



# MARTOB – Application of low sulphur marine fuels New challenges for the Marine Industry

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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**

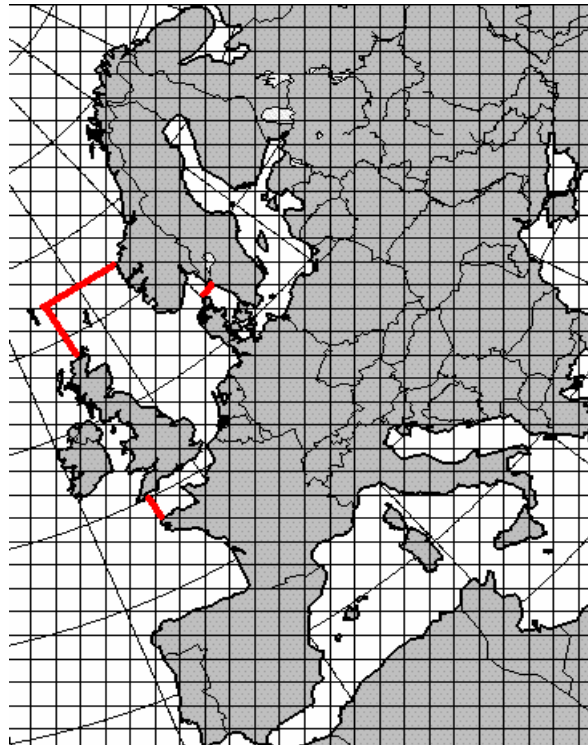
**Project activities:**

- 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

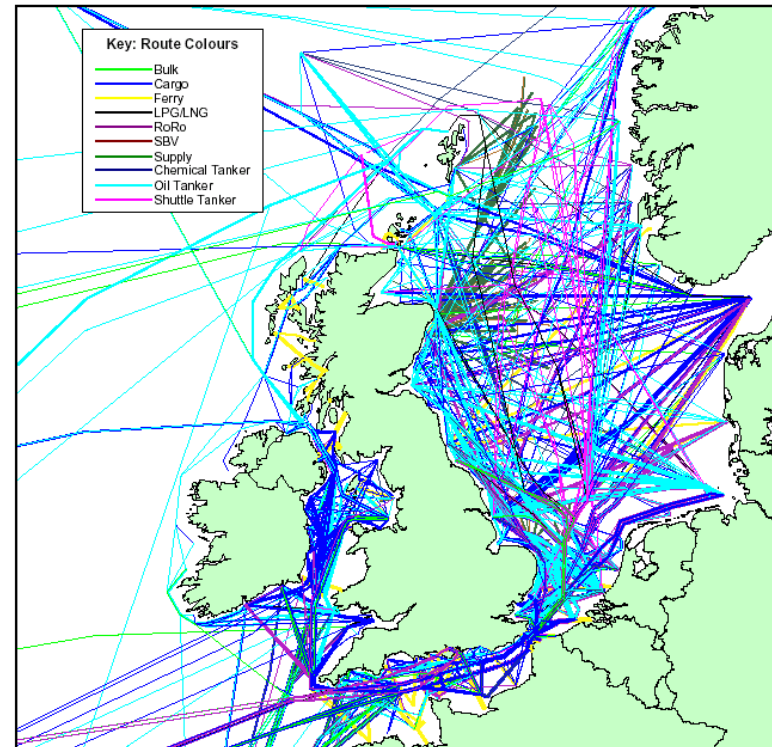
**MARTOB consideration based on assumption:**

- ❑ **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 SOxECA 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 SOxECA
- ❑ More than 500 ports/loading points



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

## 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)

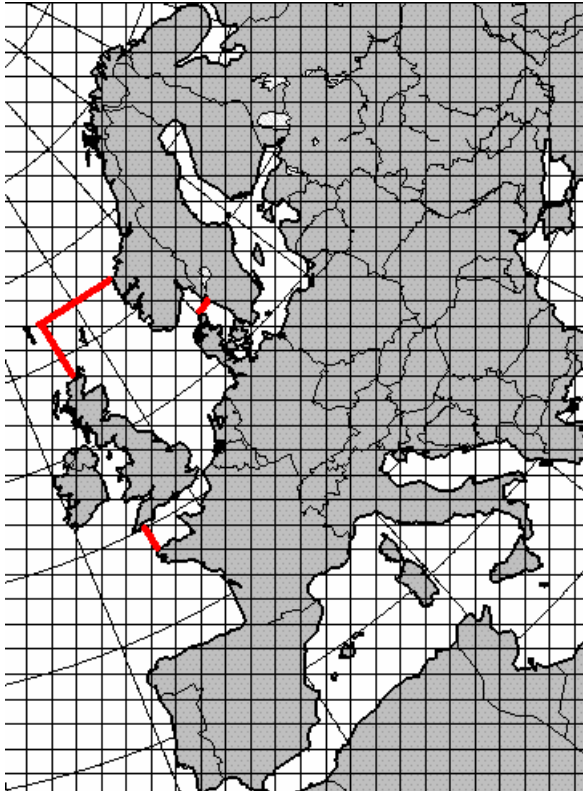


## Technical & operational impact

- ❑ **MARTOB not capable of producing one clear conclusion or present one uniform "best practice guideline" due to:**
  - **Diversity in fuel oil system design**
  - **Variety in power plant layout**
  - **Complexity of trading pattern and ship types**
  - **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**



## Main findings: operational aspects

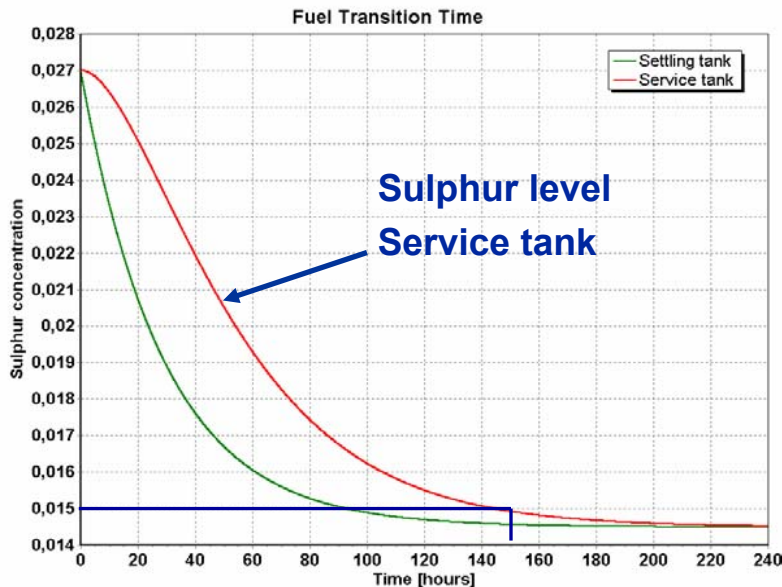
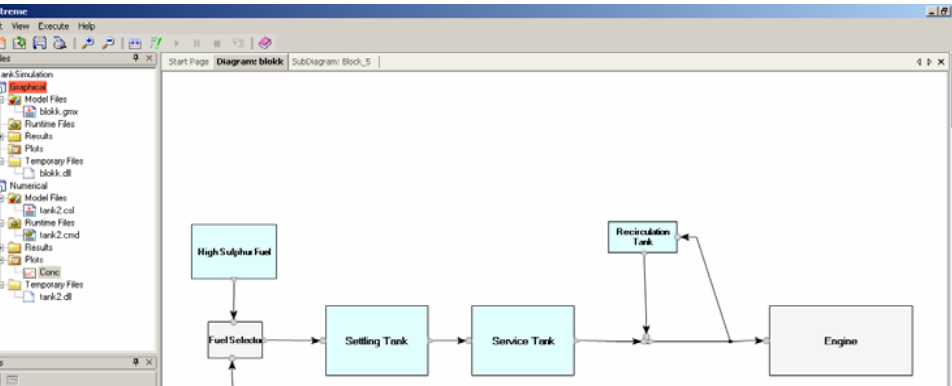


### Conclusion depend on ship and trade:

- ❑ **European coastal vessels:**  
Continuous LS operation,  
LSHFO, MDO, MGO
- ❑ **Inter Continental trade:**  
HS HFO outside SO<sub>x</sub>ECA, 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<sub>x</sub>ECA Border (MARPOL)

# 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

# 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.**

# 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)*



## 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