Designing Light Electric Vehicles for urban freight transport

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Summary

LEFV-LOGIC (2016-2018): Light Electric Freight Vehicles for city Logistics

Trend:
More light commercial vehicles (LCV) leads to increasing pressure on the liveability of cities.

Possible solution:
Small electric freight vehicles and cargo bikes: take less space, can manoeuvre easily and are free from polluting emissions.

Research question:
How can light electric freight vehicles be used cost-effectively for city logistics?

This paper:
Guidelines for the design of LEFV based on two standardized rolling containers (length 800 mm, width 640 mm, height 1600 mm) and for the charging infrastructure.

The results:
The customer and design requirements of LEFV, the design of a LEFV, the evaluation of its design, the guidelines for the design of LEFV and solutions for the energy-charging infrastructure.

Explorative design

Design guidelines:

1. With respect to the propulsion:
Reduce vehicle driving force (air drag and rolling resistance).
Choose the components for the regular user profile and take measures (ie. battery replacement) to prevent for worst case scenarios.

2. With respect to the packaging:
Put the load on the lowest floor level close to the vehicle centre.
Maximise the vehicle track width within the allowed range (1500 mm vehicle width).

Redesign sketch based on design guidelines

Requirements for the energy and charging infrastructure:

In the figure below the load on the power network is given for a typical distribution company in the Netherlands with most energy consumption during daytime. Up to now most LEFV are charged when the vehicles return at the end of the day, as you can see in the figure below. With smart charging the capacity during the night can be used more efficiently and more vehicles can be charged.