CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Cast iron typically contain Fe-3.2C-2.5Si wt%, which is all cast iron contain more than 2% carbon. In addition to carbon, cast iron also contains silicon, usually from 1 to 3%; thus, it’s actually iron-carbon-silicon alloys. Hence, it’s containing graphite flakes in a matrix. This microstructure is called pearlitic. Carbon in cast irons is known to cause the formation of graphite flakes.

Treatment with magnesium is the way for changing form from flake to nodular. Magnesium will act as nodularising elements which is also a powerful desulphurizing element and so reacts with all of sulphur present in the cast iron before it becomes effective in changing graphite form from flake to nodular. One of the techniques of adding magnesium to molten metal is Sandwich process. The main objective of this technique is to produce a high magnesium recovery.

Inoculation is the addition of material to liquid iron (molten metal) in order to increase the nucleation of the iron or to increase the number of points which is the iron begins to solidify. It also will decrease the tendency to form chill or mottle. Normally, the most commonly used for ductile iron is foundry grade ferrosilicon, so that, in this case, the stabilizing inoculant is ferrosilicon. Actually, the inoculation process is important in order for maintaining good nodule shape and produce high nodule numbers.
Thin wall is the most application used especially in automotive part. Thin wall ductile iron is an alternative for producing automotive parts such as intake manifold. The definition of thin wall is it the thickness is must below 10mm and its length must 12 times its thickness. However, the minimum thickness of thin wall is 2mm.

1.2 IMPORTANCE OF RESEARCH

This research is significant because of several causes:

i. Analysis of the effect of different thickness of thin wall ductile iron.

ii. Analysis of mechanical properties of the different thickness of thin wall ductile iron.

1.3 PROBLEM STATEMENTS

The cast iron has graphite in a matrix called pearlitic. The graphite shape is flake which is has lower strength. The study of graphite changes from flake form to nodular form by adding magnesium ferrosilicon as inoculation agent is under consideration. The ductile iron form is enhanced in strength and other mechanical properties. However the thickness of thin wall is related to the composition of the magnesium adding.

1.4 OBJECTIVE OF THE RESEARCH

There are two main objectives of this research:

i. To investigate the processing parameter of thin wall ductile iron by using Sandwich method.

iii. To investigate the process design parameter for thin wall ductile iron
1.5 SCOPE OF THE RESEARCH

The mould use in the ductile iron metal casting is green sand mould. For producing thin wall ductile iron, the thickness of cavity from 3mm and 7mm. For inoculation, the treatment use is nodularisation of magnesium ferrosilicon (MgFeSi).

1.6 RESEARCH METHODOLOGY

1.6.1 Literature Review

Induction furnace functional for melting cast iron ingot which is has high melting temperature around 1350°C. This invention relates to induction furnaces for use in metal casting [1]. So that, the induction furnace can resist high temperature. Sandwich process was used ladle which is has the height to diameter ratio around 1.5 to 2:1.

There are many types of retaining pocket for use with sandwich treatment which is normal recess, deep pocket and weir recess. However, the normal recess type was used since the type of pocket is not under consideration parameter. For completing the height to diameter ratio and making normal recess type pocket, lining material which is C0₂/silicate sand is used. This lining material maybe employed with equally advantageous effects [2] and easily for making the needed height to diameter ratio and normal recess pocket. However, it is not permanent and has short life.

Cast irons ingot is used as a material under investigation. Cast irons same family as ferrous alloys. Usually steel contain less than 1 percent carbon, but cast iron is different. Normally, cast irons contain 2 to percent and 1 to 3 percent silicon [3]. So that, magnesium ferrosilicon (MgFeSi) is needed where as magnesium act as nodularising agent and ferrosilicon act as inoculating agent.