

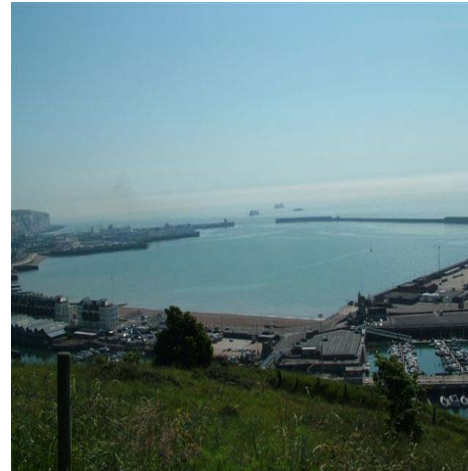
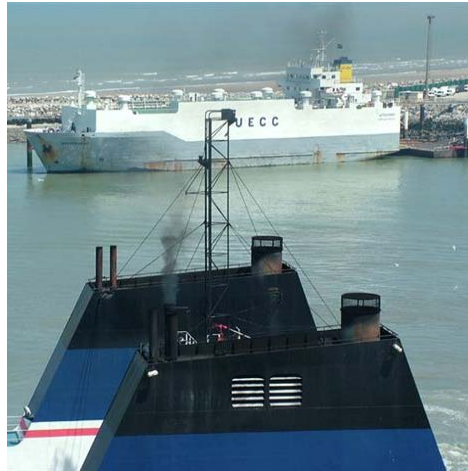
# Hamworthy Krystallon – Sea Water Scrubbing

Introducing the technology to owners, operators and shipyards



# Hamworthy Krystallon – Drivers

Legislation on fuel sulphur and particulates – what was acceptable is no longer so.



# Hamworthy Krystallon – Sea Water Scrubbing

Sea Water Scrubbing is a proven technology

**Sea Water Scrubbing has a long and successful history**

|                                 |                            |
|---------------------------------|----------------------------|
| <b>Shenzhen</b>                 | - China                    |
| <b>Bankside &amp; Battersea</b> | - London (1930s)           |
| <b>Manjung</b>                  | - Malaysia 2, 100MW (2003) |
| <b>Vassilicos</b>               | - Cyprus (2005)            |
| <b>Longannet</b>                | - Scotland                 |

(approved By EU and Environmental Groups – sulphur into sea – equivalent to 40 super tankers in port at one time)

|                    |          |
|--------------------|----------|
| <b>Guam</b>        |          |
| <b>Puerto Rico</b> |          |
| <b>Mongstad</b>    | - Norway |
| <b>Tata</b>        | - India  |

**Total  
sulphur in  
all fossil fuel**

Sulphur in the ocean

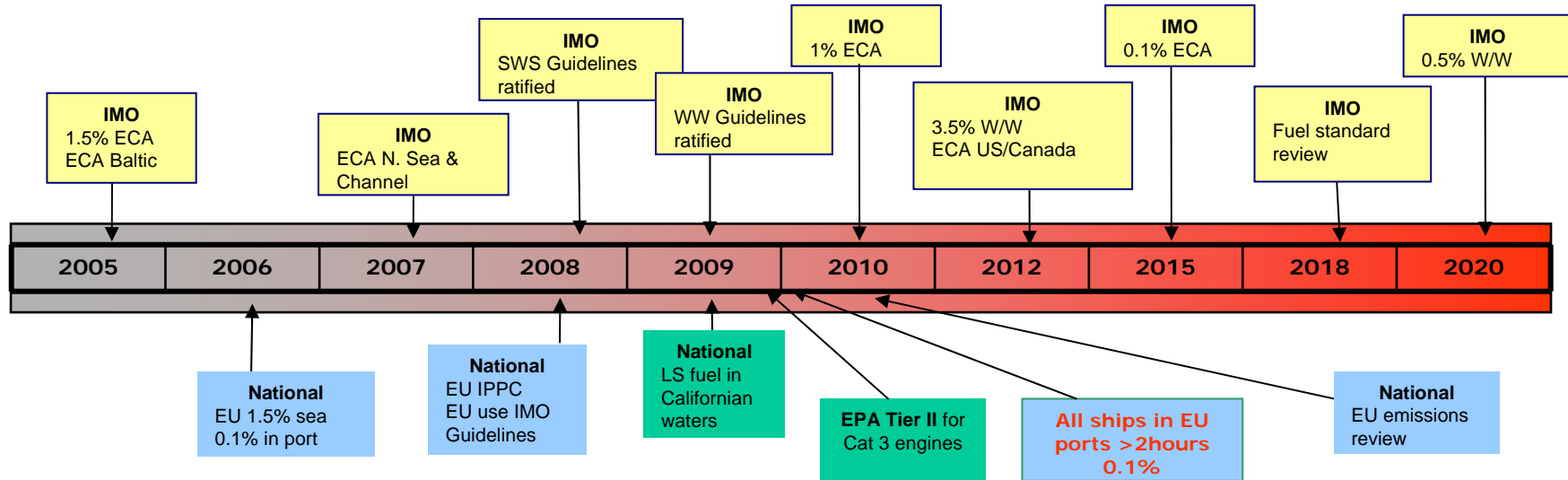
10microns

1.7metres



# Hamworthy Krystallon – Legislation

When will this legislation be introduced?



- ▶ Operators required to use cleaner fuels and/or abatement technology.
- ▶ All are subject to further debate BUT are only expected to reduce emission levels.
- ▶ All allow for Scrubbing by means of performance based emission limits.
- ▶ Legislation is already affecting geographic Hi/Lo sulphur heavy fuel oil differentials.



## The Future

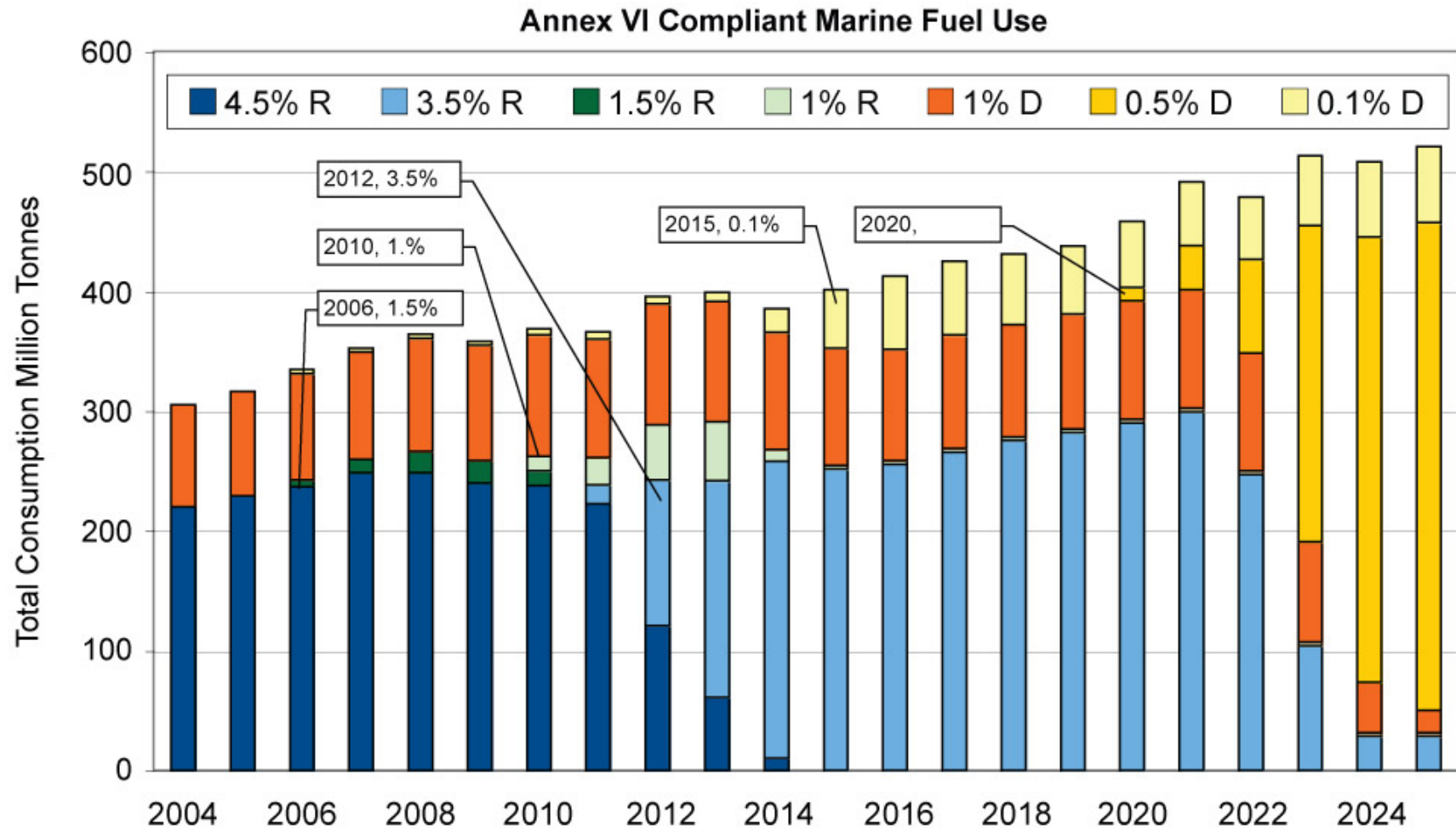
- ▶ A large rise in LSFO/Distillate fuel demand
- ▶ Rising differential between LSFO and Distillate
- ▶ Increasing disconnect between HSFO & Crude

## Geography/Total Tons/Fuel Diff

- Baltic Sea (ECA) / 4-6MT (\$10 - 30)
  - North Sea (ECA) / 14-18MT (\$25 -45)
  - Greece PPC & EU Ferries / 3MT / (\$60)
  - Mediterranean / 16MT / (\$40 - \$60)
  - N. America / 30-45MT / (\$30 - \$50)
- (EPA Proposals)

# Hamworthy Krystallon – Marine Fuel Market

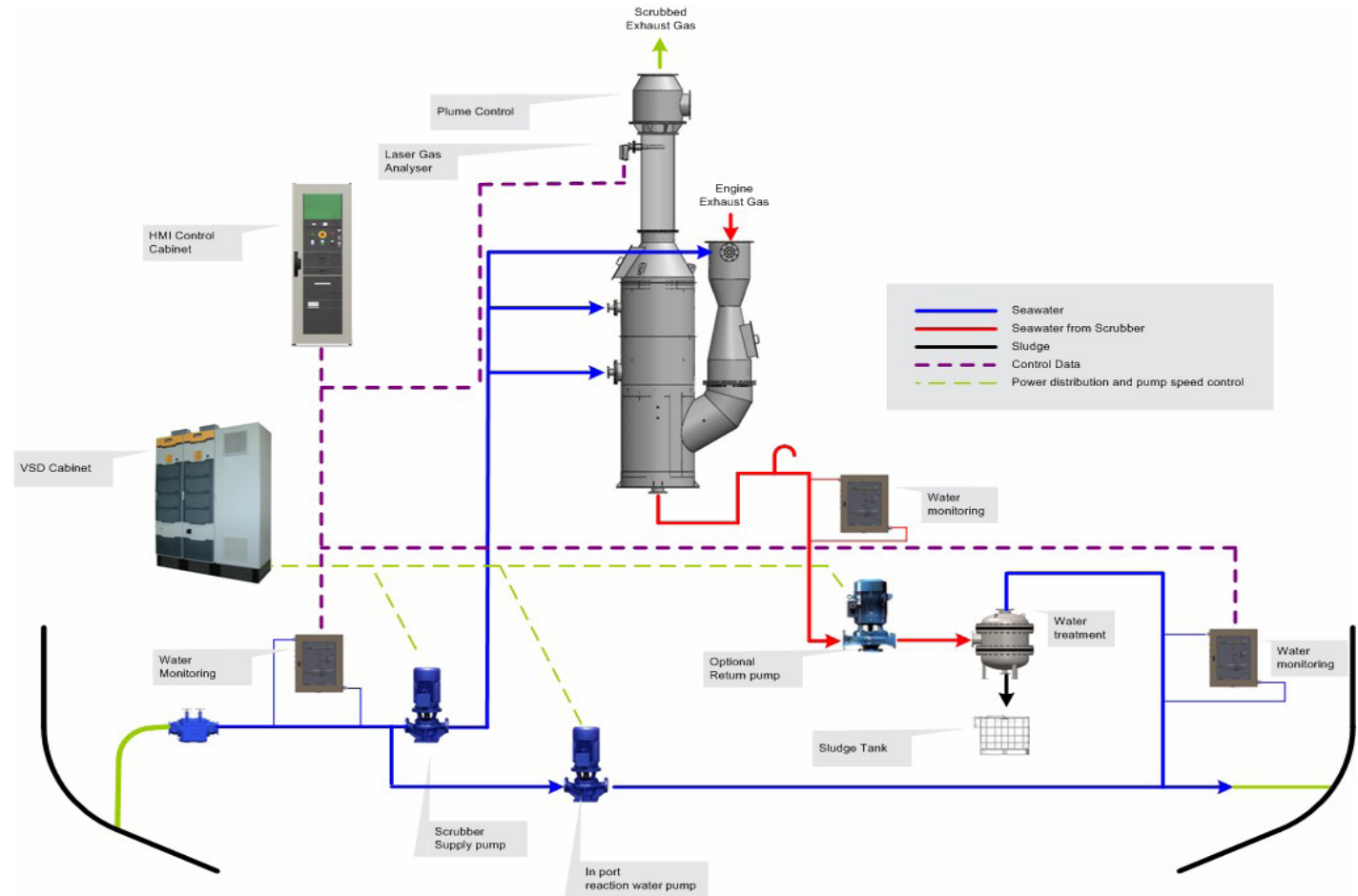
What effect will this have on the bunker fuels market?



# Hamworthy Krystallon – Technology

## The basic technology

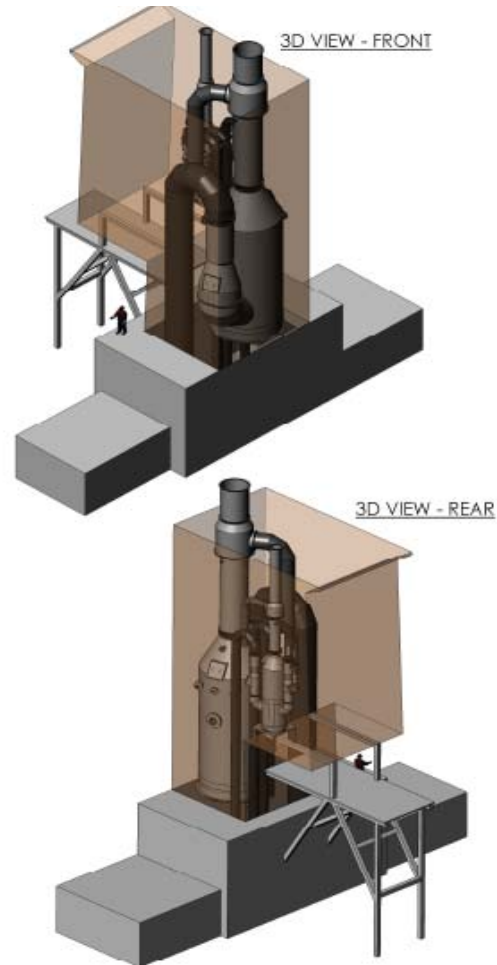
- ▶ Scrubber
- ▶ Wash Water
- ▶ Control
- ▶ Monitoring
- ▶ Application
- ▶ Installation
- ▶ Track record



# Hamworthy Krystallon – Technology

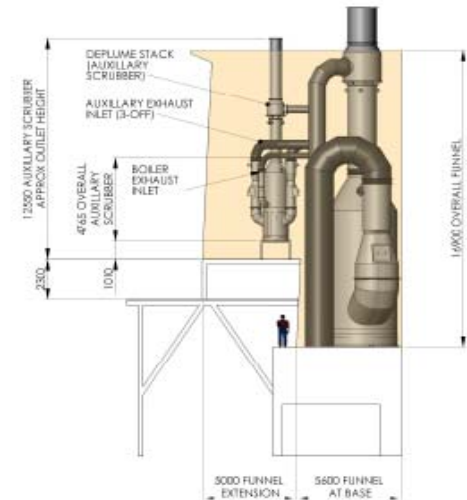
## The basic technology

- Cape Size Bulk Container (example below)
- 18MW scrubber main engine fitted into the funnel
- Main propulsion, auxiliary & boiler



### GENERAL NOTES:

- THIS DRAWING IS INTENDED FOR ILLUSTRATIVE PURPOSES ONLY. ALL FINAL SITE AND SCRUBBER SYSTEM DETAILS TO BE CONFIRMED.
- PIPEWORK DETAILS ARE INDICATIVE ONLY. FINAL POSITIONS AND DETAILS TO BE DETERMINED.



| NO.       | REV. | DESCRIPTION | DATE | BY | APPR. |
|-----------|------|-------------|------|----|-------|
| REVISIONS |      |             |      |    |       |

# Hamworthy Krystallon – Environmental Credentials

## Approvals and environmental compliance

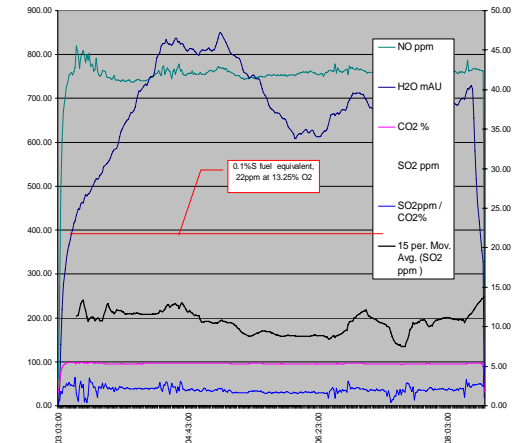
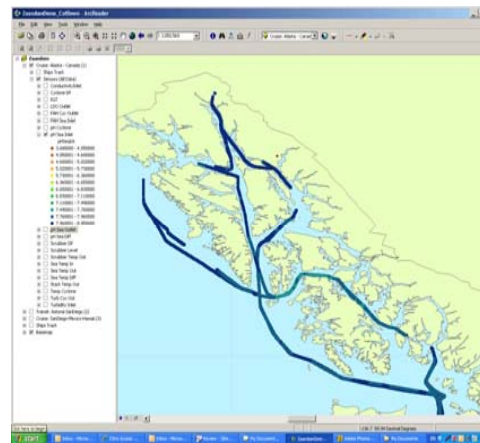
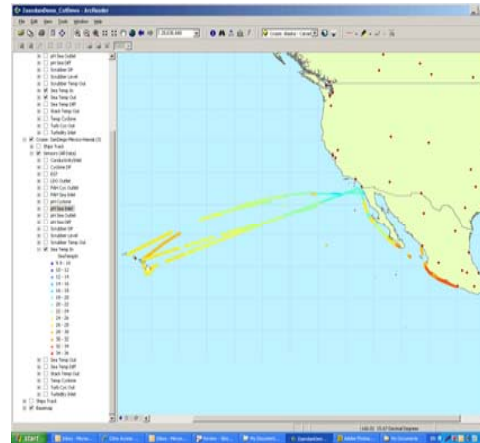
Approved under Method B of IMO Annex VI Regulation 14 - Sea Water Scrubbing Guidelines including latest amendments for Wash Water Criteria.

Monitoring emissions to air and sea with marine approved systems.

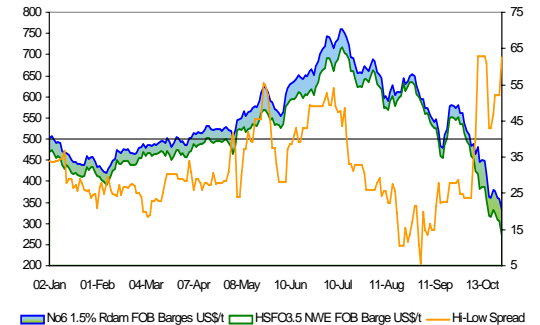
Remote reporting of performance and GPS position with secure data storage

### 3 detailed EIA

- Water interchange
- Toxicology
- Plume modeling
- Physical measurement and verification



YTD LSFO and HSFO Flatprice (LHS) and Hi-Low Spread (RHS)



# Hamworthy Krystallon – Sea Water Scrubbing

This legislation will require owners to make tough choices

- ▶ No ‘do nothing’ option to comply with the incoming legislation.
- ▶ More emission control areas (ECAs) will be introduced. Baltic, N Sea, N.America, *Atlantic Coast France, Norway, HK Pearl River ....*
- ▶ Abatement technology or costly switch to low sulphur fuel.
- ▶ Initial cost of switching will rise due to ‘shorts’ in market.
- ▶ Plus cost of shore based power (cold ironing) when in port.
- ▶ ***Our message; Avoid this and install a Sea Water Scrubber!***

