Filament-wound composite cylinders are used in the marine and transportation industries for storing breathing gases (SCUBA, firefighter tanks) and gaseous fuels (vehicles). These cylinders offer lightweight, corrosion resistance, dimensional stability, and the ability to store more gas than equivalent metal tanks. The design methodology currently used for composite tanks, however, cannot yet guarantee their safe operation. Accordingly, the U.S. Department of Transportation (DOT) is unable to issue full certification of filament-wound tanks. The composite tank industry desires to improve their safe use and to obtain full certification.

This presentation discusses the development of a fiber optic sensor system for structural health monitoring of a filament-wound composite SCUBA tank. Using a simple, low-cost optical fiber sensor embedded in the composite shell wall this “smart” SCUBA tank can be checked easily for structural integrity each time the tank is refilled. The opportunity to provide such continuity in structural health monitoring should have a significant positive impact on obtaining DOT certifications and extending product useful life, establishing buyer confidence and increasing sales. The design of the sensor system and the results of hydrostatic pressure tests of the first prototype will be presented.

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