



Mitigation measures for air emissions

**MARTOB activity restricted to:
Sulphur Regulations in European Waters
New Challenges for the Marine Industry**

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Content



- The MARTOB project**
- Proposed legislation as basis for the work**
- Project findings**
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The MARTOB Project 2001 – 2004

On Board Treatment of Ballast Water and Application of Low-sulphur Marine Fuels



Partners involved in low sulphur fuel activities:

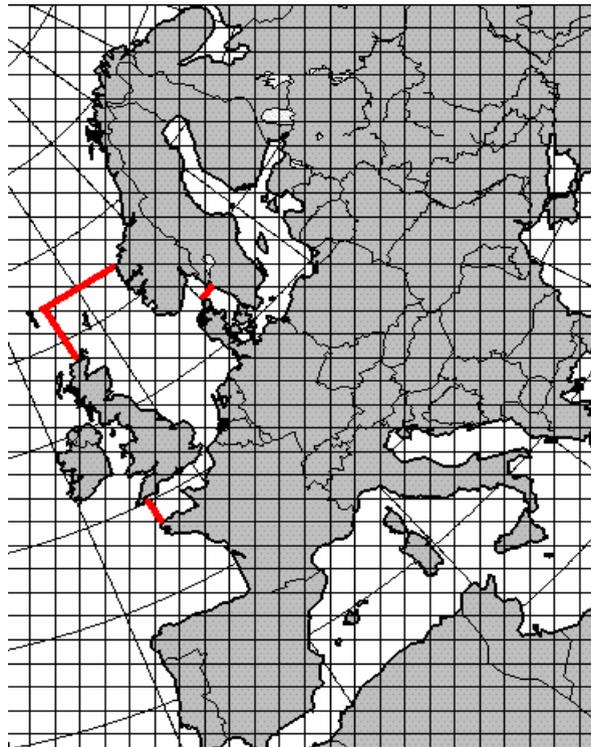
Wallenius Wilhelmsen, Shell Marine Products, MAN B&W, Norwegian Shipowners' Association, Fueltech, University of Newcastle, MARINTEK

Project activities:

- State-of-the-art European marine fuel market**
- Future availability of low-sulphur marine fuels**
- Technical implications for machinery systems**
- Operational aspects of a sulphur cap on marine fuels**
- Verification of compliance with sulphur cap regulation**

Reference: 30 European based ship owners consulted through questionnaire

IMO – MARPOL Annex VI



- ❑ Adopted at IMO Diplomatic Conference 1997
- ❑ Global sulphur cap of 4.5% for HFO burned by ships
- ❑ Designated two SOxECAs, Baltic Sea (1997) and North Sea & English Channel (2000), sulphur cap of 1.5%
- ❑ Enter into force internationally one year after ratified by 15 flag states representing 50% of gross tonnage of world's merchant shipping, probable ratification winter 2003/2004

SOxECA Border (MARPOL)



Directive 1999/32/EC

Various amendments under discussions during 2003

MARTOB consideration based on assumption:

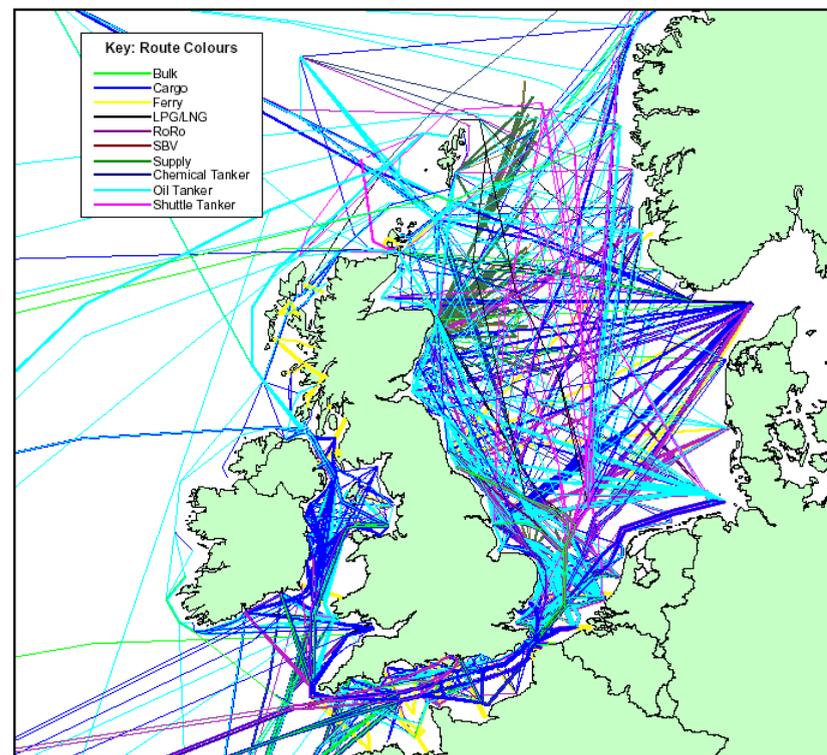
- ❑ **In the North Sea & Baltic:
All ships to use < 1.5% S fuel**

- ❑ **Throughout the EU:
All regular passenger vessels to use < 1.5% S fuel by 2007**

- ❑ **In all EU ports:
All ships at berth to use < 0.2% S fuel (0.1% by 2008)**

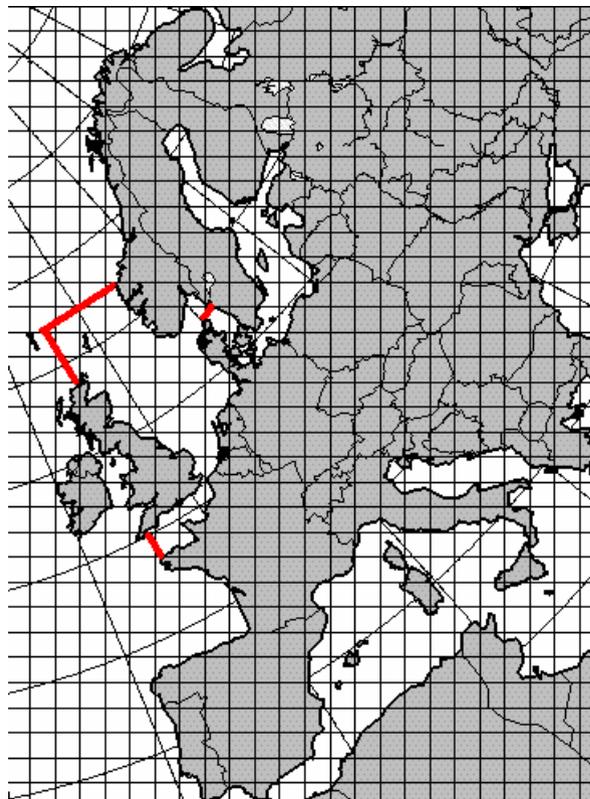
Elements affecting impact of new legislation

- ❑ Area with complex trading patterns
- ❑ Operational time inside SO_xECA varies between 0-100% of total time
- ❑ Large number of different trades, type of ships, sizes of ships, implicating a variety of ship designs
- ❑ Large bunker market, including bunker export for use outside SO_xECA
- ❑ More than 500 ports/loading points



Source: ST-8639-MI-1-Rev 01, Safetec UK Ltd, December 1999

Main findings: Operational aspects



Conclusion depend on ship and trade:

- ❑ **European coastal vessels:**
Continuous LS operation,
LSHFO, MDO, MGO
- ❑ **Inter Continental trade:**
HS HFO outside SO_xECA, LSHFO inside
- ❑ **Inter European / US trade:**
Dependent on number of roundtrips, port calls etc.
- ❑ **Choice of investment in fuel system/cleaning systems vs. increased operational cost will be trade dependent.**

SO_xECA Border (MARPOL)



Main findings: Fuel availability

- ❑ A number of studies performed to assess fuel consumption in European waters. Results are not consistent.
- ❑ MARTOB estimates fuel oil sale figures to be 42 Mt (2001). This does not include distillates.
- ❑ MARTOB estimates demand for low sulphur fuel oil (LSHFO) to be in the range of 17-20 Mt by 2007.
- ❑ Present supply of LSHFO has been estimated to 6.5 Mt, with an estimated marine share of less than 10%.
- ❑ No clear indication from oil majors on how the increasing demand will be met (crude-mix, blending, re-direct from land use, desulphurisation)



Main findings: Technical aspects

Operation on low sulphur fuel, including switch between fuel qualities technically feasible, but be aware:

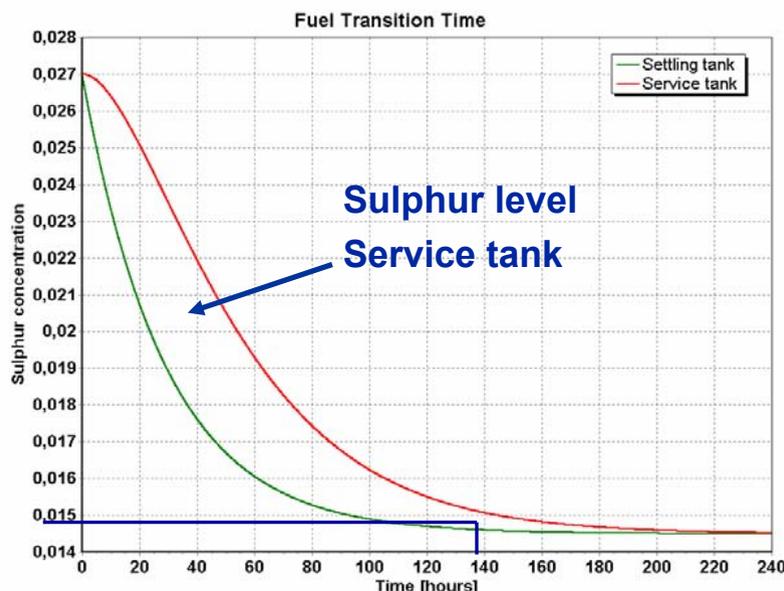
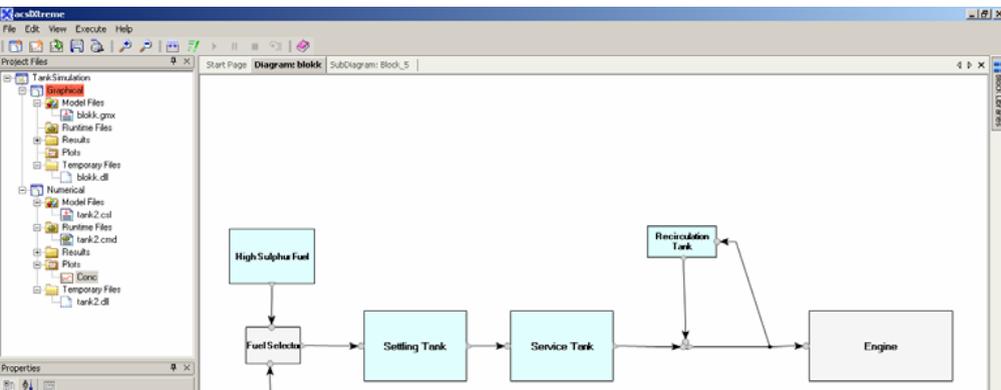
- ❑ Change over procedure should be in line with engine manufacturers recommendation (controlled viscosity at injection)**
- ❑ Sulphur content of fuel and engine lubricant Base Number must be balanced**
 - Avoid > 10 hours on low sulphur if HFO preferred fuel**
 - Use more than one lubrication oil quality for dual fuel operations**
- ❑ Monitor engine conditions if frequent change over between varying sulphur contents.**



Technical & operational impact

- ❑ **MARTOB not capable of producing one clear conclusion or present one uniform "best practice guideline" due to:**
 - **Complexity of trading pattern and ship types**
 - **Diversity in fuel oil system design**
 - **Variety in fuel preferences**
- ❑ **MARTOB has assessed technical and operational aspects, and provides guidance and input for solutions on these aspects, covering a number of alternative approaches for future compliance**

Time needed for change over – a major issue



- ❑ Vessels with single fuel system must pay attention to needed change over time and fuel handling procedures.
- ❑ Time from change over of supply to settling tank to LSHFO to engine may take 1-6 days
- ❑ Relevant issue for the majority of ship owners approached by the project

Safety aspects single service/settling tanks

Experience From **Blended**, Low Sulphur Fuel
Quality: Not OK!
Separation process impossible.



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- ❑ Fairly complex changeover procedure, especially if tank draining/low tank level operation is practiced, risk for faulty operation.
- ❑ Operation involves mixing of two fuel qualities in all fractions, high exposure to operation problem due to fuel incompatibility.
- ❑ Complexity in procedures impede verification of compliance.



Monitoring of compliance

- ❑ **Monitoring of compliance, and legal framework for dealing with non-compliance, an important element for successful implementation**
- ❑ **Monitoring should be based on:**
 - **Onbord log books**
 - **Fuel oil test records**
- ❑ **Maritime administrations should prepare to answer questions related to requirements for fuel systems and fuel segregation, fuel sampling, log book procedures**

*Those ships using separate fuel oils to comply with paragraph (4)(a) of this regulation shall allow sufficient time for the fuel oil service system to be fully flushed of all fuels exceeding 1.5% m/ m sulphur content prior to entry into SOx Emission Control Area. The volume of low sulphur fuel oils (less than or equal to 1.5% sulphur content) in each tank as well as the date, time, and position of the ship when any fuel-changeover operation is completed, shall be recorded in such log-book **as prescribed by the Administration** (Annex VI Reg. 14)*

Control regime



Proper control regime is essential to avoid unfair competition from more lenient operators

Quoted from UNEW report:

“The practice to maintain documentary evidence of fuel oil quality standards laid down under regulation 18 of Annex VI of MARPOL 73/78 must be firmly adhered to so that a legally sound method can be documented for follow up of non-compliance vessels. Due to the possibilities of falsification of documentary evidence and samples, and also the cost and labour associated with undertaking a high percentage of investigation calls for additional verification procedures. These additional verification procedures should be designed to allow identification of possible non-compliance warranting a more detailed default investigation.”

Recommended further work

- ❑ **Improve estimates on quantification of impact of new regulations. Fuel supplier industry should assist in providing assessment of how demand will be met and improved cost-estimates.**
- ❑ **Development of fuel testing standards. ISO/CIMAC standards (e.g. ISO 10307-2) and methodology for testing of fuel stability may not be adequate**
- ❑ **Procedures for change over for dual/multi fuel operation. Operators must prepare for new requirements. Change over procedures dependent on trade, ship design and power plant layout**
- ❑ **Operational feedback related to dual fuel operation must be collected and disseminated to end users (future "best practice guidelines" for new and existing ships)**
- ❑ **Monitoring equipment development
User friendly emission monitoring equipment not available**



Summary:

- ❑ **Important for shipowners to keep informed and assess own options**
- ❑ **Shipowners heading for a period of uncertainty. New operational experience about to be gained – be prepared**
- ❑ **Fuel quality likely to again become an issue – stability margin of "new" products uncertain**
- ❑ **A push for acceptance of onboard exhaust aftertreatment as equivalent option. Issue of waste handling (dump or treat) or availability of "tamper proof" continuous monitoring equipment not properly addressed so far, hence a significant risk in investment today.**
- ❑ **Future operational costs will increase – individual paths to minimise level of increase**
- ❑ **Marine administrations must be prepared to provide guidance on enforcement of new regulations**



Dissemination

Nov 2003

NSA seminar in Oslo on coming sulphur regulations

- **45 delegates, shipowners, bunker suppliers, equipment manufacturers, authorities**
- **Presentations, proposed legislation, availability LSHFO, operational challenges**
- **Group discussions, status, policy, plans, need for common actions, joint industry**

Conclusions:

- **Concern regarding control regime and enforcement not harming competitiveness of serious players**
- **Need for joint industry project, both regarding information handling, communication and systemisation, technical operational experience**



Dissemination, cont.

March 24, 2004

NSA mini-seminar in Oslo – follow up

- **Presentation of drafted Joint Industry Project**
- **Short status reports, four ship operators + SMP**
- **Project discussions**

Conclusions:

- **Several ship operators have prepared machinery design for newbuildings and plans for operation/procedures/retrofit of existing ship**
- **Some ship operators have started rebuild programs as ships pass normal drydock schedule**
- **Joint industry project decided**