

Design and Manufacturing of Crankshaft Main Bearing Runout Inspection Machine



Author

Arslan Rahat

Sultan

Roll/Registration Number

00000274817

Supervisor

Prof. Dr Riaz Ahmed Mufti

DEPARTMENT OF MECHANICAL ENGINEERING
SCHOOL OF MECHANICAL & MANUFACTURING ENGINEERING
NATIONAL UNIVERSITY OF SCIENCES AND TECHNOLOGY
ISLAMABAD

JUNE 2021

Design and Manufacturing of Crankshaft Main Bearing Runout Inspection Machine

Author

Arslan Rahat Sultan

Registration Number

00000274817

A thesis submitted in partial fulfillment of the requirements for the degree of
MS Mechanical Engineering

Thesis Supervisor:

Prof. Dr. Riaz Ahmed Mufti

Thesis Supervisor's Signature: _____

DEPARTMENT OF MECHANICAL ENGINEERING
SCHOOL OF MECHANICAL & MANUFACTURING ENGINEERING
NATIONAL UNIVERSITY OF SCIENCES AND TECHNOLOGY,
ISLAMABAD
JUNE 2021

THESIS ACCEPTANCE CERTIFICATE

Certified that final copy of MS thesis written by Mr. Arslan Rahat Sultan Registration No. 00000274817 of SMME has been vetted by undersigned, found complete in all aspects as per NUST Statutes/Regulations, is free of plagiarism, errors, and mistakes and is accepted as partial fulfillment for award of MS/MPhil degree. It is further certified that necessary amendments as pointed out by GEC members of the scholar have also been incorporated in the said thesis.

Signature with stamp: _____

Name of Supervisor: Prof. Dr Riaz Ahmed Mufti

Date: _____

Signature of HoD with stamp: _____

Date: _____

Countersign by

Signature (Dean/Principal): _____

Date: _____

Declaration

I certify that this research work titled “*Design and Manufacturing of Crankshaft Main Bearing Runout Inspection Machine*” is my own work. The work has not been presented elsewhere for assessment. The material that has been used from other sources it has been properly acknowledged / referred.

Signature of Student

ARSLAN RAHAT

SULTAN

2018-NUST-MS-Mech-00000274817

Language Correctness Certificate

This thesis has been read by an English expert and is free of typing, syntax, semantic, grammatical, and spelling mistakes. Thesis is also according to the format given by the university.

Signature of Student

Arslan Rahat

Sultan

2018-NUST-MS-Mech-00000274817

Signature of Supervisor

Plagiarism Certificate (Turnitin Report)

This thesis has been checked for Plagiarism. Turnitin report endorsed by Supervisor is attached.

Signature of Student

Arslan Rahat

Sultan

2018-NUST-MS-Mech-00000274817

Signature of Supervisor

Copyright Statement

- Copyright in text of this thesis rests with the student author. Copies (by any process) either in full, or of extracts, may be made only in accordance with instructions given by the author and lodged in the Library of NUST School of Mechanical & Manufacturing Engineering (SMME). Details may be obtained by the Librarian. This page must form part of any such copies made. Further copies (by any process) may not be made without the permission (in writing) of the author.
- The ownership of any intellectual property rights which may be described in this thesis is vested in NUST School of Mechanical & Manufacturing Engineering, subject to any prior agreement to the contrary, and may not be made available for use by third parties without the written permission of the SMME, which will prescribe the terms and conditions of any such agreement.
- Further information on the conditions under which disclosures and exploitation may take place is available from the Library of NUST School of Mechanical & Manufacturing Engineering, Islamabad.

Acknowledgements

I am thankful to my Creator Allah Subhana-Watala to have guided me throughout this work at every step and for every new thought which Your setup in my mind to improve it. Indeed, I could have done nothing without Your priceless help and guidance. Whosoever helped me throughout the course of my thesis, whether my parents or any other individual was Your will, so indeed none be worthy of praise but You.

I am profusely thankful to my beloved parents who raised me when I was not capable of walking and continued to support me throughout in every department of my life.

I would also like to express special thanks to my supervisor **DR. RIAZ AHMAD MUFTI** for his help throughout my thesis and for **Tribology** course which he has taught me. I can safely say that I haven't learned any other engineering subject in such depth than the ones which he has taught.

I would also like to pay special thanks to **Dr. Jawad Aslam** and **Dr. Mian Ashfaq** for their tremendous support and cooperation. Each time I got stuck in something, they came up with the solution. Without their help I wouldn't have been able to complete my thesis. I appreciate their patience and guidance throughout the whole thesis.

I would also like to thank **Dr. Rehan Zahid**, for being on my thesis guidance and evaluation committee and express my special thanks To **Talha Yousaf, Fazal Badshah, Syed Hamza Ahmad, Aaras Ahmad** for their help.

*Dedicated to my exceptional family, friends and teachers whose
tremendous support and cooperation led me to this wonderful
accomplishment.*

Abstract

The purpose of this project is to design and fabricate a Crankshaft Inspection Machine. It serves as a proof of concept for later versions to be designed for Tractor OEM. The machine will be able to measure runout of main journals of two crankshafts: 3-cylinder and 4-cylinder. The runout is measured by rotating crankshaft and using a LVDT that takes the readings over defined intervals. Machine uses two dead centers for mounting the crankshaft and a servo motor attached via belt to rotate the crankshaft. One LVDT probe is utilized to take the readings with an accuracy of 1 micron. The accuracy and precision requirements are specified by the manufacturing drawings provided by the OEM. The design of machine components is dictated by the dimensional constraints rather than stress and loading conditions since most components are stationary and have light weight components to hold. It is mainly due to innovative arrangement that allows tangent contact to the main bearing surface and the LVDT is not in direct contact with the main bearing which is not common in precision industry.

Key Words: *Crankshaft, Crankshaft design, Crankshaft Inspection machine*

