



# Low Sulphur Fuel Potential Consequences

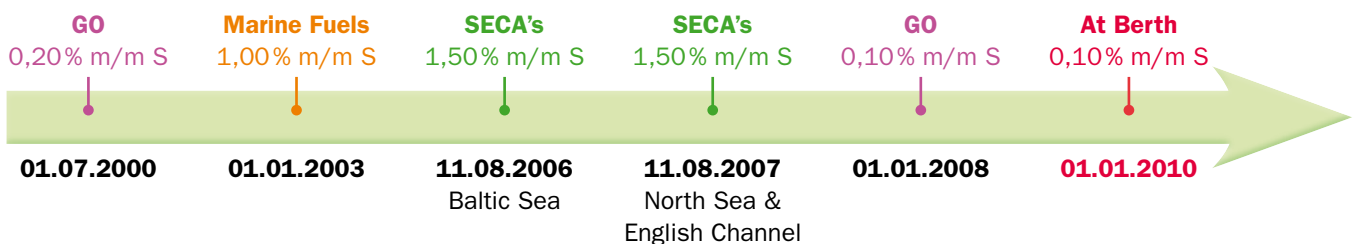
The **International Maritime Organisation (IMO)** and the **European Community (EC)** both addressed the subject and issued progressive deadline in the reduction of sulphur content in **Any** Marine Fuels.

Main risks associated in running Low Sulphur Fuel (LSF) may involve potential damages to **ship's equipment**, **ship design modifications** and **crew training needs**.

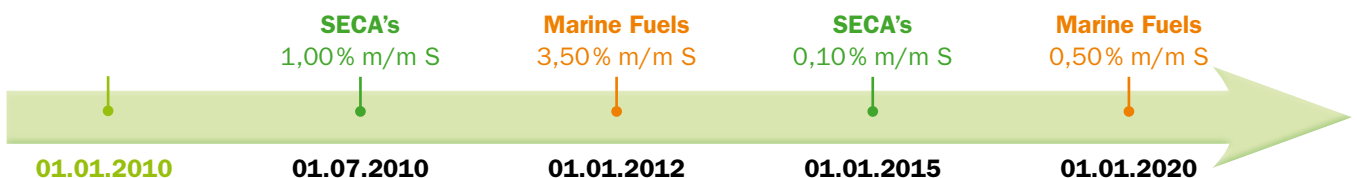


## Sulphur Oxides (SOx) legislation timeline

**EUROPEAN COMMUNITY (EC)** EU Directives 1999/32/EC & 2005/33/EC



**INTERNATIONAL MARITIME ORGANISATION (IMO)** MARPOL 73/78 Annex VI



**Sulphur Control Areas (SECA's)** include the Baltic Sea, North Sea and the English Channel

**At Berth** means any ships secured at anchor or alongside in EU ports lasting more than 2 hours

**m/m S** term indicates the percentage on a mass basis (% mass)

## Consequences of shift

### Risk of engine damages

| Potential damages   | Type of equipment |                 |         |
|---|-------------------|-----------------|---------|
|   | 2 Stroke Engine   | 4 Stroke Engine | Boilers |
| <b>Low Viscosity &amp; Lubricity</b>                                    |                   |                 |         |
| Insufficient fuel injection   | ✓                 | ✓               |         |
| Potential power shortfall   | ✓                 | ✓               |         |
| Poor combustion and ignition  | ✓                 | ✓               |         |
| Engine starting difficulty  | ✓                 | ✓               |         |
| Fuel valves, pump plungers and suction valves sticking/scuffing/seizure | ✓                 | ✓               | ✓       |
| <b>Compatibility</b>  |                   |                 |         |
| Heavy deposits leading to excessive wear (TBN70 with LSF)               | ✓                 |                 |         |
| Cylinder liner bore-polishing and scuffing (TBN70 with LSF)             | ✓                 |                 |         |
| Fuels compatibility leading to clogging filters and fuel starvation     | ✓                 | ✓               |         |
| <b>Heat Value</b>   |                   |                 |         |
| Re-adjustment of the air/fuel ratio                                     |                   |                 | ✓       |
| <b>Low Density</b>  |                   |                 |         |
| Increased smoke emission  |                   |                 | ✓       |
| Explosive atmosphere in case of flame failure                           |                   |                 | ✓       |

### Ship design challenges

Vessel's sailing into SECA's or calling in EU ports for more than 2 hours, will have to check the following and possibly go through structural modifications to avoid any fuel or lubricating oil contamination.



- Additional Fuel tanks capacity for different fuel grades
- Fuel oil supply system adjustment
- Lubricating oil system adjustment
- Main and Auxiliary boiler upgrading

### Crew training on technical and operational issues

#### Shipowner's should be required to implement:

- Change-over procedures under ISM 1.2.2.2
- Record three specific entries in Oil Record Book...
  - FWE time
  - Change-over starting time
  - Time at which vessel is operating only on 0,1 m/m S
 ... same apply at departure taking "Engine required for" time instead of FWE.

#### Vessel should be required to keep available onboard the following

- Bunker Delivery Notes (BDN) for a minimum of 3 years
- Oil Record Book up to date
- Bunker sample in safe storage location

## Recommendations

Shipowner's are invited to conduct a risk assessment on each individual ship and to contact their...

- Engine Manufacturers
- Boilers Manufacturers
- Classification Society

...for engine checks and modifications, as well as tank and system modifications onboard. Plans could typically address the issues and include arrangement drawings, together with a description of change-over procedures and the quantities of fuel available for operation of the propulsion and generating plant.