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Turbofication

The evolution (or not) towards an ultra-reliable and long-lasting turbocharged car

Webster's dictionary doesn't recognize "turbofication." Arguably, it should. After all, the rapid-adoption rate of turbochargers by carmakers far exceeds their rate of "electrification" of car drivetrains, and Webster's has accepted that word.

Germany's car companies are the world leaders in technology. Sure, their uber engineers promise much broader future electrification. Yet check what Audi, BMW, Mercedes and Porsche have debuted over the most recent years to meet ever-tightening fuel economy and emissions requirements. Their line-ups are now almost entirely turbocharged eight-, six- and four-cylinder internal-combustion engines and *nein* electrification. Turbofication—it isn't even hard to spell or pronounce.

TURBOFICATION
It should be in the dictionary by now. . . and it isn't even hard to spell or pronounce

Turbocharging is to engines what waterboarding is to drinking fluids. A normally aspirated engine relies on the vacuum-producing downstroke of each piston to passively draw in the air-fuel mixture. "Forced induction" adds an air pump to hyper-fill that combustion chamber with air-fuel mixture. With turbocharging, that air pump is driven by turbine-harnessed exhaust gas kinetic energy. When turbocharging is applied to a normally aspirated engine, the torque, horsepower and fuel consumption are increased. Waterboarding would cause me to drink faster too.

So how is it that auto manufacturers use turbofication to help meet ever-more-challenging fuel economy and emissions targets? Agreed, it is counterintuitive. Alas, as turbofication happens the manufacturers are simultaneously switching to significantly smaller internal combustion engines—often with fewer in cylinders. Waterboarding a mini-me, so to speak.

Turbocharging is to engines what waterboarding is to drinking fluids

Even stranger, these fuel-economy and emission-target switches to smaller turbocharged engines are generating much faster versions of the same cars. Again, I agree that this is counterintuitive. Having your cake and eating it too. More power from less fuel. Or is it engineering hocus pocus? Drill deeper and you may find cause for angst.

Cautious tiptoe driving at low rpm generates limited turbocharger air-pump pressure and thus less over-filling of the cylinders. Waterboarding lite or even ultra-lite. Drive the EPA's test loop like that and the manufacturer aces its test, posting great mpg claims.

Turn the same turbocharged car over to a performance car magazine. They'll drive like they stole it, maximizing high rpm, turbocharger pumping of air fuel into the cylinders. The new version of car morphs into the proverbial rocket ship in that setting—but fuel economy and emissions are worse than that car had with the former, larger normally aspirated engine. You can't defy the Laws of Thermodynamics.

Turn the same car over to me or you, and what happens? Is it Jekyll or Hyde, or both? Our results will vary depending on how and where we drive. Regardless, these smaller turbo engines are taking over their larger, normally aspirated ancestors. Consumers aren't being given a choice in the matter.

So, do the new smaller turbo engines give a different driving experience?

I recently had back-to-back drives in a six-cylinder normally aspirated Porsche sports car and also its replacement four-cylinder turbo version. My strongest reactions were to the auditory cues and sub-sonic vibrations. A Porsche just isn't the same icon with a Subaru-like flat-four warble, nor with turbo whine/whistle. Then there was the throttle response: immediate and satisfying with the bigger six; delayed and less organic with the smaller turbo four, though ultimately stronger if I kept my foot on it long enough.

Turbo cars also get a wide berth from the mechanically inclined. Just like waterboarding isn't a sustainable form of fluid consumption, a turbocharger runs at the heat of exhaust gases. That would be 1000ºC/1800ºF. The turbo itself also has to spin at over 200,000 rpm. These conditions take their toll on under-hood components and the shared engine oil tasked with keeping turbochargers lubricated. This presents another question: Will the current crop of turbo cars meet the crusher sooner once do-it-yourselfers demur to take on older versions?

If we can have humans living in space stations then, no doubt, we can make ultra-reliable and long-lasting turbocharged cars. Maybe we're already there? To date, I've been able to avoid dealing with my turbofication biases. With our family's SUV in its ninth year we may not be able to rely on avoidance much longer. I predict turbofication's various trade-offs will serve to speed fleet electrification—my family's and yours too.

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