Hybrid Foam Structures through Polymer Injection Forming (2019-034)

Integration of polymer injection forming and supercritical assisted injection modling methods to produce multi-material hybrid structures

Market Overview

This technology combines traditional injection molding methods to create a novel injection forming process for hybrid materials. Polymer injection forming is used to produce multi-material hybrid structures consisting of metals, fabrics, and polymers for a wide range of industries, such as automotive and aerospace. Combining different materials improves the mechanical properties, adds to the aesthetic appearance, and allows for more complex design geometries. However, traditional methods are subject to major drawbacks, such as non-uniform deformation and high manufacturing costs. Clemson University researchers have developed a novel forming process that combines polymer injection forming and supercritical assisted injection methods to efficiently create multi-material hybrid structures for a wide range of applications. The novel process and design cuts down on operational costs while enabling more complex geometries with a more uniform deformation and shape.

Technical Summary

Clemson researchers have developed a polymer injection forming system that produces multi-material hybrid materials. The process revolves around the combination of traditional methods with supercritical fluid assisted injection, and allows for different geometries and depth of deformation. This is achieved through a novel mold and modelling approach with an adjustable cavity thickness and thermal and pressure sensors. By monitoring the melt flow pattern, the technology can be used to better model the mechanical interaction of melt flow and blank deformation, and the effect of the solidified layer. This technology mitigates the practical challenges related to shrinkage and springback while serving as an efficient way of producing multi-material hybrid structures.

Application

Injection forming for hybrid foam structures

Development Stage

Prototype

Advantages

- Enabling lightweight hybrid metal foam composite structures
- Mitigates traditional setbacks while making hybrid structures more cost-effective and efficient
- Combines separate metal forming and injection molding processes into a single scalable production process

App Type	Country	Serial No.	Patent No.	CURF Ref. No.	Inventors
Provisional	United States	62/912,257	NA	2019-034	Dr. Srikanth Pilla Saeed Farahani

About the Inventors

Dr. Srikanth Pilla

Assistant Professor of Automotive Engineering at Clemson University International Center for Automotive Research (CU-ICAR)

Dr. Srikanth Pilla is the Patrick Jenkins endowed professor in automotive engineering at Clemson University. He holds a joint appointment in the departments of mechanical engineering and materials science and engineering and is also a fellow of the Wood Utilization + Design Institute at Clemson University. Pilla earned his doctorate in mechanical engineering from the University of Wisconsin-Milwaukee, with postdoctoral training from Stanford University. Prior to joining Clemson University, he worked as an assistant scientist at the University of Wisconsin-Madison. Pilla has also spent time working in industry as an R&D scientist at SC Johnson and Suganit Biorenewables, and currently serves as a materials and manufacturing consultant to several industries. In addition to his industry experience, Pilla is the founding director of the Clemson University Composites Center, is the director of the Automotive Engineering Certificate Program.

For more information on this technology contact:

curf@clemson.edu

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