

Vehicle Fuel Tank Capacity and Retail Motor-Fuel Dispenser Accuracy

When fuel prices rise, the New Hampshire Division of Weights and Measures will often see an increase in the number of consumer complaints related to the accuracy of gas pumps (retail motor-fuel dispensers). Frequently, complaints are from motorists who believe they filled their vehicle's fuel tank with more fuel than what the declared tank capacity is indicated in the owner's manual. While the possibility does exist that a fuel meter may not be within the allowed tolerance, this article will examine some possible reasons why a vehicle's tank might be different than what a motorist thinks. The article will also explain what tolerances are allowed for typical retail motor fuel meters.

The vehicle owner's manual provides a reasonable estimate of your vehicle's fuel tank capacity. Some manufacturers estimate that the capacity of a fuel tank may vary by as much as three percent from the actual tank capacity. This results from normal variations in design characteristics, the manufacturing process, and other inherent factors. The rating is determined by taking an average volume, based upon the capacities of multiple tanks, since fuel tanks are not calibrated to a "known" capacity.

Furthermore, the rated capacity may include only the usable portion of the fuel tank, or it may include both the usable and unusable portions. The "unusable portion" is the area of the fuel tank where the fuel is located out of reach of the fuel pump. The "usable portion" is the area where the fuel is delivered through the filler pipe into the tank, when the vehicle is in a level position. The vehicle's fuel tank capacity does not include the portion of the filler pipe or the vapor headspace, which is the area of the tank compartment above the filler pipe neck.

Sometimes people attempt to deliver additional fuel into their tank after the fuel dispenser automatically shuts off, commonly known as "topping off". When this happens, the additional fuel begins to fill the vapor headspace and the filler pipe, which are not considered part of the tank's rated capacity. This may result in receiving more fuel than the indicated tank capacity. This may also occur if the driving lanes that surround the fuel dispensers are not level. This condition may allow fuel to shift into the vapor headspace and deliver more fuel into the tank.

When the fuel tank gauge indicates a certain level of fuel in the car, consumers often assume this indication represents a corresponding fraction of fuel left in the vehicle's tank. For instance, if you have a fuel tank declared as (18) gallons and the fuel gauge indicates that you have half a tank of fuel, you might assume that you have (9) gallons of fuel remaining in the tank. If you then fill-up the tank and receive more than (9) gallons, you may assume you now have more than (18) gallons in the tank and would conclude that the fuel meter is in error.

Taking into consideration that the rated capacity is only an estimate, many variables can affect a vehicle's fuel level indication. A shift in the fuel level may occur when the vehicle is not on level ground, such as when a vehicle is on an incline/decline or traveling around a curve. This temporary change in the position of fuel within the tank can cause the fuel gauge to indicate more or less fuel than what is actually in the tank. The indication of fuel in the tank can even vary depending upon the position of the driver's eye when reading the gauge on the instrument panel.

Many newer vehicles have trip computers that digitally indicate the average miles per gallon of the vehicle. These vehicles may also digitally indicate how much fuel is in the tank and how many miles can be driven before the tank is empty. There are a number of variables, such as maintenance, cargo and passenger load, use of accessories such as air conditioning, driving habits, terrain, traffic, weather, and even fuel composition, that require the engine to work harder and results in increased/decreased fuel consumption.

Just as the fuel tank on your vehicle may hold more than the manufacturer's declared volume capacity, fuel cans may also hold more fuel than their stated capacity, since they are only estimates. Additionally, fuel cans are designed to allow room for expansion, and some of this space may be filled with fuel, resulting in more fuel than the declared volume.

When the Division of Weights and Measures tests the accuracy of a standard fuel meter, the Division uses a calibrated five-gallon test measure. The investigator will pump fuel into the calibrated test measure until the fuel dispenser indicates five gallons. The test measure is analyzed and a reading in cubic inches (in^3) is determined. The maximum tolerance allowed on a five-gallon test draft is $\pm 6 \text{ in}^3$. If testing a fuel meter within 30 days of a new install, the allowed tolerance is reduced by half and only $\pm 3 \text{ in}^3$ is allowed. For perspective, (1) in^3 equals 0.55 fluid ounces. Equally important to note, meters at a single place of business shall not be considered in proper operating condition, if the predominant number of fuel meters are found to be in error in a direction favorable to owner of the fuel meters. Which means that a gas station owner is not allowed to take advantage of the tolerances to benefit their business.

The Division of Weights and Measures thoroughly investigates all fuel quantity, price posting, and maintenance of equipment issues related to the sale of retail motor fuel in New Hampshire. We suggest that any noted discrepancies be immediately report to the station attendant, then contact the NH Division of Weights and Measures at (603) 271-3700 or nhwm@agr.nh.gov.