

Do Tonneau Covers Really Improve Gas Mileage?

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Truck owners often have their own theories on how to improve gas mileage and reduce the air drag on their pickup trucks. One simple solution is to lower the tailgate. Another is to replace the tailgate with a cargo net. Bed caps or tonneau covers can be added as well. According to the Federal Chamber of Automotive Industries, while sales of passenger vehicles in July 2004 were down 9.2% vs. July 2003, sales of SUVs and light trucks increased 1.2% and 4.2%, respectively. With the desire to own pickup trucks combined with high gas prices, it seems as though more studies on how to decrease drag should be conducted.

In the simplest terms, drag deals with resistance to airflow. Cars and trucks alike experience drag. The drag coefficient, C_d , is usually determined experimentally—the lower the value of C_d , the better. The most important thing for the average car or truck owner to know is that the larger the value of C_d , the more work the automobile has to do to push against the air it drives through. And if the car or truck has to do more work, it is going to use more fuel.

Two students from Western New England College's Department of Mechanical Engineering, Todd J. Ortolani and Vanwijak (Kehm) Ewosakul, wrote a paper in 1997 entitled "Improving Aerodynamic Characteristics of a Dodge Ram Pickup Truck." Their paper describes a series of experiments in which various conditions were simulated in a water tunnel, while making use of different aftermarket products, in order to determine the coefficient of drag for each condition.

The coefficient of drag of the pickup without its mirrors was 0.432—this is the baseline value in order to compare other conditions. Notice that when a square cap was added, C_d had a value of 0.480, representing an 11.11% increase in the coefficient of drag. Surprisingly, there was a decrease in the drag coefficient when the tailgate was lowered, with a value of 0.414, even though the drag coefficient experienced an increase when the tailgate was completely removed. C_d was reduced by 11.81% with a value of 0.381, when a tonneau cover was added to the truck. And finally, the best result were produced from a cap Ortolani and Ewosakul designed—the drag was reduced by 30%, with C_d equal to 0.302.

| Condition Drag Coefficient | Cd % | Change From Baseline | MPG |
|----------------------------|-------|----------------------|-------|
| Baseline | 0.432 | N/A | 16 |
| Square Cap | 0.480 | 11.11% | 14.9 |
| Cargo Net | 0.461 | 6.71% | 15.33 |
| Removed Tailgate | 0.447 | 3.47% | 15.65 |
| Lowered Tailgate | 0.414 | -4.17% | 16.42 |
| Tonneau Cover | 0.381 | -11.81% | 17.18 |
| New Cap Design | 0.302 | -30.09% | 19 |

Source: Improving Aerodynamic Characteristics of a Dodge Ram Pickup Truck

In order to determine how coefficient of drag translates into fuel efficiency (MPG), a simple equation is derived. First, assume the Dodge truck is equipped with the 5.2 liter V8, combined with an automatic transmission. If the truck is 2WD, an average 16 mpg fuel economy is assumed. Under this condition, the increases and decreases in drag can be equated to fuel consumption using a simple equation. We will call Y the baseline mpg, which is 16. X will represent the ratio of the change in mpg (A) to the change in drag (B). Z will represent the percentage change from the baseline condition to a new condition, where a decrease in drag is a positive (%) and an increase in drag is a negative (%). In each case, A is what needs to be determined, and it can be found by: $A = (X \times Z) + Y$. The results in the table above show the gas mileage results using this equation.

The study indicates that the best way to reduce drag, and thereby improve fuel efficiency for pickup trucks, is to add a tonneau cover, unless an improved cap design is developed. However, studies have indicated that other factors can also contribute to improved fuel efficiency, including choices in air filters, aftermarket grilles and by keeping tires properly inflated. Also, it is important to remember that drag depends on the size and shape of the vehicle, and therefore a Chevrolet, a Dodge, and a Ford pickup with the same cap might have different drag coefficients because of different design features. While the increases or decreases in drag coefficients might not mean much to most truck owners, increases or decreases in fuel economy have both economical as well as environmental significance.

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Source: SEMA Research and Information Center