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Evaluation of Bucket Utility Truck In-Use Driving Performance and Electrified Power Take-Off Operation

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Abstract : In an effort to evaluate the in-use performance of electrified Power Take-off (PTO) usage on bucket utility trucks operating under real-world conditions, data from 20 medium- and heavy-duty vehicles operating in California, USA were collected, compiled, and analyzed by the National Renewable Energy Laboratory's (NREL) Fleet Test and Evaluation team. In this paper, duty-cycle statistical analyses of class 5, medium-duty quick response trucks and class 8, heavy-duty material handler trucks are performed to examine and characterize vehicle dynamics trends and relationships based on collected in-use field data. With more than 100,000 kilometers of driving data collected over 880+ operating days, researchers have developed a robust methodology for identifying PTO operation from in-field vehicle data. Researchers apply this unique methodology to evaluate the performance and utilization of the conventional and electric PTO systems. Researchers also created custom representative drive-cycles for each vehicle configuration and performed modeling and simulation activities to evaluate the potential fuel and emissions savings for hybridization of the tractive driveline on these vehicles. The results of these analyses statistically and objectively define the vehicle dynamic and kinematic requirements for each vehicle configuration as well as show the potential for further system optimization through driveline hybridization. Results are presented in both graphical and tabular formats illustrating a number of key relationships between parameters observed within the data set that relates specifically to medium- and heavy-duty utility vehicles operating under real-world conditions.

Keywords : drive cycle, heavy-duty (HD), hybrid, medium-duty (MD), PTO, utility
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