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)

By

Eng. Mohamed Bachier Mohamed

B.Sc. Mechanical Engineering

Military Technical College

Supervised by:

Prof. Dr. Mahmoud Mohamed Abo El-Nasr
Professor in the Mechanical power Eng. Dept.
Faculty of Engineering - Ain Shams University

Dr. Hamdy Ahmed Abotaleb
Assistant professor in the Mechanical power Eng. Dept.
Faculty of Engineering - Ain Shams University

Cairo, 2018

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EXAMINERS COMMITTEE

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Pro.Dr. Adel Abdelmalek Alahwany Professor in the Mechanical power Eng. Dept. Faculty of Engineering - Ain Shams University	……
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Pro.Dr. Ramadan Abdelaziz Amer Professor in the Mechanical power Eng. Dept. Faculty of Engineering - Benha University	……

Date : …/…/….

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.

Signature

Eng. Mohamed Bachier Mohamed

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Researcher Data

Name of Researcher	Eng. Mohamed Bachier Mohamed
Date of Birth	June, 10th, 1982
Place of Birth	Cairo. Egypt
Nationality	Egyptian
University degree	B.Sc. Mechanical Engineering
Department	Mechanical Power Department
University	Military Technical College
Date of Degree	June 2004
Current Job	Engineering Officer in Egyptian Forces

Acknowledgement

In the beginning, I very thankful for our mercy god Allah for his wisdom and guidance to show me the right way in my life.

All the gratitude to my father, **Bachier Mohamed** and my mother, **Soad Hamed** for them support all over my life and giving me the motivation to establish my studies and to my wife**, Afaf Husien** for her help and support to provide me the time to finish my work especially when you are responsible for a family with two kids.

I want to express my utmost gratitude to my advisor, **Prof. Dr. Mahmoud Mohamed Abo El-Nasr** for his guidance through the research period, and **Dr. Hamdy Ahmed Abo Taleb,** for his inspiring guidance, valuable advice, and encouragement throughout the progress of this research. His suggestions, criticism, and patients have been great assets.

I want to express my deeply indebted to Department of Mechanical Power Department, Faculty of Engineering, Ain Shams University for providing the required facilities to finish my experiment and guidance through my study.

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.

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