Regulatory landscape of Sulphur content

M.C. Vink

UN environment programme

Mediterranean Action Plan
Barcelona Convention

REMPEC

IMO INTERNATIONAL MARITIME ORGANIZATION

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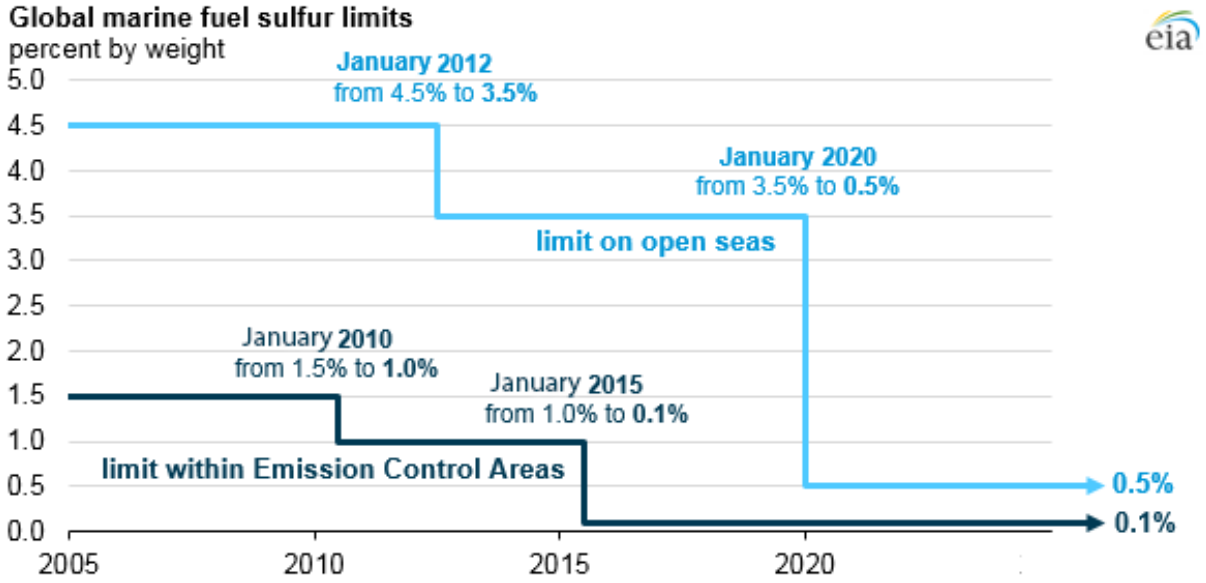
Producing future Marine fuels

Global versus Regional Sulphur limits in fuels

- IMO,EU, California and China
- Compliance mechanisms and Trends



Source: U.S. Energy Information Administration, based on International Maritime Organization (IMO)

European Union

- Road Fuels: EU Directive 2003/17/EC mandates a <10 ppm (0.001%) sulphur in diesel and gasoline (EURO VI standards).
- Marine Fuels: EU Sulphur Directive aligns with IMO, with 0.5% globally and 0.1% in ECAs.
- EU Sulphur Directive requires ships at berth in EU ports to use fuel with ≤0.10% sulphur, regardless of global cap.

China

- Road Fuels: National VI fuel standards limit Sulphur to 10 ppm in gasoline and diesel.
- Domestic ECAs along coastlines and inland rivers (Yangtze, Pearl River Delta, Bohai Bay).
- Typically, 0.10% Sulphur limit in designated zones and at berth.

California (CARB Rule)

- Ships within 24 nautical miles of California coast must use 0.10% Sulphur distillate fuel (MGO/MDO).

Compliance Mechanisms

- PSC inspections
- Fuel Sampling & Testing
- Onboard Scrubbers (for ships)
- Monitoring Systems (CEMS for SOx emissions)
- Audits & Reporting
- Fines and Detention

Trends and Outlook

- Stricter Enforcement: Increased port inspections and fuel testing, especially in ECAs.
- Alternative Fuels: Growth in LNG, hydrogen, and low-sulphur fuels.
- Technological Adaptation: Rise of scrubbers and emission-monitoring systems.
- Global Harmonization: Efforts to align domestic laws with IMO standards.

Trends and Outlook

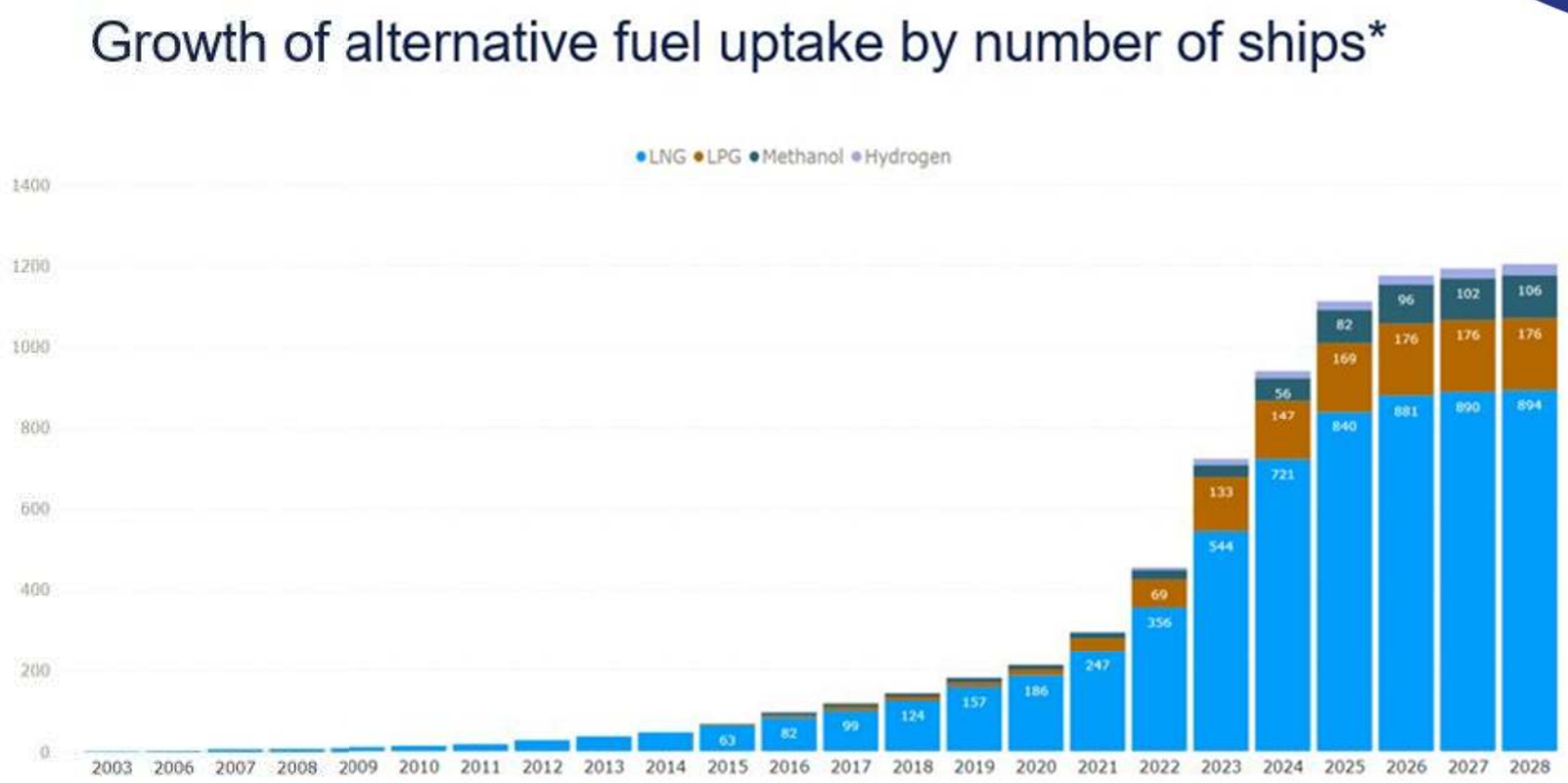
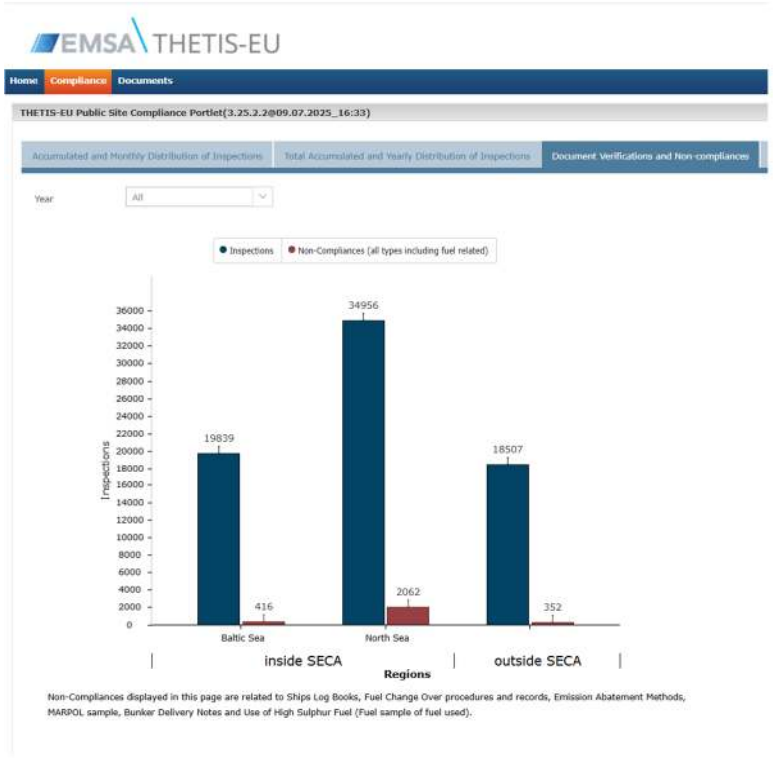


Figure Safety4sea
Credits DNV

SOx emissions decreased in the North and Baltic Sea zones.



Implications for Shipping and Refining

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Shipping

1. **Fuel Switching Costs**: This increases operational costs.
2. **Scrubber Installation**: These involve high upfront costs, downtime during retrofit.
3. **Fuel Availability Concerns**: In some regions, consistent access to compliant fuels can be limited.
4. **Operational Complexity**: More fuel types separated on board
5. **Bunker management** becomes more complex with multiple fuel types, compatibility issues.
6. **Compliance & Penalties**: Increased risk from non-compliance, especially in Emission Control Areas (ECAs) with stricter 0.10% Sulphur limits.

Refining

1. **Product Shift**:

   Refineries must produce more low-sulfur fuels. This shifts feedstock selection and investment in desulfurization units (e.g., hydrocrackers).

2. **Crude Selection Pressure:**

   Preference for sweeter (low-sulfur) crude grades increases demand and pricing for such crudes, impacting global crude flows.

3. **Retrofits**:

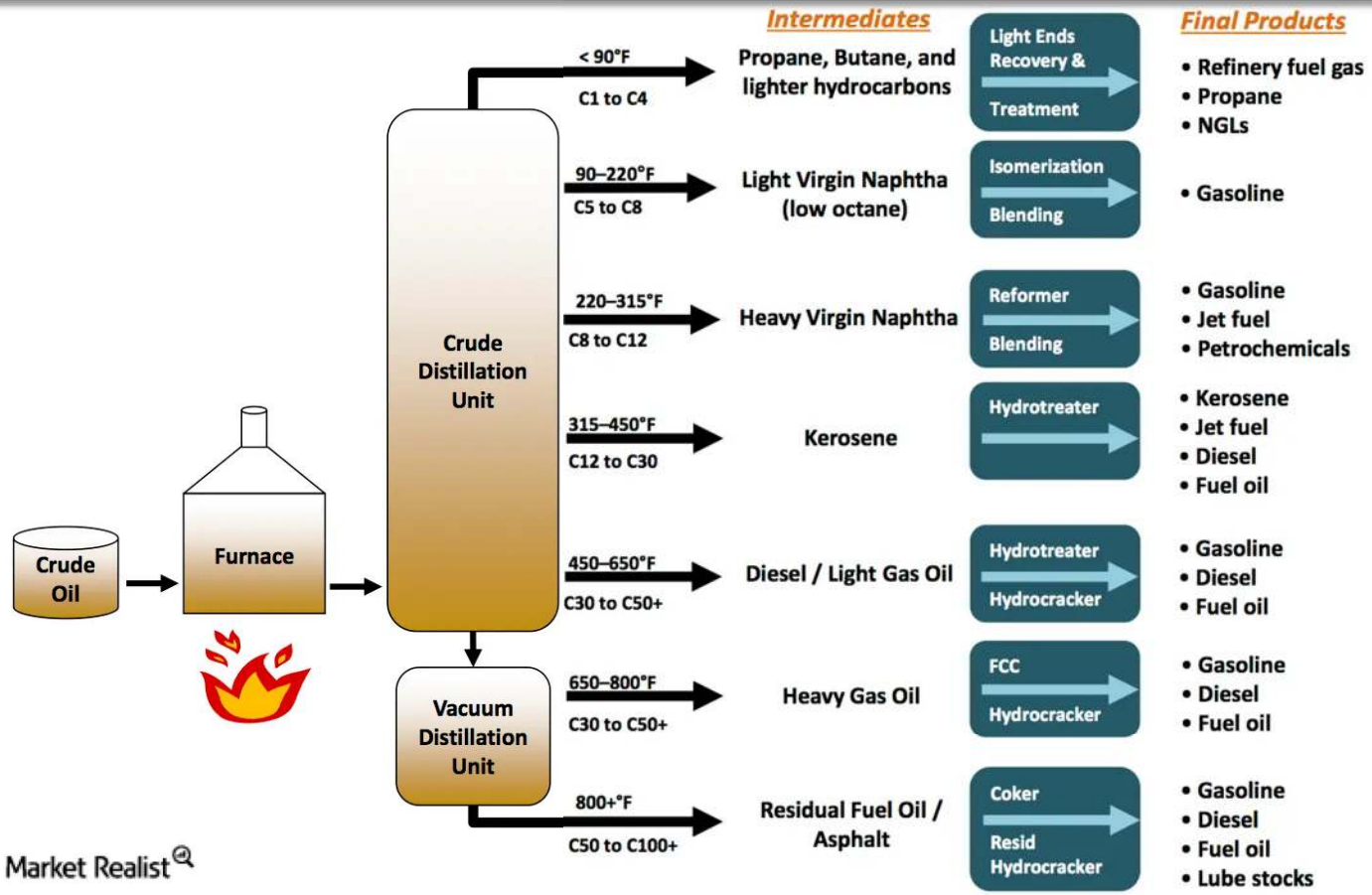
   Many refineries have had to upgrade infrastructure to handle sweet crudes or install advanced desulfurization units.

4. **Complex refineries**

   Benefit (can produce more VLSFO and MGO), while simple refineries may struggle to stay profitable.

Source : Valero

Basic Refining Concepts



Market Realist

Enforcement trends and penalties

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Trend	Detail
Penalties historical weak	Usually less than cost savings; harder to enforce at sea
Improved compliance since IMO 2020	Infringements and penalties have dropped significantly
Emerging tech-enhanced enforcement	Drone sniffers, remote sensing and data analytics are gaining ground
New (S)ECA broaden scope	Canadian Arctic & Norwegian Sea North East Atlantic

Non compliance actions

- Fines
- Suspension of licenses
- Legal action, depending on severity of violation
- Reporting non-compliance to the IMO's Global Integrated Shipping Information System (GISIS)
- Detaining of ships

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Lessons learned from experience

- Compliance is achievable – but enforcement critical.
  - Most shipping companies can and do comply when enforcement is consistent and penalties are meaningful.

- PSC is vital.
  - Document checks (e.g., bunker delivery notes, fuel logs)
  - Fuel sampling and analysis
  - Remote sensing in some areas (e.g., sniffers on drones or bridges)

Detection of Sulphur

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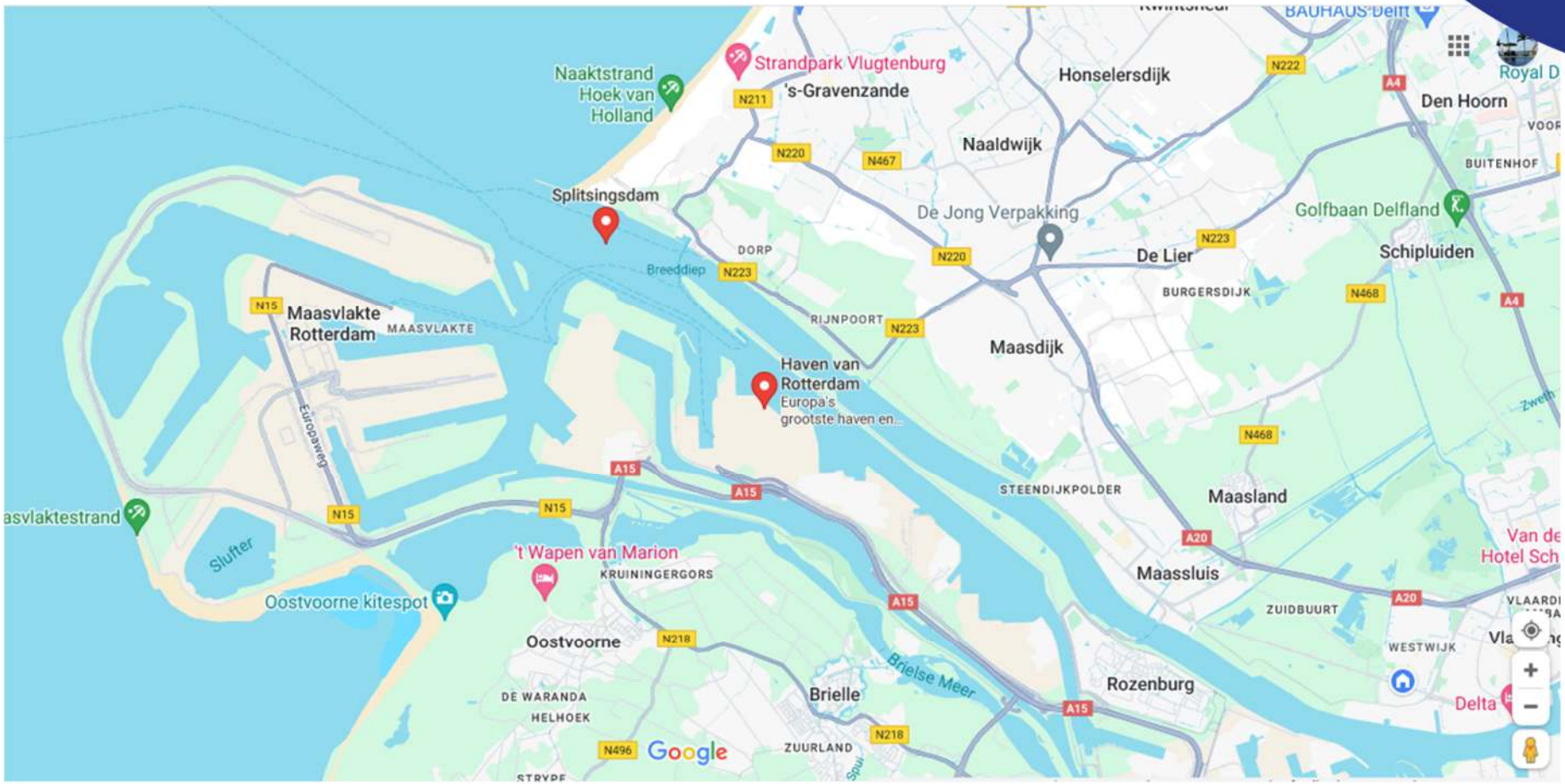
Monitoring

1. Fuel sampling and testing
2. Bunker delivery note and log book checks
3. Onboard portable Sulphur analyzers
4. Sniffer technology used by Drones, Fixed stations and Planes
5. Continuous emissions monitoring systems (Scrubbers)
6. Satellite monitoring (Still under development)
7. Risk-based inspections and data analyses

Sulphur Control by drone

Port Of Rotterdam Air Quality Sensor

Port of Rotterdam



Belgian NOx, CO2, SOx sniffer plane

Belgian sniffer plane

How to measure % of S in the air

- Fuel oil sulphur limits and corresponding Emission Ratio limit values

Fuel oil sulphur content (% m/m)	Emission ratio SO2 (ppm) / CO2 (% v/v)
0,50	21,7
0,10	4,3

- Note: The use of the above Emission Ratio limit values is only applicable when using petroleum-derived distillate or residual fuel oils.

International alerts

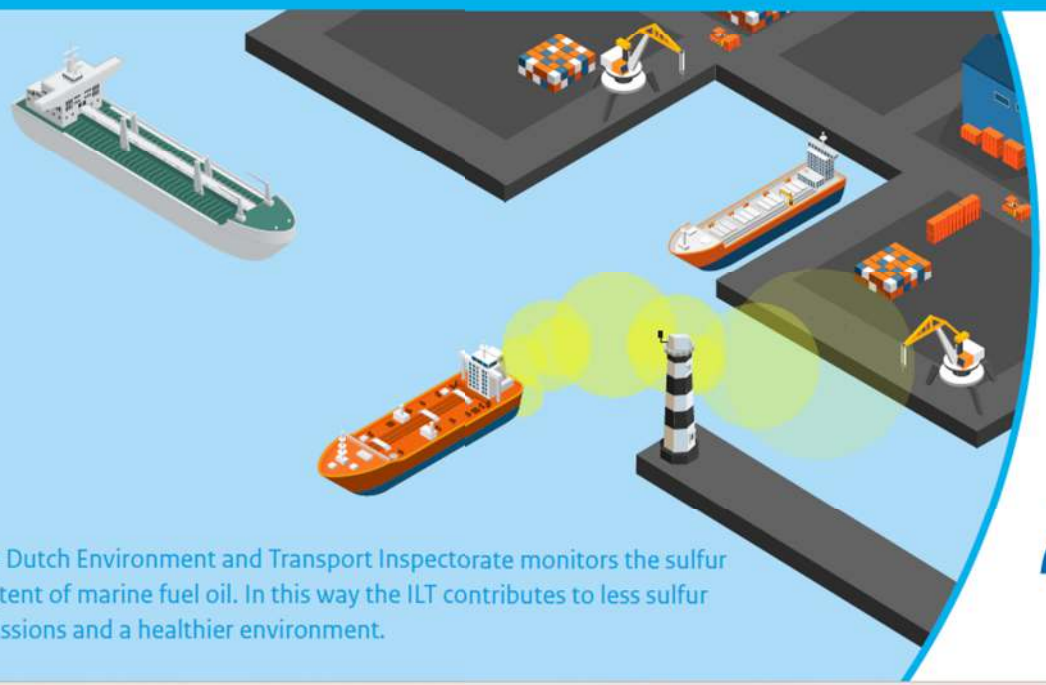
- **EMSA THETIS-EU** was developed to enable authorities to report **fuel sulphur inspections**, share results, and support coordinated enforcement.
- **PSC** inspect ships in ports of (S)ECAs
- Findings are reported via the THETIS-EU system
- The system also supports **risk-based targeting of inspections**—ships may be selected for inspection based on alerts or data from THETIS-EU.

Human Environment and Transport Inspectorate
Ministry of Infrastructure and Water Management

Sulphur inspections of fuel oil of seagoing ships

Alerts for possible non-compliances:

1. International alerts
2. Coastguard sniffer flights
3. Fixed sniffer station
4. Inspections ILT



- Alert for possible non-compliance
- On board sampling of fuel oil
- Laboratory analysis
- Test against legal standards >0,1%

Intervention
- Warning
- Notification and change fuel before depart
- Detention and change fuel before depart (PSC informed and penalty applied)

The Dutch Environment and Transport Inspectorate monitors the sulfur content of marine fuel oil. In this way the ILT contributes to less sulfur emissions and a healthier environment.

Two Questions about sniffing