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Research Results

Field Study of Battery-Electric Sweepers

Evaluating the effectiveness, benefits, drawbacks, and special use cases of Battery-Electric (BE) street sweepers as alternatives for traditional fuel technologies.

Equipment

May 2026

Project Title: Battery-Electric Sweeper Evaluation

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WHAT WAS THE NEED?

In order to reduce greenhouse gas (GHG) emissions and improve air quality, California is moving towards Zero-Emission Vehicles (ZEVs), which do not produce any on-road GHG emissions or criteria pollutants. The California Air Resources Board (CARB) has ZEV targets in place for light-duty vehicles and in 2020 CARB adopted ZEV requirements for heavy trucks (California Air Resources Board, 2020). California Department of Transportation's (Caltrans') Division of Equipment (DOE) will be acquiring eighteen BE street sweepers to help the state meet its climate and air quality goals. The implementation of this new technology generates a need to understand specific usage and performance characteristics to help evaluate the benefits, drawbacks and nuances of the introduction of this new equipment to the Caltrans' fleet.

WHAT WAS OUR GOAL?

The goal of this research was to assess the in-use characteristics of the acquired BE street sweepers to provide insight into their particular usage and performance. Parameters of interest included values such as daily travel time and distance, hours of operation, per charge travel times and distances, and recaptured energy through regenerative braking.

WHAT DID WE DO?

This research project collected and evaluated detailed activity and Controller Area Network Bus (CAN Bus) data from a subset of BE street sweepers and fleet management level activity data from the Geotab fleet management system for all acquired BE street sweepers in the Caltrans

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fleet. Additionally, a survey of Caltrans BE sweeper operators and mechanics were conducted to help characterize function and performance of the BE sweepers.

WHAT WAS THE OUTCOME?

The battery capacity and availability of opportunity charging greatly impacted the feasibility of a BE platform achieving the range needed. With existing limitations on charging infrastructure much of the existing sweeper fleet operations can be achieved with the BE platforms performing solely overnight charging. Sufficient charging infrastructure is required for the sweepers to perform daily sweeping activity, and it is critical to resolve charging and infrastructure limitations to allow needed overnight and opportunity charging.

Evaluation of work order data revealed that the BE sweepers have increased downtime relative to other street sweeper fuel technologies. This is somewhat expected from an initial product release. BE downtime is expected to decrease over time as some of the initial issues are addressed and with subsequent releases of BE sweepers. Reliability was an issue and limited the amount of up time and quantity of days sweepers were available to perform maintenance operations.

Interactions with operators and maintenance staff through surveys and interviews revealed several insights. Operators were generally pleased with the functionality and performance of the BE sweepers when they had sufficient charge and range. BE Street sweepers accelerated quickly and smoothly and were quieter when compared to other street sweeper fuel technologies.

WHAT IS THE BENEFIT?

This research will provide necessary information to help assess the effectiveness, benefits, drawbacks, and special use cases of BE street sweepers as alternatives for traditional or competing fuel technologies.

IMAGES



Image 1: Installation of time-lapse camera for 2018 HFC Street Sweeper Evaluation project



Image 2: Video generated by time lapse camera at 1Hz showing broom activation

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