

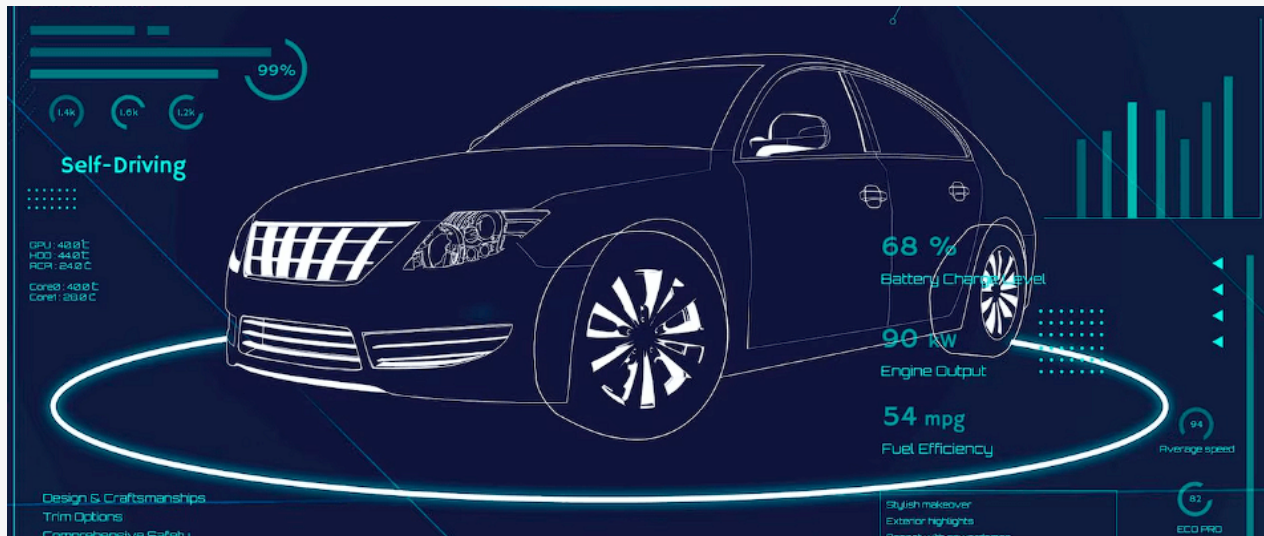
The Future of Driving: Top 7 Auto Innovations



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To create more efficient and sustainable vehicles, the auto industry is constantly evolving and innovating as technology advances. SAE World Congress is a tech show held in Detroit every year, where engineers from around the world share their latest advances. It was no different this year, and we have compiled our favorites.

What are the main innovations we are going to talk about in this post?

- E-Motor Disconnect: Preventing regenerative brake drag for two-motor EVs.
- The Big e-Torque: Improving motor performance with the soft-magnetic powdered-metal rotor.
- ADAS: SPAD Cam: Superior low light performance with advanced ADAS camera.
- High-efficient E-Defroster: Efficient electric vehicle windshield defrosting.
- Compound Turbo: Enhancing heavy-duty diesel engines with small fuel injections.
- Orbis Brakes: Innovative brake systems for improved performance.
- MPP Maxwell: Cost-effective aluminum alternative with improved conductivity and scalable motor design.

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E-Motor Disconnect

Amsted Automotive showcased an attractive solution for two-motor EVs using permanent-magnet machines, allowing the ability to disconnect one motor to prevent regenerative brake drag. Their design features a mechanical one-way clutch that functions similarly to a Schwinn 10-speed, automatically resuming power transmission when the motor is activated. However, it doesn't enable regenerative braking or reverse power. To address this, Amsted incorporates a controllable second one-way clutch with an electromagnetic ram that engages clutch paddles for reverse torque on demand. With reliable components from existing production, this combination offers a dependable solution.

The Big e-Torque

Metal Powder Products (MPP) showcased their soft-magnetic powdered-metal rotor in the Maxwell axial-flux motor. The rotor's use of soft magnetic composites, formed from sintering powdered metal, generates three-dimensional magnetic flux lines, boosting performance compared to traditional laminate plates. MPP's rotors have more poles and a "pancake" axial-flux design, improving power and torque density. Different concepts for conductive materials around the poles were presented, including preassembled copper wire windings and options for solid copper or aluminum encasement.

ADAS: SPAD Cam

Ubicept, an MIT spinoff, introduced an ADAS camera using the advanced Single Photon Avalanche Diode (SPAD) chip instead of traditional CMOS technology. By streamlining the data and leveraging open-source object recognition software, the SPAD camera exhibited superior performance in low light conditions, detecting pedestrians that CMOS cameras missed.

High-efficient E-Defroster

Betterfrost Technologies presented an efficient concept for electric vehicle windshield defrosting and defogging. Using low-e glass with a metallic inner layer, the system electrifies the glass to remove frost in as little as 1 minute and 14 seconds, consuming

2

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only 1/20th of the power of traditional HVAC systems. This technology eliminates the need for defroster ductwork, allowing space for advanced head-up projection systems and addressing driver dry-eye concerns.

Compound Turbo - Micro-Combustion

Micro-Combustion LLC has introduced an ingenious concept for enhancing heavy-duty diesel engines by injecting small amounts of diesel fuel into a secondary turbine. This patent-pending idea, "cavitation combustion," is based on implosion and is thought to involve homogeneous-charge compression ignition (HCCI). Although still in the early stages of development, obtaining funding, and patenting, the concept promises to yield fuel efficiency gains up to 10%, providing potential cost recovery within two years.

Orbis Brakes

Orbis, known for their NASA-inspired brakes, received an innovation award at the 2023 SAE World Congress for their EcoWave brake system. The latest design retains the wavy profile suggested by NASA but replaces heat-rejection grooves with internal venting, resulting in a lighter rotor that operates below the temperature threshold for increased brake dust production. They are also preparing to launch the LightWave aftermarket brake, offering a retrofit option for Tesla, Porsche, and Ford Shelby vehicles. These kits weigh 20% less and run 40% cooler than stock rotors and calipers, providing improved performance.

MPP Maxwell

MPP offers cost-effective aluminum as an alternative to copper, although less conductive. Knowledge sharing at the SAE World Congress revealed improved conductivity in aluminum alloys with scandium. The liquid-cooled Maxwell traction motor displayed impressive scalability, ranging from 5 kW to 2 MW, generating 380 hp and 203 lb-ft of torque.