THE STRENGTH AND HYGROSCOPIC STUDY OF AGING FS3200PA NYLON MATERIAL USING SS402P SLS MACHINE FOR HYDRO QUALITY SURVEY SYSTEM (HydroQS) HOUSING

AINURYUSRA BINTI MOHAMAD ZAWAWI

B091810326

BACHELOR OF MECHANICAL ENGINEERING TECHNOLOGY (AUTOMOTIVE TECHNOLOGY) WITH HONOURS

2022

Faculty of Mechanical and Manufacturing Engineering Technology

THE STRENGTH AND HYGROSCOPIC STUDY OF AGING FS3200PA NYLON MATERIAL USING SS402P SLS MACHINE FOR HYDRO QUALITY SURVEY SYSTEM (HydroQS) HOUSING

Ainuryusra Binti Mohamad Zawawi

Bachelor of Mechanical Engineering Technology (Automotive Technology) with Honours

(2022)

THE STRENGTH AND HYGROSCOPIC STUDY OF AGING FS3200PA NYLON MATERIAL USING SS402P SLS MACHINE FOR HYDRO QUALITY SURVEY SYSTEM (HydroQS) HOUSING

AINURYUSRA BINTI MOHAMAD ZAWAWI

A thesis submitted
in fulfillment of the requirements for the degree of
Bachelor of Mechanical Engineering Technology (Automotive Technology) with Honours

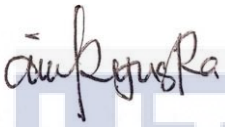
Faculty of Mechanical and Manufacturing Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2022

DECLARATION

I hereby, declared this report entitled THE STRENGTH AND HYGROSCOPIC STUDY OF AGING FS3200PA NYLON MATERIAL USING SS402P SLS MACHINE FOR HYDRO QUALITY SURVEY SYSTEM (HydroQS) HOUSING is the results of my own research except as cited in references.

Signature: 

Name: **AINURYUSRA BINTI MOHAMAD ZAWAWI**

Date: 28 JAN 2022

APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Automotive) with Honours. The member of the supervisory is as follow:

Signature: .....

Supervisor: **TS. MOHD NAIN FAHMI BIN ROSLEY**

Date: 28 JANUARY 2022

DEDICATION

To my beloved parents, family, and friends.

ABSTRACT

Water resources have been depleting in recent years. Statistics show that India, China, and Nigeria are the top three countries with a large number of deaths each year regarding water pollution. Water pollution can have negative effects on the health, environment, and economy. Furthermore, it can also bring impact on climate change that, resulting in higher water level, can cause floods and bad weather. In Malaysia, the beverage industries are one of the main water pollution contributors. All of these problems have also happened in Melaka. Sungai Melaka is currently being contaminated that has caused the death of fish diversity. Law enforcement, water recourse regulations, religious and moral education regarding the importance of rivers have all been implemented by the Melaka state government. However, the implementation of such initiatives has not resulted in lower levels of water contamination. The issue has progressed to a greater level, and it has grown more serious. Therefore, the main pollutants emitted by the major sources of pollution should be studied and identified, particularly in terms of spatial variation in Sungai Melaka. In this study, a Hydro Quality Survey System or HydroQS device will be implemented based on the best selection of material which is PA-12 Nylon powder, FS3200PA. The reason why PA-12 is chosen is that it suits the SS402P SLS 3D Printing machine that has been selected for printing HydroQS housing. This study will perform a field test to determine the mechanical properties and hygroscopic growth of the aging FS3200PA and to measure the dimension stability of the sintering samples. This study is to test the HydroQS housing based on the sample shape to be sent to 50KN Universal Tensile Machine (UTM) and the sample shape will be tested in Sungai Melaka. The HydroQS housing that will be produced is expected to have a lightweight, high strength, and low drag coefficient and fulfill all PPSPM concerns and requirements.

ABSTRAK

Sumber air telah berkurangan semenjak beberapa tahun yang lalu. Statistik menunjukkan bahawa negara India, China, dan Nigeria adalah tiga negara teratas yang mengalami masalah pencemaran air dan telah menyebabkan kematian yang besar setiap tahun. Pencemaran air boleh mendatangkan kesan yang negatif kepada kesihatan, persekitaran dan ekonomi. Selain itu, hal ini juga bakal memberikan kesan perubahan iklim yang akan mengakibatkan penigkatan permukaan air, banjir dan cuaca buruk. Di Malaysia, industri minuman adalah salah satu penyumbang pencemaran air. Masalah yang dinyatakan juga telah berlaku di Melaka. Pada masa ini, Sungai Melaka telah dilaporkan tercemar dan menyebabkan kematian kepada pelbagai spesies ikan. Kerajaan negeri Melaka telah mengambil tindakan undang-udang, dasar sumber air, pendedahan melalui pendidikan agama dan moral tentang kepentingan sungai. Namun begitu, pelaksanaan projek-projek untuk menjaga kualiti air sungai tersebut masih belum mengubah tahap pencemaran air ke peringkat yang lebih rendah. Masalah ini berlanjutan sehingga tahap yang lebih tinggi dan menjadi lebih berbahaya. Oleh itu, punca pencemaran air yang utama perlulah dikaji dan ditentukan, terutamanya dalam variasi ruang di Sungai Melaka. Dalam kajian ini, *Hydro Quality Survey System* atau peranti HydroQS akan dilaksanakan berdasarkan pemilihan bahan yang terbaik iaitu serbuk nilon PA-12, FS3200PA. Antara sebab pemilihan bahan ini adalah kerana ia sesuai untuk digunakan pada mesin percetakan SLS 3D SS402P yang telah dipilih untuk mencetak *'HydroQS housing'*. Kajian ini akan melaksanakan ujian lapangan untuk menentukan sifat mekanikal dan perkembangan hygroscopic untuk FS3200PA yang telah digunakan semula dan ujian ini juga untuk mengukur kestabilan dimensi pada sampel pensinteran. Kajian ini adalah untuk menguji *'HydroQS housing'* berdasarkan bentuk sampel yang akan dihantar pada *50KN Universal Tensile Machine* dan bentuk sampel akan diuji di Sungai Melaka. Projek HydroQS yang akan dijalankan ini diharapkan akan mempunyai jisim yang ringan namun kuat dari segi ketahanannya dan mempunyai koefisien seret pekali yang rendah.

ACKNOWLEDGEMENT

First and foremost, I would like to thank to my supervisor, Ts. Mohd Idain Fahmi bin Rosley, for the opportunity to be under his supervision. I appreciate all his contributions of time and guidance. Without his assistance and dedicated involvement in every step throughout the process, this Final Year Project would have never been accomplished. I would like to thank to my family for their love and encouragement. To my friends, Siti Aisyah binti Badrul Hisham, Siti Nur Amirah binti Azizi and Muhamad Ariff Hilmi bin Mokhtar Amat, thank you for all their support and ideas to complete my study.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES