Project Title: Modeling of Composite Hydrogen Storage Cylinders Using Finite Element Analysis

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Student Involvement: One graduate student

Project Objective: To develop a finite element simulation tool for the design of hydrogen storage composite cylinder.

Project Abstract: Pressurized hydrogen storage cylinders are critical components of hydrogen transportation systems. Composite cylinders have pressure/thermal relief devices that are activated in case of an emergency. The difficulty in accurately analyzing the behavior of a filament wound composite storage cylinder derives from the continually varying orientation of the fibers. In the proposed research, a finite element model will be developed to perform thermo-mechanical analysis of storage cylinders. Optimization of design variables such as, cylinder size, type of liner, fiber orientation, thickness of the various layers, and location of the pressure relief device will be performed.

Anticipated Benefits: A database of various design variables will be developed to provide guidelines for the design of hydrogen storage cylinders.

Modal Orientation: Hydrogen transportation systems

Relationship to other Research/Projects: The proposed project is related to the development of a rural hydrogen transportation test bed that will demonstrate, evaluate and promote hydrogen-based technologies in a real-world environment.

Technology Transfer Activities:

1. Technical reports showing findings, conclusions and recommendations;
2. Technical papers for publication in conference proceedings and journals; and
3. Development of consensus codes and standards.

Transportation Research Board Keywords: Hydrogen Storage Cylinder, Finite Element Analysis, Pressure/Thermal Relief Devices