

Plug in and go...

Monday, September 30, 2013

By Molly Dill

Joel Casterton, engineering director, Engine Products Group at Modine Manufacturing Company, and Chris Alessi II, manager, Customs Unlimited / K-Man and Tesla owner.



As Tesla Motors Inc. rolls out its revolutionary electric cars and builds its network of superchargers across the country, the company will have plenty of Wisconsin voltage fueling its journey.

Tesla Motors is like the Apple of car manufacturers. The company has created an entirely electric sedan, the Model S, which rivals the likes of Mercedes and BMW sports cars and has also been named Motor Trend's 2013 Car of the Year and Consumer Reports' Best Car Ever Tested.

The Palo Alto, Calif.-based company sells its vehicles not at licensed dealerships, but directly to customers at storefronts in shopping malls. The company has created a buzz around its cars by advancing the conversation around electric vehicles in a way that the Detroit-based automakers have not.

Wisconsin is playing a key role in Tesla's business plan.

- Racine-based Modine Manufacturing Co. developed the chiller that keeps the enormous Tesla battery cool while the car is in motion or charging. Without the chiller, the battery would not last long.
- DMT Workholding in Slinger makes some of the workholding equipment for Tesla's parts. However, DMT executives declined to provide additional details.
- Marshall Auto Body in Waukesha is one of the first certified Tesla collision repair shops in the nation.
- Wisconsin native J.B. Straubel is a co-founder of Tesla and now serves as chief technical officer.
- Five new Tesla superchargers will be installed across Wisconsin this year to enable interstate and nationwide travel in the Model S.



The Tesla Model S can go 200 miles on a single charge.

- Tesla CEO Elon Musk plans to prove the emerging supercharger network, which can charge half a Model S battery in 20 minutes, by taking a cross-country trip by the end of the year that will likely land him in Wisconsin (Read sidebar).

Standing out from the crowd

Tesla has framed its branding effort around being a high-performance sedan that just happens to be all-electric. The goal is to compete with the Audis and BMWs of the car world, rather than other electric vehicles.

"It's not intended to look like an electric car," Tesla spokeswoman Alexis Georgeson said. "It's intended to be a car that you can drive all day long and do all of the things you would normally do with a car."

The Chevy Volt and Toyota Prius, its predecessors, are electric vehicles like the Model S, but there's one key difference: they are hybrids, meaning they have a gasoline engine that recharges the battery.

The Tesla Model S is powered by a large battery that runs the length of the car, and is charged using electricity flowing through a modified home outlet or at public supercharging stations.

One of the major technological advancements included in the Model S is the battery chiller made by Modine. Engineering, testing and validation for the chiller is done at the Racine facility, and it is manufactured at Modine's Lawrenceburg, Tenn., facility.

Joel Casterton, engineering director for Modine's Engine Products Group, leads a team that designed and engineered the chiller to meet Tesla's needs for the Model S.

About three years before the vehicle was brought to market, Modine was working with Tesla on creating a lightweight chiller for its battery. The chiller is essential to keeping the battery from overheating. It's an integral part of the powertrain.

Tesla was having problems with the technology from its original chiller supplier during the prototype phase, which is why it approached Modine, Casterton said. Modine had experience producing chillers for other hybrid and electric vehicle manufacturers, and could use its expertise to adapt the model for Tesla.

"One of the reasons Tesla probably came to us is we have a lot of experience with this general product family – we are No. 1 or No. 2 in the world," Casterton said.

Modine's chillers work by distributing coolant throughout the large lithium-ion battery to maintain an 86-degree temperature during driving and charging.

"The long-term performance and life of the battery would not be there if you didn't control its temperature," Casterton said.

Modine has been working with vehicle manufacturers since it supplied the radiator for the Ford Model T.

"We can't ignore where the market is going," he said. "We need to pay close attention to where the passenger vehicle market is going – it's a huge part of our company. Electric vehicles are a very significant part of that equation."

Tesla already has started working with Modine on development for its next line of vehicles.

"A lot of the people in Detroit are looking at Tesla, trying to figure out what they're doing. They don't want to fall asleep at the wheel," Casterton said. "Tesla has already made a name for itself in a way that other electric vehicle manufacturers have not, so we've been able to partner with a leader."

Tesla refuses to disclose supplier relationships and declined to discuss its relationships with Modine and DMT Workholding.

While the Tesla Model S has a \$69,900 base price means it is not accessible for many consumers, the goal is to eventually build a \$30,000 car using the technology the company has developed, Georgeson said.

Selling the Model S

Tesla had 13,000 Model S cars on the road at the end of the second quarter. The high-end Roadster sports car, its first model, sold about 2,000 worldwide.

The company plans to deliver more than 21,000 Model S vehicles worldwide by the end of the year.

"We've ramped up production, which is the main reason for that," Georgeson said. "Obviously, there's demand in sales, but there's always demand in sales."

In June 2012, when the Model S was announced, the company was producing five cars per week. Now it's producing 500 cars per week, she said. That's why initial orders for the sedan took as long as three years to fulfill.

Continuing with the theme of breaking the traditional automaker mold, Tesla sells its cars in a unique way. It doesn't distribute them through dealerships, but instead sells them directly to the consumer through its website (www.teslamotors.com) and at storefront showrooms.

A consumer could conceivably walk into a mall and see the Apple store right next to a Tesla showroom. It's a similar approach of creating buzz and excitement surrounding the product.

However, that model could have a problem. Several states, including Wisconsin, do not allow the direct sale of automobiles to customers unless the seller is a licensed dealer.

"In Wisconsin, displaying a motor vehicle that is offered for sale is considered 'selling,'" said Michael Domke, field investigation unit supervisor at the Wisconsin Division of Motor Vehicles. "Henceforth, if you offer a motor vehicle for sale that is not privately titled and (has not) been used for personal use, you are required to obtain a motor vehicle dealers license to sell a vehicle for profit."

Tesla has not applied to open a showroom in Wisconsin, Domke said. If it did, the showroom likely would not be approved without adjustments.

"It depends on which business model they would use," he said. "I've heard that they've kind of tweaked here or there in other states based on what their laws are."

In addition, delivering vehicles directly to customers as a business practice would require a dealership license. But Tesla has delivered vehicles directly to some Wisconsin customers who ordered them online.

"Though I can't speak to plans for a showroom in Wisconsin at this time, we are always looking for new opportunities to engage and educate more people about Tesla," Georgeson said. "We are able to sell cars in Wisconsin."

Getting repairs

Eventually, Tesla owners will need to have their cars repaired, but there are only four certified Tesla repair technicians in the country.

Luckily, one of those technicians works at Marshall Auto Body in Waukesha.

"We got an invitation from them," said company president Scott Marshall. "They will not sell collision repair parts to anyone unless they're trained by Tesla. It requires a lot of skill and equipment to do it properly."

Marshall invested about \$150,000 in the welding and fixtures needed to hoist and repair the high-strength aluminum car.

Structural welds need to be properly executed and rivets expertly installed to maintain the structural integrity of the vehicle, he said. Because the undercarriage is totally flat, special jig fixturing is needed to lift the car. And a 3-D measuring system is used to establish the proper control points.

Marshall Auto Body, which has about 20 employees, has already provided a couple of minor Tesla repairs, Marshall said.

He sent the technician who does the work to a \$3,000, two-week training session in California and is preparing to send another employee for training.

It was worth the investment, Marshall said, to plan for the future. He expects his auto body may also become a destination for Midwest Model S owners who need repairs.

"We know that many cars, probably the majority of cars, are going to be built this way soon," Marshall said. "I feel it was a very good deal – they did a wonderful job."

Marshall began providing repairs because he inquired as he was purchasing his own Tesla. He bought the \$115,000 performance version of the Model S, the P85+. It has an 85-kWh battery and some additional

features.

"I bought the best one they had because I wanted to use this as kind of an introduction and a demonstration to our employees and everyone," he said.

While he knows most people cannot yet afford a Model S and consumers will be driving gas cars for quite a while, Marshall believes the industry is moving toward electric vehicles as the prices drop.

The shop recently installed solar panels on its roof and provides a free solar charging station to the public.

"It's time to start moving in the direction of making things in a clean way," he said.

Constant innovation

General Motors announced this month it plans to engineer an electric vehicle that can travel 200 miles on a charge, for about half the price of a Model S.

As a more established and much larger competitor, General Motors could present a significant threat to Tesla's success. And other major car makers are reportedly developing vehicles with longer range.

The 10-year-old Tesla, which just reported its first quarterly profit and is working on making a \$30,000 car, is in a race to stay at the top of the electric vehicle market.

An advantage for Tesla is its momentum. The company's stock has surged as the buzz around the Model S draws investors far and wide.

Straubel, the Tesla executive who is a Wisconsin native is tasked with developing its technology. Tesla declined to make Straubel available for an interview.

According to the company's website, he became interested in electric vehicles at 14, when he found an electric golf cart in a junkyard and rebuilt it.

While Straubel now lives in California, he once served as a propulsion engineer at Rosen Motors, which has eight dealerships in southeastern Wisconsin and northern Illinois. There, he developed a new hybrid electric vehicle drivetrain.

Straubel later founded Volacom, an electric aircraft developer, and now serves as Tesla's chief technical officer, overseeing technical and engineering design for the cars.

The Wisconsin native has his work cut out for him as Tesla races against the competition.

"We really wanted to find a car and design a car that could compete with a gasoline car, head-to-head," Straubel said in an interview on YouTube. "The best place to do that is in high performance. I see the future of electric vehicles...as really phasing in faster than most people think...This is the future roadmap."

In the meantime, Tesla will continue trumpeting its rave critical reviews for performance and safety.

"With the Model S, we had the ability to design it from the ground up to optimize safety," Georgeson said. "During their tests, trying to flip the car, it wouldn't flip."