

Impact of Process Temperature on Thermoplastic Composites Processed by Deep Drawing

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Deep drawing of a sheet metal blank is one of the most popular and conventional forming processes. It has been employed in various industries such as automobile and can since it is advantaged to rapid processing time, product consistency, complex design, saving material waste, and high cost efficiency. The process involves complex material flow and force distributions and occurs under a combination of tensile and compressive conditions. Deep drawing of thermoplastic composites is suitable as inexpensive and fast cycle processing technologies for fiber composites since material softens when heated and harden upon cooling. Herein, we assess the influence of process temperature to thermoplastic composite products processed by deep drawing. The interested range in process temperature is around melting point of thermoplastic composites. The experimental study of deep drawing is undertaken to evaluate the formability of thermoplastic composites along with optical micrograph and temperature histories of the material. In parallel, resin flow during deep drawing is examined on commercial multi-physics computational fluid dynamics software, FLOW-3D, to assess the interaction between fiber and resin in a blank depending on process temperature.