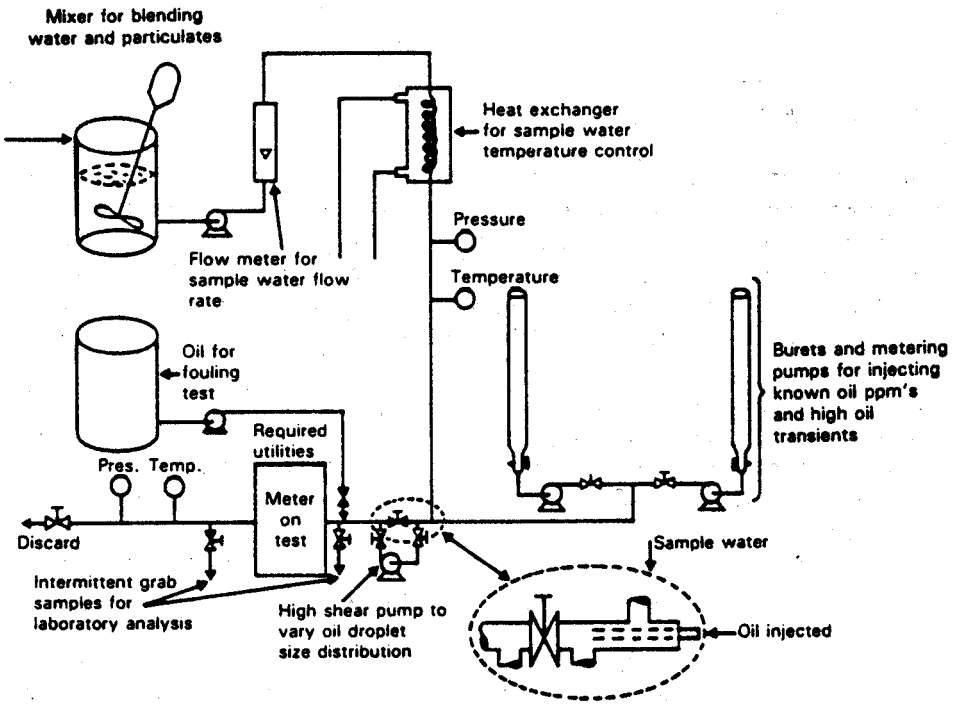


Figure 5 - Diagrammatic arrangements of test facilities

Contaminant and colour test

2.2.6 The 15 ppm Bilge Alarm should undergo contaminant and colour tests as follows:

.1 the 15 ppm Bilge Alarm should be run on a mixture of clean water and 10 ppm Test Fluid "B" and reading noted;

.2 the water supply should be changed from 10 ppm Test Fluid "B" and clean water to 10 ppm Test Fluid "B" and water contaminated with iron oxide in a concentration of 10 ppm;

.3 any shift in the 15 ppm Bilge Alarm reading should be noted. The reading should be within the accuracy limits specified in paragraph 2.2.1;

.4 the procedure specified in .2 and .3 above should be repeated with iron oxide concentrations of 50 ppm and 100 ppm respectively;

.5 the 15 ppm Bilge Alarm should be run on a mixture of clean water and 10 ppm Test Fluid "B" and its reading noted;

.6 the water supply should be changed from clean water to very salt water (a solution of 6% common salt with clean water);

.7 any shift in the 15 ppm Bilge Alarm reading should be noted. The reading should be within the accuracy limits specified in paragraph 2.2.1; and

.8 sufficient water should be available in the mixing tank to ensure an effective test of not less than 15 min.

Sample pressure or flow test

2.2.7 The 15 ppm Bilge Alarm should be run on a 15 ppm Test Fluid "B" sample. The water pressure or flow rate of the mixture should be adjusted from one half normal, normal and twice normal. Any effect of these changes on the 15 ppm Bilge Alarm ppm display reading should be noted and recorded on the Certificate. This test may require modification for 15 ppm Bilge Alarms with flow or pressure regulators or 15 ppm Bilge Alarms designed to discharge into an ambient pressure sump.

Shut off tests

2.2.8 The 15 ppm Bilge Alarm should be run on a 15 ppm Test Fluid "B" sample. The water and Test Fluid injection pumps should be shut off. The 15 ppm Bilge Alarm will be left turned on with no other changes made. After 8 hours, the water and Test Fluid injection pump should be turned on and set to provide the mixture of 15 ppm. The 15 ppm Bilge Alarm ppm display readings before and after each test and any damage to the 15 ppm Alarm should be noted and recorded on the Certificate.

Utilities supply variation test

2.2.9 If the 15 ppm Bilge Alarm requires any utilities besides electricity, it should be tested with these utilities at 110% and 90% of the design figures.

Calibration and zero drift test

2.2.10 The 15 ppm Bilge Alarm should be calibrated and zeroed. A 15 ppm Test Fluid "B" sample will run through the 15 ppm Bilge Alarm for eight hours and any calibration drift noted. Following this, the 15 ppm Bilge Alarm should run on oil-free water and any zero drift noted and recorded on the Certificate. During this test grab samples should be taken 0, 2, 4, 6, and 8 hours into the test schedule to verify any calibration drift.

Response time test

2.2.11 The response time is to be taken for the 15 ppm Bilge Alarm to give an alarm at 15 ppm oil concentration after the supply to the 15 ppm Bilge Alarm is changed from clean water to oily water having a concentration of more than 15 ppm oil.

2.2.12 A specification of the instrument concerned and a diagrammatic presentation of the test arrangements should be provided and the following data should be reported.

.1 types and properties of Test Fluids used in the tests (refer to part 1, paragraphs 1.2.4 and 1.2.16 of this annex);

.2 details of contaminants used, in the form, for example, of a supplier's certificate or laboratory test protocol; and

.3 results of tests and analysis of grab samples.

PART 3 - SPECIFICATIONS FOR ENVIRONMENTAL TESTING FOR TYPE APPROVAL OF POLLUTION PREVENTION EQUIPMENT

3.1 General

The specifications for environmental testing for type approval relate to the electrical and electronic sections of:

.1 15 ppm Bilge Separator; and

.2 15 ppm Bilge Alarm.

The above-mentioned items, hereafter referred to as "equipment", when tested should comply with all the relevant requirements contained in section 5 of these Guidelines and Specifications.

3.2 Test specifications

3.2.1 *Testing requirements*

The electrical and electronic sections of the equipment in the standard production configuration should be subjected to the programme of environmental tests set out in this Specification at a laboratory approved for the purpose by the Administration or by the competent authority of the manufacturer's home country. A copy of the environmental test document, in a format similar to that specified in section 2 of part 5 of this annex, should be submitted to the Administration by the manufacturer, together with the application for type approval.

3.2.2 *Test specification details*

Equipment should operate satisfactorily on completion of each of the following environmental tests:

.1 Vibration tests:

.1.1 a search should be made for resonance over the following range of frequency and amplitude of acceleration:

.1.1.1 2 to 13.2 Hz with an amplitude of $\pm$ 1mm; and

.1.1.2 13.2 to 80 Hz with an acceleration of $\pm$ 0.7 g.

This search should be made in each of the three planes at a rate sufficiently low to permit detection of resonance;

.1.2 the equipment should be vibrated in the planes at each major resonant frequency for a period of 2 hours;

.1.3 if there is no resonant frequency, the equipment should be vibrated in each of the planes at 30 Hz with an acceleration of $\pm$ 0.7 g for a period of 2 hours;

.1.4 after completion of the tests specified in .1.2 or .1.3 of this paragraph a search should again be made for resonance and there should be no significant change in the vibration pattern.

.2 Temperature tests:

.2.1 equipment that may be installed in an enclosed space that is environmentally controlled, including an engine-room, should be subjected, for a period of not less than 2 h, to:

.2.1.1 a low temperature test at 0°C; and

.2.1.2 a high temperature test at 55°C.

At the end of each of the tests referred to, the equipment should be switched on and it should function normally under the test conditions.

.3 Humidity tests:

Equipment should be left switched off for a period of 2 h at a temperature of 55ºC in an atmosphere with a relative humidity of 90%. At the end of this period the equipment should be switched on and should operate satisfactorily for 1 hour;

.4 Inclination test:

Equipment should operate satisfactorily at angles of inclination up to 22.5º in any plane from the normal operating position;

.5 Reliability of electrical and electronic equipment:

The electrical and electronic components of the equipment should be of a quality guaranteed by the manufacturer and suitable for their intended purpose.

PART 4 – METHOD FOR DETERMINATION OF OIL CONTENT

Scope and application

The International Standard ISO 9377-2:2000 "Water quality - Determination of hydrocarbon oil index – Part 2: Method using solvent extraction and gas chromatography" specifies a method for the sampling and subsequent determination of the hydrocarbon oil index in water using solvent extraction and gas chromatography. This method should be used for the determination of oil content requirements outlined in these Guidelines and Specification

PART 5 – DOCUMENTATION OF APPROVAL

5.1 Certificate of Type Approval for pollution prevention equipment.

5.1.1 Satisfactory compliance with all the test requirements enumerated in parts 1 and 2 of this annex should be shown in the Certificate of Type Approval issued by the Administration in the format specified in paragraph 5.1.2 below. An Administration may issue a Certificate of Type Approval based on separate testing or on testing already carried out under supervision by another Administration.

5.1.2 A Certificate of Type Approval should be in the format shown in appendix 1 or 2 to this annex. The Certificate should identify the type and model of the pollution prevention equipment to which it applies and identify equipment assembly drawings, duly dated. Each drawing should bear the model specification numbers or equivalent identification details. The Certificate should include the full performance test protocol on which it is based. If a Certificate of Type Approval is issued by an Administration based on a Certificate previously issued by another Administration, the Certificate should identify the Administration which conducted the tests on the pollution prevention equipment and a copy of the original test results should be attached to it.

5.2 Format of environmental test protocol

5.2.1 Satisfactory compliance with the environmental tests laid down in these Guidelines and Specifications, where applicable, should be shown on the environmental test protocol issued by the testing laboratory. The protocol should include at least the following details.

.1 identification of the equipment by type and drawing number, duly dated; and

.2 a statement of the tests conducted on the equipment, including the results thereof.

5.2.2 The environmental test protocol should be endorsed by either the Administration or a competent authority of the manufacturer's home country to confirm that the laboratory is approved to conduct such tests. The protocol should also be signed and dated by the person in charge of the laboratory.

Badge or Cipher

APPENDIX 1

NAME OF ADMINISTRATION

CERTIFICATE OF TYPE APPROVAL FOR 15PPM BILGE SEPARATOR

This is to certify that the 15 ppm Bilge Separator listed below has been examined and tested in accordance with the requirements of the specifications contained in part 1 of the annex to the guidelines and specifications contained in IMO resolution MEPC.107(49). This certificate is valid only for 15 ppm Bilge Separator referred to below.

15 ppm Bilge Separator supplied by
……..……..…

Under type and model designation ……..……...…….
and incorporating:

*15 ppm Bilge Separator manufactured by
to specification/assembly drawing No …….. date

*Coalescer manufactured by
to specification/assembly drawing No ……

*Filters manufactured by other means…….
to specification/assembly drawing No

*Other means ……
to specification/assembly drawing No……..

Control equipment manufactured by
to specification/assembly drawing No ……

Supply pump capacity…….m^3/h……..…Motor kW rating……kW……..…

Maximum throughput of system ……. m^3/h ..……

If integral feed pump is not fitted state method proposed for ensuring maximum throughput of system is not exceeded…….

A copy of this Certificate should be carried aboard a vessel fitted with this Separator at all times.

Limiting conditions imposed……..…….

Test date and results attached in the appendix.

Official stamp

Signed…….……..……
Administration of …..……..
Date this …… day of ……20..

* Delete as appropriate.

APPENDIX

TEST DATA AND RESULTS OF TESTS CONDUCTED ON A 15 PPM BILGE SEPARATOR IN ACCORDANCE WITH PART 1 OF THE ANNEX TO THE GUIDELINES AND SPECIFICATIONS CONTAINED IN IMO RESOLUTION MEPC.107(49)

15 ppm Bilge Separator submitted by
……

Test location ……..

Method of sample analysis ...…
.....…
……...…
……

Samples analysed by ….……

Environmental testing of the electrical and electronic sections of the 15 ppm Bilge Separator has been carried out in accordance with part 3 of the annex to the guidelines and specifications contained in IMO resolution MEPC.107(49). The equipment functioned satisfactorily on completion of each test specified on the environmental test protocol.

……
……
……
……

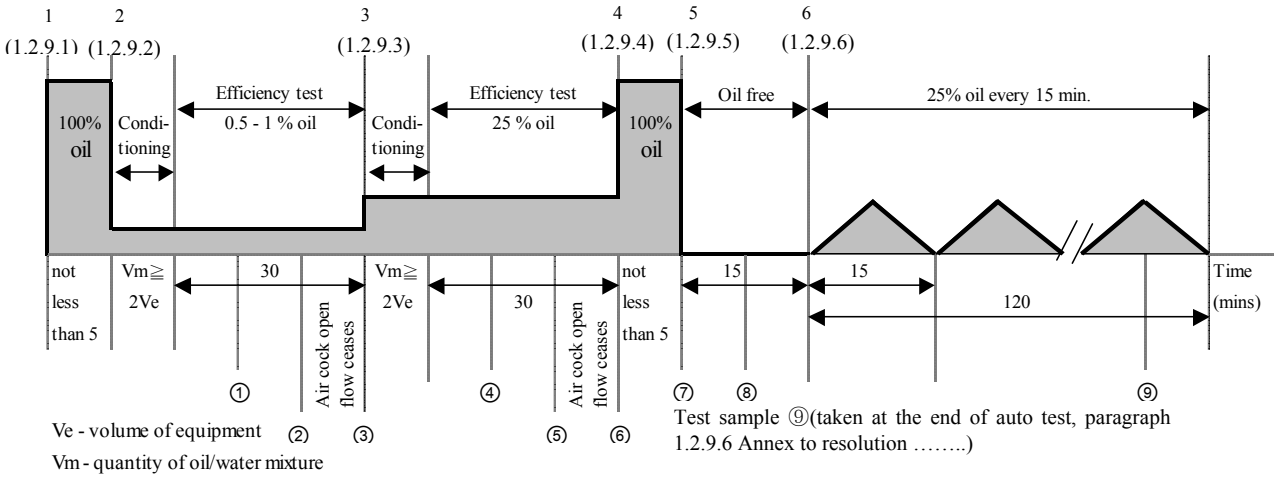
Test fluid "A"		
	Density	at 15ºC
	Viscosity	Centistokes at 100ºC
	Flashpoint	ºC
	Ash content	%
	Water content at start of test	%
Test fluid "B"		
	Density	at 15ºC
	Viscosity	Centistokes at 40ºC
	Flashpoint	ºC
	Ash content	%
	Water content at start of test	%
Test fluid "C"		
	Surfactant - documentary evidence*	
	Iron oxides - documentary evidence*	
Test water		
	Density	at 20ºC
	Solid matter present	
Test temperatures		
	Ambient	ºC
	Test fluid "A"	ºC
	Test fluid "B"	ºC
	Test fluid "C"	ºC
	Test water	ºC

Diagram of test rig attached
Diagram of sampling arrangement attached

* Certificate or laboratory analysis.

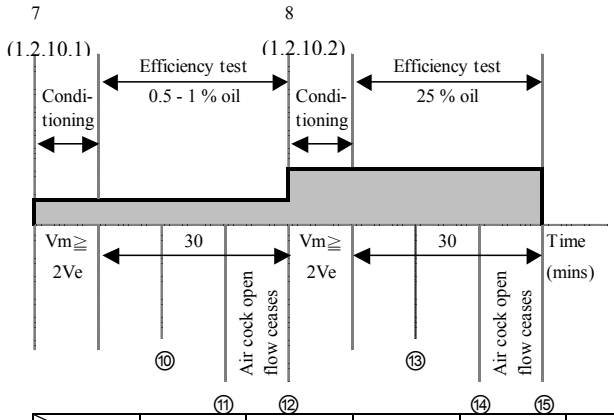
TEST RESULTS (IN PPM) AND TEST PROCEDURES

Test Fluid A

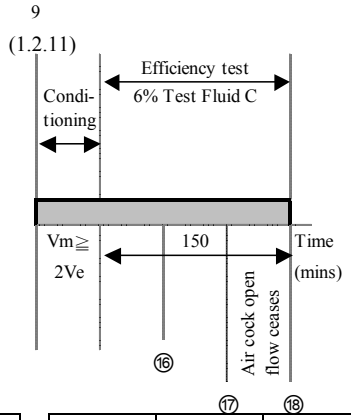


	1	2	3	4	5	6	7	8	9
Influent									
Effluent									

Test Fluid B



Test fluid C



	10	11	12	13	14	15
Influent						
Effluent						

16	17	18

1 – 9 steps refer to paragraph ① - ⑱ points where samples to be taken

Signed …….. Date …… Official stamp

(Official stamp or equivalent identification and the date of approval to be placed on all pages of the test protocol.)

APPENDIX 2

Badge or Cipher

NAME OF ADMINISTRATION

CERTIFICATE OF TYPE APPROVAL FOR 15 PPM BILGE ALARM

This is to certify that the 15 ppm Bilge Alarm, comprising the equipment listed below, has been examined and tested in accordance with the requirements of the specifications contained in part 2 of the annex to the Guidelines and Specifications contained in IMO resolution MEPC.107(49). This Certificate is valid only for the 15 ppm Bilge Alarm referred to below.

15 ppm Bilge Alarm supplied by ……..

under type and model designation …….
and incorporating:

15 ppm Bilge Alarm analysing unit manufactured by ……..……

to specification/assembly drawing No. …… date ..……..……

Electronic section of 15 ppm Bilge Alarm manufactured by ……..…….....

to specification/assembly drawing No. …… date……..

*Sample feed pump manufactured by ...……

to specification/assembly drawing No. …… date…..……

*Sample conditioning unit manufactured by ……

to specification/assembly drawing No. …… date……..

The 15 ppm Bilge Alarm is acceptable for use in accordance with regulation 16(5).

A copy of this Certificate should be carried aboard a vessel fitted with this 15 ppm Bilge Alarm at all times.

Test data and results attached as appendix.

Official stamp

Signed:……..

Administration of …….

Dated this …….. day of …….. 20.…

* Delete as appropriate.

APPENDIX

TEST DATA AND RESULTS OF TESTS CONDUCTED ON A 15 PPM BILGE ALARM IN ACCORDANCE WITH PART 2 OF THE ANNEX TO THE GUIDELINES AND SPECIFICATIONS CONTAINED IMO RESOLUTION MEPC.107(49)

15 ppm Bilge Alarm submitted by …….…….

Test location …….

Method of sample analysis ……..

Samples analysed …….

Environmental testing of the electronic section of the 15 ppm Bilge Alarm has been carried out in accordance with part 3 of the annex to the Guidelines and Specifications contained in IMO resolution MEPC.107(49). The equipment functioned satisfactorily on completion of each test specified on the environmental test protocol.

……

……

……

……

CALIBRATION TEST AND RESPONSE TIME

Test Fluid	A		B		C	
	Measured	Grab sample	Measured	Grab sample	Measured	Grab sample
0 ppm						
15 ppm						
Full scale (ppm)						
Water Temperature	ºC		ºC		ºC	
Re-zero	Yes/No		Yes/No		Yes/No	
Recalibrate	Yes/No		Yes/No		Yes/No	
Response Time	sec		sec		sec	

CONTAMINANT(S) AND COLOUR TEST	
	Non-oil particulate matter Meter reading shift with ppm non-oil particulate contaminants and with very salt water .

		Oil Content Meter Reading
Clean water and 10 ppm Test Fluid "B"		ppm
Very salt water		ppm
Iron Oxide	10 ppm	ppm
Iron Oxide	50 ppm	ppm
Iron Oxide	100 ppm	ppm

SAMPLE PRESSURE OR FLOW TEST

15 ppm Bilge Alarm reading shift at 50% of normal … ppm
15 ppm Bilge Alarm reading shift at 200% of normal … ppm
Deviations from this test should be stated if necessary

SHUT OFF TEST

15 ppm Bilge Alarm reading before shut-off … ppm
15 ppm Bilge Alarm reading after start-up
(minimum dry period 8 hours) … ppm

Damage to 15 ppm Bilge Alarm as follows:
……
……
……
……

UTILITIES SUPPLY VARIATION TEST

110% voltage effects ……..

90% voltage effects ……..

110% air pressure effects ……..

90% air pressure effects ……..

110% hydraulic pressure effects ……..

90% hydraulic pressure effects ……..

OTHER COMMENTS

……

……

……

……

……

……

CALIBRATION AND ZERO DRIFT TEST

Calibration drift	… ppm
Zero drift	… ppm

Signed……Dated……..Official stamp

(Official stamp or equivalent identification and the date of approval to be placed on all pages of the test protocol)

***