



Ain Shams University
Faculty of Engineering
Mechanical Power Department

Effect of Surface Roughness on Horizontal Cylinder Cooling

A thesis submitted in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN MECHANICAL ENGINEERING
(Mechanical Power Engineering)

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STATEMENT

This thesis is submitted in the partial implementing of a master degree in Mechanical Power Engineering, Ain-Shams University.

The author carried out the work included in this thesis, and no part of this thesis has been submitted for a degree or qualification at any other university or institution.

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Researcher Data

Name of Researcher	Eng. Mohamed Bachier Mohamed
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Abstract

Several experimental studies have been studied the effect of the impinging jet on horizontal cylinder cooling whether the impinging jet is fixed or rotating.

Very few studies have been investigated the effect of surface roughness in the quenching process. The current study focused on making a comparison of the cooling characteristics between smooth and roughened horizontal stainless-steel cylinders.

The cooling characteristics have been studied taking into consideration different parameters as specimen initial temperature from 250 to 450°C, coolant temperature from 40 to 80°C, number of impinging jets from 1 to 3, effect of coolant velocity from 2.5 to 6 m/s and surface roughness. Two different types of surface roughness have been used. The first one is fabricated by using laser cutting machine used to roughening the specimen. The second type fabricated by making narrow groove channels in the specimen of 2 mm width and 30° apart from each other.

Key Words: Quenching, impinging jets, surface roughness.

Thesis Summary

Experimental work has been done to study the effect of surface roughness on horizontal cylinder cooling.

Changing parameters such as specimen initial temperature, coolant temperature, number of impinging jets, the effect of coolant velocity and surface roughness have been studied to investigate its effects.

The study consists of five chapters as follow:

- **Chapter one:**

Contains an introduction to the quenching process, history, technique, applications, impinging jet, regions of cooling curves, surface roughness.

- **Chapter two:**

Includes the literature review of some of the previous researches which are interrelated with the subject of this study with a brief summary for each of them, and then the purposes of this study will be discussed.

- **Chapter three:**

This chapter consists of the experimental set up and the procedure used in this study. Also the operation and the investigated parameters is clarified.

- **Chapter four:**

Deals with the results of the tests, analysis of these results, and the phenomena and criteria are determined from them.

- **Chapter five:**

Represents the conclusions of the present work. Finally recommendation of the future work is presented.

TABLE OF CONTENT

Statement	I
Researcher data	II
Acknowledgment.....	III
Abstract	IV
Thesis summary	V
Table of contents	VII
List of Figures	XI
List of Tables	XVI
List of Abbreviation.....	XVII
List of Symbols.....	XVIII
<i>Chapter 1: Introduction</i>	<i>I</i>
1.1.General.....	1
1.2. Heat transfer characteristics of impingement jets	2
1.3.1.3 Types of Jet Impingement	3
1.4.Jet Parameters	4
1.5.hydrodynamics of impingement jets	5
1.6.Applications of impinging jets in industrial usage	6
1.7.What is quenching	9

1.8. Quenching methods	10
1.9. Benefits of quenching	11
1.10. Surface roughness	11
1.11. How we can specify surface roughness	12
1.12. The physical approach to my thesis	12
1.13. Outline of This Dissertation.....	14
<i>Chapter 2: Literature Review.....</i>	<i>16</i>
2.1 General	16
2.2 Boiling Heat Transfer	16
2.2.1 Classification of boiling	16
2.2.2. Pool boiling	17
2.2.3 Flow boiling	20
2.3. Impingement jets	20
2.3.1 Theoretical studies investigated impingement jets	20
2.3.2 Experimental studies investigated impingement jets.....	21
2.4. Surface roughness	24
2.5. Objectives of the present study	26
<i>Chapter 3: Experimental work</i>	<i>27</i>
3.1. General	27
3.2 Test rig.....	27
3.3. Specimen.....	29
3.4. Thermocouples	29

3.5. Specimen heater	29
3.6. Flow meter	31
3.7. Data acquisition unit.....	32
3.8. Roughening of the specimen	32
3.9. The impingement Jets	34
3.10. Investigated parameters.....	36
3.8. Uncertainty of measurements.....	36
3.9. Experiment procedure.....	36
<i>Chapter 4: Results and Discussion.....</i>	<i>39</i>
4.1. General.....	39
4.2 Effect of Specimen Initial Temperature (T_{surface}) and Comparison with the Effect of Surface Roughness on cooling the process	39
4.3 Effect of increasing no. of jets (single/double/triple) jet and Comparison to Effect of Surface Roughness.....	44
4.4 Effect of water sub-cooling temperature (ΔT_{sub}).....	48
4.5 Effect of water velocity at jet exit (V_j).....	52
4.6 Effect of surface roughness.....	54
<i>Chapter 5: Conclusions and Future Directions.....</i>	<i>57</i>
5.1. Conclusions.....	57
5.4 Direction for Future Work.....	58
References.....	59
APPENDIX A : Physical properties of specimen material	62

APPENDIX B: Chemical composition	64
APPENDIX C: Thermocouples calibration	65
APPENDIX D: Heater specification	66
APPENDIX E: Calibration of flow meter	67
APPENDIX F: Uncertainty analysis	68

List of Figures

Fig.1.1: Electrical Equipment Cooling	1
Fig.1.2: Processing of steel	2
Fig.1.3: Schematic of jet configuration	5
Fig.1.4: Turbine inlet guide vane's typical use of impingement cooling	7
Fig.1.5: shows a small nuclear reactor used for research	8
Fig.1.6: application of quenching in industry	11
Fig.2.1: Typical pool boiling curve for water at one atmosphere	17
Fig.2.2: Regions of Nucleate boiling	18
Fig.2.3: Transition boiling	19
Fig.2.4: The Schematic diagram of the test apparatus	22
Fig. 3.1: Layout of the experimental test rig	28
Fig 3.2 : Experimental test rig	28
Fig 3.3: thermocouples distributed in the test specimen	30
Fig 3.4: Shape of first type of roughened surface	34

Fig 3.5: Shape of second type of roughened surface.....	34
Fig 3.6: single impingement jet	35
Fig 3.7: Double impingement jet	35
Fig 3.8: Triple impingement jet	35
Fig. 4.1, Effect of T_{surface} , comparison between $T_{\text{surface}} = 450, 350,$ and $250\text{ }^{\circ}\text{C}$, effect of surface roughness, $\Delta T_{\text{sub}} = 60\text{ }^{\circ}\text{C}$, $V_{\text{jet}} = 2.5\text{ m/s}$, $N_j = 1$, Outer TC, $\Theta = 0^{\circ}$	41
Fig. 4.2, Effect of T_{surface} , comparison between $T_{\text{surface}} = 450, 350,$ and $250\text{ }^{\circ}\text{C}$, effect of surface roughness, $\Delta T_{\text{sub}} = 60\text{ }^{\circ}\text{C}$, $V_{\text{jet}} = 2.5\text{ m/s}$, $N_j = 1$, Inner TC, $\Theta = 0^{\circ}$	41
Fig. 4.3, Effect of T_{surface} , comparison between $T_{\text{surface}} = 450, 350,$ and $250\text{ }^{\circ}\text{C}$, effect of surface roughness, $\Delta T_{\text{sub}} = 60\text{ }^{\circ}\text{C}$, $V_{\text{jet}} = 2.5$ m/s , $N_j = 1$, Outer TC, $\Theta = 90^{\circ}$	42
Fig. 4.4, Effect of T_{surface} , comparison between $T_{\text{surface}} = 450, 350,$ and $250\text{ }^{\circ}\text{C}$, effect of surface roughness, $\Delta T_{\text{sub}} = 60\text{ }^{\circ}\text{C}$, $V_{\text{jet}} = 2.5$ m/s , $N_j = 1$, Inner TC, $\Theta = 90^{\circ}$	42
Fig. 4.5, Effect of T_{surface} , comparison between $T_{\text{surface}} = 450, 350,$ and $250\text{ }^{\circ}\text{C}$, effect of surface roughness, $\Delta T_{\text{sub}} = 60\text{ }^{\circ}\text{C}$, $V_{\text{jet}} = 2.5$ m/s , $N_j = 1$, Outer TC, $\Theta = 180^{\circ}$	43

- Fig. 4.6, Effect of T_{surface} , comparison between $T_{\text{surface}} = 450, 350,$ and $250\text{ }^{\circ}\text{C}$, effect of surface roughness, $\Delta T_{\text{sub}} = 60\text{ }^{\circ}\text{C}$, $V_{\text{jet}} = 2.5\text{ m/s}$, $N_j = 1$, Inner TC, $\Theta = 180^{\circ}$43
- Fig. 4.7, Effect of number of jets, comparison between No. of jets = 1, 2 and 3, effect of surface roughness, $\Delta T_{\text{sub}} = 60\text{ }^{\circ}\text{C}$, $V_{\text{jet}} = 2.5\text{ m/s}$, $T_{\text{surface}} = 450\text{ }^{\circ}\text{C}$, Outer TC, $\Theta = 0^{\circ}$45
- Fig. 4.8, Effect of number of jets, comparison between No. of jets = 1, 2 and 3, effect of surface roughness, $\Delta T_{\text{sub}} = 60\text{ }^{\circ}\text{C}$, $V_{\text{jet}} = 2.5\text{ m/s}$, $T_{\text{surface}} = 450\text{ }^{\circ}\text{C}$, Inner TC, $\Theta = 0^{\circ}$45
- Fig. 4.9, Effect of number of jets, comparison between No. of jets = 1, 2 and 3, effect of surface roughness, $\Delta T_{\text{sub}} = 60\text{ }^{\circ}\text{C}$, $V_{\text{jet}} = 2.5\text{ m/s}$, $T_{\text{surface}} = 450\text{ }^{\circ}\text{C}$, Outer TC, $\Theta = 90^{\circ}$46
- Fig. 4.10, Effect of number of jets, comparison between No. of jets = 1, 2 and 3, effect of surface roughness, $\Delta T_{\text{sub}} = 60\text{ }^{\circ}\text{C}$, $V_{\text{jet}} = 2.5\text{ m/s}$, $T_{\text{surface}} = 450\text{ }^{\circ}\text{C}$, Inner TC, $\Theta = 90^{\circ}$46
- Fig. 4.11, Effect of number of jets, comparison between No. of jets = 1, 2 and 3, effect of surface roughness, $\Delta T_{\text{sub}} = 60\text{ }^{\circ}\text{C}$, $V_{\text{jet}} = 2.5\text{ m/s}$, $T_{\text{surface}} = 450\text{ }^{\circ}\text{C}$, outer TC, $\Theta = 180^{\circ}$47
- Fig. 4.12, Effect of number of jets, comparison between No. of jets = 1, 2 and 3, effect of surface roughness, $\Delta T_{\text{sub}} = 60\text{ }^{\circ}\text{C}$, $V_{\text{jet}} = 2.5\text{ m/s}$, $T_{\text{surface}} = 450\text{ }^{\circ}\text{C}$, Inner TC, $\Theta = 180^{\circ}$47