

The Evolution of EV and HEV Branded Sound Experiences

Sound branding today has become an important concept for automakers promoting brand identity and recognition. By incorporating sound into the overall ambience of a car, drivers of electric vehicles and hybrid-electric vehicles have a higher level of enjoyment and a greater feeling of uniqueness from their automobile experience. This also promotes brand loyalty, and in some cases, contributes to the cult following experienced by select automotive brands.

Sound branding is a technique used to improve brand recognition with the help of acoustics. Sound branding has been a widely used technique in the present day, especially in the manufacture and production of electric vehicles that are hitting the markets around the world. Sound branding is also known by the names of acoustic branding, sonic branding and audio branding. The following is a survey of some of the more innovative and exciting advancements in the field of sound brand management for the EV and HEV vehicle industry.

The Lotus HALOsonic Software

Perhaps one of the most well-developed sound brands comes from Lotus, which makes use of the HALOsonic Demonstrator system. The system consists of four patented Active Noise Control technologies that augment to a great extent the performance of sound to enhance in-cabin sound experiences while ensuring pedestrian safety.¹ Two of these technologies, the Engine Order Cancellation and the Noise Cancellation system (Road), effectively control the levels of sound and by doing so, significantly cancel out unintended low frequency noises.

In addition, the HALOsonic Demonstrator creates internal sounds independent of noises on the exterior of the vehicle through the Internal Sound Synthesis (ISS) system in order to provide a better in-cabin experience. After all,



driving experience is largely enhanced if the engine of the vehicle is able to provide the driver with sonic information about the vehicle's speed and acceleration based on sonic feedback. This sound scaping inside the cabin is customizable, allowing for the selection of a branded internal combustion engine sound.

Finally, the External Sound Synthesis (ESS) system provides the needed safety sounds to protect pedestrians. Since (according to ah University of California study) pedestrians can only judge the approach of a hybrid electric vehicle from seven feet – a much shorter distance than the 28 feet by which a pedestrian can judge the approach of an ICE engine – incorporating recognizable sounds above a minimum noise level will greatly assist those who are visually or hearing impaired.ⁱⁱ The ESS system of the HALOsonic technology throws forward the sound concentrating it in the danger zone for pedestrians. This ensure minimal noise pollution is added to the local area.ⁱⁱⁱ

Interestingly, the HALOsonic Demonstrator systems satisfy driver desires for their EVs and HEVs to sound like internal combustion vehicles. Consider what one of the executives involved in the project had to say about their research:

“We interviewed 600 people with involvement in the car purchase process and it produced very interesting results. As a first headline, the majority of respondents, the figure is around 57 percent, say they want electric or hybrid cars to sound like real cars. This really doesn't tell the full story though and it is necessary to look much deeper than this. We then segmented the audiences –for example family car owners, SUV owners, sports car owners etc. Here, the differences were more startling; family car drivers prefer a hum or whirring sound such as a hairdryer, leaf blower or washing machine for their electric cars. Sports car drivers wanted a louder, throaty sound but were deeply concerned about authenticity. There were differences between genders too, with female respondents preferring quieter sounds.”^{iv}

Lotus has licensed the HALOsonic Demonstrator technology to integrate and develop production systems. Since this technology satisfies legislation for artificial sound requirements in EVs, HEVs, and other quiet vehicles, no doubt this system will become quite popular in the industry for those OEMs not interested in doing their own sound branding research.

Audi's Sound Branding Technology: Corporate Sound

Audi recently developed a concept known as the Corporate Sound that has taken sound branding to a whole new level in the world of vehicle acoustics. Apart from conveying the actual "sound of Audi," Corporate Sound has been holistically developed to coordinate with the brand's visual identity. As such, Corporate Sound incorporates Audi's acoustics in all touch points and allow customers to feel the Audi acoustic experience.

In order to enable this ambitious sound branding concept, Audi has put in a lot of research in the field of psychoacoustics and evaluated various sound interactions in vehicles by employing computer-aided engineering (CAE) tools. The use of CAE tools has greatly benefited the Audi sound brand, which was developed in a specially designed Audi sound studio that gathers, analyzes, and makes use of sounds from various elements of the vehicle's interior and exterior.^y



[Audi Corporate Sound Development](#)

Most are already familiar with the sound logo associated with Audi, but Audi believes that one of the most recognizable Audi vehicle sounds is the sound of its engine roaring. As such, Audi has made it a priority to reproduce their unique Audi ICE engine sounds electronically for their electric vehicles. Additional sounds are tested for recreation, including all car sounds for every model available. Each of these are made available in the Audi sound studio.

The Audi sound studio team goes to great lengths to ensure they record all vehicle sounds in unprecedented quality. Using specialized and highly advanced equipment, they record these vehicles sounds in stereo to ensure they convey the most accurate driver experience possible.

Further, particular attention is paid to achieving optimum use of this technology. For instance, during testing, sounds from nine microphones were evaluated individually and then microphones were integrated to check the responses. Recording of sound was performed in diverse environments to obtain the most accurate results possible.

Sound Branding and Computer Aided Engineering Tools

Sound branding would not be possible without CAE tools. Like Audi, Nissan has also employed CAE tools to develop their Approaching Vehicle Safety for Pedestrians (VSP) System. By providing efficient simulation system for different vehicle systems like sound systems, powertrains, suspensions and body structures in a single sitting, event based simulations on a three dimensional surface (a road surface) can easily be performed.

These CAE tools have proven to be a major advantage in sound and vibration analysis. Emitted sounds and other aspects that govern appropriate functioning can be evaluated by performing simulations of a wide variety of scenarios.

In the case of the Tesla Model S, for instance, CAE tools were used to perform vibration analysis (or NVH analysis) to assess the influence of various vehicle components and their vibration modes. To view real time system responses, animations and shape plots were employed. Tesla's NVH analysis allowed the automaker to unveil a complete car sound package that satisfies various customer requirements. NVH analysis is performed on almost all proposed Tesla electric vehicles that are due to hit the markets in order to detect a range of errors under different environmental conditions.^{vi}

Conclusion

At this stage, sound branding for electric vehicles has been addressed by only a handful of the OEMs in the automotive market. While most are working on ways to meet new legislations for pedestrian safety by generating sounds that will warn those who are hard of hearing or blind, most have not gone so far as to create a holistic sound experience like that developed by Lotus or Audi. Clearly more technological progress and greater attention will be necessary before these sound brands take concrete shape.

That said, OEMs and solution providers are collaborating on a number of fronts to make the audio experience of their EVs and HEVs more all-inclusive. For instance, many sound design companies are working with auto manufacturers to find ways to integrate unique sounds into their vehicles. Additionally, a great deal of focus has been directed toward creating energy efficient sound systems for electric vehicles to ensure there isn't undue drain on the batteries.

Further, by incorporating portable audio devices such as iPods into the sound systems of these vehicles, drivers can customize their own sound experiences. Several sound design companies have created sound packages drivers can purchase which mimic the audio experience of, for instance, a V8 engine to give the driver of an electric vehicle a sportier feel. These sound packages can be swapped out and tweaked to suit the driver's preferences for a more unique experience.

No doubt there are plenty of other opportunities for solution providers to meet the needs of the electric vehicle industry in unique and creative ways. It'll be interesting to see how the soundscape of this segment of the market develops over time.

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Sources

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