

How A Company *Transformed* Itself to Capture the Opportunities of the AC Marketplace

Hi Performance Golf Cars: Staying Flexible in a Changing Market

By Laretta Harris

On a recent busy day at HPGC, the President of the company was nowhere to be seen. Nowhere, that is, unless you happened to glance under one of the trucks in the R&D lot. That's where you would have found President and Owner Brian Seymour, personally assembling the connections of a prototype electric drive system. For the head of a company, it doesn't get much more hands-on than that.

"This is a small family business, just six people at present," explains Seymour when he comes out from under the truck. "My father started it in the early 1960s. His focus was repairing electric motors. But eventually it became more cost-efficient for people to buy new motors rather than repair them. So we reinvented the business, and we keep reinventing as we go."



Brian (left) and Darren Seymour

of Ontario in southern California. Both men have a flair for engineering and a passion for anything with wheels. Brian Seymour does all the metal fabrication, welding and software engineering for controller programming; Darren Seymour does all the mechanical engineering and programming the CNC machinery.

The two brothers take pride in the fact that they create motors on-site, from scratch. "In an age when so much of this industry is sourced overseas, our motors are built by hand in the USA, and we feel they are the finest quality in the marketplace."

From rewinding ... to rethinking

The original company, Seymour Electric Motor Service, was founded 1962 with a specialty in rewinding electric motors – from small pool pumps up to 200 hp industrial motors. As that business fell off, the electronically-gifted family began to explore other options.



Hi Performance team and facility

Then, about six years ago, the brothers came up with the concept of putting AC motors in golf cars and other light applications. They renamed the compa-

ny Hi Performance Golf Cars. Now they're going by their initials, HPGC, because it's not just golf cars anymore.

"We've really branched out," says Brian Seymour, "expanding from the golf car after-market industry into customized AC motors for a wide range of industrial and utility vehicles. Electric motors are so environmentally friendly, they're becoming more and more of a popular solution. We're designing electric drive systems for light industrial and utility vehicles that are used in so many applications; from seaports, airports, military bases, postal services and municipalities to private communities and university campuses. We're also designing AC drive systems for small flatbed trucks that can carry up to 1,000 lbs. There's a lot of opportunity in the AC market that we're really just beginning to explore."

For example, they are working with Roush Industries, which imports a pickup truck from Brazil and converts it to an AC drive motor system, with HPGC supplying the customized drive. Same for Boshart Engineering, which is importing a vehicle out of South Korea originally manufactured as a diesel. In both instances, the companies are achieving economies by acquiring vehicles overseas, and converting them stateside.

"There's truly a void in the industry," notes Seymour. "On the heavy-duty end, there are full-size gasoline pickups,



Flatbed e-ride



Curtis AC controller 1238

and on the light end there are golf carts, but there's a void in mid-weight utilities."

Taking e-ride to new heights

The opportunity is further illustrated by a project in conjunction with e-ride Industries: an AC drive system developed for an e-ride flatbed truck. The drive technology has enabled e-ride to penetrate new markets because of a very

important advantage, the vehicle has excellent hill climbing ability. "HPGC literally took us to a new level by creating a vehicle with all the fuel-related benefits of an electric drive, but one that's powerful enough to perform in hilly terrain. That opened up a lot of new markets for us," says Dan Christy, manufacturer's rep for e-ride Industries.

e-ride specializes in customized electric vehicles for light utility and "street legal" applications. The flatbed they've developed with HPGC is the EXV2, which Christy describes as a must-drive vehicle. It is so well built and has such high performance virtues, it's become a best seller for e-ride's fleet accounts.

"The quality of HPGC's motor and the Curtis controller they use – known as one of the best in the industry – created a vehicle that can take the hills and tow a load without heating up," says Christy. "Plus it's a brushless, maintenance-free motor. It's enabled us to build a larger, more powerful electric truck with a lot of accessories. We've doubled our fleet sales because of it."

Christy gleefully recalls taking a customer from the City of San Francisco for a demo ride. "I told him to pick a street and he picked Ripley, known as Ripley's Believe It Or Not because of its super-steep 25% grade. You can barely walk it! We went up, stopped in the middle of the hill, and started again. Then we went down, and because of the regenerative capability of the motor, there was plenty of power to brake the vehicle on the way down. My customer's jaw was dropping – he'd never seen any electric vehicle perform like that. Needless to say, we got the order."

The appeal of AC

As Seymour tells it, the advantages of AC motor technology are many. In addition to more power and better hill climbing ability, AC delivers as much as 40% more battery efficiency and – with advanced engineering – a smoother ride. "HPGC motors run extremely smooth – that's definitely our advantage in the marketplace. We can go as low as 1 mph, but when we put the pedal to the floor we get a huge performance difference. It's like driving a V8 versus a four cylinder."

However, the road to success was a bit of a bumpy ride. "In early stages we had a components company working on an AC controller for us. But it had a lot of performance issues that we just couldn't resolve. I even tried to design my own, but couldn't reach a satisfactory solution. Then we saw an announcement that Curtis Instruments was coming out with an AC controller. We knew they had a reputation for quality, so we contacted them. I said 'let's team up and work together,' and that's exactly what happened. We've developed a very strong partnership."

Unique programming flexibility

"The main obstacle they were having was controlling the motor for a smooth ride," says Anders Hultman, HPGC's Curtis representative and technical liaison. "But because they're so inventive and entrepreneurial, they needed a lot

of flexibility to explore new ideas. Curtis is unique in offering VCL – Vehicle Controller Language software that can quickly accomplish customized design. For example, we arrange the inputs and outputs a certain way for traction purposes, but HPGC can easily rearrange them for other uses such as monitoring battery acid levels and activating pumps.”

a drive train and we install a customized electric system specifically for low-speed, short distance use. In designing for these vehicles, the Curtis AC motor controller gives us the versatility to perform other functions, not just run a motor.”

Since the programmable Curtis AC controller can handle multiple functions, no separate computer for custom fea-

tures is required. It's essentially a complete vehicle system within one box, greatly simplifying production and allowing cost efficiencies that HPGC can pass on to their customers, creating a marketplace advantage.

A mutually productive partnership

For a company as entrepreneurial as HPGC, partnership is essential. Although they're a relatively small company, and Curtis is a global leader in electric motor technology, they've never felt shuffled to the back burner.

“We've worked with Curtis since they started in the AC arena,” says Seymour, “so we've developed components right along with their

engineers. We provide a practical usage that's good for them, acting almost as an extension of their lab. We put their evolving AC technology on the road, get it field tested, and give feedback. It's been a really good relationship that benefits both companies.”

Anticipated growth

The Seymour brothers have good reason to be proud of their business. Since re-engineering from golf cars to unique AC motor system applications for the IUUV market,

they've accelerated rapidly. In their first year, they sold 50 drive systems; in their second year, 150. Last year they sold 500 systems – 350 for golf cars, and 150 for industrial applications. “In 2007,” predicts Brian Seymour, “we expect our industrial sales to outstrip golf car sales by two to one, so our business is clearly evolving. We're projecting about 1,000 motor systems in this year's total sales.”

Enjoying the challenge – and looking ahead

Seymour is not only seeing his business grow, he's having a great time doing it.

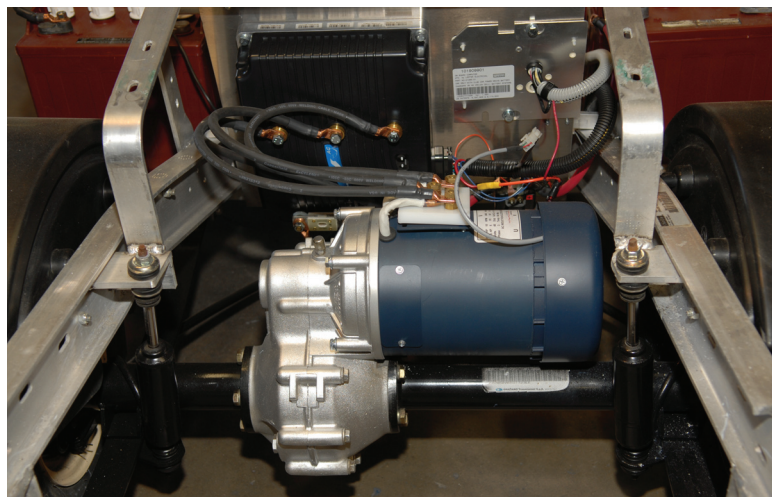
He admits to having a lot of fun applying AC technology to different needs. For example, he's modified one utility motor to run in six different types of vehicles – from a golf car to full size pick-up truck. “Every project is different, very challenging and interesting.”

Down the road, HPGC's next entrepreneurial phase may focus on a city vehicle. Seymour says he can foresee the time when people will use AC commuter cars for local driving to stores, workplace and school.

And, as a pet project, he's getting into electric motorcycles and go-carts for indoor racing – a personal passion.

The family gene for electrical invention has even taken Seymour to Hollywood. He provided technical support on THE AVIATOR. “The airplane that Leonardo DiCaprio's Howard Hughes character broke the speed record with, in the scenes where the plane taxis down the runway – we did the drive train for that,” confides Seymour. In many ways, this company president is still a gearhead – and a kid at heart.

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Drive system in chassis

“VCL makes the Curtis controllers very versatile as to what we can do,” agrees Seymour. “For example, one of our customers is now buying a combustion engine pick-up truck produced in Brazil that we convert to an electric system. Through the Curtis motor controller we are able to control heating and air conditioning for the passenger compartment. We're doing the same for another customer who's importing a vehicle out of South Korea, originally manufactured as a diesel. They bring it over without

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AC Delivers A Difference

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- Precision control
- Improved acceleration
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- Suitability for a wide range of applications, including heavy duty and demanding environments



Manufacture of AC motors

IUV ... or NEV?

The line between Industrial/Utility Vehicles and Neighborhood Electric Vehicles is blurring. As is the case with many HPGC installations, the same chassis can be used for both types of applications, with modifications to accommodate either passengers or workloads.

What's more, some manufacturers are seeking NEV classification for light industrial usage. Acquiring a VIN and "street legal" status gives a light truck or utility vehicle more flexibility and broader appeal in the marketplace.

Whether designated as an IUV or NEV, these electric vehicles earn praise for their non-polluting, low-operating-cost advantages. By some estimates, "fuel" costs can be as low as 1.5¢ per mile. Today's electric motor technology allows a 55 mile range on a single battery charge, and the future holds promise of more.

Think "green"

As the world begins to focus on concerns of global warming, electric vehicles are looking better and better. Not only do they offer considerable advantages over conventional internal combustion engine vehicles in terms of emissions; they also produce real cost savings in terms of reduced running and service costs and longer life spans per vehicle.

Fuel costs, traffic congestion and environmental pressures will only continue to mount, making electric-powered vehicles highly appealing for urban environments. The opportunities in this market are taking off, and visionary companies like HPGC will be there to serve them. By constantly experimenting with new batteries, drive trains and body configurations, they're developing a powerful head-start on what works and what sells.

About the Author:

Lauretta Harris, a freelance writer based in the New York area, writes frequently on technology subjects. Contact information .LSHwrite@optonline.net

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without the risk of overloading sensitive, low-voltage components. It also allows users to utilize low cost switches to control the actuator rather than heavy relays, and permits a smaller wire cross section for the control circuits. The result is an easier, faster and more cost effective installation.

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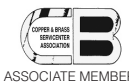
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