



AUTOMOTIVE

Automotive manufacturing and engineering continue to fuel Greenville, SC as a key player in job creation and university-wide programs. From BMW's \$6 billion investment in their Upstate SC plant to Clemson University's International Center for Automotive Research (CU-ICAR), the region continues to attract the biggest and best in the industry.

BMW DRIVING GROWTH



With the decision to locate in Upstate South Carolina in 1992, BMW Manufacturing Co. has created momentum for overall growth in the Southeastern automotive region. Since then, the BMW plant has produced more than 2 million units.

- This plant exports 70% of their throughput to BMW's other global markets, making the facility truly a substantial "world plant"
- BMW has invested \$6 Billion and created more than 8,000 jobs at the Spartanburg County plant



BMW's decision to locate **40** of its suppliers in the Southeast, resulted in **10,000** new jobs for South Carolina.

ALTERNATIVE ENERGY VEHICLES



Proterra

In 2010, Proterra, an electric and hybrid bus manufacturer, announced plans to be located in Greenville.

- Capacity to create 400 EcoRide™ Battery Electric-35 buses annually

INTERNATIONAL TRANSPORTATION INNOVATION CENTER (ITIC)



ITIC is a cutting-edge automotive research infrastructure that offers a new approach to transportation innovation that is safe, secure and confidential. In partnership with CU-ICAR, and with testing infrastructure embedded at the South Carolina Technology and Aviation Center Campus, ITIC allows companies to physically validate - in real-world scenarios - vehicles and electric and autonomous technologies in a lab environment.

UNIQUE AUTOMOTIVE R&D CAMPUS



As a cornerstone for the auto industry, BMW, the state of South Carolina, and Clemson University formed a partnership to establish a premiere automotive/motorsport research center in Greenville. The Clemson University International Center for Automotive Research (CU-ICAR) is located on a 250-acre campus along I-85. CU-ICAR is the home to the Clemson University Graduate Engineering Center that offers advanced degrees in automotive engineering and motorsport technology.

D03

A HYBRID MAINSTREAM SPORTS CAR

DEEP ORANGE 3



Case Study DEEP ORANGE

Deep Orange is a graduate engineering vehicle prototype design program at CU-ICAR that focuses on an open-architecture approach to automotive manufacturing. Through the collaborative effort of faculty and participating technology partners, a new vehicle prototype is engineered and manufactured each year, offering

a unique opportunity for graduate students in the Upstate.

Focuses include:

- Vehicle Architecture
- Alternative Powertrain Integration
- Infotainment Integration
- Safety
- Flexible Supply and Lean Low-Cost Manufacturing Concepts

SELECT AUTOMOTIVE COMPANIES



Alfmeier Friedrichs & Rath – Fuel Tank & Gauge Systems
Bosch Rexroth – Hydraulic Fluid Pumps
Diversified Coating Systems – Metal and Plastic Coating Systems
FSI Advanced Research, LLC – R&D of Machine Vision Technologies
Fuyao North America – Automotive Replacement Glass Distribution
JTEKT – Bearings & Driveline Components
Magna/Drive Automotive Industries – Major Body Panels and Assembly
Magna/Decostar – Exteriors & Interiors
MGA Research Corp. – Automotive Testing and Consulting Services
Michelin North America Inc. – Car & Light Truck Tires
Nissan – Automotive Parts Distribution
Ortec Machining & Fabrication – Full Service Manufacturer of Precision Parts
Pierburg – Hydraulic Fuel Systems
PRETTL North America – Wire Harnesses
Proterra Inc. – Advanced Battery Powered Vehicles and Systems
redi-Group North America, LLC – Management Services
RodingTechnology North America, LLC – Headquarters
Safety Components – Air Bags
Sage Automotive Interiors – Automotive Fabric
South Carolina Plastics – Plastic Components
Standard Motor Products Inc. – Ignition Coils and Fuel Injectors
Stueken, LLC – Fuse Caps
TBMC Inc. – Timing Belts
Tower International – Stampings, Frames and other Chassis Structures



www.proterra.com

CU-ICAR'S UNIQUE R&D LABS



- Renk Labeco 4-Wheel 500 HP Chassis Dino and Fast Semi-Anechoic Chamber
- MTS 320 Tire Road Simulator and Weiss Climate Test Chamber

CLEMSON UNIVERSITY INTERNATIONAL CENTER FOR AUTOMOTIVE RESEARCH (CU-ICAR)



Clemson University International Center for Automotive Research (CU-ICAR) is an advanced-technology research campus located in the City of Greenville that focuses on automotive research and innovation. CU-ICAR offers the nation's only doctoral program in automotive engineering via Clemson University and holds some of the most heavily endowed chairs in the nation. These include:

- BMW Endowed Chair in Systems Integration
- BMW Endowed Chair in Manufacturing
- Michelin Endowed Chair in Vehicular Electronics Systems Integration
- Timken Endowed Chair in Automotive Design and Development

There are currently a number of existing on-site partnerships with select companies, such as BMW, JTEKT Group, and Proterra. Funding includes \$50 million from public partnerships and \$200 million from private partnerships. Companies have access to the research facilities at no cost.

THE CENTER FOR EMERGING TECHNOLOGIES (CET):



- Located on the Clemson University International Center for Automotive Research (CU-ICAR) campus at One Research Drive
- Offers a three-story, multi-tenant, 60,000 SF Class-A facility
- Funded in part by a \$3 Million Economic Development Administration Grant from the Federal Department of Commerce
- Houses smaller, separate work areas to benefit multiple tenants desiring a location with a smaller footprint

SPECIALIZED AUTOMOTIVE TRAINING FOR OUR WORKFORCE



Greenville Technical College Automotive Engineering

Greenville Technical College Automotive

Engineering programs cover virtually all aspects of engineering and design for automotive components.

Mechatronics Program at Greenville Technical College

- This area of high tech problem-solving covers the disciplines of control systems, electronic systems, and computers and mechanical systems
- Professionals in this program will gain knowledge in the following:
 - Systems integration
 - Machinery placement and installation
 - Preventive and predictive maintenance

Center for Manufacturing Innovation (CMI)

CMI offers machine tool technology, CNC machining, and mechatronics through Greenville Technical College's associate degree and certificate programs as well as corporate training and continuing education options in:

- Industrial Automation
- Robotics and Mechatronics
- CNC Machining
- 3D Printing and Additive Manufacturing
- Project Management
- Lean Six Sigma
- Engineering Design and Prototype
- Metrology and Quality Management
- Manufacturing Process Design

readySC

readySC is a state program that provides customized pre-employment training at no cost to new and expanding industries in the state via technical colleges such as Greenville Tech.

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