

Acoustic Training Wheels

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I am curious what the readers of *Sound & Vibration* magazine think of this question: Should automakers synthesize the sound of an internal combustion engine (ICE) to augment the sound of an electric vehicle (EV)? In my work as an NVH engineer for a California EV automaker, I am faced with this question nearly every day, and I would very much like to learn what you think. For me, the short answer is “no.” That said, I’d like to offer justifications for both sides as I understand them.

People in favor of this approach often feel that EVs are too quiet and that they lack the emotional appeal of an ICE vehicle due to the lack of engine noise. They’ll say that there is nothing like the visceral experience of a high-performance engine at full boil, thrusting the car forward, and you back into the seat. Have you heard the Dodge Challenger Hellcat, or the Ford Mustang Shelby GT350 with the flat-plane crank? Or how about the Corvette Z06 or a Ferrari V12? Most would say that these engines sound absolutely amazing. The people in this camp will claim that much of the thrill of the performance of these cars is due in large part to the aural soundtrack that goes along with the feeling of acceleration. They don’t call it the “loud pedal” for nothing.

I have to admit that I completely agree with these sentiments. Surprised? Full disclosure – I am a huge motorsports fan *and* I ride a Harley Davidson, neither of which is well known for being exceedingly quiet. There truly is something hair-raisingly wonderful about the sound of a great internal combustion engine!

So you might think that I would line up with the folks who claim that EVs are too quiet and that we should augment their sound with synthesized (fake) engine noise, right? Nope. Here is my point of view – I think cars and trucks should have a sound that is authentically true to what the vehicle is, whatever that may be. In the case of EVs, to me they represent advancing technology and the future, and will slowly replace the ICE car. (Sorry folks, but it is only a matter of time.) I think it is disingenuous to impose the past onto these cars simply because that is what we are used to. It is cheating. It is fake. It is inauthentic.

An electric car’s powertrain is different, and it should sound different. It is a much simpler, more efficient machine than an ICE vehicle, and its acoustic signature should reflect that. What one hears from an EV powertrain is a subtle combination of electromagnetic force fluctuations, gear-mesh whine and inverter-control electronics sound. I, for one, think it can sound very “cool” if done right.

Let me also tell you from first-hand experience

that there is something *exceedingly visceral* about accelerating from 0-60 mph in less than 3.0 seconds with nary a sound from the car, other than a slight whirring from the motor and gearbox. The silent but unrelenting and brutal acceleration is otherworldly, shocking, and even unnerving. It never fails to elicit wide grins and even fits of giggling when it happens. It’s like some colossal unseen force has thrust you toward the horizon with seemingly no effort from the vehicle.

That’s partly it for me – you simply don’t hear the effort required to hurl a two-ton automobile forward like an EV powertrain does. There is something inherently good about that. In some ways, this amazing experience would be spoiled by the wild banshee roar of a supercharged V8 engine breathing through open pipes, crackling at every upshift. I actually love that sound, but it just doesn’t fit the EV experience.

I’ll give you an example of how this played out at my last employer (that other EV manufacturer in California). This is not an acoustical example, but I believe that the principle is still well elucidated.

The first iteration of the Tesla Model S did not have what has now become known as “creep” mode (which has nothing to do with the moral character of the driver!). Tesla found that many of its customers, who had spent their whole lives driving automatic transmission cars, did not like the way the car behaved when stopped. For them, it had become instinct for the car to “creep” forward when the brake pedal was released. Tesla responded by introducing a very simple bit of code to the motor control firmware system that simulated the (fake) feel of an automatic transmission creep behavior using the electric motor.

These owners were happy at first, but something interesting happened. Over time, many of them actually found that driving without creep mode (the natural state of an EV) was not only more intuitive but easier to manage the car’s low-speed behavior. As a result, they would eventually switch creep mode off. In many ways, creep mode was like training wheels for these early adopters, and once acclimated, they were actually happy to drive without their “training wheels.”


My point is that like creep mode, I believe that once people spend more time with EVs, they will quickly realize how much different (and better) the driving experience is without the incessant din from the engine. I suspect that many of the people who today feel that EVs should sound like ICE vehicles, would change their mind after a few days with an EV.

Think of it this way, back in WWII, I can

imagine that the sound of a B-29 Super Fortress taking off was probably an amazingly satisfying aural experience for those on the ground and in the plane. That said, how silly would it be for the first jet-powered airplanes to have had that sound imposed on them simply because everyone liked the sound of the piston engines? No, the jet engine represented the future and sounded like it. Thankfully, aircraft manufacturers let early jets sound like jets (and still do). So too, the EV sounds like the future, and I believe that it must stay true to its mechanical and electrical nature. No acoustic training wheels needed here.

I can’t leave this subject without bringing up the very important and real issue of pedestrian safety and EV motor noise (or lack of it). Many studies have shown that pedestrians can often miss the presence of an EV at low speeds due to their lack of acoustic output. Governments around the world are now requiring EVs to emit noise at low speeds to ensure that pedestrians can hear EVs approaching. I support this because I care about the safety of pedestrians, but also find it sad that we in the noise control field must now introduce noise back into the product that we’ve spent so much time, money and effort to make quiet. The temptation with these systems will be to do exactly what I think we shouldn’t do, which is to make an EV sound like an ICE vehicle at low speeds. In fact, the regulations that govern this activity seemed specifically designed to ensure that the synthetic noise emitted by an EV does, in fact, sound like an ICE vehicle.

In some ways it makes sense. Since this is what pedestrians have become used to, but I still bristle at the idea. Perhaps our early EVs will only need to emit fake engine noise until society in general has become accustomed to their behavior, and other, less noisy solutions will become practical, socially acceptable and ultimately safe. I would like to think of these early noise-emission requirements for EVs as “acoustic training wheels” and that one day we could ride freely without them.

Until then, the transition to a world with electrically propelled mobility will continue, and we will all need to get used to the sound of an EV. There will be a day when our kids and grandkids will only know the sound of an internal combustion engine from the annual parade, classic car cruise night or in a museum. Perhaps that is sad for some, it even is for me, but I still believe that the future sound of mobility is the sound of the electric motor. I for one, intend to keep it that way. 

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