Airborne Marpol Annex VI Monitoring in Belgium: Current Status

RBINS – OD Nature – MUMM – SURV

Shipping and Environment Conference

4-6/09/2019 – Gothenburg
Marpol Annex VI compliance monitoring

Belgian Sniffer program:
  • Methodology
  • Results
  • Future prospects
Equipment: Platform and Sniffer

- Britten Norman Islander
- Range: max 4 hr (4 POB)
- Cruise speed: 110 kts
- Stall speed: 35 kts
Reporting and communication

• Non compliant observations: Flight report (Position, MMSI, Destination, ETA, **FSC**) ➔ PSC

➔ Inspection with Fuel Sample

• Database with all observations on cloud ➔ Thetis-EU link

<table>
<thead>
<tr>
<th></th>
<th>Compliant</th>
<th>Non Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting Time</td>
<td>&gt;1hr after flight</td>
<td>Near real time</td>
</tr>
<tr>
<td>Reporting Means</td>
<td>Web-database</td>
<td>Mail</td>
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Belgian Sniffer program:

- Methodology
- Results
- Future prospects
Monitoring Results (2015-2019)

- 360 flight hours
- 3900 ships monitored
  $\rightarrow$ >10 x [PSC Fuel samples] in < 40 days/yr
- 340 possible non-compliant ships (FSC >0.15%)
  $\rightarrow$ 1 possible non-compliant ship per flight hour

- Monthly average FSC
- Airborne FSC measurements
- Linear (Airborne FSC measurements)
Top 20 of 58 observed Flag States

Average for GR FSC 0.14%

Certain significant difference (MH, FI, DE)
PSC follow-up of airborne alerts

- Flight reports send for int ports
- Follow-up by PSC (INT)
- Confirmations by PSC of non-compliance (INT)
- Flight reports send for BE ports
- Follow-up by PSC (BE)
- Confirmations by PSC of non-compliance (BE)

**Total enforcement cost**
aircraft + PSC = reduction 30%
Average number of successful ship measurements per flight hour and Success rate of measurement attempts

- Yearly average number of measurements per flight hour
- Monthly average number of measurements per hour
- Average number of successful measurements per flight
- Percentage of successful measured ships

- Number of ships
- Average number of successful ship measurements per flight hour
- Percentage of successful measurement attempts

Yearly average number of measurements per flight hour
Monthly average number of measurements per hour
Average number of successful measurements per flight
Percentage of successful measured ships

0 5 10 15 20 25 30 35 40
Airborne vs PSC inspection results (2016-2018)

Accuracy (bias)

precision

Frequency of observations

Airborne Inspections
PSC inspections
Median Airborne data
Median PSC inspections
Evaluation difference repetitive measurements (FSC1 and FSC2)

STD difference = 0.02  R² = 0.846
Evaluation color flag thresholds

- Uncertainty: combination accuracy + precision
- Precision: combination intra reproducibility variation and supplementary uncertainty factors (e.g., uncertainty calibration)

- **Red flag:** 99% CI \( FSC > 0.15\% \)
- **Orange Flag:** 95% CI \( FSC > 0.15\% \) False positives
- **Yellow flag:** 68% CI \( FSC > 0.11\% \)
- **Green Flag:** 95% CI \( FSC <0.20\% \) False negatives
Marpol Annex VI compliance monitoring

Belgian Sniffer program:

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Marpol Annex VI: Regulation 13

- Tier I
- Tier II
- Tier III
- Tier I + Uncertainty
- Tier II + Uncertainty
- Tier III + Uncertainty

2000
2011
2021
BC need for field data → IMO