

Innovating
batteries forward



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Charging Ahead: Pouch cells save 20% on space

Lightfighter Racing revolutionizes the
e-motorbike racing industry





Brian Wismann

Lightfighter Racing

Lightfighter Racing was founded in 2018 by Brian Wismann and Ely Schless in the United States. The aim of this non-commercial project is to revolutionize motorcycle racing and make it more environmentally friendly through electrification. Together with a small team, the two founders have developed and designed an electric motorcycle for use on the racetrack. Lightfighter Racing regularly competes with its e-superbike in club racing and tests the machine's capabilities head-to-head against petrol powered motorcycles on the track. A pioneer in electric motorcycle engineering, Brian Wismann has been a fixture in the scene for over 15 years. From creating championship winning race bikes for Brammo and Victory Motorcycles to award-winning street and

off-road bikes at Zero Motorcycles, his expertise has left an indelible mark on the industry. With a rich background in automotive design, Wisman's journey into the world of high-performance vehicles began long before his tenure at Lightfighter. His involvement in Formula SAE and Mini Baja projects in college laid the groundwork for his later ventures, including designing a Le Mans-style prototype for Crawford and various sports car designs for Brammo.

Lightfighter racing team



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Challenges

- + Optimal use of installation space
- + Lightweight battery for use during racing
- + High energy density for optimal performance
- + Fast charging capability and quick cooling between races
- + Durability in the event of crashes and quick battery replacement

Solution

- + Unidirectional P32 pouch cells from Farasis Energy fulfill all requirements regarding durability, provided installation space, and energy density



Result

- + 20 percent less space required thanks to the pouch cell in comparison to cylindrical cells – no dead space
- + Lightweight battery with an energy density of 249 Wh/kg combined with Lightfighter Racing's active air-cooling system for optimum performance
- + Quick charge, system cool down, and maintenance between races in less than an hour
- + Battery well protected from damage in the event of a crash thanks to chassis design
- + Quick battery change possible
- + Milestone on the way to an environmentally-friendly racing experience

E-racing motorbike with battery technology from Farasis Energy



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Challenges

Racing meets e-mobility

The smell of burnt rubber in the air, an adrenaline rush before the start, top speed on the home stretch, and a pure racing experience – all of this thrills racing fans around the globe almost every weekend. Is it possible to transform an industry that was previously dominated by the smell of gasoline and the sound of engines? E-mobility has recently experienced a huge boom, especially in the automotive sector. Electric cars are now ubiquitous, but electric motorcycles are still a rare sight on the roads and virtually non-existent on racetracks. With the Lightfighter V2, founders Brian Wismann and Ely Schless wanted to prove that an electric superbike is in no way inferior to a gasoline-powered motorcycle. However, the development work was complex and full of challenges that had to be overcome. For Wismann and Schless, it was clear that they needed special battery technology and had to pass test runs in order to realize their vision of a high-performance e-motorcycle.

“We want to establish e-motorcycles in racing and knew that we were starting from scratch. Among other things, it was important to develop a model that weighs about as much as a conventional motorcycle. To avoid compromising, we didn’t want to build the chassis around the battery, but rather find the right battery for our plans. So, we were looking for technology that would meet these enormous requirements,” says Wismann, explaining the beginnings of Lightfighter Racing.

Lightweight, powerful, and robust

The market offered many high-quality cylindrical cells, but these were not suitable for installation in the electric motorcycle due to their space requirements. Only by making optimum use of the small installation space in combination with cells that have a high energy density, and an appropriate cooling system could the performance requirements be met.

There was not much data and experience available for the development of such a motorcycle for use in racing. The limited installation space for the battery technology requires innovative solutions without compromising on performance. Another important aspect is the weight of the battery in order to be competitive with conventional racing bikes. The battery must be able to achieve a full charge within an hour to avoid any unnecessary delays in the race. The given criteria in e-racing put maximum strain on the battery technology: use at the speed limit, cooling down in the shortest possible time, the fastest possible charging of the battery, and quick repairs or replacement of the battery pack are essential for club racing, where up to four races often take place in one weekend. What was needed were compact, lightweight cells that are robust, have a fast charging capability, and a high energy density. In addition, the technology had to have a new level of reliability and safety to withstand race weekends and possible crashes – far beyond the use of a “normal” electric motorcycle.

Solution

The miracle space saver: The pouch cell

The unidirectional P32 pouch cells from Farasis Energy offer ideal conditions for the construction of a battery module: Minimal volume with an energy density of 249 Wh/kg. The cell’s rectangular shape and minimal expansion make optimal use of the installation space with absolutely no dead space. In comparison, a cylindrical cell

would take up 20 percent more space. In combination with components developed in-house, active air cooling from Lightfighter Racing, and additional external fans during breaks in the race, the battery technology proved to be ideally suited to the high requirements.

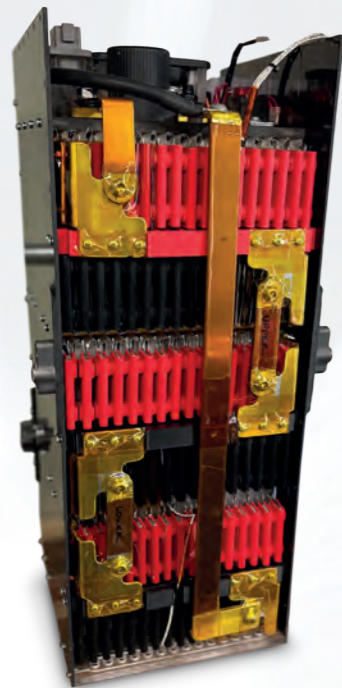
Chromoly steel frame, CNC aluminum, high-end racing parts, and an ideal sized battery with Farasis P32 cells come together in Wismann’s workshop



© Lightfighter Racing

Result

Dream Team – crossing the finish line together



The implementation of the pouch cells had already proved to be smooth during the development of Lightfighter Version 1 and the first races in 2019. For the current Lightfighter Version 2, the frame design was adapted so that the battery module now fits completely vertically and is optimally protected, but at the same time can be quickly removed by loosening just a few screws. Wismann emphasizes the special collaboration between the American company and Farasis Energy: “We have known and valued Farasis Energy for a long time. The team has an incredibly high level of technical expertise and the necessary understanding of the special application in racing. During development, we were able to jointly evaluate data from the track and carry out tests to obtain further suggestions for improving our battery module.” A typical club race is comprised of up to 10 laps, which corresponds to about 40 kilometers. The robustness of the battery technology in the event of a crash is important here. The low level of damage in accidents demonstrates this characteristic as well as the effectiveness of the specially developed suspension of the battery in the chassis, which optimally protects the technology inside.

Innovative strength and courage to break new ground

“We are proud of our developmental work and want to actively promote electromobility with Farasis Energy. Through our collaboration with Lightfighter Racing, we are demon-

strating our ability to think beyond the boundaries of our usual areas of application and provide the right battery technology for every case. Lightfighter’s passion for racing and our passion for high performance battery cells is a good combination to achieve great success in the future and to inspire a new target group for an electric alternative,” explains Jack Johnson, Vice President Sales at Farasis Energy USA.

The future is bright – sustainable, fast, and exciting

In recent years, the market for electric motorcycles has experienced significant growth, especially in the USA and Europe. Electric scooters are still particularly popular, but the “big” machines are also increasing their sales figures. In Germany, for example, a total of around

9,400 new electric motorcycles were registered in 2022 – almost three times as many as in the previous year. Lightfighter Racing is convinced that the enthusiasm for e-motorcycles is contagious. Other racers have already shown interest in a machine. The team surrounding Wismann and Schless is planning to offer more “customer bikes” in the coming years. One of the goals is to compete regularly against gasoline motorcycles in Super Hooligan races in the near future. “We want to revolutionize the racing industry,” says Wismann. There’s a long way to go until then, with a lot of convincing of gasoline engine fans. E-motorcycles are a sustainable alternative that will prevail – even with a somewhat unusual sound that is more reminiscent of a jet. At Farasis Energy, we have found the perfect partner who will continue to push this high-performance battery technology, as has already been proven in recent years.



With bodywork removed, the central location of the battery in the Lightfighter frame is visible

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Latest version of the Lightfighter battery incorporates carbon fiber side plates for strength, polycarbonate for toughness, and aluminum bulkheads for heat sinking capabilities

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Performance Knows No Borders



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