

**INTERNATIONAL UNIVERSITY LIAISON INDONESIA**

BACHELOR’S THESIS

**Effects of different 3D Printer Nozzles Material on 3D printing Polylactic Acid (PLA) and its Abrasive derivatives**

By

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**11201902005**

In Partial Fulfillment of the Requirements for the Degree of

Sarjana Teknik

In

MECHATRONICS ENGINEERING

FACULTY OF ENGINEERING

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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgment is made in the thesis.

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**ABSTRACT**

3D Printing is the process of creating a 3D model or object into reality, it was first developed in 1981 by Japanese Researcher Hideo Kodama with a layer-by-layer technique. Which was later most popularly known as Fused Deposited Modeling (FDM). It is part of a wider technique known as the Additive Manufacturing Method because it involves adding/fusing material to create the product.

Nowadays, many and many more 3D printers have entered the market and the price of the 3D printer has become more affordable to purchase even for home consumer grade. This also came along with the fact of more and more materials are being developed to meet the requirement of 3D printing by many customers requirement.

The material used for 3D printing by Fused Deposition Modeling is called a Filament. A filament is a thermoplastic that must follow a Heating, Extruding, and Cooling Process during a printing cycle. The process began with the Filament being Heated to just slightly above its glass transition temperature inside a chamber that is more known as a Hotend. Then it is extruded by the Hotend to a flat surface where it will be cooled down. The process is continuing layer by layer to make a finished model.

There are several types of Filaments available in the market. The most used for 3D printing are Polylactic Acid (PLA), Acrylonitrile Butadiene Styrene (ABS), and Polyethylene Terephthalate Glycol (PETG). Some Unique and Exotic types of filaments are available for 3D printing, although they might require some special modification to the machines or the printing environment to get the most optimized results from them.

One of the types of Exotic/Unique Material is the Abrasive type of filaments. These kinds of Filaments can cause accelerated wear damage for the stock brass-made nozzle for 3D printers. To print them effectively without making much damage to the printer itself, some modifications are required to effectively use the abrasive type of filaments. For example, Wood Filaments which is a blend of basic PLA and some wood fiber to make its unique Wood-like feel. *Keywords: 3D Printing, Nozzles, Abrasive Materials, Polylactic Acid, Wood Filament, Exotic Filaments.*

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DEDICATION

I dedicate this thesis to my parents. Without their patience, understanding, support and most of all love, the completion of this work would not have been possible.

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I have found my coursework throughout the Curriculum and Instruction program to be stimulating and thoughtful, providing me with the tools with which to explore both past and present ideas and issues.