Analysis of electric vehicles used in urban logistics operations pilot projects

Tharsis Teoh¹, Oliver Kunze², Chee-Chong Teo³, Gebhard Wulfhorst⁴

¹ TUM CREATE, 1 CREATE Way, #10-02 CREATE Tower, Singapore 138602, tharsis.teoh@tum-create.edu.sg
² University of Applied Sciences Neu-Ulm (Germany), ³ Nanyang Technological University (Singapore), ⁴ Technische Universität München (Germany)

Research Question

The electrification of goods vehicles for urban transport offers some benefits, in terms of the reduction of local air pollutants, reduction in noise emission, decoupling of transport from fossil fuelled-power generation, and the increase in energy efficiency and the decrease in operating costs borne by companies. However, there remains a lot of research needed to successfully incorporate electric vehicles in goods transport, since the incumbent conventional vehicles have shaped the operational characteristics of the firms. The study aims to synthesize various case study reports to develop theories for the suitability of market-available electric vehicles for selected urban logistics operation types.

Content

Each categorized pilot project case was assigned an acceptance indicator. The general feedback of the pilot project participants were taken as an indicator of whether the vehicles were suitable for the operations.

The parameters of the vehicles trialled and those which were found suitable to the operations.

The 59 cases cover a variety of operation types and had different levels of funding. The table shows the variety of cases, as well as the acceptance of their chosen electric vehicles. In general, electric vehicles were well accepted, however this must consider the possible bias that only case studies of successful endeavours are usually published.

Due to a lack of available definitions of urban logistics operation types, the authors resorted to use three categorisations: based on the firm’s establishment, on the product transported and on the types of movements associated with the operation. From this the operations were grouped into 8 major types to be further discussed.

The type of vehicles chosen strongly depends on the operation demands. For instance, comparing retail and food deliveries (to homes), the weight of the vehicle for food is much lower than what retail deliveries require. In this case, the product’s “lead time”, the degree of consolidation of shipments, and the number of customers served per tour makes a large difference.

Existing electric vehicles can be used for heavier applications, depending also on future research to improve batteries.

Construction logistics and waste collection typically require a heavy weight capacity for their vehicles. The vehicles chosen for construction logistics here only represent the “light-duty” construction, such as road maintenance. Waste collection routes require also a high driving range but not necessarily a high speed.

Construction logistics and waste collection

Batteries, which are an extremely important component in an electric vehicle, exhibit different characteristics depending on the chemical composition. Research is going particularly in the direction of improving the lithium-based batteries, since they currently show the most potential.

Conclusion

The paper introduced a methodology to gain generalized insights from case studies in very heterogeneous urban logistics settings. These are:

• the type of electric vehicles chosen for selected major categories of urban logistics operations,
• the type of electric vehicles which were “generally accepted”,
• the trend of battery types used in vehicles in the pilot projects, and
• a comparison between the specification of the vehicles in terms of total vehicle weight, electric driving range, top speed and battery capacity for the three battery types.

Literature


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