Journal of Zhejiang University-SCIENCE A

Cite this as: Shao-ce DONG, Cheng-gao LI, Gui-jun XIAN, Zhong-jie ZHAO, Xu-feng ZHANG, Qing-wen YUN, 2022. Environmental impact assessment of aircraft elevator made with new lightning protection material. *Journal of Zhejiang University-SCIENCE A (Applied Physics & Engineering)*, 23(9):669-682.
https://doi.org/10.1631/jzus.A2200105

# Environmental impact assessment of aircraft elevator made with new lightning protection material

**Key words:**

Environmental impact assessment; Lightning strike protection materials; Aircraft elevator; Life cycle assessment (LCA); Non-metallic lightning strike protection material

# Aims of research

- Non-metallic lightning strike protection (NM-LSP) film covering CFRP has the potential to reduce the weight of aircraft structure.

## Traditional Elevator

- LSP material: aluminum net, GFRP



## NEW Elevator

- LSP material: NM-LSP covering CFRP

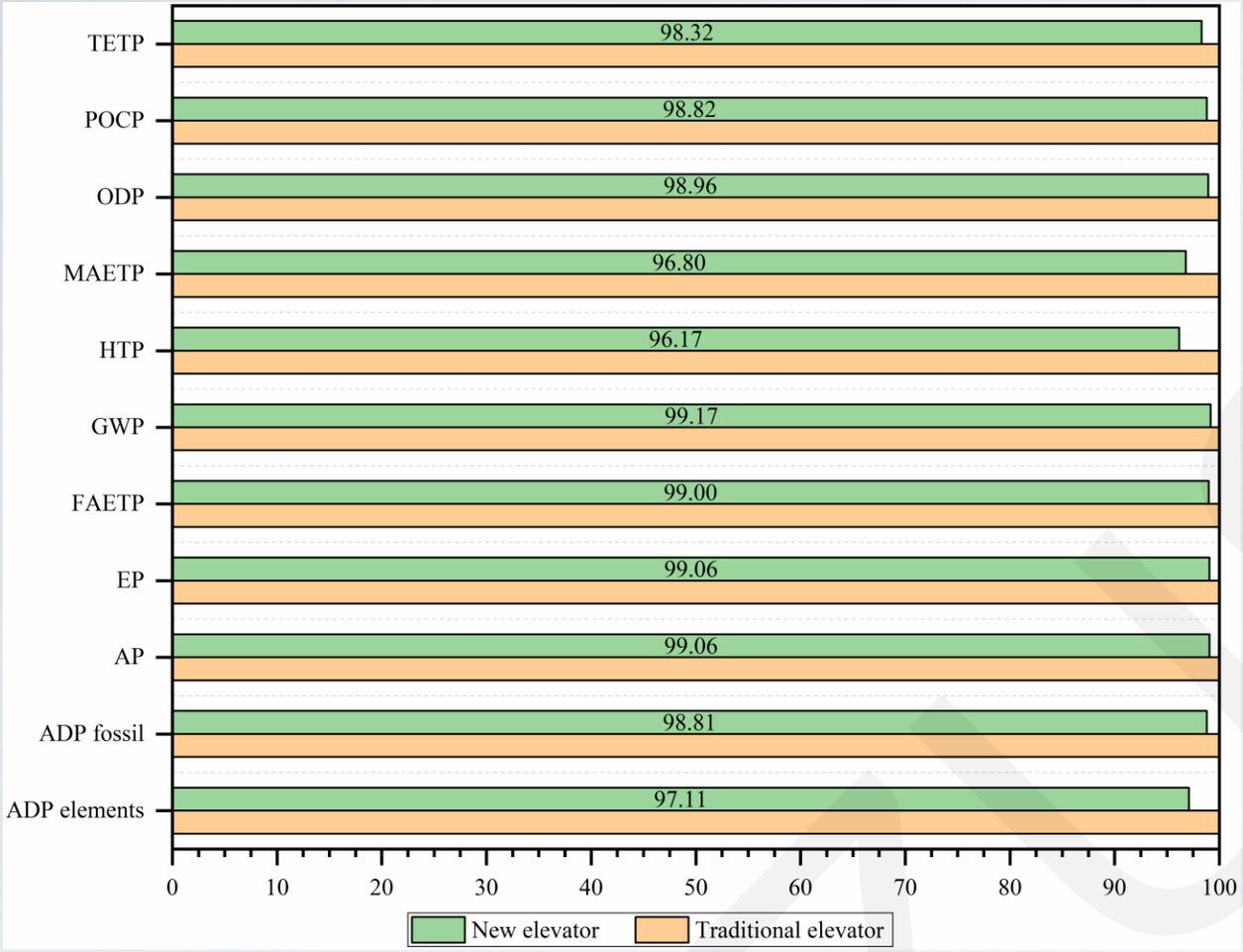
- Life cycle assessment (LCA) results comparison between two elevators
- LCA results comparison between two kinds of LSP materials
- LCA contribution analysis for two elevators and NM-LSP covering CFRP

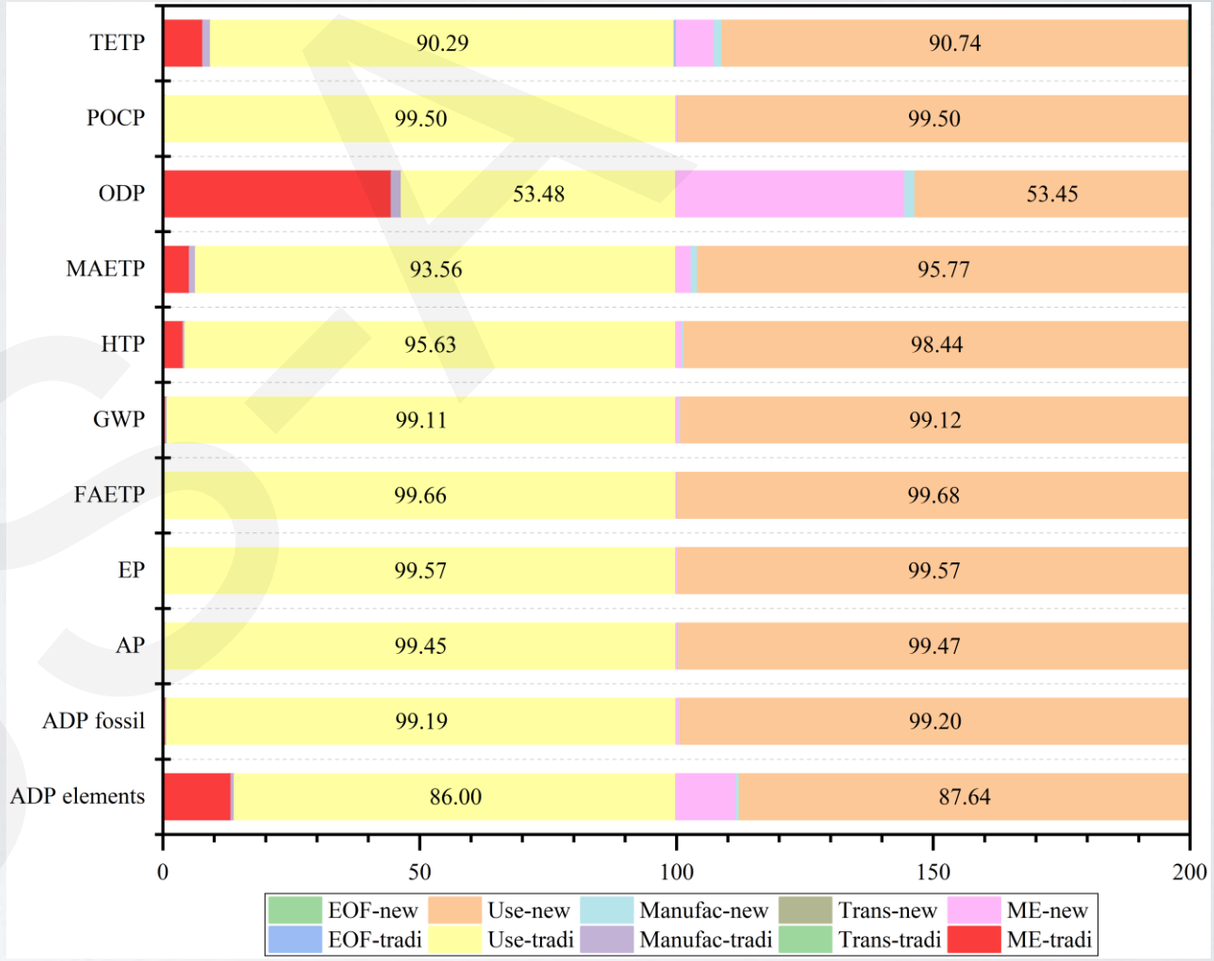
# Research Method

Life cycle impact assessment method CML, together with eleven life cycle impact categories were adopted to assess the environmental impacts of two elevators. Phases included were shown below:

- Material extraction phase: Production of constituents of two elevators
- Transportation: Transporting constituents to aircraft manufacturing center;
- Manufacturing phase: Assembling and manufacturing elevator
- Service phase: Production and combustion of fuel
- End-of-life phase: Transporting waste to landfill

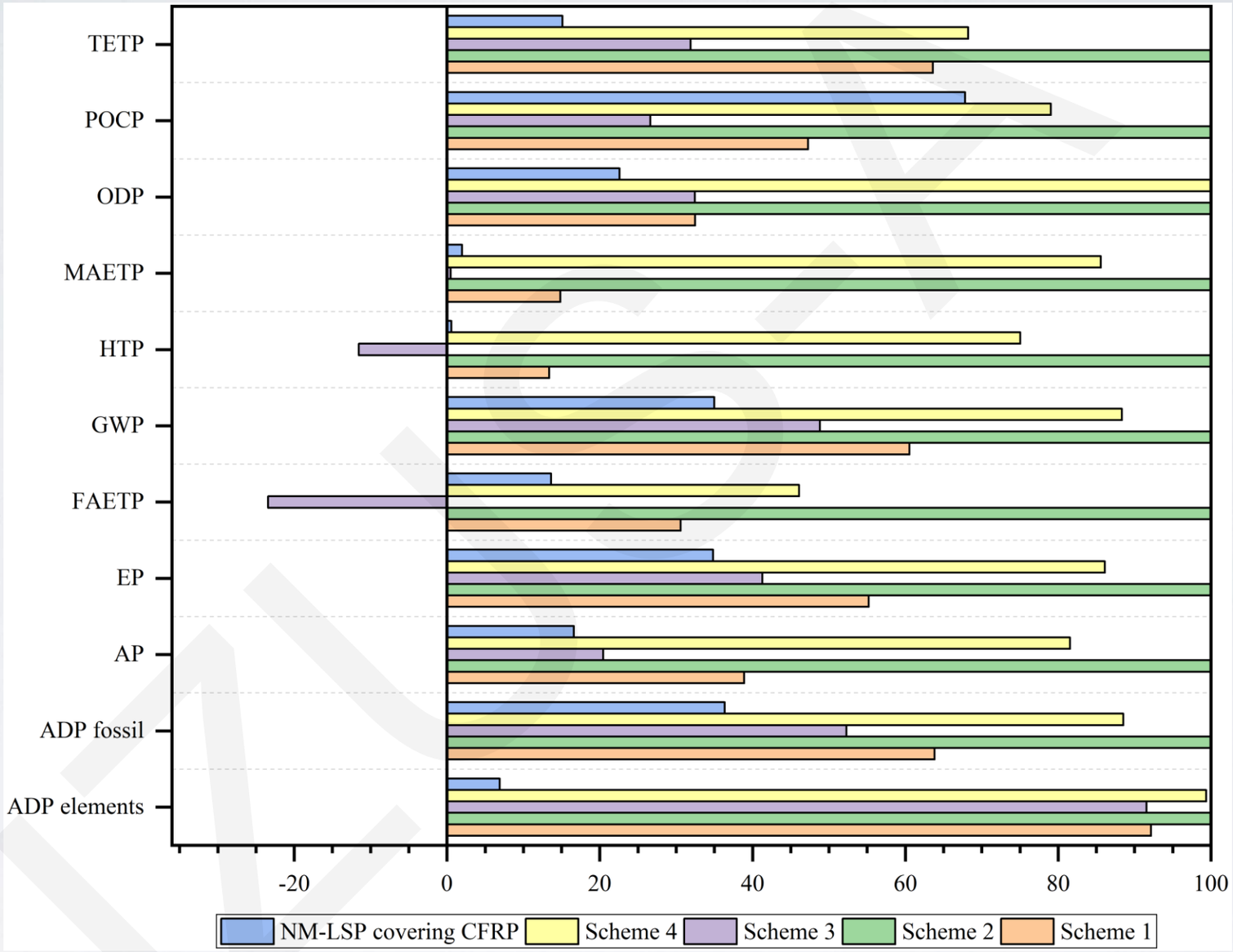
# Comparison between two elevators




- New elevator achieved reduction in all the eleven categories with reduction rates from 0.83% to 3.83% compared with traditional elevator. In terms of weighting results, New elevator achieved 1.75% reduction of the overall environmental impacts.
- Use phase contributed most to all the eleven categories for both elevators and material extraction phase contributed secondly for two elevators.

# Comparison between two lightning strike protection materials




- NM-LSP covering CFRP achieved reduction in eleven environmental impacts categories except FAETP, HTP, MAETP and POCP compared with traditional LSP material when aluminum recycling was considered and the BTF ratio is 1. When recycling was not included, NM-LSP is more eco-friendly.