ELECTRIC VEHICLE TEAM

SPONSORSHIP PACKET

2016 - 2017

ROCHESTER INSTITUTE OF TECHNOLOGY

EvT

R·I·T


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Our Purpose

The RIT Electric Vehicle Team (EVT) is a student-run organization dedicated to promoting the viability of electric vehicles through real-world demonstrations of electric drivetrains in action. The team has designed and built a fully electric superbike that is raced in events at the professional level.

About the Team

The three main subgroups within EVT are the electrical engineering, mechanical engineering, and firmware/software engineering teams. These three groups work together seamlessly to design, create, and integrate the different components of the motorcycle. The main goal of the team is to foster the available talent in each member as much as possible, providing opportunities to apply theoretical knowledge learned in the classroom. From the start, new members are challenged to innovate through the design, construction,and optimization of electric bicycles. This experience provides the opportunity to learn about the fundamental concepts of electric drivetrains.

After the introductory project is complete, members are then challenged with intermediary development vehicles, such as the team's electric go-kart. The vehicle was built for an Imagine RIT competition, so improvements are made on an annual basis. Experienced members earn the privilege to collaborate and improve on REV 1, our flagship fully electric custom-built superbike. The intention of all these projects is to provide a more advanced learning experience for the members, as well as providing a trial platform for future technologies that will be implemented on the motorcycle.

Racing Events

Previous Competitons:

- eMotoRacing Varsity Challenge
  New Jersey MotorSports Park (NJMP)
  Milleville, New Jersey

Future Competitions:

- eMotoRacing Varsity Challenge
  Barber MotorSports Park
  Barber, Alabama
- Pikes Peak International Hill Climb
  Pikes Peak Summit
  Cascade, Colorado

The Rider

Karl Smolenski is an engineer at Cornell University's Laboratory for Accelerator Based Sciences and Education. As a hobby, Smolenski competes professionally in motorbike races. Some of the national races that he's participated in include the:

- 1998 AMA's in Loudon, NH
- 2000 VRRA's in Shubenacadie, Nova Scotia
- 2004 AHRMA's in Daytona, Florida.

2010
Club Formation

August 2011
"Hellboy" motor bike prototyping platform

August 2012
REV 1 (RIT Electric Vehicle 1) conception

August 2013
"Hobbes" Go-kart prototyping platform

Jan 2015
REV 1 design compete

April 2015
XALT 12 cell LI+ pack complete

June 2015
REV 1 build complete

July 2015
NJMP 1st Place first race

Nov 2015
Complete software & improve data collection system

Nov 2015
XALT 14 cell LI+ pack complete

March 2016
New revision of hardware on IMU & BMS

April 2016
Custom rear subframe completed

July 2016
2nd place at NJMP

March 2017
Zero motor upgrade 55HP → 75HP

April 2017
New battery pack using 900 18650's

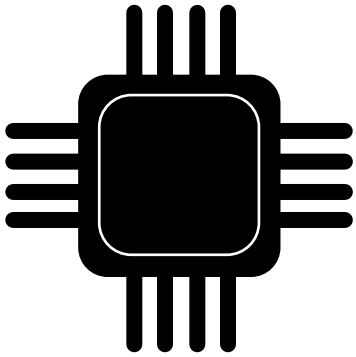
Oct 2017
Barber Motorsports Park

2018
Pikes Peak

REV 2

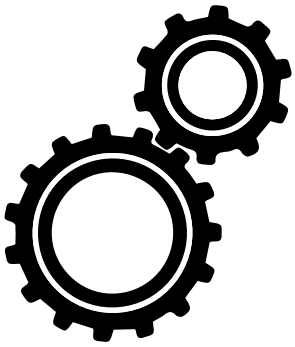
Electrical

The electrical team is responsible for all custom circuit design and electrical system integration for the superbike. The team works on a diverse set of projects that include the battery management system, inertial measurement unit, low voltage subsystem, and the supercharger. The team continues to set itself apart by designing everything in-house, guaranteeing maximized bike performance and safety throughout the duration of the race. With the implementation of advanced battery characterization and cutting edge architecture inspired from the best companies in the world, the team continues to redefine the impossible.



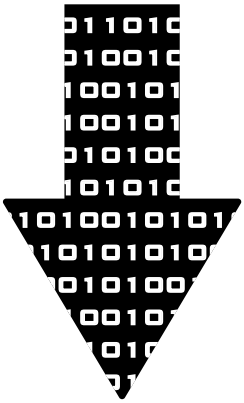
Mechanical

The mechanical team is responsible for the design of various components on the motorcycle, as well as the integration of everything inside the frame. Custom designs include the battery enclosures, a custom rear subframe, housing for all circuit boards, and carbon fiber fairings. The largest challenges faced by this team included designing the battery enclosures and integrating the motor, and motor controller into a motorcycle frame previously designed for a gasoline engine. In addition to the design work, the mechanical team is responsible for manufacturing several of the parts used on the bike. This team is vital in ensuring that all of the major components of the motorcycle meet technical and safety specifications, as well as work seamlessly together.



Firmware

The firmware team is a multidisciplinary design team dedicated to building the software systems required to field a competitive race vehicle. The work covers a wide range of activities including data collection regarding vehicle performance,the balancing of individual cells inside the battery packs, managing the rider-vehicle interface, and high-speed charger control. The electrical and firmware teams work very closely to develop a complete system of high-quality devices that are flexible enough to allow the team to design a race vehicle that is optimized for any situation.



Batteries

REV1's battery pack is made up of 24 XALT 63 Amp-Hour high power cells arranged in a series configuration. This yields a system with a maximum voltage of 100.8 Volts with a peak current draw of 720 Amps. The resulting energy storage capacity is 5.6 Kilowatt-Hours. The entire assembly consists of two custom aluminum battery enclosures, each housing 12 individual cells. Each cell is separated by vulcanized fiber insulation and connected via copper busbars. Thermal management of the pack is provided by a custom phase change material from AllCell Technologies that restricts the maximum temperature to 48°C.

Subframe

The subframe is the section of the frame that seats the rider and houses the motor controller. The custom design raises the incline of the seat to accommodate the motor controller, ensuring that full compression of the rear suspension does not allow any interference of the controller with the rear tire. The custom subframe is both compact and lightweight, allowing the controller to be mounted while maintaining the structural integrity of the motorcycle.

Motor

REV1's motor is a Z-Force 75-7 unit designed by Zero Motorcycles in California. This model is a synchronous three-phase, radial flux, surface mounted permanent magnet machine. It is capable of producing 95 Nm of torque and 38 kW peak power at the output shaft, spinning at 6000 RPM. The motor is air-cooled via aluminum heatsinks mounted to the exterior of the housing.

Gateway/Telemetry System

The gateway consists of a Raspberry Pi paired with a CAN module, and is responsible for retrieving and sending real-time data from all monitored components on the bike. In addition, the gateway acts similar to an ECU when it makes performance decisions based upon the environment. The gateway communicates with the Sevcon motor controller, which allows for precise control over the motor and the capture of many data points provided by the motor controller.

BMS/IMU

The custom battery management system (BMS) collects data on individual cells in each battery pack. These measurements include cell voltage, pressure, and temperature. Additionally, the cells can be kept from drifting too far out of balance with one another. In the event of an error being detected, operation of the superbike can even be suspended. The inertial measurement unit (IMU) is a custom embedded system that collects acceleration, rotation, and altitude data. This data is then sent over the CAN bus to the gateway, which then stores the data until it is collected. The IMU allows the optimization of lap times based upon previously collected data, allowing the rider to have more performance feedback.

REV1

REV 2

Custom Frame Maximizing Electric Drivetrain Potential

Why build a fully custom electric superbike?

- Battery centered frame design
- Custom carbon-fiber farings
- Effective weight distribution
- Higher energy density
- More powerful motor
- Faster top speed

What it Takes

Frame

Design frame to accommodate a higher battery volume

Motor Controller

Custom software integration to maximize motor output

Suspension

Tuned to accommodate a custom electric drive train

Batteries

Cutting edge battery architecture and integration to increase power and endurance

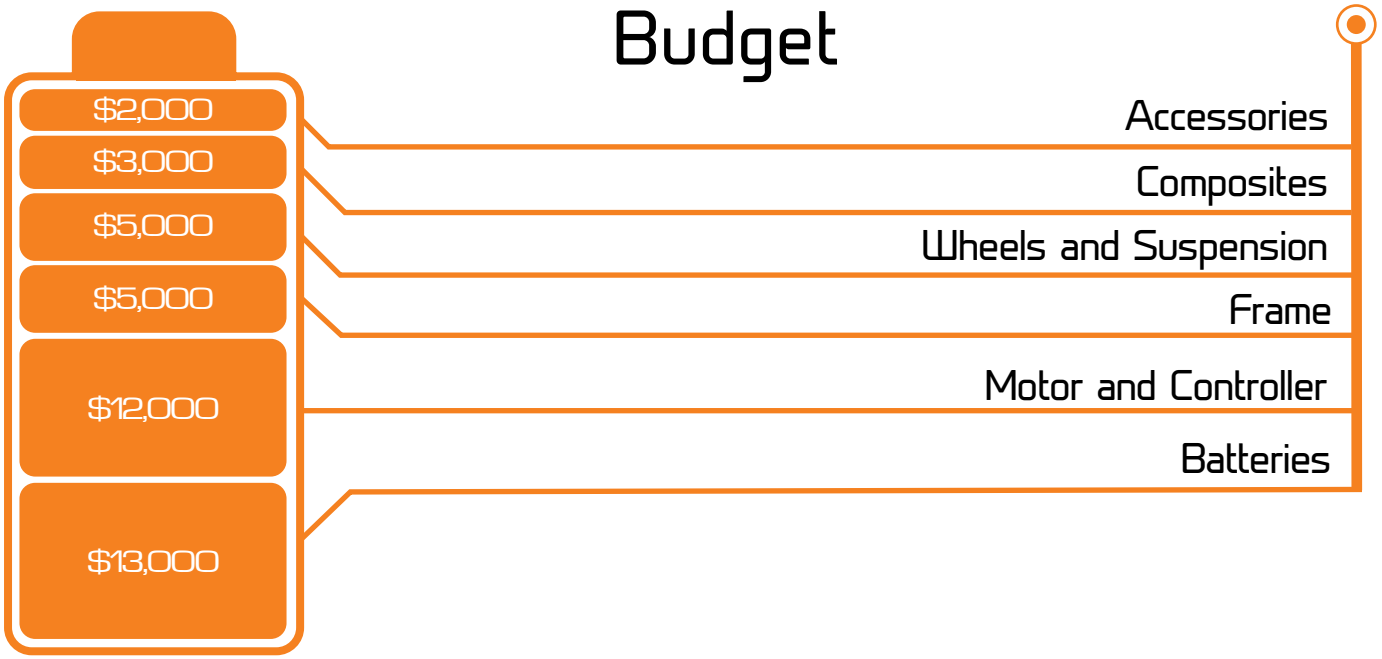
Telemetry

Integrated telemetry system records bike metrics to monitor and adjust race performance

Motor

State of the art motor to efficiently transfer power from the electric drive train to the wheels

Budget



Sponsorship Benefits

Ways To Invest

Materials

Services

Money

Sponsorship Tiers

KILOWATT SPONSOR
$250 - $999

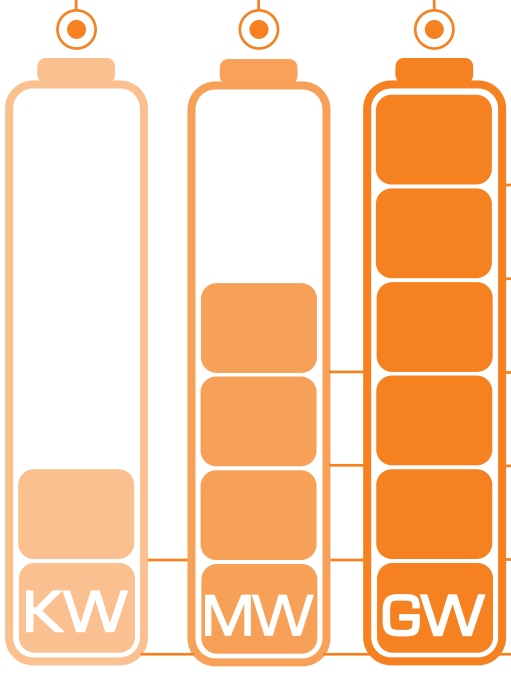
A Kilowatt level sponsor receives a smaller logo display.

MEGAWATT SPONSOR
$1,000 - $3,999

The Megawatt level sponsor receives a medium sized logo that will be prominently displayed on the bike.

GIGAWATT SPONSOR
$4,000 and above

Gigawatt sponsors are our most generous benefactors who receive the largest logo promotional display on all EVT paraphernalia.



- Private tour of team room and projects
- Company logo on REV 1
- Company logo on team banner
- Company logo on team t-shirts
- Company logo on team website
- Invitation to Sponsor Day

Contact information

Thank you for time and for considering sponsorship of the Electric Vehicle Team. If you have any questions or would like to know more about what we do, please feel free to reach out to the contacts listed below.

RIT Contact

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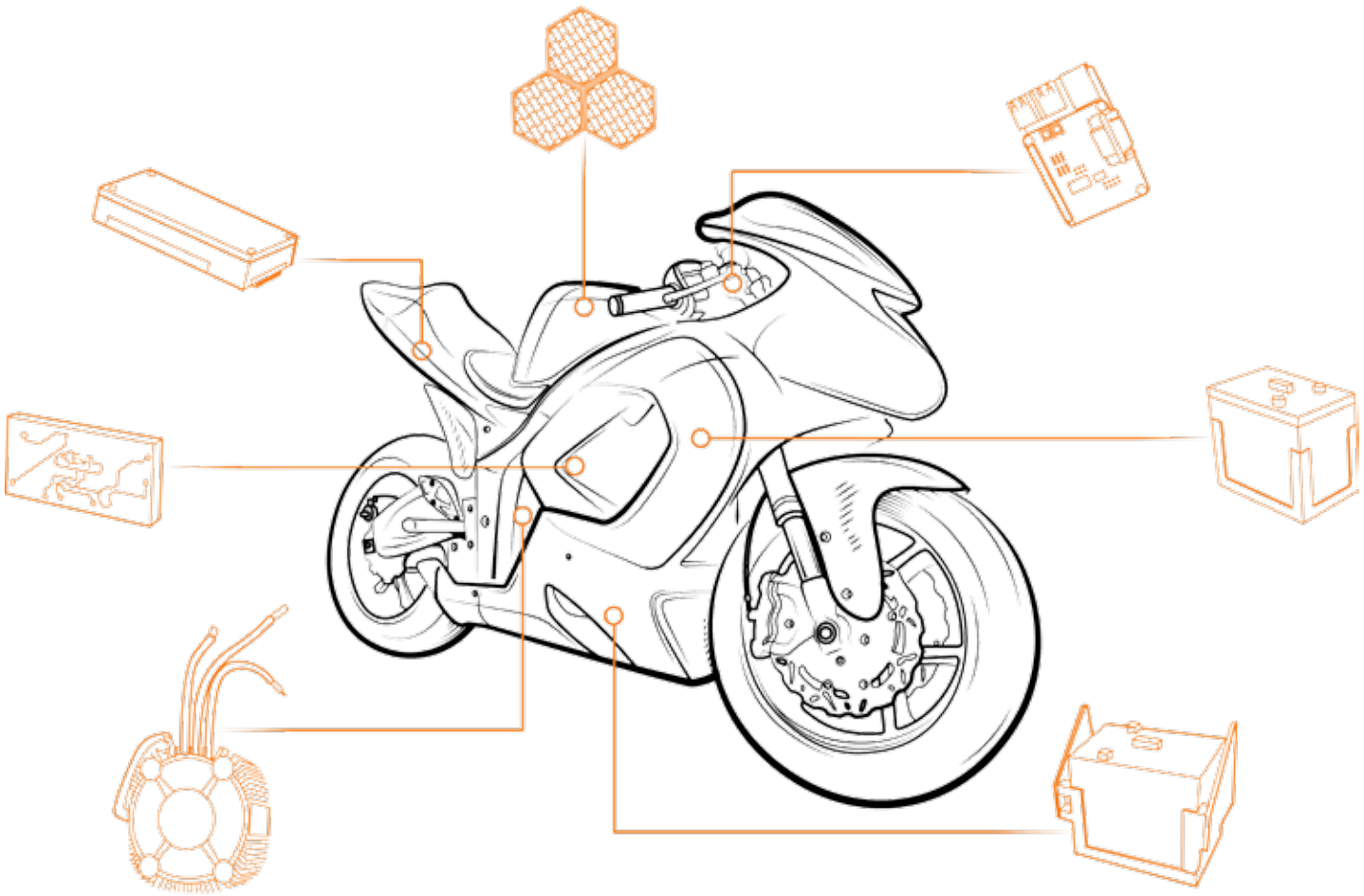
Interested in Becoming an EVT Sponsor?
Contact Us!



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