Bulkhead Liner Via Two-Step Molding Process

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Mechanical EngineeringProducts, Materials, and Services

Abstract

The Bulkhead Liner is made of a two-step plastic molding process that introduces patterned ribs inside of a liner for composite pressure vehicles to hold and transport hydrogen gasses, while maintaining structure and preventing leakage.

Problem

Corrosion from hydrogen gasses in CPVs create safety concerns as polymer liners can be permeated, leading to storage and long-term durability inefficiencies.

Solution

Introducing a two-step plastic molding process that creates patterned ribs inside of the liners, improves performance, reduces weight, adds strength, prevents leakage, and accelerates manufacturing speed.

Value Proposition

The Bulkhead Liner simplifies manufacturing costs and maintains structural stiffness to prevent the liner from buckling during the filament winding process and gas cycle servicing.

Benefit

Composite overwrapped pressure vessels (COPV or CPV) are useful for hydrogen storage with strong, lightweight components. Current hydrogen tanks predominantly use metal and polymer liner CPVs which are subject to corrosion or embrittlement due to hydrogen gasses. This creates a safety concern as the hydrogen molecules permeate polymer liner materials, leading to storage inefficiencies and challenges with long-term durability. In an effort to alleviate this problem, the Bulkhead Liner is made through a two-step plastic molding process that introduces patterned ribs inside of the liners to reduce the liner weight by more than 60% while remaining structurally robust. Each element composing the liner improves CPV performance, prevents long-term hydrogen leakage, reduces weight, adds strength, and accelerates manufacturing speed, while also facilitating recycling and reuse of CPV components.

The Bulkhead Liner simplifies manufacturing and maintains structural stiffness toprevent the liner from buckling during the filament winding process and gas cycle servicing. Each element improves performance, prevents leakage, increases energy storage efficiency, and lessens overall production costs for manufacturing.

Market Application

Potential markets for the Bulkhead Liner include the transportation and heavy industry sectors, particularly for high-pressure hydrogen storage in fuel cell vehicles. Businesses involved in hydrogen tank and composite overwrap pressurized vehicle manufacturing would possibly be interested in licensing this technology.

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Intellectual Property

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