Clemson University International Center for Automotive Research
A Case Study for Research/Advancement Collaboration

Prof. Imtiaz Haque
Formerly Executive Director and Founding Chair
In The Beginning: The University Players

- Board of Trustees
- University President
- VP of Research and Economic Development
- VP of Advancement and University Foundation Leadership
- Dean of College of Engineering and Science
- Department Chair of Mechanical Engineering

- Leadership circle: Tightly knit with strong focus!
- Regular Meetings
- Careful parsing of responsibilities
CU-ICAR Today

- Heavily dependent on Research and Advancement/Development Activities

VP of Research

VP of Advancement

Dean of COES

Executive Director and Chair of Automotive Engineering

Academic Program/Research Responsibility

Executive Director

CU-ICAR

Economic Development Responsibility

VP of Economic Development

Close Collaboration

The CU-ICAR Enterprise
Home to several companies like CADFEM, intech, Tigges, Sage, Segula

250 Acre High Technology Campus focused on
Research
Education
Economic Development
CU-ICAR’s Focus: The Automotive Industry

More than 1,000 Automotive Assemblers & Suppliers are within a 500-mile radius of CU-ICAR location.

The U.S. automotive industry:
- Employs over 660,000 people (12/2012)
- Produces over $522 Billion in shipments (2012)
- Exports over $128 Billion in motor vehicles and parts (2012)
- Supports $564 Billion in U.S. automotive sales (2012)
- Supports $173 Billion in repairs and service revenue (2012)
- Provides $92 Billion in state tax revenues (13% of total) in the U.S. (2010)
- $28.3 Billion in the 12 southern states, where auto contributes 16% of total tax revenues
- Provides $43 Billion in federal tax revenues (2010)
- Has a jobs multiplier of 10 — one of the highest of any industry

Source: Center for Automotive Research
Automotive Engineering ≠ Mechanical World ... anymore. Needs a new kind of workforce!
Clemson University, government and industry all came together to invest in an industry-focused center for the automotive industry. Strong roles of Research and Development VPs along with academics.


- **Clemson University and CURF**: $26.4M
- **Industry equipment-related**: $19.7M
- **State and Local or Other Government**: $113.5M
- **Fellowships and Scholarships**: $250,000
- **Other Industry Partnerships (50/50 with state) in 4 engineering program endowed chairs**: $27.7M
- **Industry and Developers**: $55.8M
- **S.C. Tax Credits for Infrastructure**: $40M
- **BMW**: $10M (for Manufacturing Chair and Systems Integration Chair)
- **Michelin**: $3M
- **TIMKEN**: $5M
- **WEISS INSTRUMENTS**:
- **E.W.S. LINDGREN**:
- **FEV**

Total of 42 companies
Some Industry Partners

BMW Manufacturing Co.

TOYOTA

Mazda

GM

ZE

FEV

Test Systems, Inc.

Ricardo

WEISS TECHNIK

AVL

WEISS INSTRUMENTS

BorgWarner

dSPACE

TIMKEN

WHERE YOU TURN

OKUMA

Proterra

Cost-effective solutions for clean transportation

Sim Pack

Michelin

REMA

ENGIN SOFT

faurecia

MTS

CADFEM

OiZEN Engineering

DCS

Engineering in new dimensions

Renishaw

apply innovation

KTM

Solutions, Inc.

On Demand Engineering

Automation Engineering

Excellence in Engineering

Staubli

Robotics
CU-ICAR’S ECONOMIC DEVELOPMENT IMPACT

From “Going South,” Automotive News, April 23, 2012:

“We’re here now in part due to what CU-ICAR can do for us. We’re going to need access to engineering talent locally as we grow. We like the idea of being in a center where people are focused on assisting you with your needs.”

— Dr. Ludger Reckmann, CEO, ZF Transmissions

• $600M+ investment, 1600 jobs
Department of Automotive Engineering

- Founded August 2010
  - Automotive Engineering is Multi-Disciplinary
  - Disciplines represented are ME, ECE, Computer Science, Business, Psychology
  - Houses the Robert Brooks Institute for Motorsports
    - ($9M endowment)
- 15 Faculty including 4 Endowed Chairs ($36M)
- 10 Staff (Part and Full Time)
- 90,000 Sq Ft. Building

- Only Department of its kind at Graduate Level in US
  - MS and PhD program in Automotive Engineering
    - 250+ graduates, 93% in Automotive Industry
Broad Scope Of Full Scale Testing Capabilities used for commercial and academic purposes

<table>
<thead>
<tr>
<th>Major Testing Facilities ($17M approx.)</th>
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<tbody>
<tr>
<td>Materials Characterization Testing</td>
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<tr>
<td>Powertrain Testing</td>
</tr>
<tr>
<td>Interior Component Testing including solar simulation</td>
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<tr>
<td>Test Track in collaboration with Michelin</td>
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<tr>
<td>Total Vehicle Testing</td>
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<tr>
<td>• Chassis Dyno</td>
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<tr>
<td>• 7 post shaker</td>
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<td>• EMC Testing</td>
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Strategic Research Areas
Strong Interface of Research and Development

- Advanced Powertrains
- Vehicular Electronics
- Manufacturing & Materials
- Vehicle-to-Vehicle Infrastructure
- Vehicle Performance
- Human Factors
- Systems Integration

Ultra Lightweight Vehicles
Education, Research, and Industry Collaboration: Funding a combination of gifts-in-kind + cash
Urban Mobility for Gen Z. Unveiled at GM Headquarters SAE World Congress
Where Academics and Advancement Meet...

• Key role for Advancement:
  – Generate student scholarships, endowments
  – Naming of Research Labs
  – Equipment gifts -in- kind from industry for research labs, Deep Orange Program
  – Cash donations for Deep Orange
  – Working jointly with VP of Research to enable industry collaboration
  – Facilitate Development of CU-ICAR Campus
  – Introduce industry/other partners to Deep Orange/research activities at CU-ICAR

Moldex3D’s $1.625 million gift to boost education and research at CU-ICAR

Srikanth Pilla demonstrates to his graduate students how the software further enhances research in his lab at CU-ICAR. Image credit: Ashley Jones
Thank You for Your Attention!
Collaborative Vehicle Engineering. Industry Participation.
Integrated Industry-Academic Research Model

- Translational and Applied Research
  - High value placed on industrial research
- Tight integration of industry partners with faculty
  - Students and faculty imbedded in manufacturing facilities
  - Industry mentors used in courses as well as on thesis committees
  - Effective technology transfer
    - Student internships, hiring
How? A Public/Private Partnership

CLEMSON UNIVERSITY/CU FOUNDATION

STATE OF SOUTH CAROLINA /LOCAL AND REGIONAL ECONOMIC DEVELOPMENT PARTNERS

PRIVATE SECTOR
Companies with a strategic interest in automotive/motorsports research, development, education or advanced manufacturing