ABSTRACT

Fused Deposition Modeling (FDM) has become one of the most popular AM techniques for polymer manufacturing. However, the limitations of FDM have been recognized, such as the low mechanical properties of the printed object due to the presence of voids. Composite materials have been widely used as a solution to increase the mechanical strength of FDM printed products. It involves adding the powder, which is known as Powder Addition Reinforcement (PAR). The powder addition mechanism can be done in various ways, one of which is the compressed air-assisted method. This method can increase the tensile strength of a Polylactic Acid (PLA) printed product; however, it still has issues, such as the impossibility to regulate the amount of added powder.

The research aims to regulate the amount of Fe3O4 powder used to create composites in the FDM process by using a powder delivery system. It can regulate the amount of powder by adjusting the powder flow rate, which is modeled as a function of the vibration produced by the DC motor. During composite printing, powder is delivered in two different ways, i.e., continuously and intermittently. The properties reviewed in this study were the distribution of powder and the porosity of the macrostructure of the composite specimen product.

The powder delivery system could regulate the powder added in the preparation of composite by using FDM. Furthermore, the amount of powder added to the printed specimen can be varied with intermittent addition with values of 1.3%, 1.7%, 2.2%, and 2.6% by changing the number of powder layers, and the porosity can be reduced from 9.6% up to 7.4%.

Keyword : Fused Deposition Modelling (FDM), powder delivery system, Powder Addition Reinforcement method (PAR), Porosity, Polymer, Powder