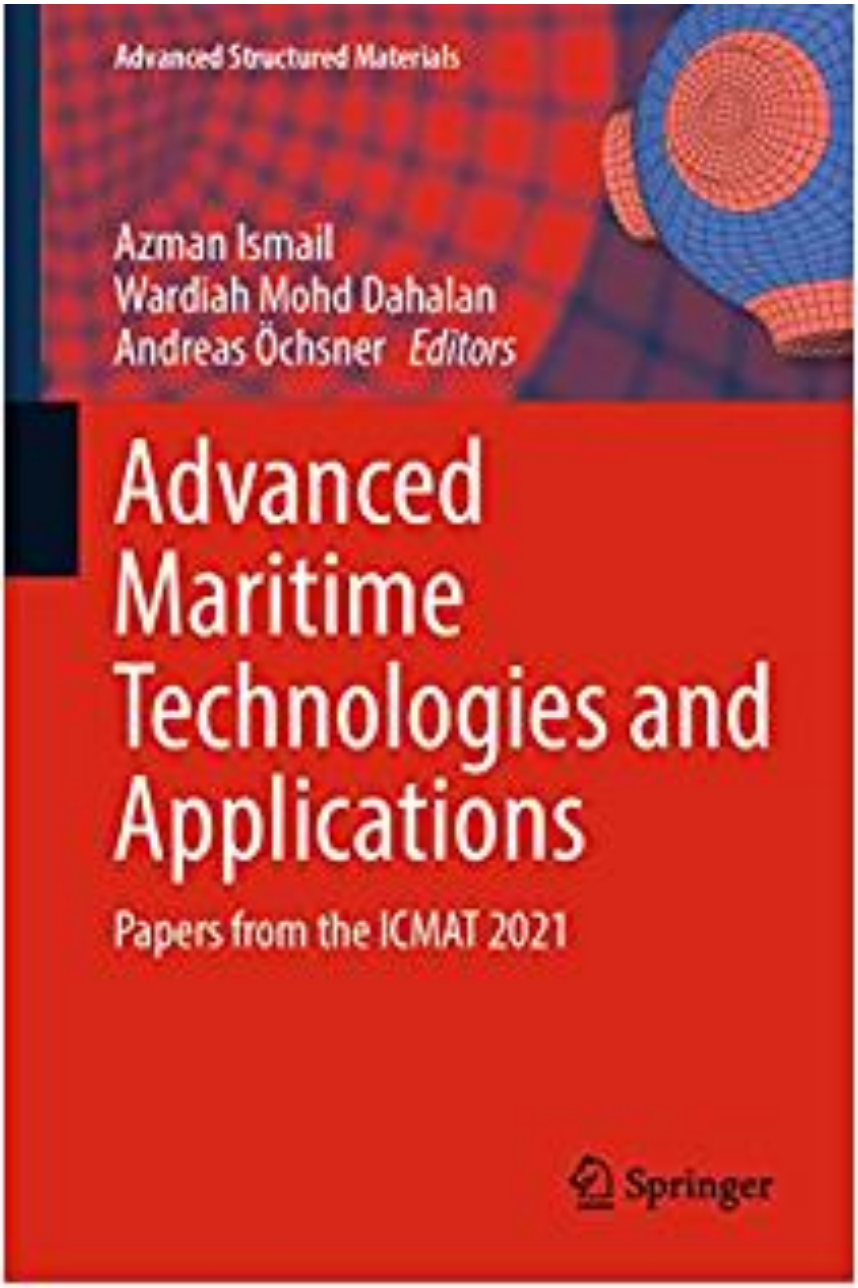

Advanced Maritime Technologies and Applications: Papers from the ICMAT 2021

edited by Azman Ismail, Wardiah Mohd Dahalan, Andreas Öchsner

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Preface

The *Advanced Maritime Technologies and Applications* monograph is one of the outcomes from the 2nd International Conference on Marine and Advanced Technologies 2021 (ICMAT 2021) which was organized by the Research and Innovation section, University Kuala Lumpur—Malaysian Institute of Marine Engineering Technology. A total of 105 papers from various universities have been showcased through virtual presentation on August 24, 2021. The theme "Propelling to the Innovative Idea" highlights prominence of recent developments in marine and advanced technologies in the field of marine application, maritime operation, energy and reliability, advanced materials, and applied science. This online conference provided a platform for presentations and discussions at the local and international level between educationists, researchers, students, and industrialists. Furthermore, it created opportunities to establish networks and meet experts in addition to exchange of up-to-date knowledge in the field. This book is the up-to-date reference, especially to those who want to learn and explore more about the latest developments and technologies of maritime industries. The papers shared in this monograph will enable other researchers to generate interests and novel ideas that can lead to the discovery of new knowledge. Sincere appreciation to all ICMAT committee members as well as all parties involved for their great work and the good cooperation with the editor from Germany, i.e., Prof. Andreas Öchsners, regardless of the challenges and hurdles faced due to the COVID-19 pandemic. We are proud that ICMAT 2021 could be realized and wish that many can benefit from this comprehensive compilation and integration.

Lumut, Malaysia — Azman Ismail
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Contents

Water Retention Properties of a Fused Deposition Modeling Based 3D Printed Polylactic Acid Vessel

Muhammad Nur Farhan Saniman, Nadzir Akif Dzulkifli, Khairul Anuar Abd Wahid, Wan Mansor Wan Muhamad, Khairul Azhar Mohamad, Erny Afiza Alias & Jamilah Mohd Shariff

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Abstract

The applications of fused deposition modelling (FDM) based 3D printing have gone beyond merely simple prototypes to where functionalities are expected. One of such functionalities is the water retention properties, especially for fluid handling products, either completely waterproof or deliberately porous. Issues arise especially in determining crucial parameters and their optimization to achieve the desired water retention properties. This study established the relationship among printing parameters (layer thickness and wall thickness) and water temperature with leakage flow rate. A series of 3D printed polylactic acid (PLA) vessels were fabricated at various layer height and wall thickness. Then, the volumetric loss of water at various temperatures was measured, elapsed time was recorded, and the leakage flow rate was calculated for each 3D printed vessel. It has been found that the leakage flow rate decreased when layer height decreased, wall thickness increased, and water temperature decreased. Based on multilinear regression analysis, the magnitude of influence for the layer height was the highest, which could reach at a point where variation in wall thickness and water temperature had no effect. A regression model having 81.27% fitness that provided a quantitative relationship among all parameters had also been obtained. ANOVA analysis revealed that all parameters were statistically significant in optimizing as well as predicting the value of the leakage flow rate.

Keywords

FDM | 3D printing | Vessel | Water retention | Layer height

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