



# Assessment of Sulnox Additive Performance on Marine Fuels and Renewable Fuel Blends

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<b>Summary and conclusive remark</b>  This report presents the results of a controlled laboratory evaluation of the Sulnox fuel additive across marine fossil fuels, renewable fuels, and FAME blends. The study assesses changes in key fuel quality parameters before and after additive treatment, with particular focus on lubricity, oxidation stability, and corrosion behaviour.  The results indicate that Sulnox does not adversely affect fuel quality and can provide measurable, fuel-specific benefits under the conditions tested, while further testing is recommended to confirm repeatability across a broader sample set.			
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## 1. Scope of Work

The scope of this study was to carry out a controlled laboratory evaluation of the Sulnox fuel additive when applied to a representative range of marine fossil fuels, renewable fuels, and FAME blends. The work was limited to laboratory-based testing of fuel quality, stability, lubricity, and corrosion-related properties under defined conditions.

Specifically, the scope included:

- Baseline testing of selected fuels prior to additive treatment
- Testing of the same fuels following Sulnox addition at a defined standard dosing rate
- Sensitivity assessment at elevated dosing levels in selected cases, without forming performance conclusions at those levels
- Evaluation of changes relative to test method repeatability and reproducibility
- Qualitative assessment of steel corrosion behaviour under elevated temperature conditions

The scope of work did not include engine trials, onboard evaluations, emissions measurements, or direct assessment of fuel consumption or combustion efficiency. Any conclusions drawn are therefore limited to laboratory-observed fuel property changes under the test conditions applied.

## 2. Background and Objectives

The increasing use of renewable and bio-derived fuels in marine applications has introduced new challenges related to fuel stability, lubricity, and material compatibility. Additives such as Sulnox are marketed to improve combustion and related fuel properties; however, their interaction with different fuel chemistries must be evaluated in a controlled and method-aware manner.

The objectives of this study were to:

- Establish baseline fuel quality prior to additive treatment
- Assess changes following Sulnox addition at a fixed standard dose
- Identify fuel-specific improvements, where present
- Confirm that no adverse effects are introduced by the additive

## 3. Fuels and Blends Tested

Neat fuels tested:

- Marine Gas Oil (MGO)
- Very Low Sulphur Fuel Oil (VLSFO)
- High Sulphur Fuel Oil (HFO)
- B100 (100% FAME)
- HVO (tested as a neat fuel only)

In addition, blends of MGO, VLSFO, and HFO with FAME were prepared at defined ratios (B10, B20, B24, and B30).

#### **4. Additive Dosing Protocol**

Standard dose: 0.5 L Sulnox per 1000 L fuel (1×)

Elevated dose: 2.5 L Sulnox per 1000 L fuel (5×, sensitivity testing only)

The standard dose was used as the basis for all primary conclusions. Elevated dosing was used solely to identify sensitivity and tolerance behaviour.

#### **5. Methodology and Analytical Considerations**

All results were interpreted with consideration of test method repeatability and reproducibility. Only changes exceeding normal analytical variability were considered indicative of real effects. Where standards have known limitations in precision at higher values, this has been explicitly noted.

#### **6. Results and Findings**

##### **6.1 Lubricity (HFRR)**

A clear and significant improvement in lubricity was observed for HVO following Sulnox addition. The HFRR wear scar diameter reduced from 358  $\mu\text{m}$  (before) to 259  $\mu\text{m}$  (after), representing an improvement of approximately 28%. This change is substantially greater than typical method variability and constitutes a confirmed benefit.

For MGO–FAME blends, modest lubricity improvements were observed at certain blend ratios. These changes are smaller in magnitude but directionally positive. No meaningful deterioration was observed for any fuel.

##### **6.2 Oxidation Stability (B100 FAME)**

B100 (FAME) showed a very strong improvement in oxidation stability following Sulnox addition. The induction period increased from 10.87 hours (before) to 34.9 hours (after), representing more than a threefold increase. While precision statements for high induction periods are limited in relevant standards, the magnitude of this change strongly indicates a real and beneficial effect. Repeat testing is recommended to further reinforce this finding.

##### **6.3 Steel Corrosion at 120°C**

Steel corrosion testing at 120°C represents a severe condition relevant to high-pressure, high-temperature fuel systems. For B100 (FAME) before additive treatment, clear pitting corrosion was observed, indicating an inherent corrosion risk under these conditions.

Following Sulnox addition at the standard dose, the same test showed a clear improvement, with the absence of pitting and an improved steel surface condition. This improvement was reproduced on retesting.

No significant corrosion was observed for other fuels either before or after dosing, and therefore no visible improvement could be demonstrated for those fuels.

Representative steel corrosion photographs:



**Figure 1:** Steel corrosion photographs

#### 6.4 Separability Number (Reserve Stability)

The separability number is commonly used as an indicator of a fuel's reserve stability and its resistance to phase separation or formation of insoluble material under stress conditions.

In the current dataset, separability number results do not show a clear or consistent trend following Sulnox addition across fuels and blends. Observed variations between untreated and treated samples do not support a definitive conclusion regarding either improvement or deterioration of reserve stability.

Accordingly, no conclusive statement is made at this stage regarding the effect of Sulnox on reserve stability as indicated by separability number. If this parameter needs to be reported as a key outcome, further targeted testing is recommended, including repeat separability measurements and complementary stability assessment methods.

### 7. Conclusions and Key Findings

Based on the results obtained in this investigation:

- Sulnox did not deteriorate any fuel property across the fuels and blends tested.
- A clear and significant lubricity improvement was demonstrated for HVO.
- A strong improvement in oxidation stability was demonstrated for B100 (FAME).
- Neat B100 (FAME) showed corrosive pitting at 120°C prior to additive treatment, which was clearly mitigated after Sulnox addition. This improvement is fuel-specific and technically significant.



These findings support the conclusion that Sulnox provides measurable benefits for specific fuel chemistries while maintaining overall fuel compatibility.