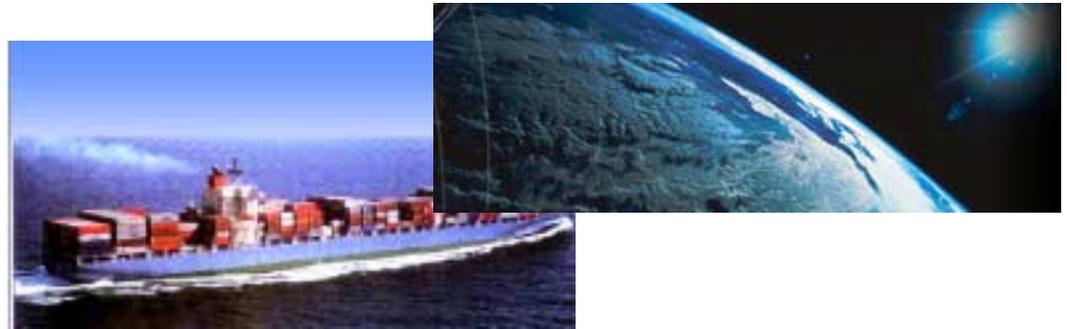


Guide to MARPOL 73/78, Annex VI – Regulation for Prevention of Air Pollution from Ships



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Chapter 1 Introduction

1.1 Ships have always enjoyed a reputation as one of the most environmentally friendly means of transport, deservedly so, as there is just no alternative method of moving vast tonnages of goods around with such a modest consumption of fuel. But expectations change, and the public demand for more and more clean air is now backed up by international protocols. So ship operators are becoming increasingly conscious of exhaust emissions from ships.

1.2 Although ships are responsible for the carriage of 80% of world trade by volume it has a much higher energy efficiency than other modes of transport using only 10% of the energy used by the road transport sector and 20% of the rail transport sector.

1.3 Just as air pollution hangs over main roads, it is detectable along the shipping routes. Additionally, just as there is increasing pressure to reduce air pollution from road vehicles and power stations or other shore side combustion plants, so there is growing pressure on the shipping industry to reduce the harmful emissions from ship exhausts. There have been spectacular reductions ashore; for instance a modern Mercedes-Benz petrol engine produces just one-fifth of the harmful emissions from their engines compared to just ten years ago. Power stations (large combustion plants) are being required to scrub and filter their atmospheric emissions, and modern plant can achieve more than half of these, compared to older machinery. The pressure is on the shipping industry to demonstrate similar progress.

1.4 The emissions which must be reduced are mainly nitrogen oxides, sulphur dioxide, carbon dioxide and particulate matter, which are the soots produced in the combustion process. All are harmful to human health, all harm the environment - acidification can be hugely harmful to forests - and there is a long term consequence on global warming. Marine diesel engines, just like any other internal combustion machinery emit all of these harmful products.

1.5 To make marine machinery more efficient is a good and practical method of reducing emissions and diesel manufacturers are doing just this. However, one of the real problems is the quality of marine fuels, which is the "end of the barrel" heavy fuel oil, in which there is generally a high sulphur content.

1.6 Better quality fuels are clearly one answer, but these are expensive and inadequate in supply, so it has been decided that in certain environmentally fragile sea areas, for a start, high sulphur fuels will not be used, the ships switching to low sulphur bunkers when entering these areas such as the North Sea, Baltic and English Channel. Progress is also being made on the scrubbing and cleaning of exhaust emissions. There are, however, some parts of the world such as the State of Alaska where air cleanliness is treasured greatly, and in order to operate here, passenger ships actually shut down all their own generating equipment in port, plugging in to shore power for their requirements when

they are alongside. Shipping clearly has to play a part in this quest for a cleaner, greener world.

Chapter 2

Air Pollutants from ships and their harmful effects

2.1 Marpol Annex VI regulates the emission into the atmosphere of specified pollutants from ships by limiting the discharge of nitrogen oxides from larger marine diesel engines; governing the sulphur content of marine diesel fuel; prohibiting the emission of ozone-depleting substances, limiting emission of volatile organic compounds during the transfer of cargoes between tankers and terminals; setting standards for shipboard incinerators and fuel oil quality; and establishing emission control requirements for platforms and drilling rigs at sea.

2.2 Control strategy for the other known pollutant from ship, oxides of carbon, which contributes in global warming is being currently debated at International Maritime Organization.

The various pollutants and their harmful effects are as follows:

2.3 Harmful Effects of SO_x and NO_x

2.3.1 Sulphur dioxide (SO₂) and nitrogen oxides (NO_x) causes “acid rain”. Acid rain is a broad term used to describe several ways that acids fall out of the atmosphere. A more precise term is acid deposition, which has two parts: wet (rain, fog, and snow) and dry (particles and gases).

2.3.2 World shipping fleet releases about 5m tonnes of SO_x each year.

2.3.3 Effects of acid rain on forests

Acid rain's effects include:

- harming fish and other organisms living in lakes and streams;
- harming a variety of plants and animals on land;
- damaging human health;
- degradation of forest and soil;
- reducing visibility through the air;
- damaging to materials used in civil constructions (e.g. buildings).

Differences in soil buffering capacity (capacity to neutralize acidic compounds) are an important reason why some areas that receive acid rain show a lot of damage, while other areas that receive about the same amount of acid rain do not appear to be harmed at all.

2.3.4 Effects of acid rain on lakes & streams

Acid rain primarily affects sensitive bodies of water, which are located in watersheds whose soils have a limited buffering capacity. Lakes and streams become acidic (pH value goes down) when the water itself and its surrounding soil cannot buffer the acid rain enough to neutralize it. In areas where buffering capacity is low, acid rain also

releases aluminum from soils into lakes and streams; aluminum is highly toxic to many species of aquatic organisms.

2.4 NO_x: What is it? Where does it come from?

2.4.1 Nitrogen oxides or NO_x is the generic term for a group of highly reactive gases, all of which contain nitrogen and oxygen in varying amounts. Many of the nitrogen oxides are colourless and odorless. However, one common pollutant, nitrogen dioxide (NO₂) along with particles in the air can often be seen as a reddish-brown layer over many urban areas. Nitrogen oxides form when fuel is burned at high temperatures, as in a combustion process. The primary sources of NO_x from ships are diesel engine exhaust. The world shipping fleet releases about 5m tones of NO_x each year.

2.4.2 Harmful effects of NO_x

- is one of the main ingredients involved in the formation of ground-level ozone, which can trigger serious respiratory problems;
- reacts to form nitrate particles, acid aerosols, as well as NO₂, which also cause respiratory problems; contributes to formation of acid rain;
- contributes to atmospheric particles, that cause visibility impairment;
- reacts readily with common organic chemicals and even ozone to form toxic chemicals.

One member of the NO_x, nitrous oxide, is a greenhouse gas. It accumulates in the atmosphere with other greenhouse gases causing a gradual rise in the earth's temperature. This will lead to increased risks to human health, a rise in the sea level, and other adverse changes to plant and animal habitat.

NO_x and the pollutants formed from NO_x can be transported over long distances, following the pattern of prevailing winds. This means that problems associated with NO_x are not confined to areas where NO_x are emitted.

2.5 Green House Gases

Greenhouse gases add to the natural 'greenhouse effect' causing global warming. The six main greenhouse gases are carbon dioxide, methane, dinitrogen (nitrous) oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).

2.6 Volatile Organic Compounds (VOCs)

2.6.1 During loading and unloading of crude oil in tankers large quantities of its light components evaporate; these oil vapours are normally termed as Volatile Organic Compounds (VOCs). Evaporation also occurs during the voyage when the oil splashes around in the cargo tanks.

2.6.2 Sunlight and heat causes VOCs to react with nitrogen oxides (NO_x) to form ground level ozone. Ground level ozone can damage crops and building materials and cause breathing difficulties in sensitive people.

2.6.3 Ozone is a bluish gas. Ground level ozone is a harmful pollutant. Ozone damages lung tissue, and causes particular problems for people with asthma and other lung diseases. Even modest exposure to ozone can cause healthy individuals to experience chest pains, nausea, and pulmonary congestion.

2.6.4 Ozone is the prime ingredient of smog in our cities and other areas of the country. Though it occurs naturally in the stratosphere to provide a protective layer high above the earth, at ground-level it is the prime ingredient of smog.

2.6.5 Ground-level ozone interferes with the ability of plants to produce and store food, so that growth, reproduction and overall plant health are compromised. Ground-level ozone has been shown to reduce agricultural yields for many economically important crops (e.g., soybeans, kidney beans, wheat, cotton). The effects of ground-level ozone on trees consequently adversely impact ecological functions such as water movement, mineral nutrient cycling, and habitats for various animal and plant species

2.6.6 Studies have shown that the loss of cargo through the release of oil vapour could be as much as 1m tonne a year. It has also been estimated that VOC given off has a global climatic impact of 20 times greater than carbon dioxide, one of the main gases implicated in the greenhouse effect.

2.7 Ozone Depleting Substances

2.7.1 Ozone-Depleting Substances (ODS) means compounds that contribute to stratospheric ozone depletion. ODS include CFCs (Chlorofluorocarbon, a compound consisting of chlorine, fluorine, and carbon), HCFCs (Hydrochlorofluorocarbon, a compound consisting of hydrogen, chlorine, fluorine and carbon), Halon (a compound consisting of methyle bromide, carbon tetrachloride, and methyl chloroform). They move to the Stratosphere and only break down under intense ultraviolet light, where they release chlorine or bromine atoms that then deplete the ozone layer

2.7.2 Stratospheric ozone (a gas composed of three atoms of oxygen) which lies approximately 15-40 kilometers above the Earth's surface is constantly being created and destroyed through natural cycles. ODS however, accelerate the destruction processes, resulting in lower than normal ozone levels.

2.7.3 Ozone absorbs a band of ultraviolet radiation called UVB, produced by the sun that is particularly harmful to living organisms. All sunlight contains some UVB, even with normal ozone levels.

2.7.4 Depletion of this layer by ODS will lead to higher UVB levels, which in turn will cause increased skin cancers and cataracts and potential damage to some marine

organisms, plants, and plastics. Plant growth can also be directly affected by UVB radiation.

2.7.5 Phytoplankton forms the foundation of aquatic food webs. Exposure to solar UVB radiation has been shown to result in reduced survival rates for these organisms.

2.7.6 Solar UVB radiation has been found to cause damage to early developmental stages of fish, shrimp, crab, amphibians and other animals. The most severe effects are decreased reproductive capacity and impaired larval development.

2.7.7 Synthetic polymers, naturally occurring biopolymers, as well as some other materials of commercial interest are adversely affected by solar UV radiation. Today's materials are somewhat protected from UVB by special additives. Therefore, any increase in solar UVB levels will therefore accelerate their breakdown, limiting the length of time for which they are useful outdoors.

2.7.8 CFCs have been in widespread use since the 1950s as refrigerants, aerosol propellants, solvents, foam blowing agents and insulants. In shipping, CFCs are used to refrigerate ship and container cargo, insulate cargo holds and containers, air condition crew quarters and occupied areas and refrigerate domestic food storage compartments.

2.7.9 The HCFCs are one class of chemicals being used to replace the CFCs. They contain chlorine and thus deplete stratospheric ozone, but to a much lesser extent than CFCs.

2.7.10 The halons are used as fire extinguishing agents. Halon production in the U.S. has been stopped since 1994 because they contribute to ozone depletion. Bromine is many times more effective at destroying ozone than chlorine.

2.8 Incineration of Heavy Metals

2.8.1 Toxic air pollutants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. Examples of toxic air pollutants include heavy metals such as cadmium, mercury, chromium, and lead compounds.

2.8.2 People exposed to toxic air pollutants at sufficient concentrations and durations may have an increased chance of getting cancer or experiencing other serious health effects.

Chapter 3

Background

3.1 The 1972 United Nations Conference on the Human Environment in Stockholm marked the start of active international cooperation in combating acidification, or acid rain. Between 1972 and 1977, several studies confirmed the hypothesis that air pollutants could travel several thousand kilometers before deposition and damage occurred. This damage includes effects on crops and forests.

3.2 In 1979, a ministerial meeting on the protection of the environment, in Geneva, resulted in the signing of the Convention on Long-range Transboundary Air Pollution by 34 governments and the European Community. This was the first international legally binding instrument to deal with problems of air pollution on a broad regional basis. Protocols to this Convention were later signed on reducing sulphur emissions (1985); controlling emissions of nitrogen oxides (1988); controlling emissions of volatile organic compounds (1991) and further reducing sulphur emissions (1994).

3.3 During the 1980s, concern over air pollution, such as global warming and the depleting of the ozone layer, continued to grow, and in 1987 the Montreal Protocol on Substances that Deplete the Ozone Layer was signed.

3.4 The Montreal Protocol is an international environmental treaty, drawn up under the auspices of the United Nations, under which nations agreed to cut consumption and production of ozone-depleting substances including chlorofluorocarbons (CFCs) and halons in order to protect the ozone layer. It controls the phase-out, production and use of ODS. Under the MP, several international organizations report on the science of ozone depletion, implement projects to help move away from ODS, and provides a forum for policy discussions. In addition, the Multilateral Fund provides resources to developing nations to promote the transition to ozone-safe technologies

3.5 A Protocol was adopted in London in 1990 - amending the original protocol and setting the year 2000 as the target completion date for phasing out of halons and ozone-depleting CFCs. A second Protocol was adopted in Copenhagen in 1992, introducing accelerated phase-out dates for controlled substances, cutting short the use of transitional substances and the introduction of phase-out dates for HCFCs and methyl bromide (a pesticidal gas which depletes the ozone layer).

3.6 In 1988 IMO agreed to include a work programme on prevention of air pollution from ships. Sulphur emissions from ships' exhausts were estimated at 4.5 to 6.5 million tons per year - about 4 percent of total global sulphur emissions. Nitrogen oxide emissions from ships were put at around 5 million tons per year - about 7 percent of total global emissions. Emissions of CFCs from the world shipping fleet was estimated at 3,000-6,000 tons - approximately 1 to 3 percent of yearly global emissions. Halon emissions from shipping were put at 300 to 400 tons, or around 10 percent of world total.

3.7 Discussions at IMO led to the adoption in 1991, of an **Assembly Resolution A.719(17) - Prevention of Air Pollution from Ships**. The Resolution called on the Marine Environment Protection Committee to prepare a new draft Annex to MARPOL 73/78 on prevention of air pollution.

3.8 The new draft Annex was developed over the next six years - and was finally adopted at a Diplomatic Conference in September 1997 as **MARPOL 73/78 Annex VI – Regulation for the Prevention of Air Pollution from Ships**.

3.9 Regulations for the Prevention of Air Pollution from Ships are set to enter into force on 19 May 2005 following ratification by 15 states with 50% of world tonnage (fulfilling the conditions for entry into force).

3.10 MARPOL 73/78 Annex VI will apply to all ships of 400 GT and above, to fixed and floating drilling rigs and other platforms. It covers:

- ozone depleting substances
- nitrogen oxide (NO_x) emissions from diesel engines
- sulphur oxide (SO_x) emissions from ships
- volatile organic compound emission from cargo tanks of oil tankers (vapour control systems)
- shipboard incineration
- reception facilities
- fuel oil quality.

3.11 For ships less than 400 GT, the flag administration may establish equivalent requirements to meet the intention of the Annex.

Chapter 4

Applicability and Definitions

4.1 Ships of 400 GT and above, floating drilling rigs and other platforms built on or after 19 May 2005, flying the flag of a signatory Party to Annex VI and intending to engage on international voyages will, on delivery, need to obtain an International Air Pollution Prevention Certificate. Similarly, existing ships, floating drilling rigs and other platforms built before 19 May 2005 intending to engage on international voyages will need to be certificated no later than the first scheduled dry docking after 19 May 2005, but in all cases by 19 May 2008. However, it should be noted that on or after 19 May 2005 signatory States can require foreign flag ships operating in their jurisdictional waters and their flag ships to comply with the applicable provisions of MARPOL Annex VI.

4.2 During formulation of the Rules it was recognized that in many countries offshore platforms are used as power generation sites. Hence applicability of the Rules was extended to these as “other platforms”. However, issuance of International Air Pollution Prevention Certificates is limited to Mobile units only.

4.3 In the light of above, prudent ship owners would ensure that their ships implement the regulation voluntarily by the due date and obtain Statement of Compliance to ensure unrestricted international trading of their vessels.

4.4 Prerequisites for ship certification include three significant retroactive aspects with respect to equipment certification:

4.5 Diesel engines (except emergency diesel engines, engines installed in lifeboats and any device or equipment intended to be used solely in case of emergency) with a power output of 130kW or more installed on ships built on or after 1 January 2000 must be certified to the requirements contained in the mandatory NO_x Technical Code. Engines with a power output of more than 130kW on existing ships, which are replaced, substantially modified, or have their maximum continuous rating increased by 10% or more are also subject to NO_x Code certification.

4.6 Incinerators installed on board ships after 1 January 2000 must be type-approved based on resolution MEPC.76(40) – Standard Specification for Shipboard Incinerators

4.7 Definition of basic MARPOL 73/78, Annex VI terms

Baltic Sea Area means the Baltic Sea proper with the Gulf of Bothnia, the Gulf of Finland and the entrance to the Baltic Sea bounded by the parallel of the Skaw in the Skagerrak at 57°44.8'N.

Continuous feed means the process whereby waste is fed into a combustion chamber without human assistance while the incinerator is in normal operating conditions with the combustion chamber operative temperature between 850°C and 1200°C.

Emission means any release of substances, subject to control by MARPOL 73/78, Annex VI – Regulation for Prevention of Air Pollution from Ships, into the atmosphere or sea.

New installations means the installation of systems, equipment, including new portable fire-extinguishing units, insulation, or other material on a ship after 19 th May 2005, but excludes repair or recharge of previously installed systems, equipment, insulation, or other material, or recharge of portable fire-extinguishing units.

The North Sea area means all sea areas within the following boundaries (including the North Sea proper and the English Channel and its approaches)-

- (i) To the north, the boundary constituted by the 62 ° N parallel from Norway westwards to 4° W meridian and thence southwards to Scotland.
- (ii) To the east, boundary constituted by the parallel 48° 30' N from France westwards to 5° W Meridian and thence northwards to England.

NO_x Technical Code means the Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines adopted by Conference resolution 2 and its subsequent amendments.

Ozone-depleting substances means controlled substances defined in paragraph 4 of article 1 of the Montreal Protocol on Substances that Deplete the Ozone Layer, 1987.

Ozone-depleting substances that may be found on board ship include, but are not limited to:

Fire extinguishing agents-

Halon 1211 Bromochlorodifluoromethane

Halon 1301 Bromotrifluoromethane

Halon 2402 1,2-Dibromo-1,1,2,2-tetrafluoroethane (also known as Halon 114B2)

Refrigerating gases-

CFC-11 Trichlorofluoromethane

CFC-12 Dichlorodifluoromethane

CFC-113 1,1,2-Trichloro-1,2,2-trifluoroethane

CFC-114 1,2-Dichloro-1,1,2,2-tetrafluoroethane

CFC-115 Chloropentafluoroethane

Sludge oil means sludge from the fuel or lubricating oil separators, waste lubricating oil from main or auxiliary machinery, or waste oil from bilge water separators, oil filtering equipment or drip trays.

Shipboard incineration means the incineration of wastes or other matter on board a ship, if such wastes or other matter were generated during the normal operation of that ship.

Shipboard incinerator means a shipboard facility designed for the primary purpose of incineration.

Ships constructed means ships the keels of which are laid or which are at a similar stage of construction.

SOx emission control area means an area where the adoption of special mandatory measures for SOx emissions from ships is required to prevent, reduce and control air pollution from SOx and its attendant adverse impacts on land and sea areas. SOx emission control areas shall include those listed in MARPOL 73/78, Annex VI, Regulation 14.

Substantial modification of a marine diesel engine means:

1. For engines installed on ships constructed on or after 1 January 2000, any modification to an engine that could potentially cause the engine to exceed the emission standards set out in Regulation 13 of MARPOL 73/78, Annex VI. Routine replacement of engine components by parts specified in the technical file that do not alter emission characteristics shall not be considered a "substantial modification" regardless of whether one part or many parts are replaced.
2. For engines installed on ships constructed before 1 January 2000, any modification made to an engine which increases its existing emission characteristics established by the simplified measurement method, as described in 6.3 (of NOx Code) in excess of the allowances set out in 6.3.11 of the NOx Technical Code. These changes include, but are not limited to, changes in its operations or in its technical parameters (e.g., changing camshafts, fuel injection systems, air systems, combustion chamber configuration, or timing calibration of the engine).

Tanker means

(a) *an oil tanker* being a ship constructed or adapted primarily to carry oil in bulk in its cargo spaces and includes combination carriers and a chemical tanker referred to in sub-paragraph (b) when it is carrying a cargo or part cargo of oil in bulk; and

(b) *a chemical tanker* being a ship constructed or adapted primarily to carry a cargo of noxious liquid substances in bulk and includes an oil tanker referred to in sub-paragraph (a) when carrying a cargo or part cargo of noxious liquid substances in bulk.

Oil record book means the oil record book required by MARPOL 73/78, Annex I.

Fuel oil supplier's representative means the person appointed by a fuel oil supplier to provide a declaration that the fuel oil supplied is in conformity with regulation 14(1) or 4(a) and regulation 18(1) of MARPOL 73/78, Annex VI;

The Protocol of 1997 means the Protocol of 1997 to amend the International Convention for the Prevention of Pollution from Ships, 1973, as amended by the Protocol of 1978 relating thereto;

Nitrogen oxide (NO_x) emissions means the total emission of nitrogen oxides, calculated as the total weighted emission of NO₂ and determined using the relevant test cycles and measurement methods as specified in the NO_x Technical Code.

Components mean those interchangeable parts which influence the NO_x emissions performance, identified by their design and or parts number;

Setting means adjustment of an adjustable feature influencing the NO_x emissions performance of an engine;

Operating values means engine data, such as cylinder peak pressure, exhaust gas temperature, etc., from the engine log which are related to the NO_x emission performance. These data are load-dependent.

Engine International Air Pollution Prevention certificate (EIAPP) means a certificate issued by the flag administration or an organization authorized to act on its behalf for each applicable engine, engine family, or engine group after the engine manufacturer demonstrates that the engine complies with the NO_x limits set out in Regulation 13 of Annex VI. The EIAPP is good for the life of the engine or until it undergoes a major conversion. These certificates will not be issued until the Annex enters into force (19th May, 2005) under Article 15 of the MARPOL Convention.

International Air Pollution Prevention certificate (IAPP) means a certificate issued to the vessel by the flag administration or an organization authorized to act on its behalf, after the owner demonstrates that the vessel complies with all relevant requirements under MARPOL Annex VI. The IAPP is valid for maximum of five years, and is subject to successful completion of initial or renewal surveys of the vessel. These certificates will not be issued until the Annex enters into force (19th May, 2005) under Article 15 of the MARPOL Convention.

On-board NO_x verification procedures mean a procedure, which may include an equipment requirement, to be used on board at initial certification survey or at the renewal, annual and intermediate surveys, as required, to verify compliance with any of the requirements of the NO_x Technical Code, as specified by the engine manufacturer and approved by the flag administration or an organization authorized to act on its behalf.

Marine diesel engine means any reciprocating internal combustion engine operating on liquid or dual fuel, to which regulations 5, 6 and 13 MARPOL 73/78, Annex VI apply, including booster and compound systems if applied.

Rated power means the maximum continuous rated power output as specified on the nameplate and in the technical file of the marine diesel engine to which regulation 13 of MARPOL 73/78, Annex VI and the NO_x Technical Code apply.

Rated speed means the crankshaft revolutions per minute at which the rated power occurs as specified on the nameplate and in the technical file of the marine diesel engine.

Statement of Voluntary Compliance is a document issued by flag administration or an organization authorized to act on its behalf prior to entry into force of the Annex, after the engine manufacturer demonstrates that the engine complies with the NO_x limits set out in Regulation 13 of Annex VI. Once the Annex goes into force, this statement must be exchanged for an EIAPP.

Technical file is a record containing all details of parameters, including components and settings of an engine, which may influence the NO_x emission of the engine, in accordance with 2.4 of this Code.

Record Book of Engine Parameters means a document for recording all parameter changes, including components and engine settings, that may influence NO_x emissions.

Chapter 5

Requirements of Annex VI and its implementation

5.1 Regulation 12 – Ozone depleting substances

5.1.1 Subject to the provisions of regulation 3 (for the purpose of securing safety of ship or saving life at sea or an emission resulting from damage to the ship or its equipment) of MARPOL Annex VI, any deliberate emissions of ozone depleting substances shall be prohibited. Deliberate emissions include emissions occurring in the course of maintaining, servicing, repairing, or disposing of systems or equipment. Deliberate emissions do not include minimal releases associated with the recapture or recycling of an ozone depleting substance.

5.1.2 After 19 May 2005, new installation of equipment containing ozone depleting substances (ODS) will not be permitted.

“new installations” shall be interpreted as follows:

(a) For new ships, installations on board ships the keels of which are laid or which are at a similar stage of construction on or after 19th May, 2005.

(b) For existing ships, new installations with a contractual delivery date to the ship on or after 19th May 2005 or, in the absence of a contractual delivery date, the actual delivery of the equipment to the ship on or after 19th May 2005.

5.1.3 Existing equipment may however be re-charged as necessary. In service, there must be no deliberate emissions of ODS and when those gases are to be disposed, it must be to appropriate reception facilities provided at ship repair or ship breaking yards.

5.1.4 But new installations containing hydro-chlorofluorocarbons (HCFCs) are permitted until 1 January 2020.

Additional Notes

5.1.5 The United Nations’ Environment Program through its Montreal Protocol on Substances that Deplete the Ozone Layer, 1987, which entered into force in January 1989; stipulates that owing to the ozone-depleting potential of chlorofluorocarbons and Halons, the production and consumption of chlorofluorocarbons and Halon, including CFC-11 (Trichlorofluoromethane), CFC 12 (Dichlorofluoromethane), CFC-113 (1,1,2-Trichloro-1,1,2,2-tetrafluoroethane), CFC-114 (1,2-Dichloro-1,1,2,2-tetrafluoroethane), CFC-115 (Chloropentafluoroethane), Halon-1211 (Bromochlorodifluoromethane), Halon-1301 (Bromotrifluoromethane) and 2402 (1,2-Dibromo-1,2,2-tetrafluoroethane also known as Halon 114B2) should be kept at their 1986 levels and phased out by 1 January 2000.

5.1.6 Accordingly, the International Maritime Organization in support of this initiative vide Assembly Resolution A.719(17)

- a. prohibited the use of CFCs in any new installation on ships after 6 November 1992.
- b. recommended and encouraged all sectors of the maritime industry to limit the use of Halons and CFCs aboard ships, and by amendment of SOLAS 1974 via MSC Resolution 27(61)
 - .1. to use alternative fire extinguishing systems and media on new buildings after 1 October 1994,
 - .2. prohibit any new installations on existing vessels and
 - .3. prohibit the release of Halons into the atmosphere when testing existing systems.

5.1.7 It is to be noted that the Safety of Life at Sea Convention, 1974, as amended by Regulation II-2/5 and 6, still permits the use of Halogenated Hydrocarbons (Halon) as a fire extinguishing media on vessels built before 1 October 1994. IMO Assembly Resolution A.719(17) permits the use of CFCs in fixed refrigeration and air conditioning systems on vessels built before 6 November 1992.

5.1.8 Some Administration have established a phase out date for existing Halon installations and systems using CFCs on ships.

5.1.9 The sale of Halon in EU ports is banned since 31st December, 2003. Non-EU flag vessels calling at EU ports since that date are unable to refill or top-up their halon systems in EU ports.

5.1.10 Halon Phase out programme of Government of India is as follows:

Halon Scenario	Year
Production ceased in India	1997-98
Halon consumption frozen at 1995-97 level	2002
Reduction of consumption 80% of 1995-97 level	2005
Zero production and consumption except for critical use	2010

5.2 Regulation 13 – Nitrogen oxides (NO_x)

5.2.1 In essence, Regulation 13 sets limits on emissions of nitrogen oxides (NO_x) from diesel engines. The objective of this regulation is to reduce NO_x emission from new marine diesel engines with effect from 1 January, 2000 while ensuring that quantum of NO_x emission from existing ships do not increase.

5.2.2 The applicable NO_x emission limits are dependent on the rated engine speed and are as follows:

g/kWh	RPM
17.0	N < 130
45.0 x n ^(-0.2)	N ≥ 130 but < 2000
9.8	N ≥ 2000

where N – rated engine speed (crankshaft rpm)

5.2.3 A mandatory Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines (NO_x Technical Code) was adopted by the Diplomatic Conference in 1997 under the cover of Resolution 2. The aim of the NO_x Technical Code is to establish mandatory procedures for the testing, survey and certification of marine diesel engines, in order to enable engine manufacturers, shipowners and Administrations to ensure that all applicable marine diesel engines comply with the this regulation 13.

5.2.4 New Ships

Although the Regulation 13 does not enter into force until Annex VI of MARPOL 73/78 enters into force, diesel engines (except emergency diesel engines, engines installed in lifeboats and any device or equipment intended to be used solely in case of emergency) with a power output of more than 130kW installed on ships, irrespective of GT, built on or after 1 January 2000 must be certified by, or on behalf of, the ship's Flag State to the requirements contained in the mandatory NO_x Technical Code.

5.2.5 Existing Ships

Diesel engines (except emergency diesel engines, engines installed in lifeboats and any device or equipment intended to be used solely in case of emergency) with a power output of more than 130kW installed on existing ships, which, after 1 January 2000,

- (a) are replacement ‘new’ engines,
- (b) “substantially modified”, or
- (c) have had their maximum continuous rating increased by 10% or more

are also subject to the NO_x certification requirements, irrespective of the date of build of the ship onto which those engines are installed. Such changes are termed as “Major Conversion” of a diesel engine.

Substantial modification

For engines installed on ships constructed **on or after** 1 January 2000, *substantial modification* means any modification to an engine that could potentially cause the engine to exceed the emission standards set out in regulation 13 of Annex VI. Routine replacement of engine components by parts specified in the Technical File that do not

alter emission characteristics shall not be considered a “substantial modification” regardless of whether one part or many parts are replaced.

For engines installed on ships constructed **before** 1 January 2000, *substantial modification* means any modification made to an engine which increases its existing emission characteristics established by the simplified measurement method as described in 6.3 in excess of the allowances set out in 6.3.11 of NOx Technical Code. These changes include, but are not limited to, changes in its operations or in its technical parameters (e.g., changing camshafts, fuel injection systems, air systems, combustion chamber configuration, or timing calibration of the engine).

The ‘major conversion’ term is extremely significant, since it potentially extends the scope of NOx emission controls to engines which would otherwise be exempt, i.e. those installed on ships built prior to 1 January 2000. The onus would be on the shipowner to demonstrate through measurements on board to the flag Administration or its Recognised Organization that any changes to such operational or technical features did not result in an unacceptable increase in emissions.

5.2.6 Exempted Engines

This regulation does not apply to:

- (a) emergency diesel engines, engines installed in lifeboats and any device or equipment intended to be used solely in case of emergency; and
- (b) engines installed on ships solely engaged on domestic voyages, provided such engines are covered by alternative NOx control measures established by the administration.

Flag Administrations may also exclude engines installed on a ship constructed or which undergoes a major conversion prior to 5th May, 2005 from application of this regulation, provided that the ship is solely engaged in voyages to ports or offshore terminals within the jurisdiction of that Government.

In the case of platforms and drilling rigs those diesel engines used solely in connection with the exploration, exploitation or processing functions are exempt from these NOx controls.

5.2.7 It is to be noted that emission from boilers and gas turbines are not covered by this regulation.

5.2.8 Notwithstanding the above the operation of a diesel engine is permitted when:

- (a) an exhaust gas cleaning system approved by the Administration in accordance with NOx Technical Code is fitted to the engine exhaust to reduce on board NOx emission at least to the limits specified above;

- (b) any other equivalent methods, approved by the Administration as per IMO Guideline (to be developed) is applied to the engine to reduce on board NO_x emission at least to the limits specified above;

Additional Note:

5.2.9 The responsibility for reduction of NO_x principally lies with the engine designer. NO_x emission from low speed diesel engines are typically higher than that of medium speed and high speed engines, largely because of the longer residence time at higher temperatures in the combustion chamber.

5.2.10 Retardation of fuel injection so as to reduce maximum cylinder pressure is the most common technology to reduce in cylinder temperatures, given the exponential correlation between NO_x formation and temperature.

5.2.11 Reduction of NO_x can be achieved with no or small increase in fuel consumption by primary methods involving adjustment of compression ratio, varying the valve timing, fuel spray pattern and scavenge air pressure.

5.2.12 IMO's intention is to revise the NO_x emission limits after a maximum of five years subsequent to 5th April, 2005.

5.2.13 Technical File

5.2.13.1 As detailed in the NO_x Technical Code, each engine is required to be delivered by the engine builder with a Technical File. The technical file should specify all components considered to influence the engine's emission level, thereby embracing the entire fuel injection system, injection and exhaust valve cams and timing, cylinder cover, piston with piston rod and shims, connecting rod and turbocharger. The file must also include adjustment data and tolerances for performance parameters, plus the detailed results of the emission measurements carried out at the test bed trial stage. The technical file will follow the engine through its whole life. The file shall contain information for subsequent surveys (initial, annual, intermediate and renewal). The technical file is required to be approved by the flag administration or its R.O.

5.2.13.2 Technical File must contain the following information:

- identification of those components, settings and operating values of the engine that influence its NO_x emissions
- identification of the full range of allowable adjustments or alternatives for the components of the engine
- the full record of the engine's performance, including the engine's rated speed and rated power
- a system of onboard NO_x verification procedures to verify compliance with the NO_x emission limits during onboard verification surveys
- a copy of the emission test report used to certify the engine

- if applicable, the designation and restrictions for an engine that is a member of an engine group or engine family
- spare part component specifications, to ensure continued compliance of the engine with the NO_x emission limits when these components are replaced
- the EIAPP or Statement of Voluntary Compliance.

5.2.13.3 The Technical File contains essential information that will be used in an engine inspection or survey. This must be kept onboard the vessel at all times.

5.2.14 Engine Group and Engine Family

5.2.14.1 To avoid emission testing of each single engine, the NO_x Technical Code allows the engine manufacturer to divide the product line into Engine Groups or Engine Families.

5.2.14.2 *Engine family*: Manufacturer's grouping of series-produced engines that are expected to have similar exhaust emission characteristics, and are used on board ships as produced, requiring no adjustments or modifications which could adversely affect their NO_x emissions. These are typically smaller high speed and medium speed engines that are produced in large numbers.

5.2.14.3 *Engine group*: Smaller series of engines produced for similar applications, requiring minor adjustments and modifications during installation or in service on board. These are normally large main propulsion engines of the same type and design features.

5.2.14.4 One engine is then selected as a parent engine and tested. The selected engine shall be one that has the highest NO_x emission level in the group and it shall be tested in the most adverse conditions, NO_x wise, that is allowed for in the Technical File of the engine. This test is then valid for all the engines in the group/family. All engines in a group/family are to have similar NO_x affecting components and the engine settings and operating parameters are to be within the range established for the group/family and stated in the Technical File for the engines.

5.2.15 EIAPP Certificate / Statement of Compliance

5.2.15.1 IMO issued an *MEPC/Circ.344 - Interim Guidelines for the application of the NO_x technical Code* in November 1998 which recommended that "Each engine which will become, retrospectively, subject to the provisions of regulation 13 of Annex VI of MARPOL 73/78 upon its entry into force, should be certified in accordance with the requirements of the NO_x Technical Code and a Statement of Compliance issued. A copy of the relevant Circular is given as an annex.

5.2.15.2 If an engine is required to carry a Statement of Compliance to NO_x Technical Code as per above circular, but for some reason this has not been provided, ship operators are strongly urged to contact the engine manufacturers for further assistance.

5.2.15.3 This Statement of Compliance may be transferred into an EIAPP Certificate issued on behalf of the relevant flag state once the Annex VI comes into force and the issuing authority has received the authorisation to act on behalf of the flag state.

5.2.15.4 After its entry into force Annex VI also requires new marine diesel engines (except emergency diesel engines, engines installed in lifeboats and any device or equipment intended to be used solely in case of emergency) with a power output of more than 130kW to carry individual certificates with regard to NO_x emissions. These will be designated Engine International Air Pollution Prevention (EIAPP) certificates.

5.2.15.5 Diesel engines installed on ships built before 2000 are not subject to issuance with an EIAPP-certificate, except an engine that has undergone a major conversion after 1 January, 2000, (e.g. replacement, substantial modification or increasing power output by more than 10%).

5.2.15.6 For each engine to which regulation 13 applies, a Technical File originally approved by the ship's flag state's Administration shall be available aboard the ship and kept together with the EIAPP certificate. The Technical File shall contain information necessary for carrying out surveys.

5.2.16 Record Book of Engine Parameters

5.2.16.1 For each engine to which regulation 13 applies, a Record Book of Engine Parameters is to be maintained for recording all parameter changes, including components and engine settings, that may influence NO_x emissions.

5.2.16.2 This is another essential document for surveys and inspections because it contains a record of adjustments to the engine. In some cases, a survey will consist simply of examining the Record Book to ensure that no changes have been made to the engine that might affect NO_x emissions. Vessel owners must make sure the Record Book is always accurate. If the settings on the engine do not match those in the record book, an engine survey may include a more time consuming investigation and, potentially, onboard measurement of NO_x emissions.

5.3 Regulation 14 – Sulphur oxides (SO_x)

5.3.1 Control of SO_x emission

The annex includes a global cap of 4.5% m/m on the sulphur content of fuel oil and calls on IMO to monitor the worldwide average sulphur content of fuel once the Protocol comes into force.

5.3.2 SO_x Emission Control Area

5.3.2.1 Annex VI contains provisions allowing for special “SO_x Emission Control Areas” to be established with more stringent controls on sulphur emissions. In these areas the sulphur content of any fuel used on board in general shall not exceed 1.5% m/m. If the ship is trading within SO_x emission control areas (SECA), it shall

- use fuel oil with a sulphur content of max. 1.5% m/m or
- use an approved exhaust gas cleaning system (Flue Gas Desulphurization)* to reduce the ship’s total SO_x emission to 6 g/kWh or less calculated as the total weight of sulphur dioxide emission or
- use another technological method to reduce SO_x emission to below 6 g/kWh*.

5.3.2.2 However where Flue Gas Desulphurization (FGD) are used, the scrubbed sulphuric waste water should not be discharged into enclosed ports, harbours and estuaries unless it can be thoroughly documented by the ship that such waste stream have no adverse impact on the ecosystem of such enclosed ports, harbours and estuaries, based upon criteria communicated by the authorities of port state to IMO.

** Note: However, the Guidelines covering these options have yet to be developed by IMO and these are not currently available options.*

5.3.2.3 The Baltic Sea Area is designated as a SO_x Emission Control area in the Protocol (with effect from 19. 05. 2006).

5.3.2.4 In March 2000, the MEPC approved a proposed amendment to Annex VI to also include the North Sea as a SO_x Emission Control Area. The aim is to adopt the amendment once MARPOL Annex VI enters into force. It is expected that North Sea would be a SECA by 2007.

5.3.2.5 Criteria and procedures for designation of SO_x emission control areas are given in Appendix III to Annex VI. Countries desirous of designating sea areas or ports within their territorial jurisdiction have to satisfy Marine Environment Protection Committee that such areas and ports fulfill the criteria given in Appendix III. Once satisfied, MEPC will designate such areas as SO_x Emission Control Area. The effective date would be 12 months from the date of relevant amendment to Annex VI.

Additional Note

5.3.3 For ships using more than one type of fuel, sufficient capacity of low sulphur fuel shall be provided and sufficient time to flush the fuel piping system after switching over at entrance into a SO_x emission control area the ship operate on low sulphur fuel oil shall be allowed. Additionally, information related to switching over to low sulphur fuel, i.e. number / volume of tanks containing low sulphur fuel, time and position of beginning and end of switching over shall be recorded in such log books as prescribed by the Administration. It is also important that these information are also recorded while leaving a SECA area on reverting to fuel oil with higher than 1.5% sulphur.

5.3.4 The EU estimates that the 1.5% emission limit being introduced in the SECAs will result in a reduction of 337,000 tonnes of SO_x emissions, a reduction worth over Euros 1.3 billion in reduced material damage to crops and buildings, and improved human health.

5.3.5 A sufficiently segregated fuel oil storage, settling and service tank capacity, together with the necessary change over arrangements, to handle both the fuel oils used outside of SECAs and the 1.5% m/m sulphur maximum fuel oils to be used within the SECAs are required on board. In some cases, duplicate engine lubricant storage may also be necessary to cope with the differing requirements of the two fuel grades. For ships where such arrangements are not possible, conversion work will be necessary.

5.3.6 There is industry concern that the use of low sulphur fuels will leave ships vulnerable to operational failures since neither their long or short term effects on propulsion systems have been properly studied.

5.3.7 Crews will also have to be trained to perform the changeover between fuel types as the ship approaches a SECA and this may be complicated by their different operating temperatures and the type of delivery system employed. Change over procedure should be in line with engine manufacturers recommendation (controlled viscosity at injection)

5.3.8 For instance, cylinder lubricating oil with an alkalinity between 30 to 40 mg KOH/g should be sufficient to neutralize the acidity produced when burning 1.5% sulphur max fuel oil but lub oil requirement would change for higher sulphur percentage fuel oil.

5.3.9 There are questions of FGD industry readiness and capacity, equipment reliability, cost and projecting investment costs against low sulphur fuel cost.

5.3.10 It is understood that many ship owners meanwhile were not getting - or not taking advice on designing newbuildings with the extra storage tanks necessary to burn both low and high sulphur fuels, despite the higher cost of retro-fitting them later.

5.3.11 Owners are asking, 'How can I comply when I have two tanks and one fuel system?' The problem is that too few have devised a strategy for their fleets, which will usually demand a ship-by-ship approach while many others have spent the past seven years with their heads in the sand.

5.3.12 Shipowners could have to look at new bunkering procedures and changes to engine rooms and vessel design.

5.3.13 Also there are warnings that if HFO is the preferred fuel, prolonged running (> 10 hours) on low sulphur fuel should be avoided and to monitor engine condition if frequent change of fuel oil with sulphur content occurs.

5.4 Regulation 15 – Volatile organic compounds (VOCs)

5.4.1 Vapour collection system need to be fitted on new and existing tankers calling at ports or terminals under the jurisdiction of a contracting State to Annex VI who have declared such ports and terminals as VOC controlled. Such collection systems are to be approved by the Administration based on the guidelines contained in MSC/Circ.585, Standards for Vapor Emission Control Systems. Contracting States must notify IMO of the enforcement date, the size of tanker and the type of cargoes that will require emission control, at least 6 months prior to the enforcement date for their respective terminals. Existing tankers without vapour collection system may be accepted by terminals installed with Vapour Emission Control System (VECs) for a period of up to 3 years after the enforcement date for that terminal.

5.4.2 If Administration of a country has designated ports or terminals under its jurisdictions, at which VOC emissions are to be regulated, it shall ensure that vapour emission control systems, approved by the Administration taking into account the applicable safety standards (IMO MSC/Circ. 585) are provided and operated safely and in a manner so as to avoid undue delay to the ship.

5.4.3 IMO would circulate updated list of such ports and terminals among its members.

5.4.4 This regulation shall only apply to gas carriers when the type of loading and containment systems allow safe retention of non-methane VOCs on board, or their safe return ashore.

Additional notes

5.4.5 Informatively, from 2006 VOC reduction plant capable of removing 78% of non-methane VOCs will be mandatory across 95% of Norway's offshore loading operations as authorities target a cut in offshore emissions to meet wider Geneva Convention commitments.

5.4.6 To keep the pressure in the storage tanks below 0.14 bar gauge (a typical contemporary design value) the VOC is discharged to the atmosphere through a pipe from the crude oil tanks. The discharge gas – a mixture of hydrocarbons and inert gas – represents a substantial loss of energy as well as an environmental problem.

5.4.7 The splashing effect combined with the presence of inert gas promotes vapourization of the light fractions, particularly methane, ethane, propane, butane, pentane and other hydrocarbons. VOC gas now vented into the atmosphere contains therefore a range of hydrocarbons plus inert gas.

5.4.8 When crude oil is being taken aboard tanker, the proportion of inert gas can amount to 80% of the emitted volume at the start of the loading to about 30% when the cargo tanks are nearly full.

5.4.9 The composition of hydrocarbon part of the VOC emissions similarly varies during the loading process. The composition of VOC from different oil fields varies considerably. Propane and heavier hydrocarbons account for 87% of the VOCs total energy at one field but only 46% at another oil field.

5.5 Regulation 16 – Shipboard Incineration

5.5.1 New Ships

Incinerators installed onboard ships the keels of which are laid on or after 1 January 2000 must be type approved by Administration / Recognised Organization based on Resolution MEPC.76(40) – Standard Specification for Shipboard Incinerators and shall meet the requirements given in Appendix IV to MARPOL 73/78, Annex VI pertaining to type approval and operating limits for shipboard incinerators.

5.5.2 Existing Ships

For existing ships, new incinerators with a contractual delivery date to the ship of on or after 1 January 2000 must also be type approved as per the above Resolution. (Note: in the absence of a contractual delivery date, the actual delivery of the incinerator to the ship on or after 1 January 2000).

5.5.3 Flag administration may allow approved incinerators as per MEPC.59(33) installed on board a ship before 5th May 2005 but after 1 January, 2000 provided that the ship is solely engaged in domestic voyages of that country from the application of above rule.

5.5.4 Incinerators installed before 1 January 2000 may continue in service, provided no changes have been done which influence the emission characteristics.

5.5.5 MEPC.76(40) addresses electrical and mechanical safe guards, fire protection provisions, emission limits and operational controls together with operator training requirements.

Incineration on Board Ships

5.5.6 Ship board incineration shall only be allowed in a ship board incinerator excepting that incineration of sewage sludge and sludge oil generated during the normal operation of a ship may also take place in the main or auxiliary power plant or boiler, but in those cases it shall not take place when the ship is inside ports, harbors or estuaries.

5.5.7 The Annex also prohibits onboard ship incineration of

1. Annex I, II and III cargo residues and related contaminated packing material,
2. Polychlorinated biphenyles (PCBs),
3. Garbage containing more than traces of heavy metals and
4. Refined petroleum products containing halogen compounds.

5.5.8 Shipboard incineration of polyvinyl chlorides (PVCs) is prohibited except in an incinerator for which an IMO type approval certificate has been issued.

5.5.9 All ships with incinerators subject to this regulation shall be provided with a manufacturer's operating manual which shall describe how to operate the incinerator within the limits specified in Appendix IV of Annex VI. The operators shall be adequately trained and capable of implementing the instructions given in the manufacturer's operating manual.

5.5.10 This Regulation requires the combustion flue gas outlet temperature to be monitored at all times and that waste is not fed into continuous feed shipboard incinerators when the temperature is below the minimum allowed temperature of 850 degrees Celsius. For batch loaded shipboard incinerators, the unit must be designed so that the temperature in the combustion chamber will reach 600 degrees Celsius within 5 minutes of start up.

5.5.11 This regulation does not preclude the development, installation and operation of alternative design shipboard thermal waste treatment device so long as it meets or exceeds the requirements of this regulation.

Additional Note:

5.5.12 It is to be noted that fitment of Incinerator is not a mandatory requirement. However, if one is fitted it is to be as per Regulation 16. Also other than sewage sludge and sludge oil generated during the normal operation of a ship, incineration is prohibited on board ship, and that sewage sludge and sludge oil may be incinerated in the main or auxiliary power plant or boiler, but in those cases it shall not take place when the ship is inside ports, harbours or estuaries.

5.5.13 The Incinerator operating manual and the training requirements are to be incorporated in the ship's Safety Management System Manual.

5.6 Regulation 17 – Reception facilities

5.6.1 This regulation imposes responsibility on Governments (Parties to MARPOL Protocol of 1997) to provide following reception facilities.

- (a) Reception of ozone depleting substances and equipment containing such substances when removed from ships in repair ports.
- (b) Reception of exhaust gas cleaning residues from approved Exhaust Gas Cleaning System where discharge of such residues is not permitted under regulation 13 of this Annex.

Use of such reception facilities should not cause undue delay to ships.

5.6.2 There is provision for visiting ships to report instances of non-availability or inadequacy of reception facilities to their respective flag administration, who in turn would communicate the same to IMO. IMO would circulate such information among member governments.

5.7 Regulation 18 – Fuel oil quality

5.7.1 This regulation calls for new measures governing both the sale and use of bunkers with the objective of ensuring that the fuel oil burnt on board ships do not give off harmful emission.

5.7.2 The fuel oil delivered to and used on board shall be:

- blends of hydrocarbons derived from petroleum refining;
- shall be free from inorganic acid;
- shall not include any added substances or chemical waste which either:
 - adversely affect the performance of machinery;
 - be harmful to personnel;
 - contributes to additional air pollution

5.7.3 Fuel oil derived by methods other than petroleum refining shall not:

- exceed the 4.5% and 1.5% limits required by Regulation 14;
- cause an engine to exceed the NOx emission limits set forth in Regulation 13(3)(a);
- contain inorganic acid; and
 - jeopardize the safety of ships or adversely affect the performance of the machinery, or
 - be harmful to personnel, or
 - contribute overall to additional air pollution.

5.7.4 This regulation does not apply to coal *in its solid form* or nuclear fuels.

5.7.5 Bunker suppliers are required to record details of fuel oil for combustion purposes delivered to ships of 400 GT and above engaged in international voyages by means of a bunker delivery note containing at least following information

- Name and IMO number of receiving ship
- Port
- Date of commencement of delivery
- Name, address and telephone number of marine fuel oil supplier
- Product names(s)
- Quantity (metric tons)
- Density at 15⁰C (kg/m³) (ISO 3675)
- Sulphur content (%m/m) (ISO 8754)

- A declaration signed and certified by supplier's representative that the fuel oil conforms to Annex VI requirements (Regulation 14(1) or 4(a) and 18(1)).

5.7.6 Bunker delivery note for each supply is to be kept on board in a manner for ready availability for inspection for a minimum period of 3 years. Fuel suppliers must also retain a copy of the bunker delivery note for at least three years.

5.7.7 Fuel Suppliers will also be required to provide a representative fuel sample on completion of bunkering. This sample, drawn by the supplier at the ships receiving manifold in accordance with the Resolution MEPC.96(47) – *Guidelines for the sampling of fuel oil for determination of compliance with Annex VI of MARPOL 73/78*, of all supplied fuel oils is to be kept under the ship's control until the corresponding fuel oil has been substantially consumed, but in any case, for at least 12 months from the date of delivery. In this respect 'fuel oils' is to be understood as covering all grades from light gas oils through to heavy residual blend products.

5.7.8 The sample is to be sealed and signed by supplier's representative, and the master or officer in-charge of bunkering on completion of bunkering operation.

- 5.7.9 There are provisions in the regulation for Port State or Flag State authorities
- to verify Bunker Delivery Note and take photocopy of the same duly attested by the Master;
 - to verify the content of bunker delivery note with the port where the note was issued;
 - to take fuel oil sample from ship for verifying conformance with MARPOL 73/78, Annex VI requirements;
 - to ensure that corrective action is taken to bring non-compliant fuel oil discovered into compliance (e.g. de-fueling the ship) and in such cases to inform the administration of the country where the relevant fuel oil was delivered.

5.7.10 Additionally, from 19 May 2005 all fuel oils are to be obtained from duly registered suppliers (registered by the appropriate authorities in the country in which they operate).

5.7.11 This regulation imposes following responsibilities on Governments with respect to supply of bunkers in their respective countries:

1. maintain a register of local suppliers of fuel oil;
2. require local suppliers to provide bunker delivery note and sealed sample as described above;
3. require local suppliers to retain bunker delivery notes as described above;
4. take appropriate action against suppliers found to have supplied non-compliant fuel oil;
5. inform flag administration of ships found to have non-compliant fuel oil during port State Control inspection;

6. inform IMO for circulation among parties to 1997 Protocol to MARPOL Convention all cases where fuel oil suppliers have been found to have supplied non-compliant fuel oil.

Additional notes

5.7.12 The accurate completion of the mandatory (MARPOL, Annex I) Oil Record Book will be an essential element in keeping track of the different fuel grades (in terms of sulphur content) onboard.

5.7.13 Also during change of ownership / management of a vessel the new owner / manager must ensure the availability of Engine Oil Record Book, Bunker Delivery Notes and Fuel Oil samples required to demonstrate compliance with the regulation.

5.7.14 With a 120m tones annual worldwide market, it makes immense sense in ensuring quality control.

5.7.15 Debunkering because of poor quality fuel is an expensive business and may cost in excess of \$100,000 per vessel, depending on port of debunkering and quantity involved.

5.8 Regulation 19 – Requirements for platforms and drilling rigs

5.8.1 MARPOL Annex VI is not applicable to emissions directly arising from the exploration, exploitation and associated offshore processing of sea-bed mineral resources. However, it applies to emission resulting from other activities on board platforms and drilling rigs e.g exhaust emission from diesel engines used solely for purposes other than exploration, exploitation and associated offshore processing of sea-bed minerals, like power supply to crew accommodation, ozone depleting substances used in air-conditioning of crew accommodation etc.

5.8.2 In other words, fixed and floating platforms, including drilling rigs and similar structures, are considered as ships for the purpose of this Annex, except in respect of those emissions to the atmosphere resulting directly from operations solely related to their drilling, production or processing functions. These controls are in addition to any imposed by the government which has jurisdiction over the waters in which they operate.

References:

IMO FP/Circ.23 Halon Banking and Reception Facility

MEPC 47/20 Guidelines for the sampling of fuel oil for determination of compliance with Annex VI of MARPOL 73/78.

MEPC.76(40) Standard specification for shipboard incinerators

MEPC/Circ.344 Interim Guidelines for the application of the NOx Technical Code

MSC/Circ.585 Standards for vapour emission control systems

Chapter 6

Summary of New Responsibilities of Ship Operators

6.1 Responsibilities of Ship operators

6.1.1 These regulations require close attention by Shipowners not only to specific Annex VI machinery and arrangement requirements on board ships but also in ensuring that necessary individual operating procedures are in place and effectively implemented, both onboard and in the office for smooth commercial operation of the vessels. In this Chapter an attempt has been made to summarise the salient new responsibilities of Ship Operators for their quick reference in connection with implementation of MARPOL 73/78, Annex VI. Ship Operators are however requested to read the actual text of Annex VI and NOx Technical Code for all relevant details. The various regulations and corresponding new responsibilities are as given hereunder.

6.2 Regulation 12 – Ozone depleting substances

6.2.1 Ensuring that in service, there is no deliberate emissions of ODS and when those gases are to be disposed off, it must be to appropriate reception facilities provided at ship repair or ship breaking yards. Necessary procedure is to be included in the safety management system.

6.2.2 Ship operators planning to carry out essential maintenance on plant containing ozone-depleting substances, including their replacement, should ensure that adequate reception facilities are available at the intended repair port.

6.3 Regulation 13 – Nitrogen oxides (NOx)

6.3.1 Ensuring the followings for engines which are required to be certified in accordance with NOx Technical Code

- .1 Availability of Statement of Compliance with NOx Technical Code / Regulation 13 or EIAPP Certificate;
- .2 Availability of Technical File;
- .3 Availability and maintenance of Record Book of Engine Parameters.

6.3.2 At change of owner or management, it will be vital for the incoming organisation to ensure the availability of the documentation (i.e. Technical File and Record Book of Engine Parameters) to demonstrate compliance as necessary.

6.4 Regulation 14 – Sulphur oxides (SOx)

6.4.1 Ensuring that vessels which intend trading in and out of Sulphur Oxide Emission Control Areas have a sufficiently segregated fuel oil storage, settling and service tank capacity, together with the necessary change over arrangements, to handle both the fuel oils used outside of SECAs and the 1.5% m/m sulphur maximum fuel oils to be used within the SECAs. In some cases, duplicate engine lubricant storage may also be

necessary to cope with the differing requirements of the two fuel grades. For ships where such arrangements are not possible, conversion work will be necessary. Engine builder may need to be consulted in this regard.

6.4.2 Development of procedure for performing changeover between fuel types as the ship approaches a SECA and incorporating the same in SMS Manual. Change over procedure should be in line with engine manufacturers recommendation (controlled viscosity at injection).

6.4.3 If fitted with Exhaust Gas Cleaning System, procedure for disposal of residues is to be included in SMS documentation.

6.4.4 Ensuring crew training on above procedures.

6.5 Regulation 15 – Volatile organic compounds (VOCs)

6.5.1 To fit VOC collection system on Tankers which intend visiting VOC controlled ports or terminals. These are to be duly approved by the Administration based on the guidelines contained in MSC/Circ.585 - Standards for Vapor Emission Control Systems on Tankers. Detail of enforcement date of such requirement is given in the regulation.

6.5.2 Development of procedure for operation of such collection system and incorporating the same in SMS documentation.

6.5.3 Ensuring crew training on above procedure.

6.6 Regulation 16 – Shipboard Incineration

6.6.1 Ensuring that incinerators installed onboard ships the keels of which are laid on or after 1 January 2000 are type approved based on Resolution MEPC.76(40) – Standard Specification for Shipboard Incinerators and meet the requirements given in Appendix IV to MARPOL 73/78, Annex VI pertaining to type approval and operating limits for shipboard incinerators.

6.6.2 Ensuring that all ships with incinerators subject to this regulation are provided with an manufacturer's operating manual which shall describe how to operate the incinerator within the limits specified in Appendix IV of Annex VI. The Operators are to be adequately trained in implementing the instructions given in the manufacturer's operating manual.

6.6.3 Development of instructions with respect to what are allowed to be incinerated and prohibited from incineration on board ships and incorporating the same in SMS documentation. Maintenance of proper record in Garbage Record Book is to be reemphasized among ship staff.

6.6.4 Ensuring crew awareness on above issue.

6.7 Regulation 18 – Fuel oil quality

6.7.1 Development of bunkering procedure addressing the requirements of this regulation and incorporating the same in SMS documentation. Such procedures are to include maintenance of bunker delivery note, collection and maintenance of representative fuel samples.

6.7.2 Ensuring crew training on above procedure.

6.7.3 Ensuring that fuel oils are obtained from duly registered suppliers (registered by the appropriate authorities in the country in which they operate).

6.7.4 Accurate completion of the mandatory (MARPOL, Annex I) Oil Record Book in keeping track of the different fuel grades (in terms of sulphur content) onboard.

6.7.5 Also during change of ownership / management of a vessel the new owner / manager must ensure the availability of Engine Oil Record Book, Bunker Delivery Notes and Fuel Oil samples required to demonstrate compliance with the regulation.

6.7.6 The Ship owners/ managers have to ensure that

1. all new ships built on or after 19th May, 2005 are issued with International Air Pollution Prevention Certificate (for signatory flag states) or Certificate of Compliance to MARPOL 73/78, Annex VI to ensure unrestricted international trading;
2. all existing ships intending to engage on unrestricted international voyages are issued with International Air Pollution Prevention Certificate (for signatory flag states) or Certificate of Compliance to MARPOL 73/78, Annex VI.

6.7.7 For ships which will be subject to Annex VI, it is for the shipowner to ensure that the necessary valid certification exists and that compliance can be demonstrated at the various scheduled and unscheduled survey stages. While certain aspects of the certification procedure may normally be undertaken by other parties, i.e. the engine builder in the case of the certification of new engines at the manufacturing stage, ultimately that responsibility will rest solely with the shipowner. Any lack of certification, or failure to be able to demonstrate the necessary compliance, will effectively bar a ship from international trade.

Chapter 7

Summary of New Responsibilities of Contracting Governments

7.1 Responsibilities of Contracting Governments

7.1.1 In this Chapter an attempt has been made to summarise the salient new responsibilities of Contracting Governments for quick reference in connection with implementation of MARPOL 73/78, Annex VI. However reference must be made to the actual entire text of Annex VI and NO_x Technical Code for all relevant details. The various regulations and corresponding new responsibilities are as given hereunder.

7.1.2 Apart from survey and certification for issuance and maintenance of EIAPP Certificate and IAPP Certificates Contracting Governments responsibilities would include:

7.1.3 Regulation 15 – Volatile organic compounds (VOCs)

7.1.3.1 If Administration of a country has designated ports or terminals under its jurisdictions, at which VOC emissions are to be regulated, it shall ensure that vapour emission control systems, approved by the Administration taking into account the applicable safety standards (IMO MSC/Circ. 585) are provided and operated safely and in a manner so as to avoid undue delay to the ship.

7.1.3.2 Such Contracting States must notify IMO of the enforcement date, the size of tanker and the type of cargoes that will require emission control, at least 6 months prior to the enforcement date for their respective terminals.

7.1.3.3 Approval of Vapour Collection System based on the guidelines contained in MSC/Circ.585, Standards for Vapor Emission Control Systems.

7.1.4 Regulation 16 – Shipboard Incineration

7.1.4.1 Type approval of incinerators based on Resolution MEPC.76(40) – Standard Specification for Shipboard Incinerators and meeting the requirements given in Appendix IV to MARPOL 73/78, Annex VI pertaining to type approval and operating limits for shipboard incinerators.

7.1.5 Regulation 17 – Reception facilities

7.1.5.1 Ensuring repair ports and ship-breaking facilities in their respective countries provide adequate provision for ships using such facilities for the reception of ozone-depleting substances and equipment containing such substances when removed from ships.

7.1.5.2 Ensuring that ports, terminals and repair ports within their jurisdiction provide adequate provision for the reception of exhaust gas cleaning residue from an approved exhaust gas cleaning system fitted to a ship if the ship is not permitted to discharge the residue into the enclosed port, harbour or estuary.

7.1.5.3 The term “adequate” means that the harbour authority and terminal operator shall provide facilities capable of receiving the types and quantities of prescribed wastes from ships normally using that harbour or terminal taking into account the operational needs of the users of the harbour or terminal, its size and geographical location, the types of ships calling there and any exemptions provided for.

7.1.6 Regulation 18 – Fuel oil quality

7.1.6.1 With respect to supply of bunker within their jurisdiction, Contracting Governments have to ensure the followings:

- .1. maintain a register of local suppliers of fuel oil;
- .2. require local suppliers to provide bunker delivery note and sealed sample as described above;
- .3. require local suppliers to retain bunker delivery notes as described above;
- .4. take appropriate action against suppliers found to have supplied non-compliant fuel oil;
- .5. inform flag administration of ships found to have non-compliant fuel oil during port State Control inspection;
- .6. inform IMO for circulation among parties to 1997 Protocol to MARPOL Convention all cases where fuel oil suppliers have been found to have supplied non-compliant fuel oil.

7.2 Port State Control

7.2.1 Like other IMO instruments there is provision for Port State Control in the detection of violation and the enforcement of the requirements of this Annex including operational requirements.

7.2.2 Action could be taken by port State against any ship, if evidence emerged that the ship has emitted any of the substances covered by Annex VI in violation of the provision of this Annex.

7.2.3 A ship, could also be subjected to PSC inspection concerning operational requirements under this Annex, where there are clear grounds for believing that the master or crew are not familiar with essential shipboard procedures relating to the prevention of air pollution from ships e.g.

- .1. procedures covering the maintenance of refrigeration and firefighting systems using ODS;
- .2. incineration on board ships;
- .3. fuel oil bunkering;
- .4. various aspects covering control of SO_x emission;

- .5. various aspects covering control of NO_x emission;
- .6. control of VOC emission on oil tankers and gas tankers as applicable.

7.2.4 There are provisions in the regulation for Port State authorities

- .1. to verify Bunker Delivery Note (BDN) and take photocopy of the same duly attested by the Master;
- .2. to verify the content of BDN with the port where the note was issued;
- .3. to take fuel oil sample from ship for verifying conformance with MARPOL 73/78, Annex VI requirements
- .4. to ensure that corrective action is taken to bring non-compliant fuel oil discovered into compliance (e.g. de-fueling the ship) and in such cases to inform the administration of the country where the relevant fuel oil was delivered.

Chapter 8

Surveys and Certification

8.1 Ships of 400 GT and above, floating drilling rigs and other platforms to which MARPOL 73/78, Annex VI applies are required to undergo Survey and Certification requirements to demonstrate compliance. There are two components in the Survey and Certification regime.

1. Survey and Certification of Engines;
2. Survey and Certification of Ships

8.2 Engine Survey and Certification

8.2.1 For new engines survey and certification takes place in two steps; the first step is test and certification of parent engine at manufacturers' test bed and the second step is Initial engine survey on-board ships. However, once a parent engine for a group or family of engines have been tested and certified engines from the same family and group need not be tested at manufacturers' test bed. It only needs to undergo an Initial survey on board its intended ship.

8.2.1 Engine Survey at Engine Builder's Test Bed

Pre-certification survey: This survey occurs at engine builder's test bed before an engine is installed onboard a vessel, to ensure the engine meets the NO_x limits. Following satisfactory survey, the Engine International Air Pollution Prevention certificate (EIAPP) is issued for each applicable engine, engine family, or engine group.

8.2.2 Initial Engine Survey on board ship

Initial Certification Survey: This survey occurs after the engine is installed onboard the vessel, but before the engine is placed into service. It ensures that the engine continues to meet the NO_x limits as installed.

- If an engine has an EIAPP, the initial certification survey will primarily ensure that any modifications to the engine's settings are within the allowable adjustment limits specified in the EIAPP and Technical File.
- Provision has been kept in the Code for engines which are uniquely built or are so large that they cannot be tested on a test bed. The initial certification survey of such engines may be carried out on board its intended ship. Initial Surveys will be more comprehensive for these engines, since they have no prior test results.

8.3 Survey of Ship

8.3.1 Scope of this survey covers all elements of MARPOL 73/78, Annex VI e.g. Regulation 12 (Ozone-depleting substances), Reg. 13 (Nitrogen oxides), Reg. 14

(Sulphur oxides), Reg. 15 (Volatile organic compounds), Reg. 16 (Shipboard incineration) and Reg. 18 (Fuel oil quality).

8.3.2 The Code was adopted in 1997 prior to introduction of Harmonized System of Survey and Certification. Hence the existing NOx Code Survey and Certification requirements are not as per HSSC. But subsequently Marine Environment Protection Committee (MEPC) has amended the requirements to align it with HSSC and the same would be applicable. As per HSSC the Surveys would be

Initial Survey;
Annual Survey;
Intermediate Survey;
Renewal Survey, and
Additional Survey

8.3.3 An Initial Survey is carried out before the ship is put into service or before an International Air Pollution Prevention Certificate (IAPP Certificate) in respect of that ship is issued for the first time. This survey is such as to ensure that the equipment, systems, fittings, arrangements and material fully comply with the applicable regulation. It would include verification of EIAPP Certificate issued to engines on board the ship, to which Annex VI applies.

8.3.4 An Annual Survey is carried out within three months before or after each anniversary date of the certificate, including a general inspection of the equipment, systems, fittings, arrangements and material to ensure that they have been maintained in accordance with the regulation and that they remain satisfactory for the service for which the ship is intended. Such annual surveys are to be endorsed on the IAPP certificate.

8.3.5 An Intermediate Survey is carried out within three months before or after the second anniversary date or within three months before or after the third anniversary date of the certificate which takes the place of one of the annual surveys specified above. The intermediate survey is to be such as to ensure that the equipment and arrangements fully comply with the applicable regulation and are in good working order. Such intermediate surveys shall be endorsed on the IAPP certificate.

8.3.6 A Renewal Survey is carried out at intervals specified by the Administration, but generally not exceeding five years. The renewal survey shall be such as to ensure that the equipment, systems, fittings, arrangements and material fully comply with applicable regulation.

8.3.7 An Additional Survey either general or partial, according to the circumstances, is carried out whenever any

important repairs or renewals are made. The survey is such as to ensure that the necessary repairs or renewals have been effectively made, that the material and workmanship of such repairs or renewals are in all respects satisfactory and that the ship complies in all respects with the requirements of this Annex. The Additional survey would include Engine Modification Survey. This survey occurs when an engine overhaul meets the criteria for a major conversion. It ensures that the modified engine complies with the NOx limits.

8.3.8 Application of the ship surveys as given in Regulation 5 to ships under 400 GT would be at the discretion of the relevant Administration.

8.4 Certification

8.4.1 Regulation 6 of MARPOL 73/78, Annex VI makes provision for the issue of an International Air Pollution Prevention (IAPP) Certificate to any ship of 400 GT or more engaged on international voyages. It also requires an offshore installation to have an IAPP Certificate when engaged on voyages to waters under the sovereignty or jurisdiction of another Party to the 1997 Protocol. These certificates will be issued after survey by a certifying authority in accordance with regulations 5, 6 and 7 of these regulations.

8.4.2 For ships constructed before 5th May, 2005, the IAPP certificate shall be issued no later than the first scheduled dry-docking after that date, but in no case later than May 19 2008.

8.4.3 The format of EIAPP is shown at Appendix 1 of NOx Technical Code, whereas format of IAPP Certificate is shown at Appendix 1 of MARPOL 73/78, Annex VI.

8.4.4 It is to be noted that the IAPP Certificate is to be issued with Record of Construction and Equipment identifying how the vessel complies with Annex VI and identification of the various relevant equipments. The purpose of this record is similar to that of Form A or Form B of International Oil Pollution Prevention Certificate.

8.5 Documents required for survey

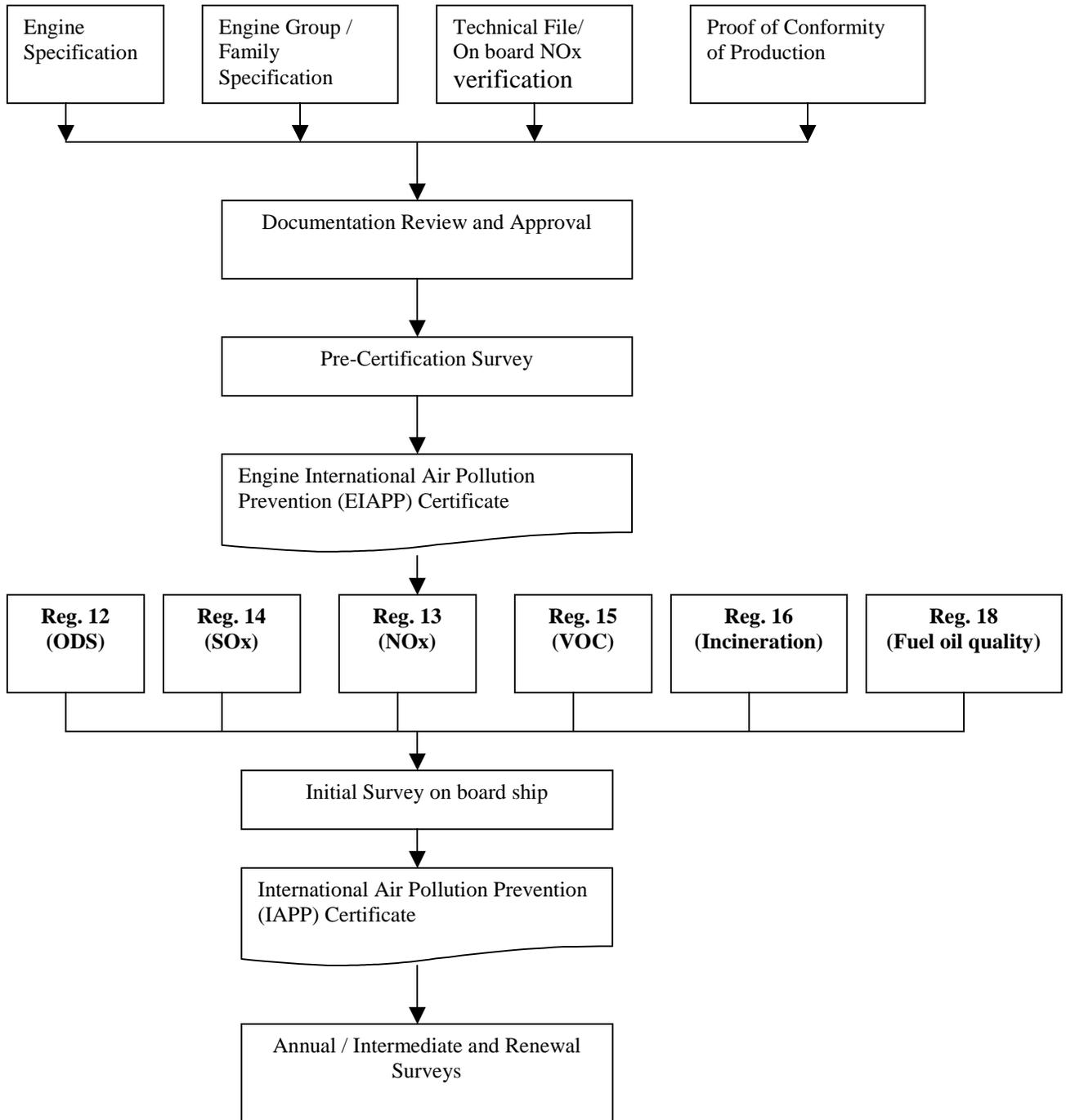
The following documents, as applicable, are required to verify compliance with MARPOL 73/78, Annex VI:

- EIAPP or Statement of Compliance to NOx Technical Code;
- Engine Technical File, and
- Record Book of Engine Parameters.
- Type approval certificate for Vapour Collection System;
- Type approval certificate for Shipboard incinerator
- Garbage Record Book;
- Engine oil record book;

- Record showing disposal of ozone depleting substances and/or equipment containing such substances to shore banking facilities;
- Record showing disposal of exhaust gas cleaning residues when inside ports or terminals to shore reception facilities;
- Bunker delivery notes etc.

Appendix 1

Flow Chart for Survey and Certification to MARPOL 73/78, Annex VI - Regulation for the Prevention of Air Pollution from Ships



ANNEX 2

RESOLUTION MEPC.96(47)

Adopted on 8 March 2002

GUIDELINES FOR THE SAMPLING OF FUEL OIL FOR DETERMINATION OF COMPLIANCE WITH ANNEX VI OF MARPOL 73/78

THE MARINE ENVIRONMENT PROTECTION COMMITTEE,

RECALLING Article 38(a) of the Convention on the International Maritime Organization concerning the functions of the Marine Environment Protection Committee (the Committee) conferred upon it by international conventions for the prevention and control of marine pollution,

RECALLING ALSO that the Conference of Parties to the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), held in September 1997, adopted the Protocol of 1997 to amend MARPOL 73/78 with a new Annex VI on the Prevention of Air Pollution from Ships,

NOTING that regulation 18(6) on fuel oil quality within Annex VI of MARPOL 73/78 requires that the bunker delivery note shall be accompanied by a representative sample of the fuel oil delivered taking into account guidelines to be developed by the Organization,

BEING AWARE that this requirement cannot be enforced before the entry into force of the Protocol of 1997,

BEING AWARE ALSO that relevant Guidelines have to be developed before the entry into force of the Protocol of 1997 in preparation for the implementation of Annex VI of MARPOL 73/78,

HAVING CONSIDERED the draft Guidelines prepared by the Sub-Committee on Ship Design and Equipment at its forty-fourth session,

1 ADOPTS the Guidelines for the sampling of fuel oil for determination of compliance with Annex VI of MARPOL 73/78, as set out in the Annex to this resolution;

2 INVITES Governments to apply the Guidelines from the date of entry into force of the Protocol of 1997.

ANNEX

**GUIDELINES FOR THE SAMPLING OF FUEL OIL FOR DETERMINATION OF
COMPLIANCE WITH ANNEX VI OF MARPOL 73/78**

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1 Preface

The primary objective of these Guidelines is to establish an agreed method to obtain a representative sample of the fuel oil for combustion purposes delivered for use on board ships.

2 Introduction

The basis for these Guidelines is regulation 18(3) of Annex VI to MARPOL 73/78, which provides that for each ship subject to regulations 5 and 6 of that Annex, details of fuel oil for combustion purposes delivered to, and used on board the ship, shall be recorded by means of a bunker delivery note which shall contain at least the information specified in appendix V to that Annex. In accordance with regulation 18(6) of Annex VI, the bunker delivery note shall be accompanied by a representative sample of the fuel oil delivered. This sample is to be used solely for determination of compliance with Annex VI of MARPOL 73/78.

3 Definitions

For the purpose of these Guidelines:

3.1 *Supplier's representative* is the individual from the bunker tanker who is responsible for the delivery and documentation or, in the case of deliveries direct from the shore to the ship, the person who is responsible for the delivery and documentation.

3.2 *Ship's representative* is the ship's master or officer in charge who is responsible for receiving bunkers and documentation.

3.3 *Representative sample* is a product specimen having its physical and chemical characteristics identical to the average characteristics of the total volume being sampled.

3.4 *Primary sample* is the representative sample of the fuel delivered to the ship collected throughout the bunkering period obtained by the sampling equipment positioned at the bunker manifold of the receiving ship.

3.5 *Retained sample* is the representative sample in accordance with regulation 18(6) of Annex VI to MARPOL 73/78, of the fuel delivered to the ship derived from the primary sample.

4 Sampling methods

The primary sample should be obtained by one of the following methods:

- .1 manual valve-setting continuous-drip sampler; or
- .2 time-proportional automatic sampler; or
- .3 flow-proportional automatic sampler.

4.2 Sampling equipment should be used in accordance with manufacturer's instructions, or guidelines, as appropriate.

5 Sampling and sample integrity

5.1 A means should be provided to seal the sampling equipment throughout the period of supply.

5.2 Attention should be given to:

- .1 the form of set up of the sampler;
- .2 the form of the primary sample container;
- .3 the cleanliness and dryness of the sampler and the primary sample container prior to use;
- .4 the setting of the means used to control the flow to the primary sample container; and
- .5 the method to be used to secure the sample from tampering or contamination during the bunker operation.

5.3 The primary sample receiving container should be attached to the sampling equipment and sealed so as to prevent tampering or contamination of the sample throughout the bunker delivery period.

6 Sampling location

For the purpose of these Guidelines a sample of the fuel delivered to the ship should be obtained at the receiving ship's inlet bunker manifold and should be drawn continuously throughout the bunker delivery period.*

7 Retained sample handling

7.1 The retained sample container should be clean and dry.

7.2 Immediately prior to filling the retained sample container, the primary sample quantity should be thoroughly agitated to ensure that it is homogenous.

7.3 The retained sample should be of sufficient quantity to perform the tests required but should not be less than 400 ml. The container should be filled to $90\% \pm 5\%$ capacity and sealed.

8 Sealing of the retained sample

8.1 Immediately following collection of the retained sample, a tamper proof security seal with a unique means of identification should be installed by the supplier's representative in the presence of the ship's representative. A label containing the following information should be secured to the retained sample container:

* The phrase "be drawn continuously throughout the bunker delivery period" in paragraph 6 of the Guidelines should be taken to mean continuous collection of drip sample throughout the delivery of bunker fuel covering each bunker delivery note. In case of receiving an amount of bunker fuel necessitating two or more delivery notes, the sampling work may be temporarily stopped to change sample bags and bottles and then resumed as necessary.

- .1 location at which, and the method by which, the sample was drawn;
- .2 date of commencement of delivery;
- .3 name of bunker tanker/bunker installation;
- .4 name and IMO number of the receiving ship;
- .5 signatures and names of the supplier's representative and the ship's representative;
- .6 details of seal identification; and
- .7 bunker grade.

8.2 To facilitate cross-reference details of the seal, identification may also be recorded on the bunker delivery note.

9 Retained sample storage

9.1 The retained sample should be kept in a safe storage location, outside the ship's accommodation, where personnel would not be exposed to vapours which may be released from the sample. Care should be exercised when entering a sample storage location.

9.2 The retained sample should be stored in a sheltered location where it will not be subject to elevated temperatures, preferably at a cool/ambient temperature, and where it will not be exposed to direct sunlight.

9.3 Pursuant to regulation 18(6) of Annex VI of MARPOL 73/78, the retained sample should be retained under the ship's control until the fuel oil is substantially consumed, but in any case for a period of not less than 12 months from the time of delivery.

9.4 The ship's master should develop and maintain a system to keep track of the retained samples.

MEPC/Circ.344 issued 19 November 1998

INTERIM GUIDELINES FOR THE APPLICATION OF THE NO_x TECHNICAL CODE

1. The Conference of Parties to the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, held from 15 to 26 September 1997 in conjunction with the Marine Environment Protection Committee's fortieth session, adopted, in Conference Resolution 2, the Technical Code on Control of Emission of Nitrogen Oxides from Marine Diesel Engines (The NO_x Technical Code).
2. The purpose of the NO_x Technical Code is to establish mandatory procedures for the testing, survey and certification of marine diesel engines which will enable engine manufacturers, shipowners and Administrations to ensure that all applicable marine diesel engines comply with the relevant limits for emission values of NO_x as specified in regulation 13 of Annex VI to MARPOL 73/78.
3. It is noted that regulation 13 of MARPOL Annex VI is intended to be applied to diesel engines installed on ships constructed on or after 1 January 2000. While the requirements of the regulation could not be enforced before the entry into force of the Protocol of 1997, it should be clearly understood that engines installed on ships constructed on or after 1 January 2000 or engines which undergo a major conversion on or after 1 January 2000 will have to meet these requirements once the Protocol enters into force.
4. To allow uniform application of the Code, and to assist Administrations in certifying engines in accordance with it, prior to the date of entry into force of Annex VI, the guidelines attached at annex to this Circular are recommended to be used.

ANNEX

INTERIM GUIDELINES FOR THE APPLICATION OF THE NO_x TECHNICAL CODE

1. Each engine which will become, retrospectively, subject to the provisions of regulation 13 of Annex VI of MARPOL 73/78 upon its entry into force, should be certified in accordance with the requirements of the NO_x Technical Code.
2. Pending entry into force of Annex VI and upon satisfactory compliance with the Code requirements, a "Statement of Compliance" with the NO_x Technical Code should be issued by the flag State Administration, or an organization acting on behalf of that Administration. Such a Statement of Compliance should contain as a minimum the information as required by appendix 1 of the NO_x Technical Code.
3. The Statement of Compliance is intended as an interim measure pending issuance of the Engine International Air Pollution Prevention (EIAPP) and/or International Air Pollution Prevention (IAPP) Certificate upon entry into force of Annex VI.
4. Administrations are urged to take into consideration the Statement of Compliance when issuing certificates in accordance with Annex VI, whether or not the Statement of Compliance was issued by their Administration, or organizations acting on their behalf, or by other Governments.

BIMCO Fuel Sulphur Content Clause for Time Charter Parties

In response to developments within the past few years concerning the regulation at international and regional levels of air pollution from ships which has led to fines being levied on shipowners, a new clause has been developed and adopted by BIMCO.

MARPOL Annex VI and EU Directive 1999/32/EC set out regulations for the prevention of air pollution from ships, including designating special sulphur emission control areas within which vessels may only use low sulphur marine fuels.

The BIMCO Fuel Sulphur Clause is designed to protect the owners under a time charter party against the consequences of the charterers supplying the vessel with fuel oils with higher sulphur content than permitted within the geographical area in which the charterers are trading the vessel.

It should be noted that the present ISO Marine Fuel Standards do not take these new sulphur emission regulations into account and therefore owners cannot rely solely on a reference in the charter party requiring the charterers to provide fuels which comply with the present ISO Standard.

BIMCO Fuel Sulphur Content Clause for Time Charter Parties

Notwithstanding anything else contained in this Charter Party, the Charterers shall supply fuels of such specifications and grades to permit the Vessel, at all times, to meet the maximum sulphur content requirements of any emission control zone when the Vessel is trading within that zone. The Charterers shall indemnify, defend and hold harmless the Owners in respect of any loss, liability, delay, fines, costs or expenses arising or resulting from the Charterers' failure to comply with this Clause.

For the purpose of this Clause, "emission control zone" shall mean zones as stipulated in MARPOL Annex VI and/or zones regulated by regional and/or national authorities such as, but not limited to, the EU and the US Environmental Protection Agency.

Dated 12 August 2004