UNIVERSITI TEKNOLOGI MARA
CAWANGAN TERENGGANU
KAMPUS BUKIT BESI

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MECHANICAL AND PHYSICAL PROPERTIES OF ALUMINIUM VS STEEL

AMNI WAFIQAH BINTI MOHD ARHAFUDIN

2020494406

SUPERVISOR:
ROS ATIKAH ABDUL KADIR@ CHE

ISMAIL

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ABSTRACT

Material properties consist of physical, chemical or mechanical that would determine the functionability of the material. The mechanical properties of a material reflect the relationship between its response to or deformation from an applied load or force. Types of mechanical properties are strength, hardness, ductility and stiffness. These properties are ascertained by performing carefully designed laboratory experiments that replicate as closely as possible the service conditions. The physical features that a material exhibits when forces are applied to it are known as mechanical properties. Currently, some researcher or manufacturer not able to choose the best materials for certain application, thus can make the materials fails and effect the fabrication cost and materials waste. If the researcher or manufacture choose the best material it will helps them to fabricate aircraft component and light weight industrial appliance with the optimum performance. The objective of this study is to investigate and compare the mechanical properties of aluminium and steel and relate with the theoretical analysis.

Furthermore, to investigate the microstructural analysis of aluminium and steel at different magnification. Next, modulus of rigidity, maximum shearing stress, maximum shearing strain, and Poisson's ratio will be measured by the tensile test. The mechanical properties of Aluminium and steel are examined by doing tensile test as the last way of investigation. It measures the force required to elongate a specimen to breaking point. As for the results, the samples will be characterized and evaluated as well as compared with aluminium and steel theoretical analysis. In conclusion, this project will help manufactures choose the best material for lightweight properties with good mechanical properties especially for aircraft components and industrial appliance.

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INTRODUCTION

1.0 Introduction

1.1 Background of Study

Materials' chemical composition and internal structure, such as grain size or crystal structure, determine their mechanical and physical qualities. Due to the rearranging of the internal structure, processing can have a significant impact on mechanical properties. Some physical qualities, like as density and electrical conductivity, may be affected by metalworking operations or heat treatment, but these impacts are usually minor.

When numerous alloys meet the service parameters, mechanical and physical qualities are a crucial determinant of which alloy is regarded suitable for a certain application. The engineer usually always designs the part to perform within a certain range of attributes. Many mechanical qualities are interconnected, which means that excellent performance in one area may be accompanied by lower performance in another. For example, higher strength may be attained at the expense of ductility. As a result, selecting the optimal material for the application requires a wide awareness of the product's environment. As example in general, Aluminium has a low density, is non-toxic, has a good thermal conductivity, is corrosion resistant, and can be cast, machined, and shaped with ease. It's also non-sparking and non-magnetic. It's the second-most malleable and sixth-most ductile metal. Then steel, Steel has a number of properties, including hardness, toughness, tensile strength, yield strength, elongation, fatigue strength, corrosion, plasticity, malleability and creep.

1.2 Problem Statement

Tensile test is an experiment that provides lots of information about the strength or the mechanical behavior of a material. Firstly, it helps the manufacture to decide or choose the best materials for aircraft component and light weight industrial appliances. Some researcher not able to choose the best materials for certain application, thus from this study it can provide a guideline to choose the optimum properties for aircraft components and lightweight material. [1]