

Equipment

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Project Title: Battery-Electric
Sweeper Evaluation

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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.

WHAT IS THE NEED?

The largest source of the state's greenhouse gas (GHG) and several smog-causing pollutant emissions is California's transportation sector including tailpipe emissions, oil extraction, and oil refining (California Air Resources Board, 2022). In order to reduce 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 in the spring of 2023 to help the state meet its climate and air quality goals. With the implementation of this new street sweeper technology, there will be a need to understand specific usage and performance characteristics for the new technology in order to help evaluate the benefits, drawbacks and nuances of the introduction of this new equipment to the Caltrans fleet.

WHAT ARE WE DOING?

This research project will collect and evaluate detailed activity and Controller Area Network Bus (CAN Bus) data from a subset of at least five BE street sweepers and fleet management level activity data from the Geotab fleet management system for all eighteen newly acquired BE street sweepers in the Caltrans fleet. Additionally, survey of Caltrans BE sweeper operators and mechanics will be conducted to help characterize function and performance of the BE sweepers.



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WHAT IS OUR GOAL?

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

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.

WHAT IS THE PROGRESS TO DATE?

The research team worked on refining telematics data processing including map-matching and up sampling of irregularly spaced time series data and validating algorithm to identify sweeping activity. The team continued analysis of sweeper trip data and methods to evaluate trips for ZEV compatibility and analysis of charging data and previously obtained hydrogen fuel cells sweeper data to calculate distance-based power consumption for trip analysis. The team had discussions with Caltrans sweeper operators regarding experience with Battery Electric sweepers.