

**IMPROVING TUBE LASER CUTTING CAPACITY
THROUGH THE IMPLEMENTATION OF A TUBE SEAM DETECTION
SENSOR: A CASE STUDY AT PT.XYZ**

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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.



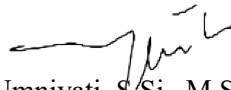
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ABSTRACT

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The increasing demand for efficiency and cost competitiveness in the automotive manufacturing industry requires continuous improvement of production processes. One critical limitation in tube laser cutting operations is the inability to accurately detect and control the longitudinal weld seam on welded pipes and additional secondary processes. This study aims to improve tube laser cutting capacity through the implementation of a vision based tube seam detection sensor integrated with the programmable logic controller of an existing laser cutting machine at PT XYZ. The research method consists of problem identification, baseline performance measurement, sensor selection, mechanical and control system integration. An industrial vision sensor is installed to identify the seam position and transmit detection signals to the controller. The proposed system employs an industrial vision sensor to automatically identify the seam position prior to cutting and to align the pipe accordingly. Seam detection data are transmitted to the controller to regulate tube rotation and cutting orientation. The results indicate that total manufacturing cycle time was reduced from 566 second to 326 seconds, representing a 42.4% reduction, while production capacity increased by 73.6%. Total manufacturing cost decreased by 46.6% due to the elimination of drilling and circular cutting processes.

Keywords: Seam Detection, PLC Integration, Laser Cutting, Vision Sensor, Pipe Welding Bead.



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DEDICATION

This thesis is devoted to my beloved family, whose unwavering love, sacrifices, and steadfast encouragement have carried me through every challenge of this journey. Your faith in me has been my greatest source of strength.

To my mentors and peers, I express my deepest gratitude for your guidance, insight, and continuous support. Your generosity in sharing knowledge and your unwavering belief in my abilities have shaped my growth throughout this academic pursuit.

Lastly, I dedicate this work to the ongoing development of laser cutting systems and future innovations in mechatronics. May this humble contribution serve, in even the smallest measure, to advance technology for the improvement of society and the lives of those within it.



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