

The influence of Depth of Cut, Feed Rate, and Step-over on Surface Roughness of Polycarbonate Material in Subtractive Rapid Prototyping

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Abstract Rapid prototyping is fast and automatic three dimensions physical modeling that uses computer aided design model as the input. One of the important requirements in various products is the surface quality. Therefore, the aim of this research is to study and then develop a model that shows the influence of depth of cut, feed rate, and step-over on the vertical and horizontal surface roughness of polycarbonate material in subtractive rapid prototyping. The subtractive rapid prototyping process is performed by using Roland MDX 40 machine assisted by CAM Modeler Player 4.0 software. This research implements response surface methodology to develop the model and then followed by the residual tests. The result shows that the increase of the depth of cut and the interaction between the step-over and the depth of cut will increase the horizontal surface roughness. Meanwhile, the vertical surface roughness will be affected mostly by the step-over. This research provides an insight on how to rapid prototype the polycarbonate material in order to achieve the surface requirement. The result of this research is the basis for achieving the main purpose of subtractive rapid prototyping which are maximum material rate removal and the minimum surface roughness.

Keywords: Polycarbonate, Subtractive Rapid Prototyping, Surface Roughness, Process Parameters

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