

RESOLUTION A.567(14)

*Adopted on 20 November 1985
Agenda item 10(b)*

REGULATION FOR INERT GAS SYSTEMS ON CHEMICAL TANKERS

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention on the International Maritime Organization concerning the functions of the Assembly in relation to regulations and guidelines concerning maritime safety,

RECALLING ALSO resolution A.473(XII) which was adopted to provide an interim solution for the requirements of inert gas systems applicable to chemical tankers carrying petroleum products, pending the possible development of final requirements applicable to chemical tankers carrying all flammable cargoes,

RECOGNIZING that the development of such requirements is not needed on the basis of results of scientific studies undertaken by industry, but that the extension of the regulation in resolution A.473(XII) to cover the carriage of petroleum and other liquid products would meet the purpose,

NOTING that regulation II-2/60 of the International Convention for the Safety of Life at Sea, 1974 (1974 SOLAS Convention) as amended requires *inter alia* new and existing tankers of a certain size, including chemical tankers, when carrying petroleum products, to be fitted with a fixed inert gas system by specific dates,

NOTING FURTHER that the draft amendment to regulation II-2/55.5 of the 1974 SOLAS Convention as amended (resolution A.566(14)) exempts certain chemical tankers and gas carriers carrying flammable products from the requirements for inert gas systems of regulation II-2/60 of that Convention under certain conditions,

HAVING CONSIDERED the recommendation made by the Maritime Safety Committee at its fifty-first session,

1. ADOPTS the Regulation for Inert Gas Systems on Chemical Tankers set out in the Annex to the present resolution, which supersedes resolution A.473(XII);
2. INVITES Governments to apply the above Regulation to chemical tankers for the purpose of the implementation of the draft amendment to regulation II-2/55.5.

ANNEX

REGULATION FOR INERT GAS SYSTEMS ON CHEMICAL TANKERS

PREAMBLE

Administrations are invited to accept the inert gas systems referred to in this Regulation for chemical tankers for which certificates of fitness are issued under the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (resolution A.212(VII)) and under the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (resolution MSC.4(48)).

This regulation shall be applied to chemical tankers as required by the draft amendment to regulation II-2/55.5 of the 1974 SOLAS Convention as amended (resolution A.566(14)).

REGULATION

1 Inert gas generator systems* shall be designed, constructed and tested to the satisfaction of the Administration. They shall be designed and operated so as to render and maintain the atmosphere of cargo tanks** non-flammable at all times except when such tanks are required to be maintained empty and gas-free. Inert gas systems supplied by one or more oil-fired inert gas generators may be accepted. An Administration may accept systems using inert gas from other sources provided that an equivalent standard of safety is achieved.

2 The systems shall be capable of:

- . 1 inerting empty cargo tanks by reducing the oxygen content of the atmosphere in each tank to a level at which combustion cannot be supported;
- . 2 maintaining the atmosphere, in all parts of each cargo tank designated to carry flammable products requiring protection by an inert gas system, with an oxygen content not exceeding 8% by volume and at a positive pressure at all times in port and at sea except when it is necessary for such a tank to be gas-free;
- . 3 eliminating the need for air to enter a tank during normal operations except when it is necessary for such a tank to be gas-free;
- . 4 purging empty cargo tanks of flammable vapour, so that subsequent gas-freeing operations will at no time create a flammable atmosphere within the tank.

3.1 The systems shall be capable of delivering inert gas to the cargo tanks at a rate of at least 125% of the maximum rate of discharge capacity of the ship expressed as a volume. An Administration may accept inert gas systems having a lower delivery capacity provided that the maximum rate of discharge of cargoes from cargo tanks being protected by the system is restricted to 80% of the inert gas capacity.

* "Inert gas generator system" means the machinery dedicated to the production and supply of inert gas and includes the air blowers, combustion chambers, oil fuel pumps and burners, gas coolers/scrubbers and automatic combustion control and supervisory equipment, e.g. flame failure devices.

** Throughout this Regulation the term "cargo tank" includes also "slop tanks containing oil residues".

3.2 The systems shall be capable of delivering inert gas with an oxygen content of not more than 5% by volume in the inert gas supply main to the cargo tanks at any required rate of flow.

4.1 Suitable fuel in sufficient quantity shall be provided for the inert gas generators.

4.2 The inert gas generators shall be located outside the cargo tank area as defined in the Bulk Chemical Code and the International Bulk Chemical Code. Spaces containing inert gas generators should have no direct access to accommodation, service or control station spaces, but may be located in machinery spaces. If they are not located in machinery spaces they shall be located in a compartment reserved solely for their use. Such a compartment shall be separated by a gastight steel bulkhead and/or deck from accommodation, service and control station spaces as defined in the Bulk Chemical Code and the International Bulk Chemical Code. Adequate positive-pressure-type mechanical ventilation shall be provided for such a compartment. Access to such compartments located aft shall be only from an open deck outside the cargo tank area. Access shall be located on the end bulkhead not facing the cargo area and/or on the outboard side of the superstructure or deckhouse at a distance of at least 25% of the length of the ship but not less than 5 m from the end of the superstructure or deckhouse facing the cargo area. In the case of such a compartment being located in the forecastle, access shall be through the deckhead forward of the cargo area.

4.3 Inert gas piping systems shall not pass through accommodation, service and control station spaces.

5.1 Means shall be provided which will effectively cool the volume of gas specified in paragraph 3 and remove solids and sulphur combustion products. The cooling water arrangements shall be such that an adequate supply of water will always be available without interfering with any essential services on the ship. Provision shall also be made for an alternative supply of cooling water.

5.2 Filters or equivalent devices shall be fitted to minimize the amount of water carried over to the inert gas main.

6.1 Two air blowers shall be fitted to each inert gas generator, which together shall be capable of delivering to the cargo tanks, required to be protected by the system, at least the volume of gas required by paragraph 3. An Administration may permit only one blower if it is capable of delivering to the protected cargo tanks the total volume of gas required by paragraph 3, provided that sufficient spares for the air blower and its prime mover are carried on board to enable any failure of the air blower and its prime mover to be rectified.

6.2 The inert gas systems shall be so designed that the maximum pressure which they can exert on any cargo tank will not exceed the test pressure of any cargo tank.

6.3 Where more than one inert gas generator is provided, suitable shutoff arrangements shall be provided on the discharge outlet of each generator plant.

6.4 Arrangements shall be made to vent the inert gas to the atmosphere in case the inert gas produced is off-specification, e.g. during starting-up or in case of equipment failure.

6.5 Where inert gas generators are served by positive displacement blowers, a pressure relief device shall be provided to prevent excess pressure being developed on the discharge side of the blower.

7 Two fuel oil pumps shall be fitted to each inert gas generator. An Administration may permit only one fuel oil pump on condition that sufficient spares for the fuel oil pump and its prime mover are carried on board to enable any failure of the fuel oil pump and its prime mover to be rectified by the ship's crew.

8 A gas regulating valve shall be fitted in the inert gas supply main. This valve shall be automatically controlled to close as required in paragraphs 17.2 and 17.3. It shall also be capable of automatically regulating the flow of inert gas to the cargo tanks unless other means are provided to automatically control the inert gas flow rate.

9.1 At least two nonreturn devices, one of which shall be a water seal, shall be fitted in the inert gas supply main in order to prevent the return of flammable vapour to the inert gas generator and to any gas-safe space under all normal conditions of trim, list and motion of the ship. They shall be located between the automatic valve required by paragraph 8 and the first connection to any cargo tank or cargo pipeline. An Administration may permit an alternative arrangement or device providing a measure of safety equivalent to that of a water seal.

9.2 The devices referred to in paragraph 9.1 shall be located in the cargo tank area on deck.

9.3 The water seal referred to in paragraph 9.1 shall be capable of being supplied by two separate pumps, each of which shall be capable of maintaining an adequate supply at all times.

9.4 The arrangement of the water seal and its associated provisions shall be such that it will prevent backflow of flammable vapours and will ensure the proper functioning of the water seal under operating conditions.

9.5 Provisions shall be made to ensure that any water seal is protected against freezing, in such a way that the integrity of water seal is not impaired by overheating.

9.6 A water loop or other approved arrangement shall also be fitted to all associated water supply and drain piping and to all venting or pressure sensing piping leading to gas-safe spaces. * Means shall be provided to prevent such loops from being emptied by vacuum.

9.7 Any water seal or equivalent device and all loop arrangements shall be capable of preventing the return of flammable vapours to an inert gas generator at a pressure equal to the test pressure of the cargo tanks.

9.8 The second device shall be a nonreturn valve or equivalent capable of preventing the return of vapours or liquids or both and fitted between the water seal (or the equivalent device) required in paragraph 9.1 and the first connection from the inert gas main to a cargo tank. It shall be provided with positive means of closure. As an alternative to positive means of closure, an additional valve having such means of closure may be provided between the nonreturn valve and the first connection to the cargo tanks to isolate the water seal (or equivalent device).

9.9 As an additional safeguard against the possible leakage of flammable liquids or vapours back from the deck main, means shall be provided to permit this section of the line between the valve having positive means of closure referred to in paragraph 9.8 and the valve referred to in paragraph 8 to be vented in a safe manner when the first of these valves is closed.

10.1 The inert gas main may be divided into two or more branches between the nonreturn devices required by paragraph 9 and the cargo tanks.

10.2 Inert gas supply mains shall be fitted with branch piping leading to each cargo tank designated for the carriage of flammable products required to be inerted by this Regulation. Each cargo tank containing or loading products not required to be inerted shall be separated from the inert gas main by:

* Gas-safe space is a space in which the entry of hydrocarbon gases would produce hazards with regard to flammability or toxicity.

- .1 removing spool-pieces, valves or other pipe sections, and blanking the pipe ends; or
- .2 arrangement of two spectacle flanges in series with provisions for detecting leakage into the pipe between the two spectacle flanges.

10.3 Means shall be provided to protect cargo tanks against the effect of overpressure or vacuum caused by thermal variations when the cargo tanks are isolated from the inert gas mains.

10.4 Piping systems shall be so designed as to prevent the accumulation of cargo or water in the pipelines under all normal conditions.

10.5 Suitable arrangements shall be provided to enable the inert gas main to be connected to an external supply of inert gas.

11 Unless the arrangements for venting of all vapours displaced from the cargo tanks during loading and ballasting comply with the requirements of the BCH and IBC Codes for controlled venting, such arrangements shall comply with regulation II-2/59.1 of SOLAS 1974 as amended and shall consist either of one or more mast risers or of a number of high velocity vents.

12 The arrangements for inerting, purging or gas-freeing of empty tanks as required in paragraph 2 shall be to the satisfaction of the Administration and shall be such that the accumulation of hydrocarbon vapours in pockets formed by the internal structural members in a tank is minimized and that:

- .1 on individual cargo tanks the gas outlet pipe, if fitted, shall be positioned as far as practicable from the inert gas/air inlet and in accordance with regulation II-2/59.1.9.3 of the 1974 SOLAS Convention as amended, or 8.2.2.3 of the IBC Code. The inlet of such outlet pipes may be located either at deck level or at not more than 1 m above the bottom of the tank;
- .2 the cross-sectional area of such gas outlet pipe referred to in subparagraph 12.1 shall be such that an exit velocity of at least 20 m/sec can be maintained when any three tanks are being simultaneously supplied with inert gas. Their outlets shall extend not less than 2 m above deck level. When in accordance with paragraph 3 an Administration permits a system designed to supply only one or two tanks simultaneously, the outlet pipes should be sized such that an exit velocity in the outlet pipes of 20 m/sec can be maintained;
- .3 each gas outlet referred to in subparagraph 12.2 shall be fitted with suitable blanking arrangements.

13 Means shall be provided for continuously indicating the temperature and pressure of the inert gas at the discharge side of the system, whenever it is operating.

14.1 Instrumentation shall be fitted for continuously indicating and permanently recording, when the inert gas is being supplied:

- .1 the pressure of the inert gas supply mains between the nonreturn devices required by paragraph 9.1 and the cargo tanks; and
- .2 the oxygen content of the inert gas in the inert gas supply main.

14.2 The devices referred to in paragraph 14.1 shall be placed in the cargo control room where provided. Where no cargo control room is provided, they shall be placed in a position easily accessible to the officer in charge of cargo operations.

14.3 In addition, meters shall be fitted:

- .1 in the navigating bridge to indicate at all times the pressure referred to in paragraph 14.1.1; and
- .2 in the machinery control room or in the machinery space to indicate the oxygen content referred to in paragraph 14.1.2.

15 Portable instruments for measuring oxygen and flammable vapour concentration shall be provided. In addition, suitable arrangement shall be made on each cargo tank such that the condition of the tank atmosphere can be determined using these portable instruments.

16 Suitable means shall be provided for the zero and span calibration of both fixed and portable gas concentration measurement instruments, referred to in paragraphs 14 and 15.

17.1 Audible and visual alarms shall be provided to indicate:

- .1 low water pressure or low water flow rate to the cooling and scrubbing arrangement referred to in paragraph 5.1;
- .2 low fuel supply;
- .3 high gas temperature as referred to in paragraph 13;
- .4 failure of the power supply to the inert gas generators;
- .5 oxygen content in excess of 8 per cent by volume as referred to in paragraph 14.1.2;
- .6 failure of the power supply to the indicating devices as referred to in paragraph 14.1 and to the automatic control systems for the gas regulating valve referred to in paragraph 8 and the inert gas generator;
- .7 low water level in the water seal as referred to in paragraph 9.1;
- .8 gas pressure less than 100 mm water gauge as referred to in paragraph 14.1;
- .9 high gas pressure as referred to in paragraph 14.1.1.

17.2 Automatic shutdown of the gas regulating valve and of the fuel oil supply to the inert gas generator shall be arranged on predetermined limits being reached in respect of paragraphs 17.1.1 and 17.1.3.

17.3 Automatic shutdown of the gas regulating valve shall be arranged in respect of paragraph 17.1.4.

17.4 In respect of paragraph 17.1.5, when the oxygen content of the inert gas exceeds 8% by volume, immediate action shall be taken to improve the gas quality. Unless the quality of the inert gas improves, all operations in those tanks to which inert gas is being supplied shall be suspended so as to avoid air being drawn into the tanks. The deck isolation valve referred to in paragraph 9.8 shall be closed and the off-specification gas shall be vented to atmosphere.

17.5 The alarms required in paragraphs 17.1.5, 17.1.6 and 17.1.8 shall be fitted in the machinery space and cargo control room, where provided, but in each case in such a position that they are immediately received by responsible members of the crew. All other alarms required by this paragraph shall be audible to responsible members of the crew either as individual alarms or as a group alarm.

17.6 In respect of paragraph 17.1.7 the Administration shall be satisfied as to the maintenance of an adequate reserve of water at all times and the integrity of the arrangements to permit the automatic formation of the water seal when the gas flow ceases. The audible and visual alarm on the low level of water in the water seal shall operate when the inert gas is not being supplied.

17.7 An audible alarm system independent of that required in paragraph 17.1.8 or automatic shutdown of cargo pumps shall be provided to operate on predetermined limits of low pressure in the inert gas mains being reached.

18 Detailed instruction manuals shall be provided on board, covering the operations, safety and maintenance requirements and occupational health hazards relevant to the inert gas system and its application to the cargo tank system. The manuals shall include guidance on procedures to be followed in the event of a fault or failure of the inert gas system.