

Determination of operation condition and product dimension accuracy optimization of filament deposition modelling on layer manufacturing application

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Abstrak

Layer manufacturing process has proven as a process that can produce a high complexity mechanical part. Now, Improvement of LM methods continuously conduct that is aimed to increase precessions and efficiency of these processes. Pressure filament deposition modelling is a form of layer manufacturing process that is designed to produce a plastic part with controlling its semisolid phase. In this research, the equipment of filament depositor is designed and tested to make the product filament deposition. With operation condition observation, the optimal temperature and pressure of deposition process was determined. These experiments used PVC as crystalline material and polypropylene as amorphous material. To optimize this process, the tensile strength and density test were conducted. The shape of tensile test specimens is based on ASTM 638 standard and made in 3 orientations deposition path, namely: in 0 degree, 45 degree and 90 degree from load force axis. To found the most accurate dimension, controlling the time delay, temperature of build part, feeding speed and variation deposition path was conducted. The results of experiments show that the filament deposition method can only be applied for amorphous material in which it has a semisolid phase. From the tensile strength test, the binding strength among filaments is 0.5 kg/mm², 20% of the tensile strength of filament. And the density of a sample product, which used the filament diameter of 0.8 mm, is 0.7668 g/cm³. Accuracy of product dimension can be increased by: controlling time delay in location where the motion orientation of hopper filament is changed and controlling temperature of build part surface.