Sustainability Evaluation of Pyrolysis of Waste Mattresses: A Comparison with Alternative End of Life Treatments

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THE ISSUE

In the Netherlands 1.5 million mattresses are discarded yearly (>60% is incinerated). Mechanical recycling of mattresses is presently hindered because 60% of the waste product (Polyurethane & latex) cannot be reused as recyclate.

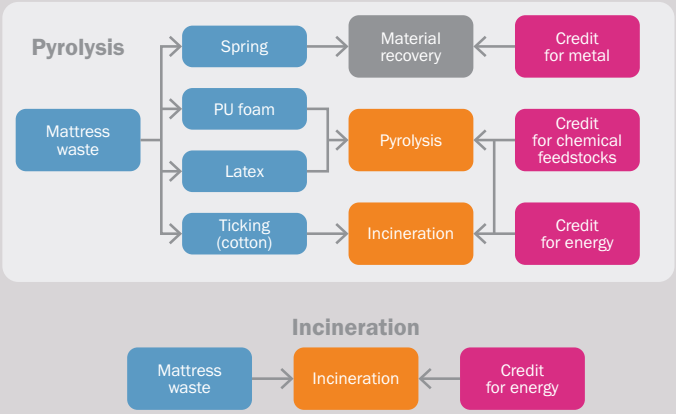
Functional Unit: 1 ton of waste mattress sent for EoL treatment

PRIMA PROJECT OBJECTIVES

- Develop and optimize pyrolysis of waste mattresses with an experimental study by deploying two installations with a minimum capacity of 100 kg/hr.
- Quantify potential sustainability benefits.

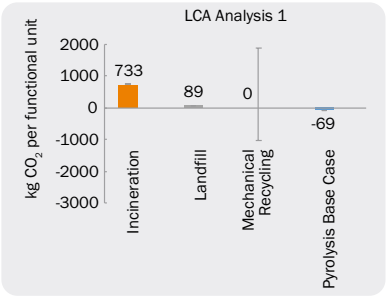
Geography: The Netherlands. Excluded: Mattress Manufacturing, Use & disassembly

SYSTEM BOUNDARY & EOL SCENARIOS

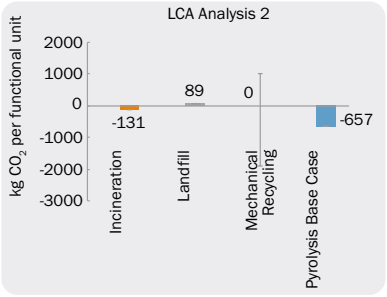


RESULTS: TWO LCA ANALYSIS (PERSPECTIVES)

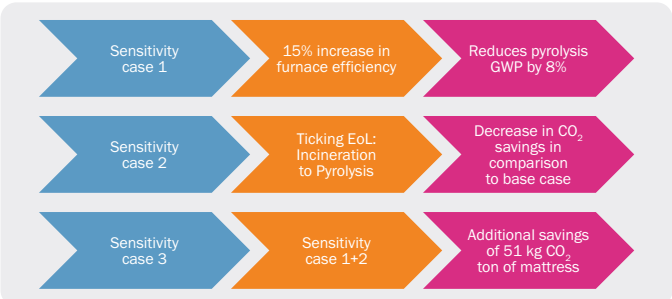
LCA Analysis 1:
Fossil Carbon Accounting
Mattress with only fossil carbon content (PU & synthetic latex). Ticking is also assumed to be of fossil origin.

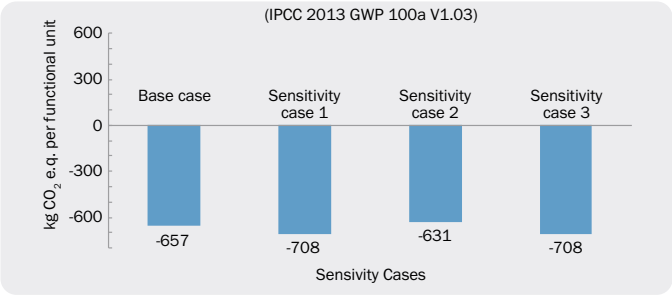


LCA Analysis 2:
Fossil & Biogenic Carbon Accounting
Mattress with fossil carbon content (PU) and biogenic carbon content (natural latex and cotton ticking).



SENSITIVITY STUDIES





CONCLUSIONS

- Pyrolysis of waste mattress can save 526 kg CO_2 eq. per ton mattress compared to incineration.
- Mechanical recycling can be better or worse than pyrolysis depending on the processes and quality of recycled material.
- CO_2 savings are higher at 802 kg CO_2 eq. per ton mattress when organic components of the mattress are assumed to be 100% fossil based.
- We recommend further research & experimental pilot trails on
  1. Mechanical recycling **2.** EoL treatment of ticking to reduce data uncertainty and assumptions.

PRIMA PROJECT PARTNERS

CBM, TNO, Dow, Waste4me, ENERPY, Matras Recycling Europe

REFERENCES

TNO Report
R12308, 2020

LCM 2021