Impact of the Center for Composite Materials Over the Past 25 Years

contact

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For further information see the Center for Composite Materials Web site:

Mission and Impact

- ***Founded in 1974, CCM is an internationally recognized interdisciplinary center of excellence for composites education and research.***
- ***Three-part mission***
  - ***conducting basic and applied research***
  - ***educating and providing financial support to more than 1500 students over 25 years***
  - ***transitioning technology to composites industry—more than 120 small, medium, and large companies in Delaware and throughout the world***
- ***$65 million expended in Delaware over 25 years (at a current annual rate of $5M)***
- ***World class—brings international recognition to State and UD***
  - ***Conducted more than 30 workshops and symposia, which brought to Delaware thousands of participants from industry, government, and academia***
  - ***Hosted some 10,000 visitors from the composites community over 25 years***
  - ***Worked with 1500 alumni who have gone on to employment in industry in Delaware and throughout US; 130 PhDs and 160 master's degrees, alumni teaching at more than 30 universities; Web-based courseware and simulations***

- ***Track record of research projects with demonstrated outcomes***
  - ***Developed new materials and affordable processes for composite materials***
  - ***Served as national leader in the application of composites to infrastructure***

History of CCM

CCM's extensive involvement with industry and 6 Center of Excellence designations has contributed to CCM's international reputation and enabled transition of research for commercialization.

- ***1978: University/Industry Consortium*, Applications of Composite Materials to Industrial Products**
  - ***120 companies in aerospace, automotive, consumer products industries***
  - ***basic research in composites, established international network of companies***
- ***1988: Composites Manufacturing Science Laboratory***

  With support from State and industry, funding was raised to establish a state-of-the-art facility for composites manufacturing, testing, design, and computation.

Since 1985, CCM has been designated a Center of Excellence in composites through 6 programs (3 current)

- ***1985: NSF-ERC***
  - ***One of first six prestigious engineering research centers awarded by National Science Foundation***
  - ***Only ERC in composites manufacturing***
  - ***Identified manufacturing science as barrier to commercialization***
- ***1986: Army Research Office University Research Initiative (ARO/URI), "Composites Manufacturing Science, Reliability, and Maintainability Technology"—thick-section processing***
- ***1992: ARO/URI, "Multidisciplinary Program in Manufacturing Science of Polymeric Composites"—intelligent manufacturing***
- ***1995: ARO (Tuskegee University Research Consortium), "Intelligent Resin Transfer Molding for Integral Armor Applications"—major university in program providing leadership to Historically Black Colleges and Universities (Tuskegee, NCA&T, and Prairie View A&M) via technology exchange, student intern program, and joint research***
- ***1996: Army Research Laboratory (ARL) Materials Center of Excellence, Composite Materials Research (CMR) Collaborative Program***
  - ***materials by design***
  - ***model university/government collaborative research program***
- ***1997: Office of Naval Research (ONR) Advanced Materials Intelligent Processing Center (AMIPC)—simulation, sensors, and controls transitioned to industry for commercialization***

Significant CCM Research Products

CCM has created a unique research and education environment for faculty, staff, students and industrial collaborators to carry out high-quality basic and applied research that can be rapidly implemented and commercialized.

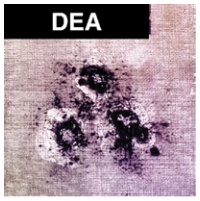
- ***Application of composites to infrastructure***
  - ***Basic research in design, analysis, materials, and durability resulted in erection of one of the nation's first all-composite bridge decks on a state-owned road.***
  - ***Selected by ASCE as the Delaware Project of the Year.***
  - ***Worked closely with Hardcore Composites (New Castle, Del.), which has recently received contract to build 100 bridges in Ohio ($60M, 16M lbs. of composites).***
  - ***Significant return on investment of State funds to establish full-scale testing facility.***

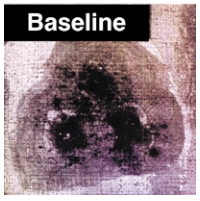


- ***Co-Injection Resin Transfer Molding (CIRTM)—technology transitioned to industry including Anholt Technologies (small company incorporated in Delaware), who has won Phase I and II SBIRs ($800K) for technology scale-up for ship structures as a follow-on to teaming with CCM.***

- ***Diffusion-Enhanced Adhesion***
  - ***New adhesion method transitioned to industry***
  - ***One of only 17 technologies nationwide highlighted in a 1997 DoD publication,* Defense Basic Research—Rapid Transition from the Laboratory to the Field**
  - ***With CIRTM, transferred to industry for use on land vehicles and also has potential use in naval and infrastructure applications***

- ***Transition of thick-section mechanics to Composite Infantry Fighting Vehicle***

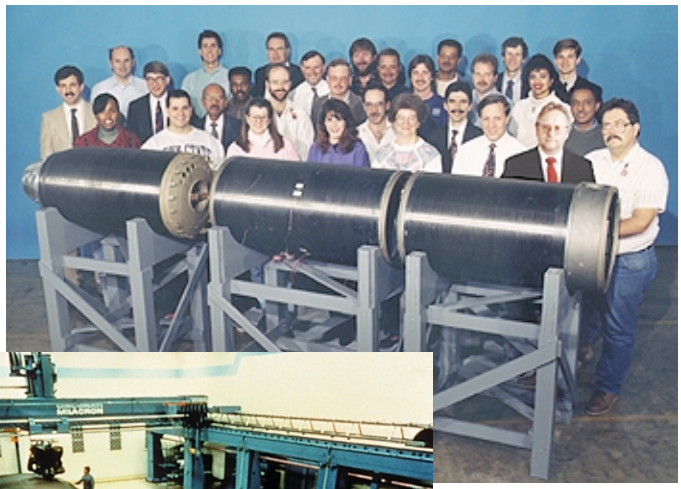





Significant CCM Research Products *(continued)*

- ***Transfer of intelligent VARTM sensing and control to industry to decrease costs and improve quality—first fully automated VARTM system, Crusader***

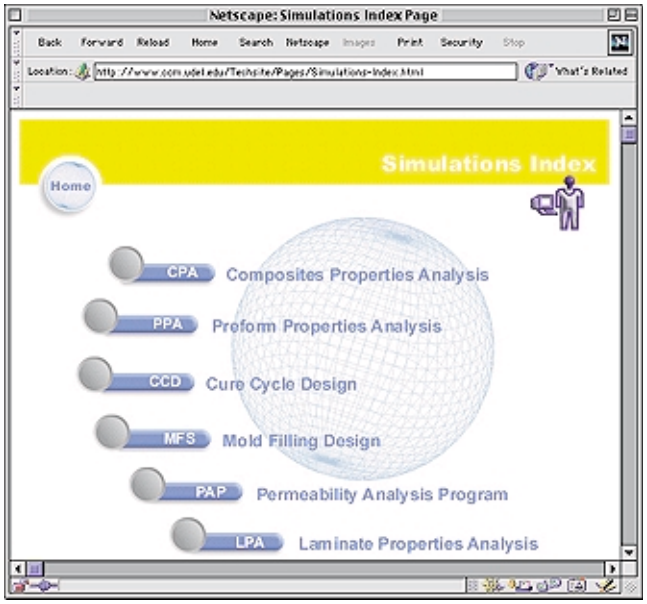
- ***RAPTECH Programs***
  - ***Worked with Delaware industry to establish filament winding technique for pressure hull that demonstrated record performance.***
  - ***Technology further developed to demonstrate cylinder-to-cylinder joint technology and transitioned to NAVSEA for the first known certified composite underwater vehicle.***
  - ***Developed the automated thermo-plastic tow-placement process to meet the need for affordable non-autoclave processing of aerospace structures.***
  - ***Scale-up of process in collaboration with industry; now commercially available at Cincinnati Milacron for next-generation High-Speed Civil Transport.***



- ***Pioneering work in micromechanics, establishing processing/property relationships for automotive and consumer products industries.***
- ***Development of new induction-based lamination process technology***
  - ***Transitioned to Accudyne Systems (small business in Newark, Del.), which is now designing and fabricating equipment for the process***
  - ***Transferred to production—Alliant Techsystems, world's largest user of carbon/thermoplastic prepreg***

Significant CCM Research Products *(continued)*

- ***Affordable Composites from Renewable Sources (ACRES)***
  - ***Synthesis of new, environmentally friendly resins from soybean oil as an alternative to petroleum-based resins***
  - ***Transfer to John Deere for production of hay baler side panel***
  - ***Technology spinoff to Cara Plastics (a new Delaware firm)***
- ***Development of new, environmentally friendly resins and adhesives under Strategic Environmental Research and Development Program (SERDP) in collaboration with government and industry.***
- ***Development of CAST™ (Composite Analysis Software Tools); now under negotiation for licensing by Collier Research, Inc.***



- ***Development of Web-based process simulations for education—virtual laboratory, world-class simulation capability for composites manufacturing.***
- ***More than 1500 students educated in composites, publication of thousands of papers, dozens of books,* Delaware Composites Design Encyclopedia*; alumni now holding key positions in academia, industry, government labs.***
- ***Recognition of Center's creation of an environment to facilitate basic and applied research and transition to industry through the February 2000 presentation of the Jud Hall Composites Manufacturing Award to Director John W. Gillespie Jr.***
  - ***Award conferred by Composites Manufacturing Association of Society of Manufacturing Engineers, an organization with 60,000 members in 70 countries.***
  - ***Award recognizes contributions to the composites manufacturing profession through leadership, technical developments, patents, and educational activities.***

Summary

- ***CCM brings international recognition to the State and the University.***
- ***CCM attracts a large number of national and international visitors to Delaware.***
- ***CCM is a significant source of high-tech employment.***
- ***CCM has a demonstrated track record of transitioning technology to small, medium, and large businesses.***