Green Lite Motors
www.greenlitemotors.com

Customer Success Story

Autodesk®
Product Design Suite Ultimate

Autodesk software has helped Green Lite Motors move from very simple designs to presenting an exceptionally strong vision of both the mechanical and aesthetic designs of our vehicle. Beyond the software, the relationship with Autodesk as a partner has been fantastic.

—Tim Miller
President and CEO
Green Lite Motors Corporation

The Autodesk Clean Tech Partner Program supports clean technology innovators with design and engineering software they can use to accelerate their development of solutions to the world's most pressing environmental challenges. For more information visit **autodesk.com/cleantech.**

Lean, green driving machine.

Green Lite Motors uses Autodesk® software to combine faster workflow and sustainable design, resulting in transportation efficiency.

Image courtesy of Green Lite Motors

Summary
As the family car rumbled along the highway en route to the family vacation destination, a young Tim Miller would see the large trucks and other vehicles and wonder about better, more efficient ways to travel. It took a few years, but Miller has been pursuing that childhood passion for transportation at the company he founded since 2006.

Based in Portland, Oregon, Green Lite Motors has been prototyping a plug-in hybrid vehicle that promises the comfort and safety of a small car, the fuel efficiency and convenience of a motorcycle, and the small environmental footprint of an electric vehicle. Equipped with both a battery- and gas-powered engine, the Green Lite Motors vehicle aims to provide commuters up to 250 miles of range, 100-mile-per-gallon fuel efficiency, and an enclosed environment to keep them warm in winter, cool in summer, and safer all year round.

"Our vehicle is designed for people making frequent commutes in metropolitan areas," says Miller. "With a steel safety cell, four-point safety harnesses, and air bags, it is much safer than a motorcycle, but you can still take it in the express lane, which saves time on your daily commute, and can park in any small downtown parking spot, all while being much kinder to the environment."

With software provided through the Autodesk Clean Tech Partner Program, Green Lite Motors has moved from using more expensive and time-consuming physical prototypes to using Autodesk® Inventor® software and Autodesk® Showcase® 3D presentation and rendering software, both part of the Autodesk® Product Design Suite Ultimate, to streamline designs, attract investors, and speed the vehicle's time to market. Early designs took several months and lots of experimentation, where the latest design—a virtual prototype of a simplified, lighter, manufacturing-ready version—took just a few weeks.

The Challenge
The unique design of the Green Lite Motors vehicle centers around the patent-pending front suspension system. The three-wheeled vehicle has two wheels up front and one in the rear. The front-end design means the vehicle leans smoothly into turns, just like a motorcycle. The vehicle also stands up automatically at stops and low speeds, enabling a full enclosure that wraps the driver in comfort and safety. These innovations combine for a smaller carbon footprint and a more stable vehicle, while also adding some modeling challenges to be worked out using Autodesk software.

While Green Lite Motors is currently creating the fourth-generation prototype of its unique vehicle, the company did not fully embrace Digital Prototyping until the third generation, relying on physical prototypes for the first two versions.

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Peyton McCann, Green Lite Motor's industrial designer, knew there was a better way of working.

"We had some very basic files of the initial prototype that had been created using other software," says McCann. "I pulled up the machine assembly to find 200 disconnected parts sort of floating around. I had to go in and constrain every piece of the model to make it work. I learned a lot about the machine, but it was pretty tedious and slow."

Combining some experience with Autodesk Inventor plus a week of training in the software, McCann knew enough about its benefits to make Miller a proposition: "I told Tim it would make sense for me to re-create the model from the ground up using Inventor," he says. "That way, we could have full manipulation of the virtual machine as well as all of the great Inventor tools. I used the physical prototype and the basic software model to create a full digital prototype for manufacturing."

The Solution

Streamlining its design and manufacturing process with Digital Prototyping has enabled Green Lite Motors to create the vehicle more quickly. "We used Inventor to completely redesign the entire front end of our vehicle," says Miller. "With Inventor, we've discovered we can start with a clean slate and do a parametric design very quickly. We can modify lengths and widths and component relationships just by tweaking the numbers. In just a few weeks, Peyton and I collaborated online between Seattle and Portland using the shared Inventor model to create a design capable of being manufactured."

"It's been amazing," says McCann. "With Digital Prototyping, I can build the machine in the computer, then Tim and I can tweak dimensions or change parameters and see what happens right away. We don't need to cut metal or waste material. It's all right there. I just make a couple of changes, and boom, they happen. I can move on to the next step instead of being stuck on one thing and trying to figure out how to make it work. Everything is laid out really logically."

McCann is also using Showcase 3D presentation and rendering software, included in the Autodesk Product Design Suite provided to Green Lite Motors through the Autodesk Clean Tech Partner Program. "Showcase makes me look good," he says. "I can bring in my Inventor model and Showcase automatically generates interactive scenes, including shots, alternatives, and animated constraints. I can set up alternatives for materials or object position, and do compelling animations and renderings. I can provide the renderings and videos I make in Showcase to the manufacturing and marketing teams. It makes for great marketing material. When I show people the renderings and animations I've made in Showcase, they are always impressed."

Image courtesy of Green Lite Motors

The Result

"The Autodesk Product Design Suite has helped Green Lite Motors move from very simple designs to presenting an exceptionally strong vision of both the mechanical and aesthetic designs of our vehicle," says Miller. "Beyond the software, the relationship with Autodesk as a partner has been fantastic."

For his part, McCann is even more enthusiastic: "I can't say enough good things about Autodesk," he says. "With the Product Design Suite, I don't even feel like I'm working. I feel like I'm playing."

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—Peyton McCann
Industrial Designer
Green Lite Motors Corporation

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