Extrusion process has been used for many decades as a transformation and shaping technology in the plastic processing industry. In this study the die deformation, critical for the extrudate product quality, was investigated in the plastic extrusion process by numerical modelling and compared with the experimental results. Dies with various thickness were fabricated by stereolithography (SLA) additive manufacturing (AM). COMSOL Multiphysics was applied as a modelling tool to simulate the experiments. Hence in this work a Fluid-Structure Interaction (FSI) numerical model based on the finite element method has been developed. The FSI model solves full Navier-Stokes (N-S) equation for the insert flow, while its output serves as an applied distributed load, e.g. as a boundary condition, for the structural analysis of the extruder. Eventually, this model can enable to identify the potential areas in the extrusion die where structural failure might occur.