



# **THIN WALL DUCTILE IRON (TWDI) AND AUSTEMPERED DUCTILE IRON (TWADI) CASTINGS**

By

**Noha Saeed Abdel-Haleem El-Banna**

A Thesis Submitted to the  
Faculty of Engineering at Cairo University  
in Partial Fulfillment of the  
Requirements for the Degree of  
**MASTER OF SCIENCE**  
in  
**Metallurgical Engineering**

FACULTY OF ENGINEERING, CAIRO UNIVERSITY  
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**Title of Thesis:**

THIN WALL DUCTILE IRON (TWDI) AND AUSTEMPERED DUCTILE IRON  
(TWADI) CASTINGS

**Key Words:**

Thin Wall Castings, Ductile Iron, Austempered Ductile Iron, Cooling Rate, Mechanical Properties.

**Summary:**

There are 3 major challenges that face automotive manufacturers: emissions control, cost manufacture reduction and fuel economy improvement. When thin wall ductile iron casting was introduced to be used for automotive industry, there were many problems experienced in trying to produce it. This research aims at investigating metallurgical and technological parameters involved in the production of thin wall and light weight iron castings (3mm) for automotive applications. Two grades of iron will be studied i.e. ductile iron (DI) and austempered ductile iron (ADI) castings. Parameters to be studied will include: the chemical composition of the iron alloys, the melting and the molten treatment, the solidification rate and the molding techniques (green sand, green sand + 10% insulation material and investment castings), and the austempering treatment for ADI. This study will cover the effect of the rate of cooling on the matrix structure and the mechanical properties of DI & ADI castings as well as the influence of the austempering temperature on the mechanical properties of ADI.

## **Disclaimer**

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

## **Dedication**

To my Family and my friends who supported me along the way.

## **Acknowledgments**

I would like to express my deep regards and sincere gratitude to Prof. Dr. Abdel-Hamid A. Hussein, Faculty of Engineering, Cairo University for his care, kind supervision, encouragement, constant efforts, and valuable stimulating guidance and fruitful discussion throughout this study.

I offer my profuse thanks with humble reverence to Prof. Adel Nofal, Foundry Technology Laboratory, Central Metallurgical Research and Development Institute (CMRDI), for his invaluable guidance and support. He was a beacon light, whose constant efforts and encouragement proved to be a parallel stimulus in completing this research successfully.

I would like to thank Assistant Dr. Mahmoud Talaat, Faculty of Engineering, Cairo University for his supervision.

I am grateful to my supervisor Dr. Mohamed Morad for his support and co-operation in the hours of need and for his expert.

This Work is fully supported by the Science and Technology Department Fund (STDF) under the frame work of the Korean project titled “Thin-Wall Iron Castings for Automotive Applications”.

Last but not least, special thanks are due to the staff of Foundry Technology Laboratory, CMRDI and particularly metallographic, melting, workshop staff for their sincere help.

Finally, I would like to acknowledge with gratitude, the support and love of my family – my parents and my lovely sister and brother. They all kept me going and my work wouldn't have been possible without them.

# Table of Contents

<b>Acknowledgments.....</b>	<b>I</b>
<b>Table of Contents.....</b>	<b>II</b>
<b>List of Tables.....</b>	<b>VI</b>
<b>List of Figures.....</b>	<b>VIII</b>
<b>Nomenclature.....</b>	<b>XIII</b>
<b>Abstract.....</b>	<b>XIV</b>
<b>Chapter 1: Introduction.....</b>	<b>1</b>
<b>Chapter 2: Literature Review.....</b>	<b>2</b>

## Ductile Iron (DI) Castings

2.1. Introduction.....	2
2.2. Background and history of thin wall ductile iron (TWDI) in automotive sector.....	4
2.3. Various grades of (DI).....	5
2.4. Thin wall ductile iron (TWDI) castings.....	6
2.5. Factors affecting the cooling rate of (TWDI) castings.....	6
2.5.1. Effect of the section size on the cooling rate of (TWDI) castings.....	7
2.5.2. Effect of the pouring temperature on the cooling rate of (TWDI) castings...	9
2.5.3. Effect of the insulation sand on the cooling rate of (TWDI) castings.....	9
2.6. Properties of (DI) castings.....	12
2.6.1. Physical properties of (DI) castings.....	13
2.6.2. Service properties of (DI) castings.....	13
2.6.3. Mechanical properties of (DI) castings.....	14
2.6.3.1. Tensile properties of (DI) castings.....	14



2.6.3.1.1. Effect of Silicon on the tensile strength and the impact toughness of (DI) castings.....	16
2.6.3.1.2. Effect of Copper and manganese on the tensile strength and the hardness of (DI) castings.....	17
2.7. Chemical composition of (DI) castings.....	18
2.7.1. The primary elements in ductile iron castings.....	18
2.7.1.1. Effect of Carbon.....	18
2.7.1.2. Effect of Silicon.....	19
2.7.1.3. Effect of Manganese.....	19
2.7.1.4. Effect of Sulphur.....	20
2.7.1.5. Effect of Phosphorus.....	20
2.7.2. Alloying elements.....	21
2.7.2.1. Primary elements.....	21
2.7.2.2. Effect of Copper.....	22
2.7.2.3. Effect of Nickel.....	22
2.7.2.4. Effect of Chromium.....	22
2.7.2.5. Effect of Molybdenum.....	22
2.7.2.6. Effect of Tin.....	23

## **Austempered Ductile Iron (ADI) Castings**

2.8. Introduction: .....	24
2.9. Background and history of Austempered Ductile Iron (ADI).....	24
2.10. Standard specification of Austempered Ductile Iron (ADI).....	25
2.11. Market development.....	25
2.12. Austempering heat treatment for (ADI) production.....	26
2.12.1. The austenitization stage.....	27
2.12.1.1. Austenitization temperature .....	27
2.12.1.2. Austenitization time .....	28
2.12.2. The quenching stage.....	28
2.12.2.1. Cooling rate.....	29
2.12.2.2. Transfer time.....	29
2.12.2.3. Quench severity of the austempering bath.....	29
2.12.3. The austempering stage.....	30

2.12.3.1. Austempering temperature.....	30
2.12.3.2. Austempering time.....	30
2.12.4. The cooling processes.....	31
2.13. Selection of ductile iron for austempering process.....	31
2.14. Microstructure of Austempered Ductile Iron (ADI).....	32
2.15. Metallurgy of Thin Wall Austempered Ductile Iron (TWADI).....	34
2.15.1. Chemical composition.....	34
2.15.2. Molding and casting.....	34
2.15.3. Solidification structure, micro segregation and carbides.....	34
2.15.4. Solid state transformation kinetics, final microstructure and properties.....	35

## **Chapter 3: Experimental Work.....36**

3.1. Research objectives.....	36
3.2. Preparation of casting and alloying.....	38
3.2.1. Pattern design.....	38
3.2.2. Mold making.....	38
3.2.3. Melting process.....	39
3.2.4. Production of ductile iron.....	40
3.3. Austempering of DI castings.....	41
3.4. Characterization of DI & ADI.....	42
3.4.1. Chemical composition analysis.....	42
3.4.2. Metallographic analysis.....	42
3.4.2.1. Sampling.....	42
3.4.2.2. Grinding.....	42
3.4.2.3. Polishing.....	43
3.4.2.4. Etching.....	43
3.4.2.5. Optical microscope.....	43
3.4.3. Mechanical testing.....	43
3.4.3.1. Tensile testing.....	43
3.4.3.2. Impact test.....	43

## **Chapter 4: Results and Discussions.....44**

4.1. Microstructures characterization of TWDI as related to chemical composition, wall thickness, mold material, type and technique of inoculating.....	41
4.1.1. TWDI cast in green sand molds (GS).....	44
4.1.2. TWDI cast in green sand + 10% insulation material molds (GS + 10% Al <sub>2</sub> O <sub>3</sub> ).....	55
4.1.3. TWDI cast in investment mold (Inv).....	64
4.2. Microstructural analysis.....	66
4.2.1. Effect of nodule count (N.C) .....	66
4.2.2. Ferrite/Pearlite ratio.....	66
4.3. Mechanical properties of TWDI with thickness of 3, 6, and 9 mm.....	67
4.3.1. The ultimate tensile strength (UTS).....	67
4.3.1.1. Green sand molds.....	68
4.3.1.2. Green sand with 10% insulating material (Al <sub>2</sub> O <sub>3</sub> ) molds.....	69
4.3.1.3. Ceramic molds (investment casting) .....	70
4.3.2. The Elongation %.....	74
4.3.2.1. Green sand molds.....	74
4.3.2.2. Green sand with 10% insulating material (Al <sub>2</sub> O <sub>3</sub> ) molds.....	74
4.3.2.3. Ceramic molds (investment casting) .....	74
4.3.3. The impact energy.....	78
4.4. The effect of heat treatment parameter on the microstructure of TWADI castings with thicknesses of 3, 6, 9 mm.....	82
4.5. The effect of heat treatment parameter on the mechanical properties of TWADI castings with thicknesses of 3, 6, 9 mm.....	84

## **Chapter 5: Conclusions.....89**

## **References.....90**

## List of Tables

<b>Table 2.1:</b> Designation of Ductile Iron .....	5
<b>Table 2.2:</b> Spectroscopic analysis of the ductile iron melts labeled A-D .....	7
<b>Table 2.3:</b> Microstructure analysis results .....	7
<b>Table 2.4:</b> General information on the mechanical properties variations of carbide free ductile iron as section thickness varies .....	8
<b>Table 2.5:</b> The ability of the mold material to absorb the heat.....	10
<b>Table 2.6:</b> Mechanical properties of ADI according to ASTM 897M-90.....	25
<b>Table 3.1:</b> The chemical composition, the carbon equivalents, the types of molding, the inoculant types and the processing of addition.....	37
<b>Table 3.2:</b> The chemical composition of the charge material.....	39
<b>Table 3.3:</b> The chemical composition of the two inoculants.....	40
<b>Table 3.4:</b> Chemical composition of thin wall ductile iron (TWDI) castings.....	42
<b>Table 4.1:</b> Nodule count range.....	49
<b>Table 4.2:</b> Nodule count values.....	51
<b>Table 4.3:</b> The effect of the inoculation technique on F/P ratio.....	54
<b>Table 4.4:</b> The effect of Si content on F/P ratio.....	54
<b>Table 4.5:</b> The effect of the cooling rate on F/P ratio.....	54
<b>Table 4.6:</b> The effect of the cooling rate on F/P ratio.....	54
<b>Table 4.7:</b> The effect of nodule count on F/P ratio.....	55
<b>Table 4.8:</b> The effect of the mold type on the properties of TWDI castings with C.E 4.5, 2.5% Si and treated with single step inoculation.....	56
<b>Table 4.9:</b> The effect of the mold type on the properties of TWDI castings with C.E 4.5, 2.6% Si and treated with double step inoculation.....	57
<b>Table 4.10:</b> The effect of the mold type on the properties of TWDI castings with C.E. 4.5, 3.15% Si and treated with single step inoculation.....	57

<b>Table 4.11:</b> The effect of the mold type on the properties of TWDI castings with C.E 4.5, 3.28% Si and treated with double step inoculation.....	58
<b>Table 4.12:</b> The effect of the mold type on the properties of TWDI castings with C.E 4.7, 2.6% Si and treated with single step inoculation.....	59
<b>Table 4.13:</b> The effect of the mold type on the properties of TWDI castings with C.E 4.69, 2.7% Si and treated with double step inoculation.....	60
<b>Table 4.14:</b> The effect of the mold type on the properties of TWDI castings with C.E 4.7, 3.32% Si and treated with single step inoculation. Nital etched samples.....	61
<b>Table 4.15:</b> The effect of the mold type on the properties of TWDI castings with C.E 4.7, 3.37% Si and treated with double step inoculation.....	62
<b>Table 4.16:</b> The effect of the double inoculation and Si content on the ferrite fraction.....	63
<b>Table 4.17:</b> The effect of Si content on the properties of TWDI.....	65
<b>Table 4.18:</b> The mechanical properties of TWDI samples cast in green sand molds.....	68
<b>Table 4.19:</b> The mechanical properties of TWDI samples cast in green sand + 10% Al <sub>2</sub> O <sub>3</sub> molds.....	69
<b>Table 4.20:</b> The mechanical properties of TWDI samples cast in ceramic molds.....	70
<b>Table 4.21:</b> Ultimate tensile strength and yield strength as a function of thickness, austempering temperature, iron composition and molding using inoculant (1).....	85
<b>Table 4.22:</b> Ultimate tensile strength and yield strength as a function of thickness, austempering temperature, iron composition and molding using inoculant (2).....	86
<b>Table 4.23:</b> Ultimate tensile strength and yield strength as a function of thickness, austempering temperature, iron composition and molding using inoculant (1).....	87
<b>Table 4.24:</b> Ductility and impact as a function of thickness, austempering temperature, iron composition and molding material using inoculant (2).....	88

## List of Figures

<b>Figure 2.1:</b> Relative cost per unit of yield strength for different metallic materials.....	3
<b>Figure 2.2:</b> Relative weight per unit of yield strength for different metallic materials.....	3
<b>Figure 2.3:</b> Variation in nodule count with varying amount of Cu additions in castings.....	7
<b>Figure 2.4:</b> Solidification time vs. thickness of sand cast plates. Both measured and calculated data points are shown by symbols. ....	8
<b>Figure 2.5:</b> Effect of cooling rate on the number graphite nodules.....	9
<b>Figure 2.6:</b> Cast iron castability as a function of wall thickness, poured into molds made of different molding materials.....	9
<b>Figure 2.7:</b> Microstructure of ductile iron in castings with different wall thicknesses: (a) 2mm (SMS mold), (b) 3mm (SMS mold), (c) 5mm (SMS mold), (d) 13mm (SMS mold), (e) 2mm (LDASC mold), and (f) 13mm (LDASC mold). No etched samples.....	11
<b>Figure 2.8:</b> Microstructure of ductile iron in castings with different wall thicknesses [8]: (a) 2 mm (SMS mold), (b) 3 mm (SMS mold), (c) 5 mm (SMS mold), (d) 13 mm (SMS mold), (e) 2 mm (LDASC mold) and (f) 13 mm (LDASC mold). Nital etched samples.....	11
<b>Figure 2.9:</b> Ferrite fraction as a function of cooling rate (near the equilibrium temperature of eutectoid transformation): experimental points for SMS mold, experimental points for LDASC mold.....	12
<b>Figure 2.10:</b> Variation of graphite nodularity with sample thickness.....	15
<b>Figure 2.11:</b> Variation of ultimate tensile strength with sample thickness.....	15
<b>Figure 2.12:</b> Variation of yield strength with sample thickness.....	15
<b>Figure 2.13:</b> Variation of elongation% with sample thickness.....	16
<b>Figure 2.14:</b> The effect of silicon content on ferrite content.....	16
<b>Figure 2.15:</b> Variation in tensile strength with respect to casting section thickness in ductile iron step castings with compositions A-D.....	17
<b>Figure 2.16:</b> Variation in hardness with respect to casting section thickness in ductile iron step castings with compositions A-D.....	17
<b>Figure 2.17:</b> Typical range for carbon and silicon contents in good quality ductile iron.....	19

<b>Figure 2.18:</b> Recommended maximum manganese content as a function of silicon content and wall thickness.....	20
<b>Figure 2.19:</b> Typical relationship between elongation and yield strength of ductile irons with different matrix structure.....	21
<b>Figure 2.20:</b> ADI European Market Distribution – Years 2012-2013.....	25
<b>Figure 2.21:</b> Schematic isothermal transformation diagram illustrating the austempering process for cast irons.....	26
<b>Figure 2.22:</b> Effect of austenitizing temperature on the mechanical properties of Austempered Ductile Iron casting.....	28
<b>Figure 2.23:</b> Isothermal transformation diagram for an ADI alloy.....	29
<b>Figure 2.24:</b> Schematic diagram shows the effect of quenching severity on the austempering reaction.....	29
<b>Figure 2.25:</b> Effect of austempering temperatures on (a) yield strength, (b) elongation in ADI.....	30
<b>Figure 2.26:</b> Schematic diagram showing the effect of austempering time on the amount and the stability of austenite and the hardness of ADI.....	31
<b>Figure 2.27:</b> ADI microstructure consists of acicular ferrite in high carbon austenite matrix.....	32
<b>Figure 2.28:</b> Microstructures of ADI heat treated by (A) The single step austempering process at different temperatures, (a) 399°C, (b) 371°C, (c) 343°C, (d) 288°C. (B) The double step austempering process at different temperatures, (a) 399°C, (b) 371°C, (c) 343°C, (d) 288°C.....	33
<b>Figure 2.29:</b> Nodule count as a function of thickness.....	35
<b>Figure 3.1:</b> The stepped pattern used for the preparation of casting molds, all dimensions in mm.....	38
<b>Figure 3.2:</b> The production of investment molds.....	39
<b>Figure 3.3:</b> (A) A typical Vortex unit used for spheroidization and inoculation of molten iron: (a) refractory, (b) additives hopper, (c) interchangeable calibrated orifice and (d) shut off slide, (B) Vortex unit available at CMRDI.....	40
<b>Figure 3.4:</b> Pouring of molten iron: (a) in green sand molds, (b) in investment molds.....	41
<b>Figure 4.1:</b> Microstructure and phase analysis of TWDI samples cast in green sand molds with C.E 4.5, 2.61% Si and treated with single step inoculation. Nital etched samples.....	45