

ABSTRACT

DEVELOPMENT OF A LOW-COST COMPOSITE COMPRESSION MOLDING PROCESS

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Abstract.

Composite parts can be manufactured using various processes. Generally, a mix of resin and fiber is formed into the desired geometry using a mold and pressure. One process used by Dr. Joseph Mello in his research is known as compression molding. Compression molds are generally made from large billets of aluminum or stainless steel, are machined by a CNC mill, and are then hand-finished with polishes and mold preparation products. This process is expensive, requires large machinery and experienced operators, and introduces long lead times relative to the design cycle of the part being manufactured. The nature of Dr. Mello's undergraduate research necessitates that molds be built by undergraduates without the machining experience needed to generate G-code for metal molds, and for less cost than the traditional method.

Additive manufacturing (AM) was investigated, as it is a mold-making process that does not require CNC experience, yet can produce complex geometry. A thermoplastic AM process and material were selected, and prepreg fiber cloth was selected based on the properties of the AM plastic. Samples were made using the cloth both by a traditional molding process, using two aluminum surfaces, and using additively manufactured molds. These parts were then tested in an Instron tensile tester for tensile and shear strength. The key findings of this report are that additively manufactured PETG molds, when prepared properly, produce compression molded parts with similar strengths to parts made using aluminum molds.