

Ask a scientist: Ethanol & car performance

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Does ethanol extend or decrease your gas mileage?

—*Tommy Holly, via Facebook*

Forrest Jehlik, Argonne mechanical engineer: In a one-to-one comparison in a regular engine, ethanol will decrease your mileage. This is because the [energy content](#) of a gallon of ethanol is lower than the [energy](#) in a gallon of gasoline—it only has about 70% of the energy. The reason why is purely chemical: the chemical bonds in ethanol store less energy than those in gasoline.

However, ethanol does have some characteristics that we engineers can take advantage of to make more power, decrease the energy loss, and make ethanol a fine [fuel](#) for a number of applications. In fact, in low concentrations, it can actually increase efficiency. There's lots of research going on here and elsewhere to optimize engines to take advantage of that. However, if the ethanol concentration gets too high, you start to lose that advantage.

I actually worked on a renewable-fuel racecar that used ethanol, and it definitely improved the performance—while being largely sustainable.

(We did need a bigger tank, though.)

You might ask: what does "sustainable" mean? One of my colleagues, Michael Wang, is an expert on what we call "well-to-wheels" analysis—looking at the whole picture of a fuel, including land use,

water use, energy to process the fuel, etc. In our racecar we used [ethanol](#) from waste biomatter (leftover wheat straw from a farm). We ran the numbers through Michael's model and found that using that fuel in our car reduced overall carbon dioxide emissions by 75%. Same with petroleum use. We were happy about that.

Provided by Argonne National Laboratory

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