

Where We Stand

The automotive industry is on the precipice of a shift. Here's what the future looks like and what you need to know to prepare for it.

Alex Cannella, Associate Editor

It's been the hot topic on everybody's lips for a few years, but we need to sit down and talk about electrification. At this point, nobody's questioning that the electric automobile is here to stay and will only be gaining relevancy as time goes on. The only questions are when will they gain traction and when will we have to start paying attention to this new sector of the market? The answer is sooner than you might expect. Namely, now.

Where We're At

At the commercial level, it doesn't look like electrified cars are really taking over the market. Sure, Teslas are in vogue and hybrid cars are increasingly common, but your average commuter's still probably using a vehicle with a standard internal combustion engine (ICE). From their point of view, the shift to electrification is a glacial one we're only in the very earliest stages of.

Look underneath the surface at the manufacturing sector, however, and you see a very different story. The industry shift has already begun at its roots, with manufacturers developing new disruptive programs and even restructuring their organization. New engineering departments focused on designing and testing e-drives are popping up.

"I think the sales figures show a relatively slow adoption of electric and hybrid vehicles in terms of total market volumes," Simon Shepherd, head of electrified power trains at Drive System Design Ltd., said. "But electrification is getting a lot of focus in the media and is really gathering momentum. Manufacturers are seeing it as an important, strategic thing to be involved with. And so whilst the actual growth of the vehicles we see on the road is fairly modest at the moment, the response in the industry is changing very rapidly."

"We have an interesting insight into advanced and new product programs within our customers," Jon Brentnall, president of Drive System Design Inc., added. "So on a day to day basis, we see the development of product that is typically two to four years out before it's going to hit the market. The majority of the automotive work we now do has a form of electrification associated with it in one way or another."

To the outsider, all the shuffling around in these organizations might paint the picture that they're preparing for an inevitable proliferation of electric automobiles in the future, but the reality is that the future is already here. The transformation is happening now, and if you haven't started thinking about how you're going to cater to this growing segment of the automotive market, you've already fallen behind. If you don't have a plan, it's time to make one, because people are already jockeying for a slice of that market.

This holds true across all segments related to automotive



Internal combustion engines aren't about to go extinct, but electrified cars are gaining momentum in the manufacturing sector.

transmissions; motors, drives, even gearing.

"It's inevitable because it's a reality today..." Dennis Beauchesne, general manager of ECM USA, said. "We haven't seen a big buy-in of the existing companies from a total electrification standpoint, but certainly from a hybrid standpoint, there are more companies signing on from that and doing work in those areas for hybridization programs for those vehicles. We've also seen a number of transmission manufacturers, tier two manufacturers that are helping that effort and providing electric drives, electric transmissions for those vehicles."

The universal point, no matter what industry you're in, is that if you have a hand in the automotive industry, it's time to stop speculating from the sidelines about what will happen with electric cars and to start planning for their arrival. The industry is already crowded with companies trying to stake out their slice of the newest, freshest pie, and the best time to get in and get your own is before things settle.

"If an automotive OEM currently chooses to outsource an e-drive, we've noticed that an awful lot of players will put their hand up for that business," Brentnall said. "And the leaders, as it were, the people who want to be the tier ones, are a mixture of original driveline tier ones that were more used to being a mechanical player, and then the traditional

e-machine and inverter suppliers who might also put their hand up. And then amongst themselves, they have to start feeding off one another to get a complete solution....What we suspect is that this multitude of players within the market right now will start to settle down and to potentially look to conglomerate over the next five or ten years.”

Where We're Going

So the future's here. The train tracks the industry's probably going to run on for the next decade are already being thrown down. Where do they lead?

First, before this all becomes too alarmist, electrified cars aren't going to take over the market overnight. Not pursuing electrification today might put you behind the curve, but it's not a death sentence. There's still life left in the internal combustion engine. There's no guarantee that they'll ever become completely obsolete, or even that electrification will be a new golden egg for the industry, but right now, the long arc of the market is trending towards electrification with no clear signs that it's going to change course. So the future, most likely, is going to see at least a reduction in ICE vehicles and an increase in electrified and especially hybrid cars.

The gear manufacturing industry in particular might look like it has a lot to fear from this ongoing market shift. After all, transmissions are the main component the automotive industry uses gears in, and electrified and even hybrid cars need fewer of them. But even fully electrified cars will require some form of gearing, even if they don't necessarily require as many gears per transmission system. The future isn't set in stone, but there are very few nightmare scenarios that see the gear industry become divorced wholesale from automotives. Even in the event that we one day see a 100 percent saturation of electric vehicles in the market, gears will still be relevant, if perhaps having a diminished role. Gear manufacturers don't have to worry about complete obsolescence, but there is concern about the industry shrinking.

But for every expert you find that's warning of a potential



Every component of the drive train from motor controls to gearing is going to be affected by the shift to electrification.

industry crunch, another will point out that even if the number of gears required per transmission goes down, a rise in overall demand over time would counteract the trend and theoretically keep the industry level.

There's obviously no one who can perfectly predict how the industry will shake out, but even if that industry shrinks, there will still be room for some players. The question you need to answer is which market do you want to try and be a player in: electrified, ICE or both?

If you want to be able to compete in the electrified market, then it's time to buckle down and start looking at how you're going to accomplish that. If you want to keep providing to the internal combustion engine market, you need to look at how you're going to survive a hypothetical industry crunch.

On the adaptation front, there are a few trends in what manufacturers are doing right now as they shift to developing electrified drive trains. For one, they're starting to take components that have typically been their own individual systems in a drivetrain and merging them into a single component. Putting a gearbox and a motor controller into the same casing, for example.

“More and more of those systems are becoming one or within one casing,” Shepherd said. “So the engineering is being brought together to condense those components into one complete product.”

If you're looking to stick to your guns, however, Beauchesne believes that the best path to survival in the ICE market is to focus on quality.

“The numbers will be smaller, but the quality will be necessary to be higher, so the manufacturers that are able to produce quality gears will be still able to survive; it's just a matter of volume,” Beauchesne said.

The exact timeline of when we're going to get there, however, is a bit less clear. As Brentnall noted earlier, we'll probably start seeing a lot of companies' current inaugural projects start hitting the market in two to four years, but that doesn't mean electrification is going to be reaching ubiquity in that time, and nobody's got a crystal ball to predict exactly when and how quickly that shift is going to happen. Most outlooks, however, predict that the slow march of progress will be picking up speed in about 10-15 years.

How to Get There

It might sound overly optimistic to start worrying about what's going to happen in 2030 when there are bills to be paid today, but if/when the electric car singularity does eventually come, it'll already be too late to jump onboard, because you're going to have to do some homework before you can get your own slice of the market.

In order to compete in this arena, a lot of manufacturers are realizing that what they're doing today isn't going to cut it. They're going to have to nurture entirely new competencies in their organizations, either through hiring or education, to provide an appealing product in this new market.

“[Manufacturers are] having to reskill and not just learn skills that are part of other industries, but work out how they apply to vehicles and passenger cars, developing new ways of doing things,” Shepherd said. “And new standards, new

norms are still being established.”

So what do you need to learn?

Efficiency is a key concern, and you'll have to know how to keep both electromagnetic and mechanical losses low. A firm knowledge of the finer points of electromagnetics in general is necessary, and being able to predict excitation forces is important.

Most important to have, however, is an understanding of how to integrate all the individual components and, more importantly, the varying disciplines required to make them, together. Knowledge of how the entire assembly goes together is paramount, and that includes learning how a battery figures into the assembly along with any effects that might have on the drivetrain as a whole. But just as important is understanding how and why each discipline, from gear manufacturing to battery design, works the way it does.

Even beyond individual competencies, you're going to have to wrap your head around an entirely new system of development. That means learning new testing cycles. Adapting to different safety legislations and standards that are still developing and may change in the future. Even figuring out a new development program. One of the largest challenges Shepherd and Brentnall cited was that while ICE development has a generally understood and well-practiced development cycle, best practices for electric drivetrains are still being established.

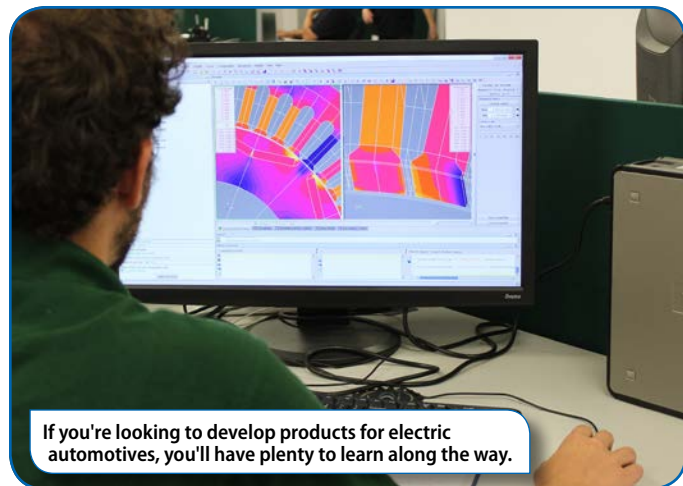
“It's rare for an OEM to develop a brand new vehicle with



ECM's Nano line is the company's leading gas quench furnace which can help you acquire the quality required to make gears that will succeed in an electrified automobile.

a brand new internal combustion engine and a brand new transmission simultaneously,” Brentnall said. “There's just too much risk in that program to hit a launch date. So typically, you pick one and you develop that new element and then introduce it into an existing vehicle, perhaps with an existing engine, and then marry it to a brand new transmission. That's pretty palatable.”

Getting into electrical drivetrains, however, requires an OEM to develop all of that simultaneously — the engine, the



If you're looking to develop products for electric automobiles, you'll have plenty to learn along the way.

mechanical drive, the battery, the oil system — they all have to come together into a cohesive whole. And manufacturers and suppliers need to at least understand enough about that whole to figure out how to get their products to fit inside it.

For gears specifically, the main focus is on making the gearing quieter. Without the hum of a combustion engine, the gears become the noisiest part of a car, and thus finding ways to make a gear run more quietly is a top priority. That means reducing distortion as much as possible, which according to Beauchesne, in turn means higher quality machining and different, better materials that are higher in hardenability and easier to quench. In short, to keep on the way that gears have already been going. This is particularly helpful for ECM, Beauchesne's company, which specializes in top-of-the-line gear quenching. Often, in order for a gear to reach the level of quality needed to reduce noise, such materials are a must for the quenching process to be effective.

This isn't a comprehensive list of all the things you'll need to learn or challenges you might face if you're thinking about designing for electrified cars, but it's a good one for establishing the scope of the project you might potentially embark on and the kind of pitfalls to consider.

And it's certainly worth putting some thought into over the next few months. Electrified cars might not be on the road yet, but the shift is already happening where it matters to us: the factories. And it's gaining momentum. For those still on the sidelines, it's time to start figuring out what to do about it. It doesn't matter if you go all in on electrification or keep providing

for internal combustion engines. What matters is that you have a gameplan on how you're going to do it. **PTE**

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