CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

This study is about the investigation of malleable iron microstructure and mechanical properties using metal casting process. Malleable iron, like wrought iron, is not often seen today. Malleable iron starts as a white iron casting that is then heated at about 900°C. It is white iron that has been converted by a two-stage heat treatment to a condition having most of its carbon content in the form of irregularly shaped nodules of graphite, called temper carbon. As stated previously, malleable iron is essentially white cast iron which has been modified by heat treatment. This annealing process is carefully controlled and can last for several days. The resulting crystalline structure makes the iron more ductile than it would normally be. It has greater ductility than gray cast iron because of its carbon content (2.5wt %), silicon content (1.0wt %), and manganese content (0.55wt %). The microstructure of malleable iron is irregularly shaped nodules of graphite in more compact or sphere form that gives malleable iron ductility and strength almost equal to cast. In this study, sand casting process is choose, where CO₂ sand will be used as a mould. The raw material that will be used is pig iron for the experiment. While the microstructure and mechanical investigation consist of hardness of the material, carbon content, and the composition of the material before and after metal casting process.
1.2 PROBLEM STATEMENT

Malleable cast irons may often be used in place of steel at considerable cost savings. The design and production advantages of malleable cast iron include low tooling, and production cost, good machinability without burring and also ability to cast into complex shapes. But the microstructure and mechanical properties of malleable cast iron is affected by following factors, such as chemical composition of the iron, rate of annealing and also the type of graphite formed (if any). From these studies, different annealing rate was used in order to develop the mechanical properties and microstructure of malleable iron.

1.3 OBJECTIVES

The objectives of this project are:
(i) To determine the processing method of malleable cast iron using metal casting process that is sand casting.
(ii) To study the effect of different annealing rate to the mechanical properties of malleable cast iron.
(iii) To investigate the difference in microstructure and mechanical properties of the malleable cast iron using different annealing rate process.

1.4 SCOPE OF PROJECT

The scopes of the project are:
(i) The CO₂ sand was used as a mould in this project.
(ii) The raw material that was used is pig iron to produce malleable cast iron.
(iii) The effect on microstructure and mechanical properties composition of malleable cast iron using different annealing rate process which consist of hardness, tensile strength, and carbon content.
1.5 OVERVIEW OF REPORT

Chapter 1 mainly briefs about the background of the project which involves the introduction, problem statements, objectives and scopes of the report. Chapter 2 basically describes more about the studies on microstructure and mechanical properties of malleable cast iron which has been done earlier by other scientists and engineers. Whereas Chapter 3 introduces the experimental procedure utilized to characterize the malleable cast iron studies the step by step process that will be done during this project. Chapter 4 mainly discuss about the results obtained during the experiment. Last but not least, Chapter 5 discuss about the conclusions that can be derived from this report and suggest few future recommendations.