FINAL YEAR PROJECT REPORT FOR THE

ADVANCED DIPLOMA IN MECHANICAL ENGINEERING

SCHOOL OF ENGINEERING, ITM, SHAH ALAM

SELANGOR

MALAYSIA

# HEAT TREATMENT OF IRON AND STEEL

BY

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# FOREWORD

Heat treating is a tremendously important technology in todays industry. Over the past seventy years a quiet revolution has taken place in the practice of heat treating of iron and steel by industry.

Tools or machinery parts varies much in complexity from simple design such as screw drivers, chisels, axles, etc to complicated ones such as progressure dies or multiple cavity dies casting or plastic moulds. To secure good runs on life of the tool or parts proper heat treatment of it is very important. It becomes more and more so with the increasing cost both to make and maintain the tools or machines.

The required preferred properties vary different works the tools or parts have to do. We need therefore to have the same idea about the different properties, toughness and hardness still have their peaks at different tempering temperature for instance.

So in this project which will be carried out will shows how do Ductile Iron and Tool Steels response to heat treatments.

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CONTENTS

# CHAPTER 1

## INTRODUCTION

### DEFINITION OF HEAT TREATING

Heat Treating is defined as any process involving the treating or cooling of a solid metal or alloy for the purpose of changing its structure or properties. From this definition it is apparent that almost every metal product undergoes heat treatment at least once in its manufacturing cycle.

### PURPOSE OF HEAT TREATING

You will recall that the above statement described heat treating as any process involving heating or cooling of a solid metal or alloy for the purpose of changing its structure or properties. Actually, it is not possible to alter the properties of a metal without changing its structure. The properties of metal such as ductility, strength, hardness, wear resistance, etc are each functions of its structure. In all solid metals the structure is crystalline and the various heat treating processes are simply straightforward methods of manipulating crystal and grain structures to optimize some physical property or properties.

Notice the significance of the word 'purpose' in the definition of heat treating. If a piece of metal is heated as in welding, it is not considered heat treating even though the structure of the metal undergoes. Any such change in this case is incidental - the primary purpose of the heating operation is to weld or join the metal. Actually when a heat treated part is repaired by welding, it is frequently necessary to perform several heat treating processes in order to ensure success. Typically, the broken parts would be annealed (softened) first, then after the welding operation was completed, the repaired part would be hardened and tempered before it would be suitable to put back in service. In some cases a second annealing operation might be required to relieve stresses built up during the welding operation prior to the final heat treating operations.