

FMD Permanent Washable Air Filters

Comparative LCA against traditional disposable air filters (BAU) on a 500 GT superyacht

1 INTRODUCTION

Air filters clean the air in a yacht's indoor ventilation. Traditional filters are single use and are replaced 3–4 times a year. FMD's permanent filters are washed with water and reused; FMD gives a 12-year warranty and says they are likely to last longer.

The study compares a 500 GT superyacht using FMD washable filters (Scenario 2) with the same yacht using disposable filters (Scenario 1, BAU). Both are 59.2 × 59.2 cm. Goal: verify FMD's filters for Water Revolution Foundation's Hub of Verified Solutions.

2 METHODOLOGY

Functional unit. 1 hour of use of one filter (in use 24/7). Life: BAU 4 months; FMD filter 12 years (warranty), steel frame 20 years.

System boundaries. Same for both. *Upstream*: BAU polypropylene frame and Viledon media; FMD stainless-steel frame and mesh, polypropylene mesh and foam; brown-paper packaging. *Core*: raw-material transport (FMD media from the USA: 5,600 km by sea plus 200 km by truck), hand assembly, packaging. *Downstream*: distribution (1,000 km), washing (FMD) or replacement (BAU), end of life 100 km away (BAU: plastic recycled, media incinerated; FMD: all recycled).

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.

Data sources. Primary data from FMD (data collection sheet, questionnaire, datasheet). Ecoinvent v3.9; SimaPro 9.5. No allocation. No production energy or waste data (hand assembly; likely negligible).

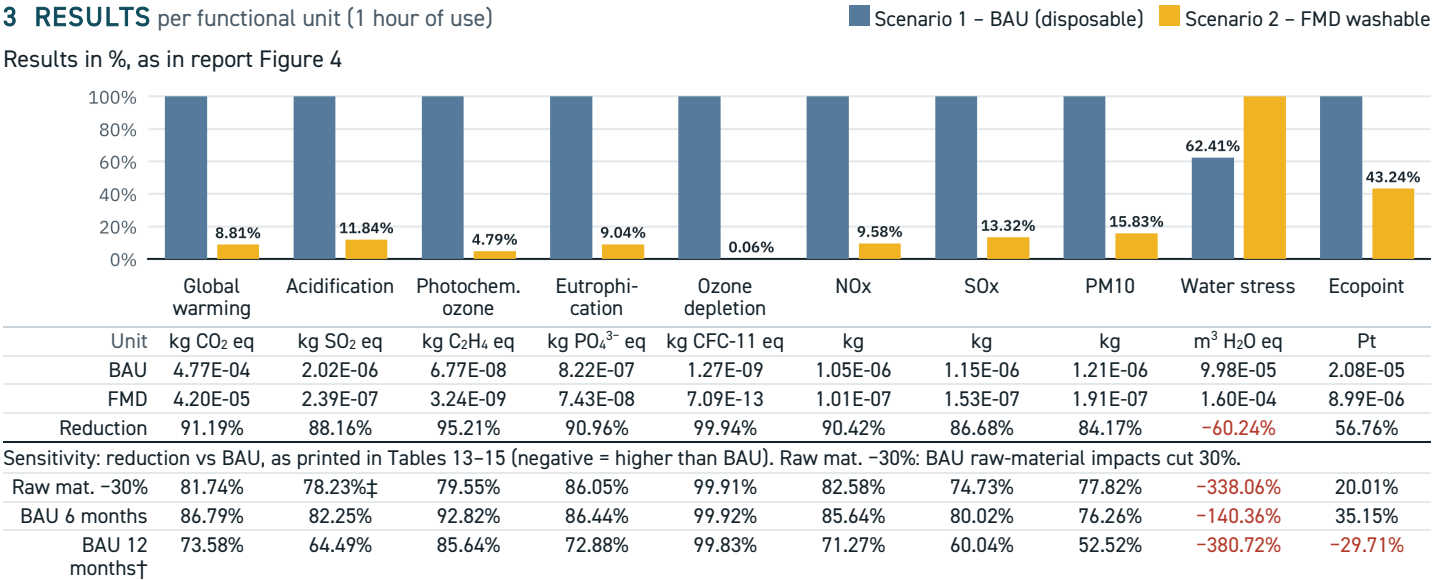
BAU reference. Disposable filter, 9.8 cm deep, modelled with a single-use plastic frame. Replaced 3–4 times a year; modelled as every 4 months (conservative).

Assumptions. BAU weights estimated: media 0.484 kg from a datasheet, frame 0.217 kg (plastic taken as one tenth the weight of steel). BAU packaging taken as FMD's (0.2 kg paper). FMD washing: 10 l of water every 3 months. US media supplier chosen as worst case.

Not reported: author, report date, cut-off criteria, data quality results, uncertainty analysis.

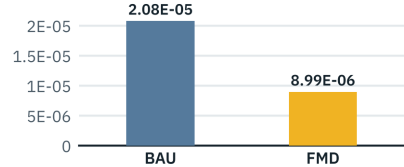
3 RESULTS per functional unit (1 hour of use)

Results in %, as in report Figure 4



Bar labels as printed on Figure 4 (for water, FMD is at the top of the scale and the BAU at 62.41%). ‡

Ecopoint (Pt per hour of use)



Layout of report Figure 1, values from Table 12.

Ecopoint by damage category

Pt per hour	BAU	FMD	Reduction
Human health	2.00E-05	8.88E-06	55.60%
Ecosystems	6.18E-07	7.74E-08	87.47%
Resources	1.71E-07	3.09E-08	81.90%
Total	2.08E-05	8.99E-06	56.76%

Values as printed in Table 12.

Where the impacts come from (report §4)

Both: raw materials lead almost every category; recycling gives negative (credit) values in most.

FMD: washing water drives the water result; the sea transport from the USA weighs on PM, NOx, SOx, GWP and acidification.

BAU: PM is the only category with no downstream credit (filter incineration and transport).

4 KEY FINDINGS

FMD is lower in 9 of 10 indicators, by 56.7% to 99% (report conclusions); Ecopoint by 56.76% (Table 12).

Trade-off: water. Water stress is 60.24% higher with FMD, because the filters are washed (10 l every 3 months, assumed).

Reuse instead of replacement. A disposable filter is replaced every 4 months; FMD's filter lasts 12 years and its frame 20, and both are recycled.

Keep in mind: the BAU component weights, its 4-month life and the washing water are estimates.

The result depends on the BAU's life. If disposable filters last 6 months, FMD stays lower in 9 of 10 (Ecopoint 35.15%). At 12 months the BAU has the lower Ecopoint (-29.71%) and FMD wins 8 of 10, which the report says does not meet WRF's criteria. It calls 12 months unrealistic and puts the turning point around 9 months.

Raw materials: with BAU raw-material impacts 30% lower, FMD's Ecopoint gain falls to 20.01%.