

CHAPTER I

INTRODUCTION

1.1. Background of The Problem

In the material industries steel is described on mechanical properties like toughness, hardness, endurance, and so on. To meet the requirements of the mechanical properties of the steel can be improved. Improved mechanical properties can be done by adding the chemical element, forging material, and heat treatment. Heat treatment on steel has a very important role in order to obtain certain properties are desirable as needed.

Steel is metal alloy between ferrous as a basic element and carbon as the main alloying element. Carbon steel is an alloy between Fe and C, with C levels up to 2%. Mechanical properties of carbon steel depend on levels of carbon contains. Each steel including carbon steel is actually a multi-component alloys besides Fe necessarily contain other elements such as Mn, Si, S, P, N, H, which can affect its properties. Carbon steel can be classified into three parts according to the carbon content it contains, namely low carbon steel with a carbon content less than 0.20%, medium carbon steel containing 0.20 to 0.50% carbon and high-carbon steel containing 0.5 - 2% carbon.

Low carbon steel with carbon content less than 0.20% C is used to industries components such as a car body, frame building construction, ship construction applications, including vehicle frame wheels. Use of low carbon steel is widely used in the material industry and the automotive industry, due to the low carbon steels have high ductility and machine ability.

Although carbon steel has so many excellent mechanical properties that used in the industries, but carbon steel has many flaws, one of them is not fire resistant, although steel is the material not flammable, but if there is a fire at high temperatures would reduce the strength of steel drastically.

Each metals has a physical nature and a good mechanic, as well as with steel, although steel impressed so tough but still has shortcomings, one of which is fatigue failure, fatigue failure is a very dangerous thing, because there is no early indication. The resulting fatigue fracture that looks fragile, because no deformation on the fracture. At the macroscopic scale, fracture surface can usually be identified from the shape of the field of fracture.

Fatigue failure, perhaps due to the generally occurs after long usage. Fatigue failure more obvious with the development of technology equipment such as: cars, airplanes, compressors, pumps, turbines and others. All of them sustained recurrent load

and vibration. Until now often expressed that covers at least 90% of all failures are caused by things are mechanical.

Based on the description above, in this study the authors will conduct research on how much the influence of heat treatment on the physical and mechanical properties of carbon steel, here the author uses a low carbon steel in the study. The process to be performs are give in the form of heat treatment temperature annealing up to 900 °C and then the next process is to examine the form of changes in the steel microstructure before and after annealing, to prove the effect of annealing the material strength then performed testing of hardness testing, tensile strength testing and fatigue rotary bending testing on carbon steel before and after annealing.

1.2. Problem Formulation

Based on the background of the problems described above, the formulation of the problem in this study is how much influence of heat treatment on microstructure and its effect on hardness, tensile strength, and fatigue strength of low carbon steel.

1.3. Problem Limitation

To further focus the problem of this research, the writer needs to limit the problem. The extent of the problem is;

1. The material used is low carbon steel ASTM and AISI tube steels A254 class or I ASTM and API pipe steels A381 class Y52.
2. Treatment options include: heat treatment such as annealing, microstructure testing, hardness testing, tensile testing, and fatigue rotary bending testing.
3. Effect of roughness material and environmental variation is negligible.

1.4. The Purpose of Research

The purpose of this study is to determine the effect of heat treatment on low carbon steel material to microstructure, in addition to know their effects on the material's strength by testing the tensile strength, fatigue strength, and hardness. So it will know the difference between carbon steel with heat treatment and without heat treatment.

1.5. The Advantages of Research

1. The results of this study are expected to deepen the knowledge of students and to provide input the science, particularly in the field of

materials science. And can be used as reference to conduct further research.

2. In the industry can be used as a reference to determine the advantages and disadvantages of steel after being subjected to heat, especially in composition of the microstructure, hardness, tensile strength, and fatigue strength.

1.6. Systematic of Writing

To facilitate the flow and structure of writing, the writer refers to the basic principles of scientific writing method. The systematic of this paper is as follows:

CHAPTER I INTRODUCTION

This chapter contains the background of the problem, boundary problem, the purpose of writing, the benefits of research and writing systematic.

CHAPTER II THEORETICAL

This chapter contains theories related to research so as to obtain the understanding and knowledge that support the analysis of the problem in this study.

CHAPTER III METHODOLOGY OF RESEARCH

This chapter contains the research plan, the operational procedures, equipment, materials used, and the specimen dimensions.

CHAPTER IV THE RESULT AND DISCUSSION OF STUDY

This chapter contains data obtained during the study and discussion of the data and the problems that occurred in the study.

CHAPTER V CONCLUSION

This chapter contains the conclusions of this study, as well as suggestions that might be useful in future studies.