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HEARD ON SHIFT

“As we get to 100 trucks per day, we start to get into a range that looks pretty interesting and would send a good signal to the market.”

Shane Stephens, co-founder and chief business development officer of FirstElement Fuel, details the number of vehicles a hydrogen filling station must serve for a viable business case. Stephens appears on the July 21 episode of “Shift: A Podcast About Mobility.” Listen at autonews.com/shiftpodcast.



On the quest to make electric vehicles cool

Changing out the coolant from what’s used in an ICE can deliver a safer car

Richard Truett
rtruett@crain.com

The quest to maximize electric vehicle efficiency — in driving and charging — and to lower the risk of fires has engineers at automakers and elsewhere looking at everything under the hood, including the coolant coursing through an EV’s tubular veins.

EV and internal combustion engine vehicle cooling systems share no mechanical parts, and they operate under different temperature ranges. But there is one thing they have in common, said Tom Corrigan, director of EV technology at Prestone Products Corp. — ethylene glycol coolant.

That’s about to change.

The problem with ethylene glycol coolant in battery-electric and in hydrogen fuel cell vehicles is that when it contacts the metals, plastics and other components in the system, it can, over time, become ionized. This means the coolant gains electrons, reducing the efficiency of BEVs and potentially causing major problems in fuel cell vehicles.

“Essentially, EVs are borrowing the internal combustion engine fluid,” Corrigan told Automotive News. “We are going to see a shift in that in the next one to two years.”

The primary driver for that shift, he said, is safety. It comes down to the electrical conductivity of the fluid — the way in which ICE coolants use corrosion inhibitors in their formulation.



PRESTONE

Prestone Products’ Tom Corrigan: “We are going to see a shift ... in the next one to two years.”

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Tesla has rivals in bid for digital dominance

Lois Hoyal
Douglas A. Bolduc
lois.hoyal@autonews.com

Volkswagen Group supplier TTTech Auto said the race isn’t yet won for software-defined vehicles as automakers scramble to form partnerships, partially out of uncertainty about which might be the right automotive software architecture to adopt.

“As of today, I have not seen one architecture everybody would confirm is the best or correct one,” said Dirk Linzmeier, CEO of TTTech Auto, a middleware supplier to automakers, including VW Group’s Audi and Porsche brands.

While Tesla relies on a central computer and a backup system in its models, which Linzmeier said he considers the closest things to true software-defined vehicles, rivals are trying to connect multiple central computers to achieve digital dominance.



Linzmeier: The future is in software.

VW partnerships

Volkswagen Group’s latest software-focused partnership with Rivian is just one of its bets on which automotive software solution will reign supreme.

The partners have set up a joint venture to develop next-generation electrical architectures and software technology.

Europe’s largest automaker also has a venture with Xpeng. VW and the Chinese electric vehicle maker have created a new architecture for

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Deals illustrate desire for fleet telematics data

Molly Boigon
molly.boigon@crain.com

Automakers including Ford and General Motors are carving out their own fleet management systems to try to reclaim telematics customers — and they are laying on the perks.

Ford Motor Co. already offers a free trial period for its telematics software and also said July 17 that it will offer free electric vehicle chargers to fleets that subscribe to its commercial charging software program in California.

Aaron Schneider, the business development director for Ford Pro Charging, estimated the chargers would normally cost \$1,400 to \$2,000 each.

“Although every car company that’s selling commercial vehicles has a kind of fleet offering, they’re not doing all that well,” said Lee Colman, chief production officer at SBD Automotive. “They’re trying to stimulate that market by offering free service.”

Ford Pro Charging subscribers in California get the charger, which will provide reliability and utilization information to Ford, and commercial electric vehicle buyers who enroll in E-Telematics get free range monitoring, GPS tracking and home charging reimbursement reporting for one or three years depending on the model year.

GM offers its OnStar Vehicle Insights for free for the first two months, and then at \$15.99 per vehicle

per month plus taxes. Volvo Trucks offers its telematics services complimentary with the purchase of the vehicle for two years.

Strategy struggles

Offerings meant to sweeten the deal for software that gathers information from vehicles, chargers and other hardware illustrate just how badly automakers want fleet customers to use their data-generating and tracking features. Connected-vehicle data was once pitched as a treasure trove of untapped revenue, but that windfall has been slow to materialize.

Fleet customers represent an attractive bet for automakers that have struggled to monetize con-

nected vehicles for passenger car consumers. The sale of driver data is no longer a foolproof strategy, as customers have revolted amid privacy concerns. Automakers are trying to charge for upgrades and subscription services, a strategy that is still in its infancy.

While automakers have taken advantage of cost savings from vehicle data through more focused R&D, they have yet to realize substantial revenue. The total revenue generated by connected services and paid updates is about \$6 billion, according to S&P Global Mobility.

Commercial vehicles appear to make a better

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SOFTWARE

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intelligent and electric cars to help VW introduce more affordable models.

VW Group is spreading out its software bets because no one is sure which solution will win. Linzmeier said what is certain is that electronic control units are not the way forward. Automakers will never create a software-defined vehicle by deploying electronic control modules, he said, adding that a central computer is the only answer.

Another certainty is that software-defined vehicles are the future, he said.

"By 2030, I think most of the vehicles coming into the market will be SDVs. ...There is no turning back," he said. "You cannot decide you will not do SDVs. The driver and the user will just expect to have these functions."

Focusing on safety-critical middleware

Founded in 2018, TTTech Auto focuses on safety critical middleware for vehicles, primarily VW premium brands. In 2022, the Austrian company received €250 million (\$272 million) from Aptiv and Audi in its latest funding round.

The company doesn't add chips to the vehicles but instead generates code. "We make this interface between the hardware and the next level," Linzmeier said.

Writing software is the last stage in software development, he said.

"If you do not do the right architecture at the beginning and build in safety and security into this architecture, then you will screw up at the end," Linzmeier said. "You cannot just code. You need a great architecture at the beginning, and that's where the industry, in my opinion, suffers the most."

One of the company's main selling points is to create a pre-defined schedule for safety critical applications. This is a sophisticated process. "There are more options than stars in the universe to create such a schedule," Linzmeier said.

He said he bemoans the fact that there is so little reuse of software in the automotive sector.

"What we see in the industry is that for each new project you spend almost the same effort as the project before because you cannot reuse what you have done before," he said. "The reusability level by all players is very low, which results in immense cost."

That can be avoided by following trunk-based software development, he said.

"Out of a single trunk you create branches for different projects, but if you don't update them in the single trunk, you have to do it in all different projects again. This complexity explodes," said Linzmeier, who added that it took TTTech two years "and a lot of money" to get its single-trunk solution to an optimal level.

COOLANTS

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"Those ionize in the fluid and carry an electrical charge. If you have an issue where high-conductivity coolant contacts high-voltage electronics or the battery, it can lead to fire," Corrigan said. "So what we are working on is low-conductivity coolant."

That requires a different formulation.

The big deal with microsiemens

Electrical conductivity in coolant is measured per centimeter in a unit called a microsiemens. Coolants for piston-engined vehicles have 3,000 to 5,000 microsiemens per centimeter, which creates high conductivity but is not an issue because the fluid doesn't cool electrical components as it does for an electric powertrain.

That's why automakers want coolant manufacturers to slash microsiemens levels for BEVs and practically eliminate them for fuel cell vehicles, which could be prone to the equivalent of an internal combustion engine's backfire if the coolant's microsiemens are too high.

Most automakers are asking for fluid measuring 100 microsiemens for BEVs. For fuel cell vehicles, which use specialized membranes that combine hydrogen and oxygen in an electrochemical reaction to produce electricity for an electric powertrain, they would like a coolant that measures just 1.5 microsiemens, and have even asked about the possibility of lowering it to 0.5, Corrigan said.

"Every bit of increased conductivity is a loss of efficiency in the fuel cell," he said. "You've got to make the fluid very pure."

Coolant flows through the stacks of a fuel cell — the heart of the system — and on bipolar plates.

"If there is any kind of conductivity in the fluid, you can essentially have a short [circuit] between the cells, and you'll lose efficiency," Corrigan said. "If the voltage is high enough, you can actually start splitting that water and making hydrogen — essentially the reverse of what a fuel cell should be doing."

In the last year, Prestone has boosted its



Prestone's Tom Corrigan evaluates low-conductivity coolant in a Ford Mustang Mach-E.

R&D budget and added five scientists and engineers to the team developing BEV and fuel cell-specific coolants. The work to reduce microsiemens mostly centers around the formulation of the corrosion preventing additives in the fluid.

Stringent specs

"When we go [with] the lower-conductivity fluid to ensure safety, we are giving up a lot of the corrosion inhibitor that we put in there," Corrigan said.

But the specifications from automakers, government agencies and standards organizations require "fairly stringent corrosion protection," he added.

Prestone tests potential low-conductivity EV coolant products in a fleet of Ford Mustang Mach-Es that it operates at its Danbury, Conn., tech center. Corrigan said it's very

likely the company's first specific coolant for EVs — about two years away — will remain ethylene glycol-based. It's possible a petroleum-based dielectric coolant would replace it — if scientists can develop a blend that's as efficient as ethylene glycol in carrying heat away from power electronics, battery packs and other EV components, he said.

As with today's motor oils, transmission fluids, axle lubricants and even windshield washer fluids, there likely will not be just one blend of coolant for all BEVs and fuel cell vehicles. Different battery chemistries such as lithium iron phosphate, solid state and nickel manganese cobalt could require vehicle-specific coolant, Corrigan said.

"We see where the future is going with EV coolants, and we want to be ready when the manufacturers are ready," he said.

FLEET

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business case — fleets have a financial interest in efficient performance and information about their vehicles, unlike individual consumers.

But even this apparently more natural revenue stream will not come easily.

In 2022, Ford said it expected Ford Pro to grow to \$45 billion in revenue in 2025. As of the first quarter of 2024, the firm's revenue was \$18 billion.

Multiple brands

For commercial fleets, managers often use aftermarket services or providers that they perceive as better serving multiple brands and models. Geotab and Samsara, among other companies, create hardware and software that collect, manage and present vehicle data across brands.

Rob Pardo, director of the central fleet for the city of Boston, said his fleet uses Samsara. The firm is able to collect vehicle data without being "intrusive," he said.

"They do integrate with Ford, so we're able to tap into the OEM telematic system of a Ford vehicle without installing any additional hardware," he said. "That's definitely a benefit with a mixed fleet like we have in the city of Boston."

Fleets often have more than one brand of vehicle. While automaker tools can support non-native brands, the experience is not the same. Man-

agers are attached to aftermarket tools that can provide a uniform experience.

"From a fleet management perspective, a lot of fleet companies and telematics companies have grown up on the basis that they can give you this cross-model, cross-brand view," said Dave Kelly, chief corporate officer at Cubic, a company that makes connected-vehicle software. Legacy automakers don't have that ability, he said.

While they are not brand-agnostic, legacy automakers can offer stream-

lined customer service, Schneider of Ford Pro Charging said.

"We are a one-stop shop," he said. "The one thing we frequently hear from customers is, 'Ford has the vehicles, we have charging solutions, we have telematics, we have service.'"

Collaboration is key

For a true cross-brand experience from the automaker, manufacturers must be willing to share application programming interfaces — the stan-

dards and rules underlying software in their vehicles. Disparate automaker telematics platforms might also give rise to third-party fleet management software companies that will purchase data and package it across brands.

But then, a slice of the pie still remains out of reach.

For automakers, "there's a tantalizing business opportunity there, but it's only really going to pan out if they can collaborate," said SBD Automotive's Colman.

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