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RECOMMENDATION ON INTERNATIONAL PERFORMANCE SPECIFICATIONS FOR OILY-WATER SEPARATING EQUIPMENT AND OIL CONTENT METERS

RESOLUTION A.233(VII)

adopted on 12 October 1971

THE ASSEMBLY,

NOTING Article 16(i) of the Convention on the Inter-Governmental Maritime Consultative Organization, concerning the functions of the Assembly,

NOTING ALSO Resolution 8 of the International Conference on Prevention of Pollution of the Sea by Oil, 1962, concerning the encouragement of development and installation of efficient oily-water separators for use in ships and the preparation of an international performance specification for such separators,

NOTING FURTHER Resolution 12 of that Conference concerning in particular, the need for research on oily-water separators for use in ships and the development of a device to detect, measure and record the oil content of discharges from ships,

HAVING CONSIDERED the Recommendation adopted by the Maritime Safety Committee at its twenty-third session,

ADOPTS the Recommendation on International Performance Specifications for Oily-Water Separating Equipment and Oil Content Meters, the text of which is set out in the Annex to this Resolution,

BEARING IN MIND that there has not yet been sufficient opportunity to obtain practical experience of applying the specifications and tests in their entirety,

INVITES governments to adopt the procedures to the maximum possible extent which is found to be reasonable and practicable and to report to the Organization on the results obtained in their application, and

FURTHER INVITES the Maritime Safety Committee to consider all such reports together with future developments in this field and to review the specifications at the appropriate time.

ANNEX

RECOMMENDATION ON INTERNATIONAL PERFORMANCE SPECIFICATIONS FOR OILY-WATER SEPARATING EQUIPMENT AND OIL CONTENT METERS

PREAMBLE

1. In response to Resolutions 8 and 12 of the International Conference on Prevention of Pollution of the Sea by Oil, 1962, which call for formulation of a suitable international performance specification for oily-water separators and the development of a device to detect, measure and record the oil content of discharges from ships, the following specifications have been formulated.

2. The specification in respect of oily-water separators is considered to be applicable especially for use in conjunction with oily bilge water, and oily ballast water from fuel oil tanks, as

these are of a low or medium capacity, and are conditioned by the need to avoid discharging oily mixture with an oil content of 100 parts or more in 1,000,000 parts of the mixture.

3. It is recommended that Administrations should implement the specification in so far as it is found reasonable and practicable, with a view to progressing towards its full application. In order to avoid hindrance in the development of improved designs, the specification will be reviewed after a reasonable period of operation taking account of the experience gained from its use.

4. The 100 p.p.m. criterion is considered to be a desirable goal for all separators regardless of capacity. It is recognized, however, that the development and test of high capacity separators designed for dealing with effluent from cargo tanks on tankers may pose a special case. Such development and test should not be hindered and Administrations should be prepared to accept deviations from this specification where they are considered necessary in this context.

5. It should be understood that a gravitational separator cannot be expected to be effective over the complete range of oils which might be carried on board ship, nor can it deal satisfactorily with oil of very high specific gravity or with a mixture presented to it as an emulsion.

6. The specification for oil content meters represents a desirable, achievable goal and should be recommended by Administrations to designers and manufacturers of such equipment. Such equipment will be of greatest value in tankers, for avoiding contravention of the Convention, when discharging dirty ballast and tank washings from cargo oil tanks, although the way has been left open for further developments in the design of separating equipment for this purpose.

GENERAL

1.1 Contents

The specifications set out in this Recommendation are in two parts as follows:

Part A - Specification for Oily-Water Separating Equipment:

This specification is intended to include both basic constructional details and the test procedures for oily-water separators and necessary ancillary equipment (hereinafter called "the separator") for shipboard use; so that the vessel so fitted is not likely to infringe that part of the Convention which defines the oil content of any discharged water as the permissible limit. Having regard to the need to deal primarily with effluent from machinery space bilges and from tanks which have been used alternatively as fuel tanks and water ballast tanks, the tests are designed with a view to complying with the requirement that the oil content of the discharge should be less than 100 p.p.m.

Part B - Specification for Oil Content Meters:

During the discharge of effluent which might contain oil the need arises for an instrument to measure continuously the oil content of the effluent in the line, to ensure that the operation does not contravene the provisions of the International Convention for Prevention of Pollution of the Sea by Oil. The aim of this specification is to lay down the most important features of the design and the method of testing such Oil Content Meters (hereinafter called "the meter").

1.2 General Provisions

1.2.1 Apparatus which in every particular fulfils the requirements of the present specifications may be approved by the Administration of the manufacturer's country for fitting on board ships. The approval should take the form of a "Certificate of Type Test" specifying the main particulars of the equipment and any limiting conditions on its usage necessary to ensure its proper performance. In the case of each size of separator the Certificate should specify the maximum throughput to which it has been tested. After the issue of such certificate a copy of the appropriate certificate for the equipment should be carried aboard any vessel so fitted at all times.

1.2.2 Approved apparatus may be accepted by other countries for use on their vessels on the basis of the first trials, or after fresh tests carried out under the supervision of their own representatives. Should separating equipment or an oil content meter pass a test in one country and fail a test of a similar nature in another country, then the two countries concerned should consult one another with a view to coming to an agreement which could be mutually acceptable.

PART A

SPECIFICATION FOR OILY-WATER SEPARATING EQUIPMENT

2.1 Technical Specification

2.1.1 This specification relates primarily to separators of low to medium capacity. A separator should be capable of giving an effluent containing less than 100 p.p.m. of oil irrespective of the oil content (from 0 to 100 per cent) of the feed supplied to it. For higher capacity separators, especially intended for dealing with effluents from cargo tanks on tankers, the specification should be used as a guide but Administrations may adapt the provisions, where necessary.

2.1.2 The apparatus should be strongly constructed and suitable for shipboard use, bearing in mind its intended location on the ship.

2.1.3 The satisfactory functioning of the apparatus should not be affected by the movements and vibrations experienced on board ship. In particular, electrical and electronic alarm and control arrangements should be tested to show that they are at least capable of continued operation under vertical acceleration forces of 2g and vibration conditions varying from 0-14 cycles per second with an amplitude of 1 mm and, additionally, be capable of reliable operation at angles up to 15° in any plane from the normal operational position.

2.1.4 If any part of the equipment, including any automatic control device is intended for installation in hazardous spaces, it should be suitable for operation therein.

2.1.5 The apparatus should be so designed that it functions automatically.

2.1.6 Separators should require the minimum of attention to bring them into operation. In the case of separators used for engine room bilges, there should be no need for any attention to bring the apparatus into operation and, when fitted in unattended machinery spaces, the apparatus should be capable of operating for at least 24 hours without attention.

2.1.7 All working parts of the separator which are liable to wear or to damage should be easily accessible for maintenance.

2.1.8 Changing the feed to the separator from oil/water to oil, or from oil/water to air should not result in the discharge overboard of any mixture containing 100 p.p.m. or more of oil.

2.2 Test Specification

2.2.1 These test standards refer to separators of low or medium capacity. Where possible, these tests should be used to test high capacity separators especially intended for dealing with effluents from cargo tanks on tankers, but where impracticable, e.g. when the use of large installations is needed, national authorities may adopt other procedures in line with the standards given below provided that the methods used are such as to allow adequate verification of the efficient working of the separator.

2.2.2 The oil/water mixture, with which the separator has in practice to deal, depends on:

(a) the position of the oil/water interface, with respect to the suction point, in the tank being pumped;

(b) the type of pump used;

(c) the type and degree of closure of any control valve in the circuit; and

(d) the general size and configuration of the system.

It is therefore desirable that the test rig be so constructed as to include not only the separator, but also the pump and the most important of the valves, pipes, etc. ... (as indicated in Fig.1).

2.2.3 The tests should be carried out with a supply rate equal to the full throughput for which the separator is designed.

2.2.4 The test oil should be a fuel oil of a specific gravity not less than 0.94 at 15°C and of a viscosity not less than 1,000 seconds Redwood No.1 at 100°F (or its equivalent figure in centistokes).

2.2.5 The mixture passed to the separator should be prepared by supplying the required quantity of oil and water to the inlet of a centrifugal pump operating at not less than 1,000 r.p.m. The pump should have a delivery capacity of not less than 1.5 times the rated capacity of the separator at the delivery pressure required for the test. The variation in oil/water ratio will be obtained by valves on the oil and water suction pipes adjacent to the pump suction, and the flow rates of oil and water or the oil content of the supply to the separator should be monitored. The excess pump capacity should be dissipated by either a by-pass to the suction side, or by a throttle valve or standard orifice plate on the discharge side. The pipe from the pump discharge to the separator should be not greater in diameter than the separator inlet, and should be as short as possible (but not less than 10 diameters in length), but in any case should be so arranged that the time taken between the mixture leaving the pump and entering the separator body should be not greater than 5 seconds or 2 per cent of the "residence time" in the separator. The inlet sampling point and a thermometer pocket should be provided near the separator inlet and an outlet sampling point and observation window should be provided on the discharge pipe. Figure 1 gives a diagrammatic representation of one suitable system, though it should be noted that the water from the separator need not be led back to the supply tank.

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 2 and, if a cock is fitted, free flow should be effected for at least 1 minute before any sample is taken.

2.2.6 Tests should be carried out with clean sea-water of a specific gravity between 1.020 and 1.025 at 25°C or a synthetic equivalent consisting of potable water containing dissolved Sodium Chloride (common salt) to raise its specific gravity to between 1.020 and 1.025 at 25°C. (Note - hereinafter the term "sea-water" should be understood to include this synthetic equivalent.)

2.2.7 In the case of separators depending essentially on gravity the feed to the separator should be maintained at a temperature not greater than 25°C, and heating and cooling coils should be provided where necessary. In other forms of separator where the dependence of separation efficiency on temperature is not established, tests should be carried out over a range of temperatures representing the normal shipboard operating range 10°C to 25°C or should be taken at a temperature in this range where the separation efficiency is known to be worst.

2.2.8 In those cases where, for the separating equipment, 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.

2.2.9 To ensure that the separator commences the test with the oil section full of oil and with all the supply line impregnated with oil, the separator should, after filling with water and while in the operating condition, be fed with pure oil for not less than five minutes.

2.2.10 The separator should be fed with a mixture composed of 5000 p.p.m. of oil in water until steady conditions have been established. The test should then proceed for 30 minutes during which time samples should be taken for analysis at the points of outlet of the water at 7½ minutes and 22½ minutes 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 water discharge as the flow ceases (this point can be checked from the observation window).

2.2.11 A test identical to that described in paragraph 2.2.10 above, including the opening of the air cock, should be carried out with a mixture composed of 25 per cent oil and 75 per cent sea-water.

2.2.12 The separator should be fed with 100 per cent of oil for 5 minutes during which time the observation window should be checked for any oil discharge.

2.2.13 The separator should be fed with sea-water for 15 minutes and two samples should be taken during operation at the water outlet, one to be immediately after the change-over.

2.2.14 A test lasting a minimum of three hours should be carried out to check that the separator will operate continuously and automatically. This trial should use a cycle varying progressively from pure sea-water to 25 per cent oil content and back to pure water every 15 minutes, and should test adequately any automatic device which is fitted.

2.2.15 Sampling should be carried out as shown in Fig.2 so that the sample taken will suitably represent the fluid issuing from the water outlet.

2.2.16 Flasks containing samples should 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, at laboratories selected by the Administration.

2.2.17 The oil content of the samples should be determined by a method acceptable to the Administration.

2.2.18 When accurate and reliable oil content meters are fitted, at inlet and outlet of the separator, one sample at inlet and outlet taken during each test will be considered sufficient if they verify, to within 10 per cent, the meter readings noted at the same instant.

2.2.19 In the presentation of the results, the following data should be reported in the International metric system of units:

(i) Properties of the oil:

- specific gravity at 15°C
- viscosity (centistokes or seconds Redwood No.1 at 100°F)
- flashpoint
- ash
- water content (total);

(ii) Properties of the water:

- specific gravity at 25°C with details of any solid matter present;

(iii) Temperature at the inlet to the separator;

(iv) The method used in analysis of all samples taken and the results thereof together with meter readings where appropriate;

(v) A diagram of the test rig; and

(vi) A diagram of the sampling arrangement.

2.3 Installation Requirements

Means should be taken to ensure that, in practice, the rated capacity of the separator is not exceeded.

PART B

SPECIFICATION FOR OIL CONTENT METERS

3.1 Technical Specification

3.1.1 The meter should be a robust and practical instrument suitable for shipboard installation and operation.

3.1.2 It should withstand normal stresses due to the ship's motion (rolling and pitching) and its operation must not be affected by such motion. It should be designed and fitted so that the vibration normally occurring on board will not affect its operation. Unless it can be shown to be unnecessary the meter and any associated equipment, particularly electrical and electronic alarm and control arrangements, should be tested to show that it is capable of continued operation under at least vertical acceleration forces of 2g, and vibration conditions varying from 0-14 cycles per second with an amplitude of 1 mm, and additionally be capable of reliable operation at angles up to 15° in any plane from the normal operational position.

3.1.3 It should resist corrosion in conditions of the marine environment.

3.1.4 It should, if intended to be fitted in hazardous spaces on tankers, comply with the relevant safety regulations for such spaces. Any electrical equipment which is part of the apparatus should be placed in a non-hazardous area, or should be certified intrinsically safe by a competent authority. Any moving parts which are fitted in hazardous areas should be arranged so as to avoid the formation of static electricity.

3.1.5 It should not contain or use any substance of a dangerous nature, unless adequate arrangements, acceptable to the Administration, are provided to eliminate any hazard introduced thereby.

3.1.6 The accuracy of the meter should be such that the reading will represent within ± 10 p.p.m. or ± 10% of the actual oil content of the sample being tested, whichever is the greater. The accuracy should be maintained despite the presence of contaminants other than oil, such as entrained air, rust, mud, sand and chemical substances introduced for the purposes of tank cleaning at the concentration recommended for such use on ships.

3.1.7 It should be designed so that its operation is not unduly affected by a 10% variation in the level of power supply from the value for which the meter was designed, i.e. in respect of electricity, compressed air, etc.

3.1.8 It is desirable that the reading should not be affected by the type of oil. If it is, it should not be necessary to calibrate the meter on board ship, but pre-set alterations in the calibration by means of switches, in accordance with instructions drawn up at the time of manufacture, are permitted. In the latter case means should be available to check that the correct calibration has been selected for the oil in question.

3.1.9 The response time of the meter, that is, the time which elapses between an alteration in the sample being supplied to the meter and the meter showing the correct response, should not exceed 20 seconds.

3.1.10 The meter may have several scales to facilitate its use on tankers but one scale must, on all ships, read from 0 to 120 p.p.m.

3.1.11 The meter should be fitted with an alarm device which can be set to operate automatically at any pre-stated value either to alert the crew of the ship or to operate control valves. This alarm should also operate automatically if at any time the meter should fail to function.

3.1.12 It is recommended that a simple means be provided aboard ship to check on instrument drift, and to confirm the accuracy and repeatability of the instrument reading.

3.1.13 The meter may be fitted with a recording device to provide a permanent record of the oil content of the discharge.

3.2 Test Specification

3.2.1 The tests should consist of an analysis by the instrument of a number of dynamic samples of known concentration extracted from a flowing stream, the oil content and type of oil involved being such as to cover a representative range of oil content which it is desired to measure, and of oils which are commonly carried aboard ship. The meter reading should be within ± 10 p.p.m. or ± 10% whichever is the greater, of the true oil content of the sample entering the meter as determined by laboratory tests using a method approved by the Administration.

3.2.2 The sampling arrangement should be as shown in Fig.2 and should be such that a representative homogeneous sample is obtained under all conditions of operation and under all operational proportions of oil content. Special care should be given to this stage of the process and the validity of the resultant findings.

3.2.3 During the various tests the response time of the apparatus should be checked and it should also be noted whether alarms operate adequately when a pre-stated threshold is exceeded.

3.2.4 Tests should be carried out on a sufficient range of contaminants to show that the instrument fulfils the requirements in paragraph 3.1.6.

3.2.5 Tests should be carried out to ascertain the reliability of the equipment and to assess its potential in terms of operating hours between rounds for maintenance purposes.

3.2.6 A specification of the instrument concerned and a diagrammatic presentation of the test arrangements should be provided and the following data should be reported in the International metric system of units:

(i) Types and properties of oils used in the tests;

(ii) Concentration of oil samples tested;

(iii) Details of contaminants tested; and

(iv) Results of tests and analysis of samples*.

3.3 Installation Requirements

3.3.1 The layout of the shipboard installation should be arranged so that the overall response time between an alteration in the mixture being pumped and the alteration in the meter reading should be as short as possible to allow for remedial action being taken before the oil content of the mixture being discharged exceeds the permissible limit.

3.3.2 The arrangements for the extraction of a sample from the discharge line on a ship should generally be as shown in Fig.2, but the end of the sampling pipe should be fixed at the centre of the discharge pipe.

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* For uniformity in the presentation of results, the concentrations of oil used and the analysis of oil samples should, in this instance, be on a volumetric basis.

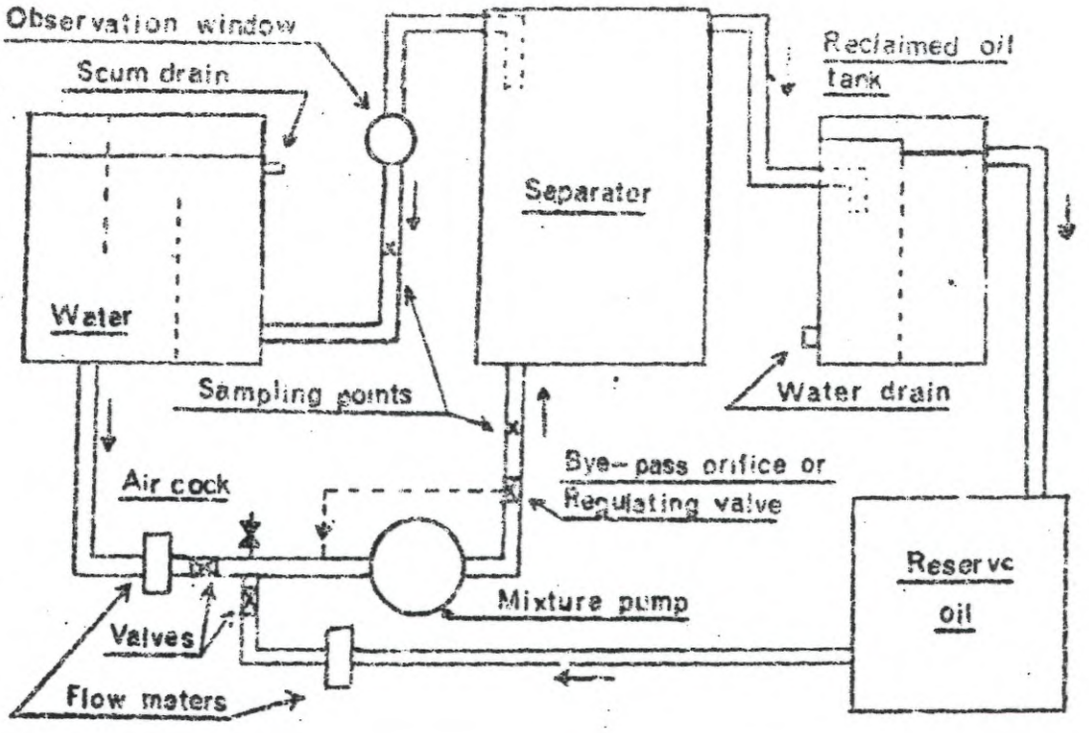
Observation window
Scum drain
Reclaimed oil tank
Separater
Water
Sampling points
Water drain
Air cock
Bye-pass orifice or Regulating valve
Reserve oil
Mixture pump
Valves
Flow meters

Fig. 1

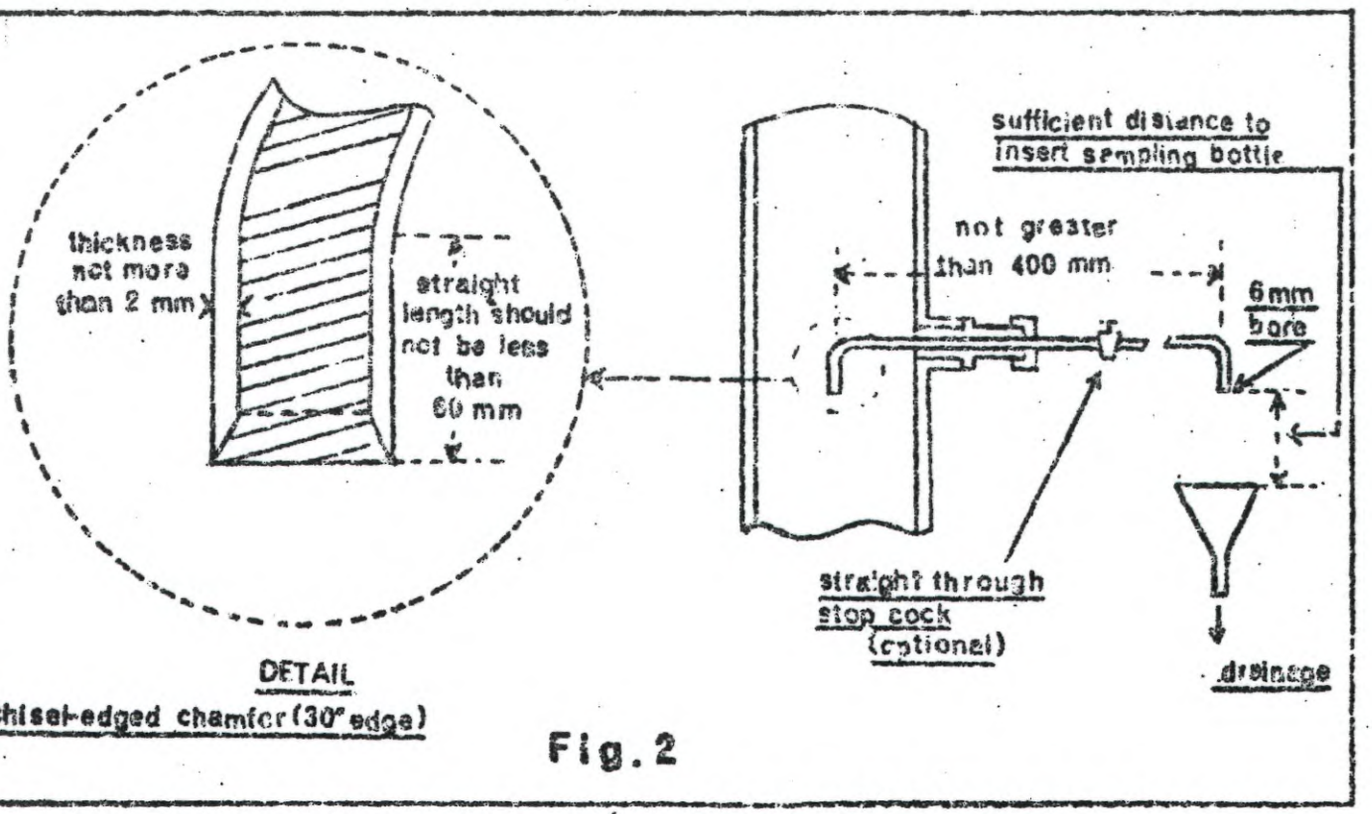
thickness not more than 2 mm
straight length should not be less than 60 mm
DETAIL
chisel-edged chamfer (30° edge)
sufficient distance to insert sampling bottle
not greater than 400 mm
6mm bore
straight through stop cock (optional)
drainage

Fig. 2