

Application of filament winding technology in composite pressure vessels and challenges : A review

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ABSTRACT

The filament winding (FW) technology is one of the emerging manufacturing practices with a high degree of excellence and automation that has revolutionized gas storage and transportation doctrine. Various pressure vessels have evolved in the last few decades, from metal to fiber-reinforced tanks, primarily for weight savings and high-pressure ratings; advantageously, Type 4 composite pressure vessels (CPVs) can affect fuel gas tanks' weight savings to 75% compared to metallic vessels. As a result, composite pipelines and CPV manufacturing through FW technology have proliferated. Though many design and manufacturing challenges are associated with various process factors involved in winding technology, careful considerations are needed to create a reliable product. Therefore, it is essential to comprehend the various process parameters, their combined effects, and the associated challenges while designing and fabricating filament-wound structures. This article reviews the FW technique's utility, its evolution, various process parameters, and the CPVs as an emerging contender for high-pressure gas and cryo fluid storage. In addition, different optimization techniques, numerical analysis strategies, and challenges are summarized with related disputes and suggestions.

KEYWORDS

Composite pressure vessel; Filament winding; Gas storage; Storage technologies; Winding pattern

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