

USING DISTILLATE FUEL TO REDUCE AIR POLLUTION FROM SHIPS

**EMSA WORKSHOP:
Revision of MARPOL Annex VI**

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International Association of Independent Tanker Owners

- **Voice of independent tanker owners since 1970**
- **Membership:**
 - 260 +/- members
 - combined fleet > 2,600 tankers
 - 75% of the worlds independent tanker fleet
 - 85% of the worlds chemical fleet
- **Main Objectives:**
 - Delivering safe, reliable & efficient transportation
 - Supporting free competition
 - Striving for zero fatalities, zero polution and zero detentions
- **Tankers use 30% - 35% of the total marine fuels**



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MARPOL Annex VI PROPOSAL FOR AMENDMENTS

- **Lower limits for SO_x & NO_x emissions**
- **SECAs with lower S cap (1.0% or 0.5%)**
- **NO_x emission limitation on existing engines**
- **NECAs – NO_x controlled areas**
- **Restriction on Particulate Matters (PM) emissions**
- **Further controls on VOC emissions from cargo oil tanks**



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MARPOL ANNEX VI REVISION INTERTANKO OBSERVATIONS

- **Type/quality of fuel is the KEY to control all air emissions from ships**
- **None of the suggestions for revision addressed the type & the quality of fuels**
- **Responsible ship owners know they have a duty to take initiatives**
- **Important to have an open debate at the international level**
- **There should be full and frank discussion of the various solutions possible, including abatement equipment**

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IMO & UNILATERAL LEGISLATION ON LOW SULPHUR MARINE FUELS

DATE	SHIP TYPE	WHERE	max. % S	REG.
19.05.2005	All	Everywhere	4.5	IMO
19.05.2006	All	Baltic Sea	1.5	IMO & EU
11.08.2006	All	All EU Ports MGO (DMA and DMX) MDO (DMB and DMC)	0.2 1.5	EU
11.08.2006	Passenger ships	EU	1.5	EU
1.01.2007	All aux. & diesel-electric main engines on all ships	24 miles off California shore MGO (DMA grade) MDO (DMB grade)	- 0.5	CARB
11.08.2007	All	North Sea & English Channel	1.5	EU
22.11.2007	All	North Sea & English Channel	1.5	IMO
1.01.2010	All	All EU ports	0.1	EU
1.01.2010	Inland waterway ships	All EU inland waterways	0.1	EU
1.01.2010	All aux. & diesel-electric main engines on all ships	24 miles off California shore MGO (DMA grade)	0.1	CARB
1.01.2012	16 Greek ferries	Greek ports	0.1	EU

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Sulphur limits in modes of transportations

Table 2 Sulphur content of fuels in different applications and sectors

Sector	Sulphur content in ppm	
Marine bunker fuel oil limit	→ 45 000	4.50%
Marine bunker fuel oil, typical values	29 900	
Marine gas oil limit	15 000	
Marine: EU limit for use in sensitive areas and in passenger ships operating on regular services to or from EU ports, 2006	→ 15 000	1.50%
Marine gas oil, typical values	7 300	
Marine: proposed EU Parliament limit for all EU waters	5 000	
Aviation jet fuel limit	3 000	
Aviation jet fuel, typical value	400–600	
Diesel used by trains and machinery, current EU limit	2 000	
Diesel used by trains and machinery, EU limit 2008	→ 1 000	0.1%
Automotive diesel EU limit before 2005	350	
Automotive diesel EU limit, 2005	50	
Automotive diesel EU limit, 2009	→ 10	0.001%

Sources: Maximum permitted sulphur content for marine fuels are from (IMO, 1997) and Directive 2005/33/EC (EC, 2005h). Typical values for marine fuels are from (EMEP/Corinair, 1996). Maritime sulphur limits are from Directive 2005/33/EC (EC, 2005h). Aviation jet fuel limit and typical value are from 'Flight path to excellence' (IATA, 2001). Current and future automotive limits are from EU Directive 99/32/EC (EC, 2005h) and Directive 98/70/EC (EC, 1998).

Source: European Environmental Agency

INTERTANKO Guiding Principles

- **Solid platform of requirements**
- **Long term and positive reduction of air emissions from ships**
- **Long term and a predictable regulatory regime**
- **Prevent fragmented regulations - International standards via IMO**
- **A global standard for at sea, coastal and at berth operations (maybe no SECAs)**
- **Realistic and feasible solution**
- **Regulations based on a fuel standard rather than an emissions performance standard only**



REVISION OF MARPOL ANNEX VI INTERTANKO SUGGESTION

- **Distillate fuels & 2-tiered S cap program:**
 - from [2010], a maximum of 1.00% S content
 - for ships' engines installed on and after [2015], a maximum [0.50]% S content
- **A Global Sulphur Emission Control Area**
- **A Single Fuel specification in Annex VI**
- **Simpler monitoring of compliance**



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MDO – ADVANTAGES AIR EMISSIONS

- Applies to ALL existing ships/engines
- With no other measure, immediately reduces:
 - SOx emissions by 80% to 90%
 - PM emissions by 90%
 - NOx emissions by 10% to 15%
- Reduces fuel consumption with some 4% from ALL ships and thus CO₂ emissions
- Facilitates further NOx reductions by in-engine modifications for IMO's Tier II & III



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MDO – ADVANTAGES AIR EMISSIONS

- **Engines designed for use of MDO only will accommodate further emission reductions over their entire life time**
- **Further regulatory reduction of air emissions from ships will be a function of better quality fuels and not limited by engine's functional parameters**

MDO - ADDITIONAL BENEFITS

- **ENVIRONMENTAL:**

- Reduces onboard fuel generated waste
- No fuel heating/treatment = energy saving
- ALL ships become “greener”
- “Cleaner” waste & free of hazardous elements contained in residual fuels
- Avoiding use of abatement technologies = no further additional waste & no need of further waste disposal
- Potential bunker spills significantly less harmful

- **SAFETY:**

- Less incidents with engine breakdowns caused by poorer quality fuels
- No need of complex fuel change-over operations
- No risk of incompatibility of blended fuels
- Safer working environment for crews



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QUALITY PROBLEMS WITH RESIDUAL MARINE FUEL OILS

- **HIGH ABRASIVE FUELS**
- **HIGH ASH**
- **LOW FLASH POINT**
- **HIGH SEDIMENTS**
- **HIGH DENSITY**
- **FUELS CONTAINING USED LUBE OILS**
- **POLYETHYLENE CONTAMINATION**
- **POLYSTYRENE CONTAMINATION**
- **HIGH CALCIUM & HIGH SODIUM (WATER?)**
- **HIGH WATER CONTENT**
- **CONTAMINATED FUELS**
- **INCOMPATIBILITY OF BLENDS**

WHY GLOBAL SULPHUR CAP

- All agree proliferation of SECAs is imminent
- Governments have clear strategies to reduce emissions around their coasts
- Threat of unilateral legislation and non harmonised local requirements
- For ships, SECA is a serious burden:
 - changeover to low sulphur fuel
 - operating scrubbers & waste processing

FUEL CHANGE OVER

- Increase/diversity of bunker storage capacity
- Complete segregation of HS & LS fuels
- A 3rd/4th storage tanks for 0.1%/0.5% S fuels
- Storage for low BN number lube/cylinder oil
- Manifolds modifications & segregation for bunkering & fuel sampling

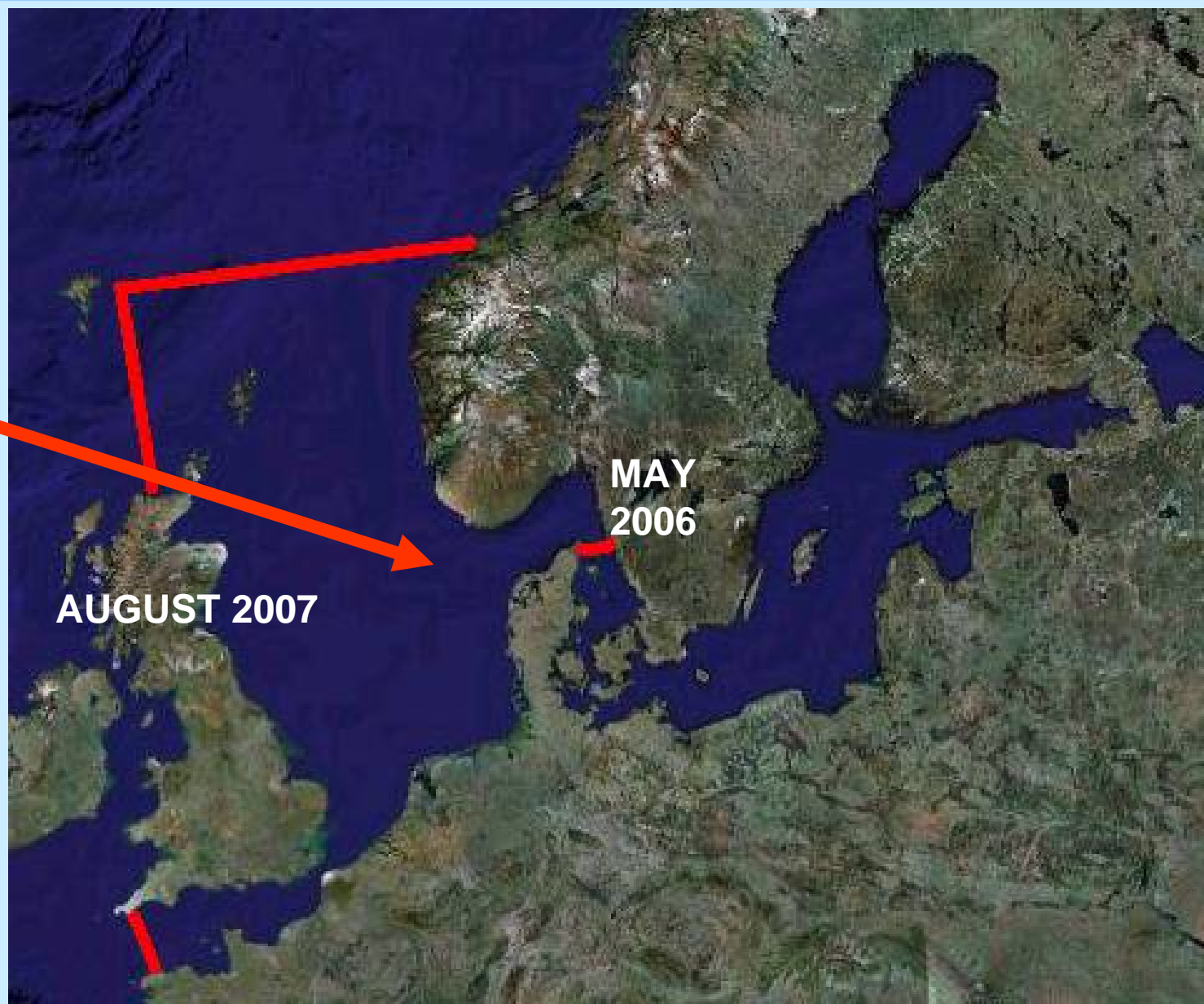


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SECAs & CHANGE OVER AREAS

Source: <http://maps.google.com/>

**Changeover
Area**





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SECAs & CHANGE OVER AREAS

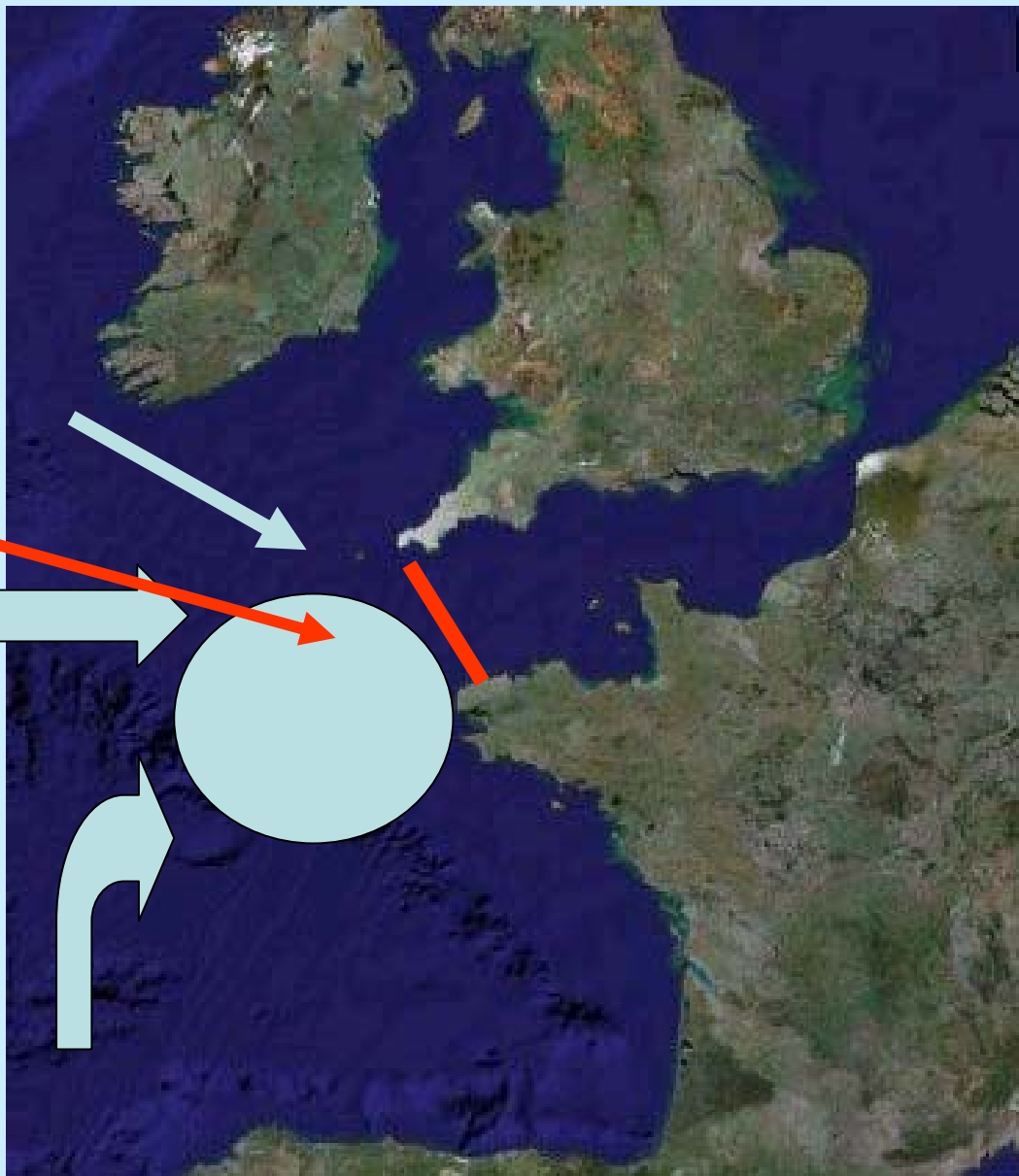
Source: <http://maps.google.com/>

**Next Changeover
Area?**

Bay of Biscay?

Is THAT safe?

Adding a NECA?





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SCRUBBERS

Scrubbers for Pride of Kent



- large space required in the ship's funnel;

- for a main engine of 20 MW, sea water up to 22,000 t/day need to be processed (45t/hr/MW*)

- up to 100 kg/day of hazardous sludge (5kg/day/MW*)



* data supplied by Krystallon



MDO AVAILABILITY

- A CHALLENGE BUT:
 - more feasible than producing LS RMFOs
 - projects to increase efficiency of conversion units/substantial conversions underway
 - additional demand of MDO represents some 6% to 9% of the heavy distillate production from world refineries
 - ADO mixed with 10% bio-component = more capacity for producing MDO
 - 2005 average utilisation of refinery capacity:
 - World wide - 86.3%
 - EU - 92.4%
 - Asia-Paific - 91.5% and
 - North America - 89.4%
 - thus quite possible also through increased refining efficiency



NET CO₂ EMISSIONS WITH MDO

- **CO₂ emissions from MDO production much less than from de-sulphurisation of residuals**
- **Lower CO₂ emissions with MDO due to lower fuel consumption by ships**
- **Lower CO₂ emissions with MDO since no need to heat residual fuels prior treatment & injection**
- **Manufacturing & operating scrubbers would result in high CO₂ emissions**



NET ENVIRONMENTAL BENEFIT

- **SOx, NOx & PM - LOCAL PROBLEMS?**
 - PM & SOx "travel" for hundreds/thousands of miles
 - NOx is a global issue
 - Should ships need to be "green" in restricted areas but can continue "business as usual" in most of seas?
 - Should ships continue to be the World incinerator? If yes, who decides so?



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SHIPS ARE THE MOST ENVIRONMENTAL FRIENDLY MEANS OF TRANSPORTATION

Comparison: ship, train, truck

Same cargo, same distance:



Atmospheric pollutants	1 (15.73g/t-km)	1.4	7.6
Energy consumption	1 (130kjoule/t-km)	2.2	9.7

Source: Canadian Shipowners' Association, MARPOL Annex VI
Consultation Meeting, Washington, DC, February, 2006

**SHIPPING SHOULD NOT BECOME THE "WASTE TREATMENT PLANT"
FOR OTHER MODES OF TRANSPORTATION**



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Who bears the responsibility for verification and compliance

- **Owner for :**
 - Combustion process
 - Exhaust gas emission standards
 - Disposal of by-products

OR

- **Fuel supplier for:**
 - Quality of fuel supplied

AND

- **Engine Manufacturers**
 - Facilitate a design of an engine that copes with a predictable rule development on lowering emissions



USE OF MDO - CONCLUSIONS

- **Ensures a solid platform of requirements**
- **Long term & positive reduction of air emissions (SOx, PM, NOx) from ships**
- **Simple, Straightforward & Realistic**
- **Long term & predictable regulatory regime**
- **Simpler and workable monitoring and control procedures**
- **Safer & simpler ship operations**
- **Technical modifications manageable**
- **Better work environment for crews**



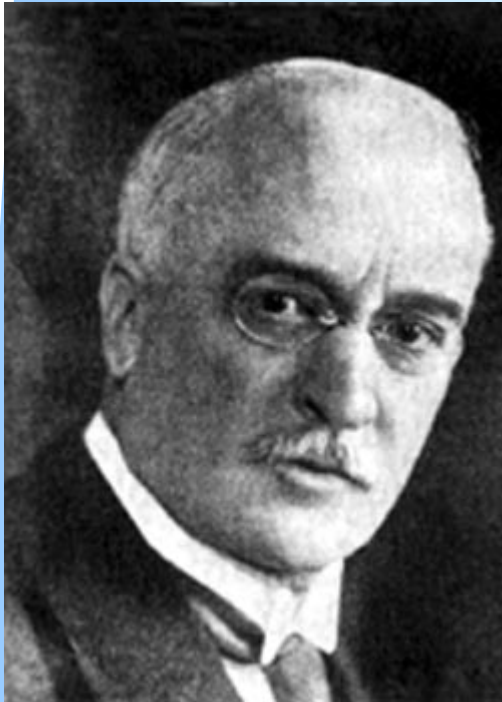
USE OF MDO - CONCLUSIONS

- **Prevents fragmented regulations = A global standard for at sea, coastal and at berth operations**
- **International standards via IMO**
- **Regulations on a fuel standard not only on emissions performance standard**
- **Overall environmental impact for across the board emissions reduction better than any of the current alternative measures**
- **Coast & sea pollution from bunker spills significantly less harmful and messy**



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USE OF MDO - CONCLUSIONS



"The use of vegetable oils for engine fuels may seem insignificant today. But such oils may become in course of time as important as petroleum and the coal tar products of the present time."

Rudolf Diesel (early 1900s)

Source: Wikipedia



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USE OF MDO - CONCLUSIONS

INTERTANKO message:

*Better to deal with the cause of a problem
than to concentrate on the effects only!*

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