

Defenda Fendaskin® fender cover

Comparative LCA against a traditional neoprene fender cover (BAU) on a 500 GT superyacht

1 INTRODUCTION

Fender covers protect inflatable fenders from UV and keep them looking good. Fendaskin is made of Bioprene, a biopolymer whose main component is natural rubber (about 65% by weight), with SBR rubber, recycled oyster-shell powder and plant oil. It is reversible and is recycled at a Defenda partner's plant.

2 METHODOLOGY

Functional unit. 1 hour of use of one cover, counted as in use 24 hours a day, 7 days a week. Life: 1 year (BAU); 4 years for Fendaskin (2 years per side, reversed by hand).

System boundaries. Same for both. *Upstream*: neoprene or Bioprene sheets, nylon thread, packaging (recycled PE bag, card label). *Core*: raw-material transport (Bioprene from Taiwan: 18,000 km by sea plus 200 km by truck), cutting and sewing in the UK, packaging. *Downstream*: distribution (1,000 km), installation by hand, end of life (neoprene incinerated, 100 km; Bioprene sent back 1,000 km for recycling).

Standards. ISO 14040; ISO 14044 (incl. Amd 2, 2020); PCR Yachts and small crafts (2015, being updated); stages per EPD System GPI v4.0.

Impact methods. CML 2001 (GWP100, AP, POCP, EP, ODP, NOx, SOx, PM10); AWARE (water); ReCiPe 2016 (H) for Ecopoint.

It compares a 500 GT superyacht using Fendaskin (Scenario 2) with the same yacht using a traditional neoprene cover (Scenario 1, BAU). Both covers are 66 × 165 cm and weigh 1.9 kg. Goal: verify Fendaskin for Water Revolution Foundation's Hub Solutions.

Data sources. Primary data from Defenda (data collection sheet, questionnaire, datasheet). Ecoinvent v3.9; SimaPro 9.5. No allocation. UK grid electricity for production.

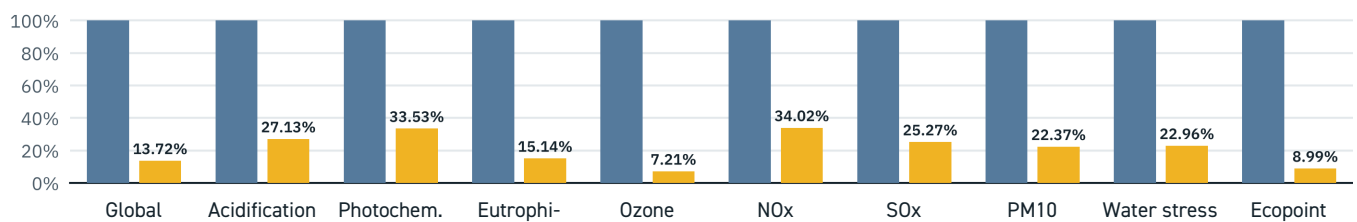
BAU reference. Traditional neoprene cover (100% oil-based rubber), replaced every year mainly for looks; not recyclable.

Assumptions. Bioprene's undisclosed 35% modelled as SBR rubber (the worst case). BAU packaging taken as equal to Fendaskin's. Neoprene origin unknown, so 100 km by truck. Recycling of Bioprene scraps counted as transport only (partner plant uses its own solar power).

3 RESULTS per functional unit (1 hour of use)

■ Scenario 1 – BAU (neoprene cover) ■ Scenario 2 – Fendaskin

Scenario 2 as % of BAU (BAU = 100%), report Figure 4



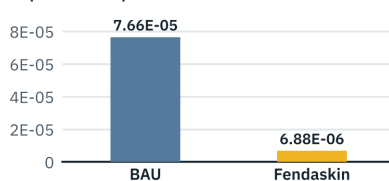
Unit	kg CO ₂ eq	kg SO ₂ eq	kg C ₂ H ₄ eq	kg PO ₄ ³⁻ eq	kg CFC-11 eq	kg	kg	kg	m ³ H ₂ O eq	Pt
BAU	1.39E-03	3.04E-06	1.55E-07	9.77E-07	1.81E-10	1.38E-06	1.88E-06	8.02E-07	4.16E-04	7.66E-05
Fendaskin	1.91E-04	8.26E-07	5.20E-08	1.48E-07	1.31E-11	4.70E-07	4.75E-07	1.79E-07	9.55E-05	6.88E-06
Reduction	86.28%	72.87%	66.47%	84.86%	92.79%	65.98%	74.73%	77.63%	77.04%	91.01%

Sensitivity: reduction vs BAU, as printed in Tables 16–17. Raw mat. +50%: Fendaskin raw-material impacts raised 50%. BAU life 2 yrs: neoprene cover lasts 2 years instead of 1.

Raw mat. +50%	80.81%	64.62%	52.80%	79.78%	90.86%	57.21%	66.34%	70.07%	65.85%	87.70%
BAU life 2 yrs	72.56%	45.74%	32.93%	69.73%	85.59%	31.97%	49.46%	55.27%	54.07%	82.02%

Bar labels as printed on report Figure 4. Base case: Tables 14–15.

Ecopoint (Pt per hour of use)



Layout of report Figure 1, values from Table 15.

Ecopoint by damage category

Pt per hour	BAU	Fendaskin	Reduction n
Human health	7.39E-05	6.38E-06	91.36%
Ecosystems	1.50E-06	2.31E-07	84.66%
Resources	1.16E-06	2.67E-07	76.90%
Total	7.66E-05	6.88E-06	91.01%

Values as printed in Table 15.

Where the impacts come from (report §4)

Both: raw materials (upstream) lead almost every category.

Fendaskin: the 18,000 km ship transport adds to NOx, SOx and acidification; trucking to the yard and back to recycling adds to ozone depletion.

BAU: production electricity adds to eutrophication; disposal of the non-recyclable neoprene adds to ozone depletion, photochemical oxidation, GWP and especially Ecopoint.

4 KEY FINDINGS

Fendaskin is lower in all 10 indicators, by 65.98% to 92.79% (Table 14); Ecopoint by 91.01% (Table 15).

Longer life and recycling. Fendaskin lasts 4 years (2 per side) against 1 year for neoprene, and it is recycled, while neoprene is incinerated. Raw-material production contributes most to almost all categories (report).

Keep in mind: the lifetimes come from Defenda, and Bioprene's exact composition is confidential.

The gains hold in the sensitivity tests. With Fendaskin raw-material impacts 50% higher, it stays 52.80–90.86% lower; with the neoprene cover lasting 2 years, 31.97–85.59% lower.

Trade-off: transport. Shipping Bioprene 18,000 km from Taiwan and trucking used covers 1,000 km back for recycling add notable impacts (report conclusions).