

LCA evaluation for long-distance transportation of heavy-duty BEV trucks

- CO₂ Emissions Per Payload 1t · Transportation Distance 1km by BEV Battery Installation -

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In this study, LCA (Life Cycle Assessment) evaluation was studied assuming long-distance transportation by heavy-duty BEV (Electric Vehicle) trucks. BEV trucks have a proportional relationship between driving distance and the weight of the BEV battery. CO₂ emissions per load weigh were estimated by increasing the weight of the BEV battery, and the results were discussed. The range of evaluation was from vehicle manufacturing to driving and maintenance, not including disposal.

In this study, DV (Diesel Vehicle) and BEV (Battery Electric Vehicle) were all set up as freight vehicles. Perform a hypothetical LCA for each vehicle hypothetical. Fig. 1 shows the evaluation range set for LCA.

Major components to be reduced from the DV include the drive system such as the engine, fuel system such as the fuel tank, and intake/exhaust system such as the after-treatment system. BEVs have motors, inverters, gearboxes, electrical systems, etc. as additional major components associated with conversion to BEVs. Therefore, the weight of LiBs (LiB : Lithium-ion Battery) for BEVs is calculated by subtracting the weight of parts to be reduced from that of DVs by the weight of additional parts to be added to BEVs. In the maintenance phase, DV is performed as earlier studies, and BEV LiB is compared with multiple patterns of 0~8 replacements in a lifetime cycle. The vehicle was assumed to have a 10-year life of 1.4 million km, a loading rate of 80%, and a LiB life of 160,000 km.

Fig. 2 shows the relationship between CO₂ emissions per ton of payload and per kilometer of transport distance and the number of LiB replacements. Comparing the lifetime CO₂ emissions per payload and transportation with the DV and BEV5 with 8 replacements, there is a difference of approximately 2.6 times. The reasons for this are thought to be largely attributable to the smaller payload and the increased number of LiB replacements, i.e., the increased number of units consumed.

From the above, with current technology, there are many issues that remain in the conversion of heavy-duty trucks for transportation to BEVs. In the near future, these issues will be resolved with the development of driving recharging and large-capacity, compact batteries. As an alternative, FCVs are a realistic option for heavy-duty trucks.

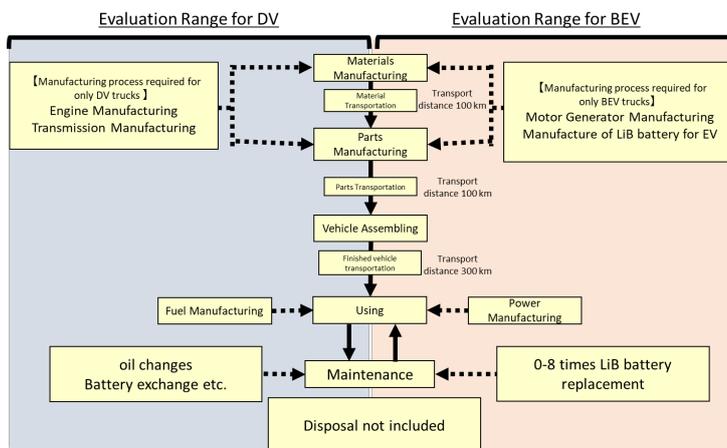


Fig. 1 Evaluation range of LCA for vehicle

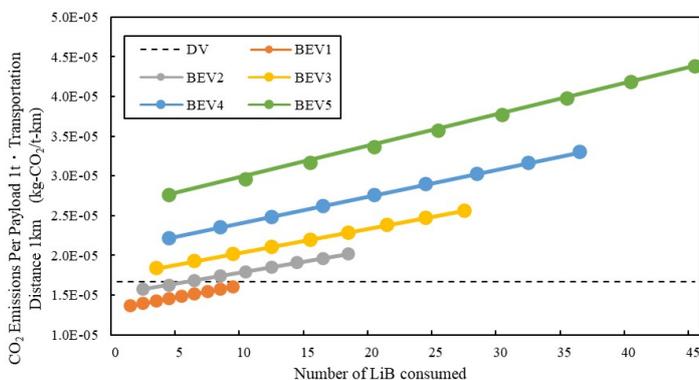


Fig. 2 CO₂ emissions per 1 ton of payload and 1 km of transportation