Shell Eco-Marathon Urban Concept Vehicle: The World’s First Jute Car

Overview
The Shell Eco-Marathon is a high mileage vehicle competition held each year in the spring. The Urban Concept Vehicle made use of new technology, especially in regards to the door design. This technology involved the use of earth friendly, sustainable materials that include Jute, Carbon Fiber, and Matline Core. Attributes of durability and sustainability were increased.

Objectives
It was our goal to address our problem statement requirements and apply an earth-friendly “sustainable” fiber layup. To meet these requirements, we held regular meetings with Dr. Thomas Juska of the Applied Research Laboratory. At the ARL, experiments with different combinations of fibers determined what created the optimal blend of durability, weight, and affordability in regards to the car body material. In addition, we implemented a “Lambo” style door into the new car design. The new overall design had to be able to integrate previous design elements of the chassis, 9 solar-film panels, windows, under-tray, and wheel-wells.

Approach
- Concept Scoring Matrix was conducted to determine what type of door would be implemented
- Patent search used to look for existing hinges, mounting tracks, door assemblies, and door handle assemblies
- Several models were designed with CAD and SolidWorks to determine door dimensions
- Test panels were created in the Applied Research Laboratory to determine what materials would be used in the lay-up process
- Test panels were cut into dog-bones, and tensile testing was carried out
- 5 layer matrix proved to be the best blend of material (Jute, Carbon Fiber, Matline Core, Carbon Fiber, Jute).

Outcomes
- Jute Fiber is a viable material for use in composites
- Implementation of Jute resulted in:
  - More affordable composite materials
  - Lesser impact on the environment
  - More widespread application of composite material
- The “Lambo” door hinge and assembly greatly improved the aesthetics of the new car body design
- Jute proved to be an effective material in automobile construction and should be considered on a manufacturing stage with large companies such as General Motors, Chrysler, etc.