

Development of a Filament-Winding Machine Based on Internal Heating by a High-Temperature Fluid for Composite Vessels

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Pressure vessels made of carbon-fiber-reinforced plastic (CFRP) materials are mainly used for hydrogen storage in fuel-cell vehicles and are manufactured by filament winding (FW). However, the FW method requires the use of an expensive autoclave; furthermore, the fiber strength decreases because of the tension induced in the fibers during lamination, and there is excessive discharge of resin during the fabrication process. To solve these problems, we developed a machine based on the fiber-reinforced plastic (FRP) manufacturing method; in this machine, filament winding is carried out by heating the inner surface of a liner. We fabricated trial CFRP vessels using this machine to show that the CFRP material can be laminated and cured simultaneously. In our method, the quantity of fibers per volume in CFRP increased, and a decrease in a non-bonded area between CFRP layers was observed. Moreover, the vessels produced by the proposed method had higher stiffness and 12–39% higher strength than those fabricated by conventional methods.

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