

## **Optimal Helix Angle and Channel Depth of Single-Screw Extruder for PLA Extrusion Using Finite Element Analysis**

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Extrusion is a process that the cross-section area of a billet is reduced by forcing it to flow through a die with a certain shape with high pressure. Different types of extruders are used with several materials in extrusion processes. Obtaining the product without defects, energy efficiency is some major considerations of the extrusion process and process optimizations are conducting for better extrusions. Among all the extruder types, single screw extruders play a major role due to low cost, easiness of manufacture and maintenance, and parts resistance to abuse. Screw speed, taper angle, channel depth, helix angle, pitch are some of the parameters related to screw and which can affect the extrusion process. Scholars have studied the effect of the metallurgical properties of the material, friction factors, and flow indexes of materials, screw speeds, and taper angles. The effect of the channel depth and helix angle should be considered in material extrusion process optimization. This study carried out the relationship between channel depth and helix angle within extrusion, optimal helix angle, channel depth for the PLA polymer extrusion process and variation of pressure gradient of extruder with channel depth and helix angle was studied using the finite element analysis methods. PLA polymers with different MFI values used for analysis in Abaqus. This study suggests the optimal helix angle and channel depth for PLA extrusion to obtain maximum flow with a high-pressure gradient.

**Keywords:** Single-Screw extruder; Helix angle; Channel Depth; Extrusion Optimization