

RentalFleet Fuel Methodology

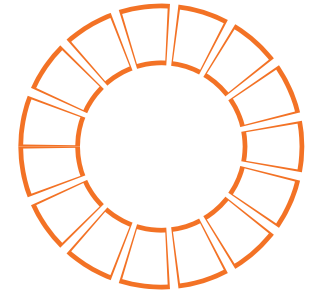
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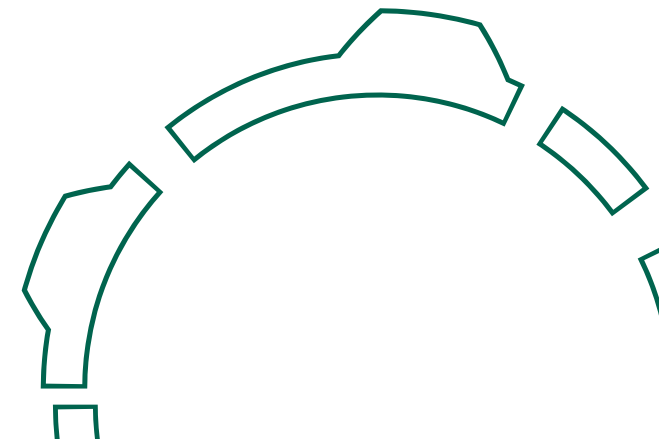
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Fuel Characterization Overview

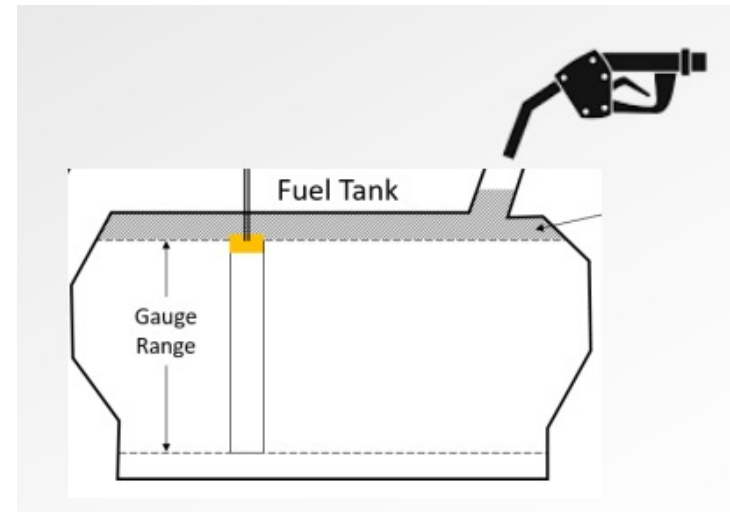


- *Fuel Characterization* is the process performed by the Powerfleet team to derive accurate fuel readings. The process requires a vehicle starting with a “near empty” tank and adding fuel incrementally while sampling the reading directly from the ECU.
- These tests involve using special tools to remove fuel, and if required, may also involve needing to drive off fuel. All tests are required to start with less than 1/8 of a tank (gauge reading) but are not required to be completely empty as this is not always possible.



Fuel Characterization Overview

- The bottom of the tank will presumably read a lower reading than the top of the tank. This is used to calculate how full the tank is in terms of gallons (not the gauge reading). Some vehicles will report “E” on the gauge when the vehicle has some reserve fuel remaining.
- The top of the tank usually contains an area that cannot be read, referred to as the top off region. This region usually encompasses a vast majority of the final 1/8 of a tank in terms of gallons (not the gauge).
- All this information is databased and used alongside an edge compute sloshing algorithm to derive the most accurate reading possible, within the limitations of the fuel sensor hardware.



RentalFleet Fuel Test Process Summary

- The Powerfleet fuel characterization process ensures that fuel level reporting is accurate to within +/- 0.3 Gallons.
- The most accurate readings from the Powerfleet solution are found when these factors are involved:
 - Time – Needed for taking sufficient samples. We recommend at least 3 minutes between tests to allow for rolling average and sloshing algorithm to assist with the collection of data.
 - Engine state transition – Turn the vehicle off after a short period of driving or a minimum of 3 minutes of engine on activity. This helps the fuel algorithm to detect “quick refuel” events that may not involve a large increase (i.e., 2-gallon increase)
- The bottom of the tank is less accurate than the mid and top levels. This is because the bottom 1/8 of a tank has not been an area of focus based on our existing customer requirements. The great majority of check-ins occur above the 1/8 region.

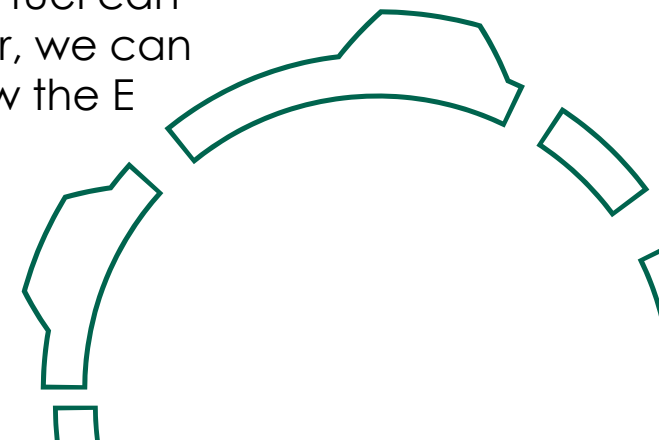
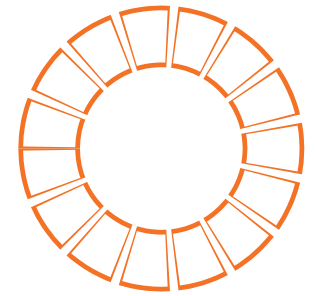
Top Off and Bottom of Tank Readings

- **Top Off Readings**

- Currently we utilize MPG to infer an incremental amount of fuel from the top as vehicle is being driven. This could be further improved to utilize idle fuel consumption data (i.e., MAF/P) and engine on time, allowing idle fuel burn off to be detected.
- If desired, we could remove the top off region calculation and simply provide data below the top off region. The area of emphasis (starting fuel level) would shift to ensure most accurate readings at $\frac{3}{4}$ full. This would allow an indisputable value for fuel to be reported.

- **Bottom of Tank Readings**

- The bottom of the tank readings can be improved by changing the current process to remove all fuel in the vehicle by any means necessary before starting the incremental refuel process.
- This would provide full visibility to the tank at the same accuracy as we maintain throughout the remainder of the tank.
- Some vehicles hide the remaining fuel in a reserve area that is only reflected in the gauge below E implying to the customer that there is zero fuel in the tank. This fuel can be up more than two gallons (e.g., Santa Fe). To compensate for this behavior, we can provide an additional reading that matches the fuel gauge when it falls below the E which can potentially be used for billing.



Thank You



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