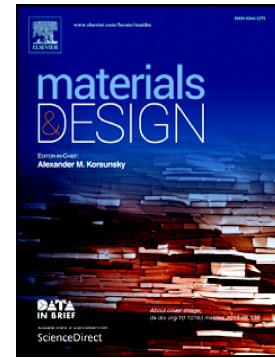


Accepted Manuscript

Fatigue performance of fused filament fabrication PLA specimens

Giovanni Gomez-Gras, Ramón Jerez-Mesa, J. Antonio Travieso-Rodriguez, Jordi Lluma-Fuentes



PII: S0264-1275(17)31103-6
DOI: doi:[10.1016/j.matdes.2017.11.072](https://doi.org/10.1016/j.matdes.2017.11.072)
Reference: JMADE 3549

To appear in: *Materials & Design*

Received date: 17 November 2017
Revised date: 28 November 2017
Accepted date: 30 November 2017

Please cite this article as: Giovanni Gomez-Gras, Ramón Jerez-Mesa, J. Antonio Travieso-Rodriguez, Jordi Lluma-Fuentes , Fatigue performance of fused filament fabrication PLA specimens. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Jmade(2017), doi:[10.1016/j.matdes.2017.11.072](https://doi.org/10.1016/j.matdes.2017.11.072)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Fatigue performance of fused filament fabrication PLA specimens

Authors:

1. Giovanni Gomez-Gras
Insititut Químic de Sarrià. Universitat Ramon Llull, Industrial Engineering Department. Address: Via Augusta, 390. 08017 Barcelona, Spain. Tel.: (+34)932672124. Mail: giovanni.gomez@iqs.edu
2. Ramón Jerez-Mesa
Universitat Politècnica de Catalunya. Escola d'Enginyeria de Barcelona Est. Mechanical Engineering Department. Address: Avinguda d'Eduard Maristany, 10-14. 08019 Barcelona, Spain. Tel.: (+34)934137431. Mail: ramon.jerez@upc.edu
3. J. Antonio Travieso-Rodriguez
Universitat Politècnica de Catalunya. Escola d'Enginyeria de Barcelona Est. Mechanical Engineering Department. Address: Avinguda d'Eduard Maristany, 10-14. 08019 Barcelona, Spain. Tel.: (+34)934137338. Mail: antonio.travieso@upc.edu (corresponding author)
4. Jordi Lluma-Fuentes
Universitat Politècnica de Catalunya. Escola d'Enginyeria de Barcelona Est. Materials Science and Metallurgical Engineering Department, Address: Avinguda d'Eduard Maristany, 10-14. 08019 Barcelona, Spain. Tel.: (+34)934137296. Mail: jordi.lluma@upc.edu

Abstract

This paper aims to analyze the fatigue response of PLA parts manufactured through fused filament fabrication (FFF). The influence of four factors (layer height, fill density, nozzle diameter and velocity) on the fatigue performance of cylindrical specimens is studied through an L27 Taguchi experimental design. This design is run for two different infills: linear and honeycomb. Specimens have been tested on a rotating fatigue bending machine. The optimal set of parameters and levels resulting in the highest number of cycles to failure have been determined, and implemented to manufacture a second set of specimens, which have been tested at different stress levels to represent the Wöhler curve. Fill density proves to be the most influential parameter on fatigue life, followed by layer height. The tests undertaken to represent the Wöhler curve revealed that 35.8 MPa can be considered as a lower threshold of the endurance limit for this kind of specimens. This value can be useful to use these devices to manufacture human implants, as PLA is a biocompatible material. The main novelty of this paper is that no previous fatigue life assessment of PLA parts manufactured through FFF has been developed.

Keywords: additive manufacturing, 3D printing, fused filament fabrication, fatigue, PLA

Nomenclature

Download English Version:

<https://daneshyari.com/en/article/7217488>

Download Persian Version:

<https://daneshyari.com/article/7217488>

[Daneshyari.com](https://daneshyari.com)