Fiberforge: A Novel Approach to Improving Cost-Effective Production of Advanced Composite Structures in High Volume

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Abstract

In recent years, the automobile has made great strides using advanced composites in structural applications that exploit the material's light weight, high performance, and market appeal. In order to build on these niche-vehicle successes, new manufacturing processes are required that would be cost-effective in high volume and robust enough to meet the automotive manufacturing standards. Fiberforge has developed a novel process for producing advanced-composite primary vehicle structures cost effectively. The Fiberforge process begins with the automated fabrication of flat "tailored blanks" comprising highly aligned, continuous or long-discontinuous fiber and thermoplastic resin. The tailored blanks can vary in thickness, fiber orientation, and shape based on the needs of the part and to minimize scrap. In order to minimize cost, dry fiber spools and bulk thermoplastic resin are used to fabricate these tailored blanks rather than fabrics, pre-impregnated tape, or other intermediate materials. Following lay-up, the tailored blank is consolidated, thermoformed into final shape with matched tooling, and trimmed. This process is being developed for use with carbon fiber, glass fiber, or their combination and a variety of engineering thermoplastics. This paper describes each step of the new process, highlights potential applications, and presents the results of a case study that identifies key cost drivers of the process and compares its economics with several other composite manufacturing processes.