Process design for advanced extrusion-based additive manufacturing applications

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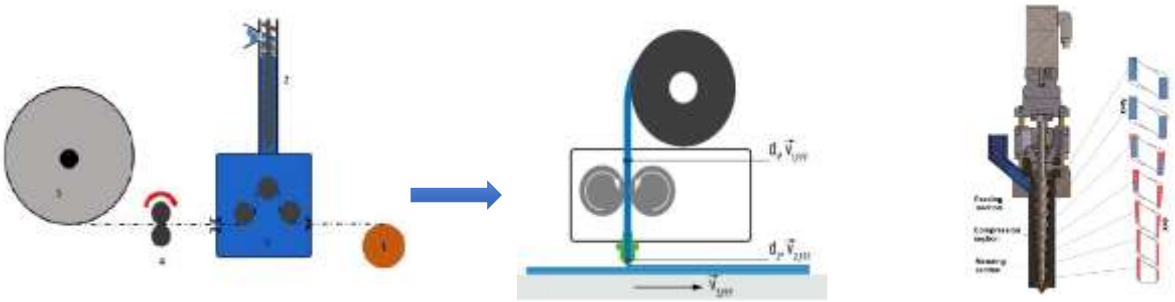
High performance, lightweight components with complex structures for industrial applications can be achieved using both short and continuous carbon-fiber reinforced composites. Extrusion-based additive manufacturing is a promising breakthrough technology offering both freeform fabrication and sustainable processability to facilitate the production of such composites.
In this study, both short and continuous carbon-fiber reinforced thermoplastic composites have been investigated using Fused Filament Fabrication (FFF), Direct Pellet Additive Manufacturing (DPAM) and an active impregnating pin technique denoted as Endless or Continuous Fiber Additive Manufacturing (EFAM / CFAM) to combine short and continuous Carbon Fiber (SCF / cCF) with polyamide 12 (PA 12) or polypropylene (PP) as a matrix material, followed by 3D printing these composites and characterizing their mechanical properties. The study aimed to define new process design for advanced extrusion based additive manufacturing applications and the impact of different 3D printing process parameters in the scope of optimizing their processing and mechanical properties.

Keywords: Additive Manufacturing, 3D printing, polyamide, polypropylene, carbon-fiber reinforced thermoplastic composite.



Impregnation CFAM DPAM

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