

**MACHINING PROCESS ACCURACY IMPROVEMENT
TO ELIMINATE THE QUALITY REJECTION OF OVERSIZED
HOLE DIAMETER OF CRANKSHAFT**

By

Agus Setyo Anto Wibowo
22452007

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SWISS GERMAN UNIVERSITY
The Prominence Tower
Jalan Jalur Sutera Barat No. 15, Alam Sutera
Tangerang, Banten 15143 - Indonesia

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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.



Agus Setyo Anto Wibowo, S.T.

13 August 2025

Date

Student

Approved by:



Dr. Yunita Umniyati, S.Si., M.Sc.

22 Aug 2025

Thesis Advisor

Date

Dr. Eng. Aditya Tirta Pratama, S.Si., M.T.

Thesis Co-Advisor

Date

Dr. Ir. Maulahikmah Galinium, S.Kom., M.Sc.

Dean

Date

ABSTRACT

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By

Agus Setyo Anto Wibowo

Dr. Yunita Umniyati, S.Si., M.Sc., Advisor

Dr. Eng. Aditya Tirta Pratama, S.Si., M.T., Co-Advisor

SWISS GERMAN UNIVERSITY

This study focuses on precision machining, specifically the dimensional accuracy of crankshaft hole diameters produced through fine boring operations. A recurring quality issue, that is “NG Hole Diameter” defects—was identified as a major contributor to reduced product quality and process instability. Traditional problem-solving approaches often rely on assumptions or managerial decisions, which tend to overlook key process-driven variations. To address this, a hybrid methodology combining the Taguchi method, Shainin Red X root cause analysis, Six Sigma principles, and data analysis was applied. This integrated approach enabled a thorough investigation of variation sources and the identification of critical machining parameters. By “asking the parts,” or directly analyzing defective components, the study uncovered that inconsistent tool offset input was the primary root cause, with secondary factors including clamper wear and misalignment of part positioning sensors. Depth of cut was found to have the greatest influence on hole diameter, while spindle speed had minimal impact. Implementing optimized machining parameters improved process capability, reduced rejection rates, and enhanced production stability. Academically, the study contributes to machining process improvement through a structured, data-driven methodology, while practically offering industries actionable strategies to improve dimensional consistency, extend tool life, and boost operational efficiency.

Keywords: *Fine Boring, Crankshaft, Taguchi Design of Experiments, Shainin Red X Method, Six Sigma Quality Improvement, Root Cause Identification*





DEDICATION

This thesis is dedicated to all those who refuse to live in mediocrity, choosing to struggle for better in bitterness and push over the boundaries of what is possible.



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