

Improved Design of a Customized Inkjet 3D Printer

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Abstract

This study presents the construction and enhancement of an open-source binder-ink jet 3D printer. The printer utilizes older technology and thought processes during the design process that were not considered initially during the final development back in 2017. Our efforts focused on leveraging the open-source design to construct improvements for modernization, maintenance, operations, and printer safety for the user while keeping the cost and essential factors within the process. This paper outlines the technical improvements made to the printer while demonstrating how the open-source initiative can dive into future research and development within the powder-based additive manufacturing community while keeping it within a cost-effective range.

Introduction

The primary issue about the added cost of powder-based additive manufacturing has been the cost of production of parts. An open-source option has existed since 2014, developed by Yvo De Haas. [1] This printer intended to get individuals more into powder-based additive manufacturing; however, most users' support for the printer has been discontinued because of its difficulty in maintainability and issues that arise with the production process. After being discontinued, the lack of support for this printer has put the printer at a significant disadvantage, leading to outdated components and design flaws playing into the components with individual revitalizing the project.

Binder Jet printing involves creating a part using a binding agent with liquid and powder-based materials, with a sugar mixture as the primary test powder feedstock. [1] Parts produced by the printer are called green parts; these parts do not involve any post-processing and have minimal support in keeping the powder together, only relying on the binding agent [2]. Typically, research-grade Binder Jet printers range in cost from \$100,000 - \$300,000 [3]. Because of this, many universities that may lack this funding may be unable to research topics related to ceramic and metal-based additive manufacturing (AM) techniques. Upgrading this printer to utilize more modern software and reduce some of the major issues seen in maintenance could revitalize research into Binder Inkjet Printers for development.