Prevention of Air Pollution from Ships
Revised MARPOL Annex VI and
NOx Technical Code 2008

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Prevention of Air Pollution from Ships
MARPOL Annex VI-2008 (Adopted)

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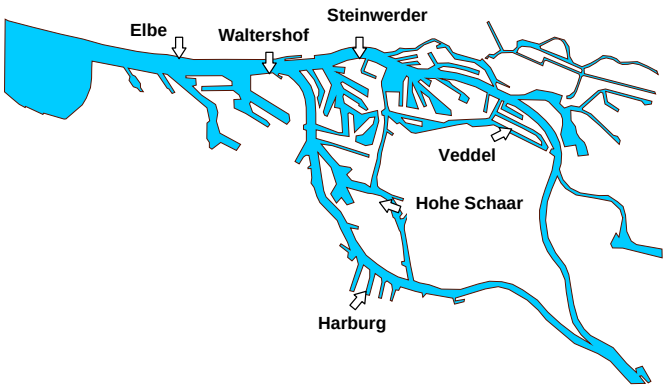
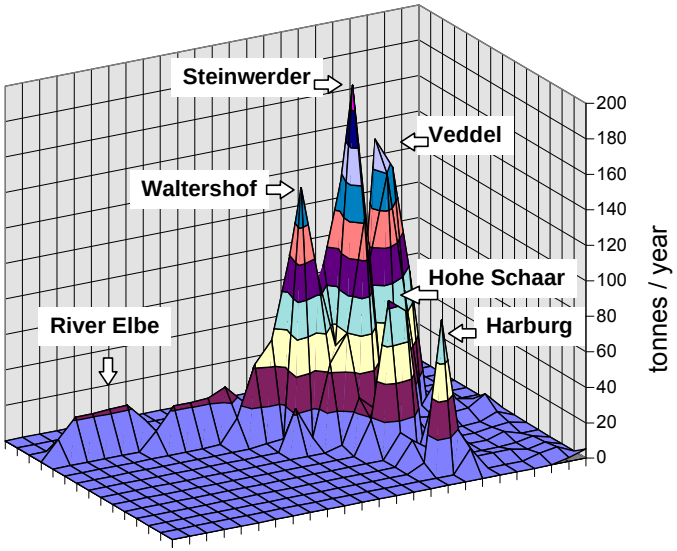
Hamburg Port Area





Hindsight

25 years ago

GL develops an emission cadastre for the Hamburg port area on behalf of the Senat for environmental affairs of the Free and Hanseatic City of Hamburg

Hindsight

20 years ago

GL starts investigating exhaust emission measurement technologies suitable for on-board measurements and arranges research projects focussing on the assessment of exhaust gas emissions from marine diesel engines using heavy fuel oil and on possible emission reduction technologies

CLEAN
Verbundvorhaben Emissionsarme Schiffsantriebsanlage

Hindsight

15 years ago

- IMO starts drafting
  regulations for the prevention of air pollution from ships
- At the same time, ISO is developing standards for the measurement of exhaust gas emissions from combustion engines → ISO 8178-1 ff.

Hindsight

13 years ago

- In September 1997,
  Annex VI to the International MARPOL Convention
  was adopted by a 'Diplomatic Conference'

  → MARPOL Annex VI
- Applies to all ships
- Regulation 13 (NOx) applies to Diesel engines >130 kW, installed on ships with a keel-laying date from 1. 1. 2000 onwards

Hindsight

7 years ago

- Germany has ratified MARPOL Annex VI
  and transferred the provisions into national law

5 years ago

- MARPOL Annex VI enters into force on 19 May, 2005

- The IMO

  starts a comprehensive Review of MARPOL Annex VI

- Review of MARPOL Annex VI

- MEPC (Marine Environment Protection Committee) delegates the drafting to BLG (Bulk, Liquid and Gases Sub-Committee)
- 2006, spring: BLG 10
- November 2006: Intersessional working group BLG WGAP 1 in Oslo
- 2007, spring: BLG 11
- November 2007: Intersessional working group BLG WGAP 2 in Berlin
- 2008, February: BLG 12 Draft Annex VI and NOx Technical Code, Report to MEPC 57
- 2008, April: MEPC 57: Final Draft, forwarded to MEPC 58 for adoption
- 2008, October: MEPC 58: Annex VI (2008) and NOx Technical Code (2008) adopted

Insight

Non-NOx/SOx/Fuel Regulations
Chapter I

- *Regulation 1: Application*
  - Annex VI shall apply to all ships
- *Regulation 2: Definitions*
  - Additional definitions aiming for clarification
    (based on ten years experience)

Insight

Non-NOx/SOx/Fuel Regulations

Regulation 3 – Exceptions and Exemptions

Trials
for Ship Emission Reduction and Control Technology Research

- Administrations may grant exemptions in case of long term trials:

  - Marine diesel engine **up to 30 litres** displacement per cylinder: The duration of the sea trial shall not exceed **18 month**. An extension for one additional 18-month period may be granted.
  - Marine diesel engine **above 30 litres** displacement per cylinder: The duration of the sea trial shall not exceed **5 years**. An extension for another period not exceeding 5 years may be granted. The trial shall be subject to a progress review.

Insight

Non-NOx/SOx/Fuel Regulations

Regulation 3 – Exceptions and Exemptions

Emissions from Sea-bed Mineral Activities

Former Regulation 19 is now included within Regulation 3.
The content has not been amended.

Emissions directly arising from the exploration, exploitation and associated offshore processing of sea-bed mineral resources are exempted from the provisions of MARPOL Annex VI.

Insight

Non-NOx/SOx/Fuel Regulations

Regulation 4 – Equivalents

- The Administration of a Party may allow alternatives to that required in the Annex if such alternative is at least as effective in terms of emission reductions as that required by this Annex.
- The Administration of a Party which allows the use of an equivalent shall endeavour not to impair or damage the environment, human health, property or resources.

Insight

Non-NOx/SOx/Fuel Regulations
Chapter II

Regulations 5 to 11:
Surveys, Certification, and Means of Control

No major amendments, in principle

Insight

Non-NOx/SOx/Fuel Regulations
Chapter III

Regulation 12 – Ozone depleting substances

- Installations which contain ozone depleting substances shall be prohibited on ships on or after 19 May 2005.
- Installations which contain HCFCs shall be prohibited on ships on or after 1 January 2020.
- Each ship* shall maintain a list of equipment** containing ozone depleting substances and an Ozone Depleting Substances Record Book.

* Every ship of 400 gross tonnage and above which has rechargeable systems that contain Ozone Depleting Substances.

** Equipment subject to this regulation

Insight

Non-NOx/SOx/Fuel Regulations

Regulation 15 – Volatile Organic Compounds (VOC)

- Tanker carrying crude oil shall have onboard and implement a VOC management plan which shall be specific to each ship and shall at least:
  - provide written procedures for minimizing VOC emissions during the loading, sea passage and discharge of cargo;
  - give consideration to the extra VOC generated by crude oil washing;
  - identify a person responsible for implementing the plan; and
  - for ships on international voyages, shall be written in the working language of the master and officers (if this is not English, French or Spanish a translation into one of these languages to be included)

Insight

Non-NOx/SOx/Fuel Regulations

Regulation 16 – Shipboard Incineration

- Shipboard incineration of the following substances is prohibited additionally to those as specified in Annex VI 1997:
  - sewage sludge and sludge oil which are not generated on board the ship; and
  - exhaust gas cleaning system residues

Insight

Non-NOx/SOx/Fuel Regulations

Regulation 17 – Reception Facilities

Each Party (Flag State signatory to Annex VI) undertakes measures to ensure the provision of adequate reception facilities for the needs of ships using their ports. If a particular port of a Party is remotely located and therefore cannot accept ozone depleting substances or exhaust gas cleaning residues, then the Party shall inform the IMO so that the information may be circulated. Guidelines to be developed.

Insight

NOx - Regulations

Regulation 13 – Nitrogen Oxides (NOx)

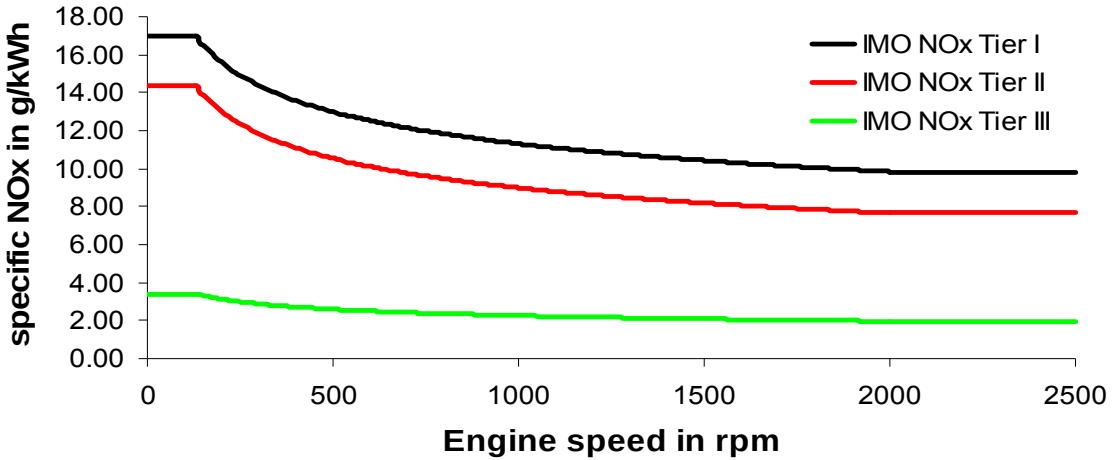
Regulation 13 applies to each marine diesel engine with a power output of more than 130 kW installed on a ship constructed (keel-laying date):

Tier I	on or after 1 January 2000 and prior to 1 January 2011
Tier II	on or after 1 January 2011
Tier III	on or after 1 January 2016 when the ship is operating in an Emission Control Area (ECA)

Insight

NOx - Regulations

Regulation 13 – Nitrogen Oxides (NOx)



	Remarks
Tier I	Current IMO NOx emission level
Tier II	Approx. minus 2,5 g/kWh (approx. -15% to - 22%) reduction compared to Tier I. (achievable by Engine Internal Measures)
Tier III	80% reduction from Tier I. Applicable in regional Emission Control Areas (ECAs). Exhaust Gas After-treatment. Outside the ECAs Tier II limits are applicable.

Insight

NOx - Regulations

Regulation 13 – Nitrogen Oxides (NOx)

Special provisions of Tier III:

- Tier III will apply in ECAs only (Emission Control Area)
- In sea areas where Tier III does not apply, Tier II is applicable
- Tier III shall not apply to a marine diesel engine installed on a ship
  - with a length of less than 24 metres when it has been designed, and is used solely, for recreational purposes, or
  - with a total rated diesel engine propulsion power of less than 750 kW if the ship cannot comply due to design or construction limitations of the ship.
- In 2012, the status of the technical developments shall be reviewed and, if necessary, the entry into force date shall be adjusted.

Insight

NOx - Regulations

Regulation 13 – Nitrogen Oxides (NOx)

- ‘Major Conversion’ (major engine conversion)
  - engines on ships constructed prior to 1 January 2000: Tier I
  - engines on ships constructed on or after 1 January 2000: The standard in place at the time the ship was constructed (keel-laying date)

Insight

NOx - Regulations

Regulation 13 – Nitrogen Oxides (NOx)

- Replacement engine or additional engine
  - Replacement by an **identical engine** in terms of type, model, performance set up, etc. :
    No requirements exceeding those applicable for the former engine
  - Replacement by a **non-identical engine:**
    Standards in force at the **time of the installation** apply
  - Installation of an **additional engine**:
    Standards in force at the **time of the installation** apply
  - **Replacement engines only**: On or after 1 January 2016 Tier II may be applicable if it can be proven that it is not possible to meet Tier III. Guidelines need to be developed.

Insight

NOx - Regulations

Regulation 13 – Nitrogen Oxides (NOx)

Pre-2000 Ships (Existing Engines)

Tier I will be applicable for engines with a power output of more than 5,000kW and a cylinder displacement ≥ 90 litres installed on ships constructed on or after 1 January 1990 and prior to 1 January 2000 if an Approved Method (NOx reduction method) for that engine has been certified by a Party to Annex VI, was notified to IMO, and is commercially available.

- Applies no later than the first renewal survey that occurs 12 month or more after the Approved Method has been certified.

If the Approved Method is commercially not available it has to be installed during the next annual survey...

Insight

NOx - Regulations

Regulation 13 – Nitrogen Oxides (NOx)

What is an Approved Method?

An Approved Method is any device, equipment, adjustment, document which brings an engine in compliance with IMO NOx Tier I or confirms that it is.

The certification of an Approved Method shall include the verification

- by the designer of the base marine diesel engine that the engine rating decreases by no more than 1.0%, the fuel consumption increases by no more than 2.0% and that there is no adverse effect on engine durability and reliability.
- that the cost of the Approved Method is not excessive (Cost-Effectiveness formula is provided).

Insight

NOx - Regulations

Regulation 13 – Nitrogen Oxides (NOx)

- Testing, survey and certification of marine diesel engines shall be done in accordance with the provisions of the NOx Technical Code
  - The main principles of the NOx Technical Code remain valid
  - The requirements for the Test Cycles were adjusted to reflect the special needs of Tier III engines and after treatment systems,
    esp. 25% load point

Insight

SOx, PM, Fuel - Regulations

Regulation 14

Sulphur Oxides (SOx) and Particulate Matter (PM)

Sulphur content of any fuel oil globally shall not exceed :

- 4.50% m/m S prior to 1 January 2012
- 3.50% m/m S on and after 1 January 2012
- 0.50% m/m S on and after 1 January 2020

Insight

SOx, PM, Fuel - Regulations

Regulation 14

Sulphur Oxides (SOx) and Particulate Matter (PM)

- Review provision:

  A review shall be completed by 2018 in order to determine the availability of 0.50% m/m S fuel oil.

  If the parties take the decision that it is not possible for ships to comply then the application date for the standard shall be postponed to 1 January 2025.

Insight

SOx, PM, Fuel - Regulations

Regulation 14

Sulphur Oxides (SOx) and Particulate Matter (PM)

Sulphur content of any fuel oil
used in Emission Control Areas (ECA) shall not exceed:

- 1.50% m/m S prior to 1 July 2010
- 1.00% m/m S on and after 1 July 2010
- 0.10% m/m S on and after 1 January 2015

- At present two SECAs worldwide are designated :
  - Baltic Sea since 2006
  - North Sea/Channel since 2007
  - others to follow

Insight

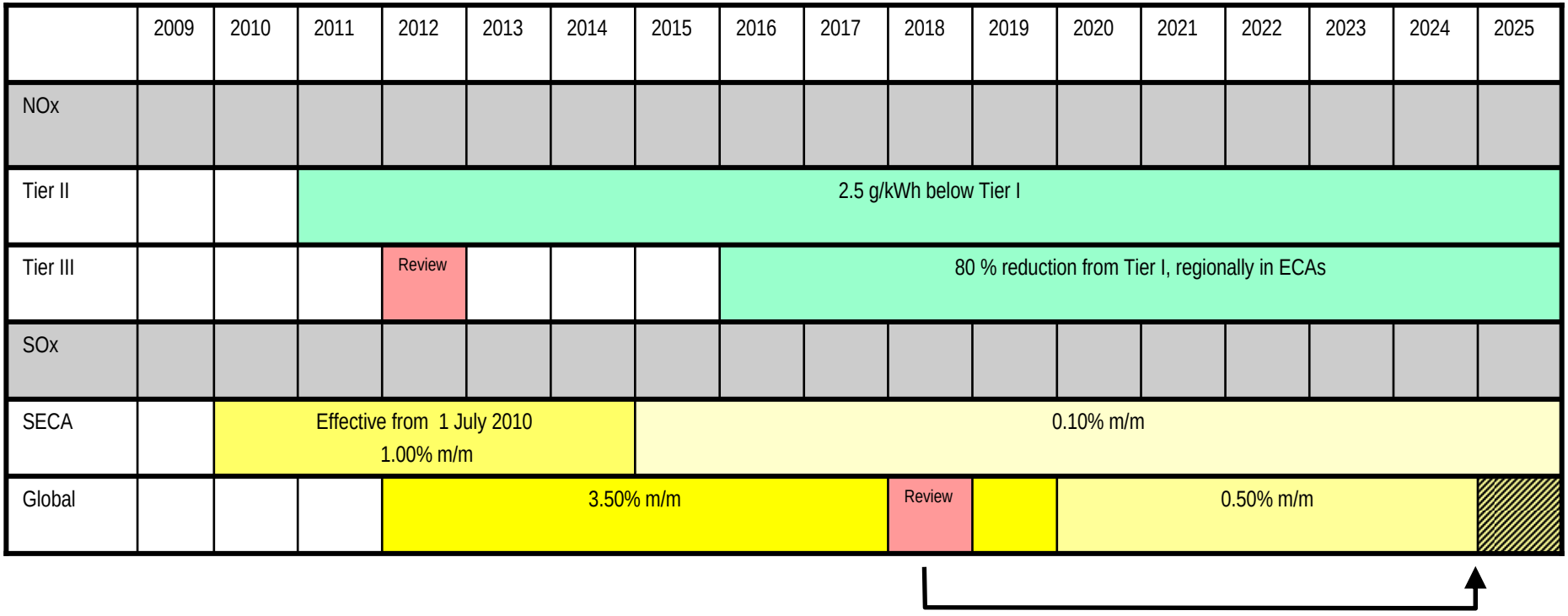
Revised MARPOL Annex VI
SOx, PM, Fuel

Particulate Matter (PM)

→ covered by the reduction of the fuel sulphur content

Insight

NOx, SOx, PM, Fuel - Regulations
Regulation 13 and Regulation 14



Insight

Fuel Regulations

Regulation 18 – Fuel Oil Availability and Quality

- Regulations on Fuel Oil Availability have been added in order:
  - to urge Parties to promote fuel oil availability of the necessary quality within their ports
  - to maintain ship operation in cases where fuel oil of the necessary quality was not available
  - to collect and spread information on fuel oil availability
- Regulations on Fuel Oil Quality have not been amended, however, the ISO is requested by IMO to review the Fuel Oil Quality characteristics and to provide recommendations on possible specifications.

Insight

Fuel Regulations

Regulation 18 – Fuel Oil Availability and Quality

- Paragraphs of Regulation 18 addressing the Bunker Delivery Note and the fuel sample do not apply to gas fuels such as LNG, CNG, or LPG
- The sulphur content of gas fuels delivered to a ship for combustion purposes onboard that ship shall be documented by the supplier

Foresight

Review of MARPOL Annex VI-2008

- Pending entry into force of the revised Annex VI, each engine to which the NOx Tier II requirements will apply, shall be certified in accordance with the revised NOx Technical Code 2008 and a Statement of Compliance should be issued accordingly
  - Entry into force of MARPOL Annex VI-2008:
    1 July 2010

Thank you for your attention!