

**Development of an Automated Rejection System for
Defective Products with Self-Monitoring Capabilities Using
PLC-based Software**

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12101001

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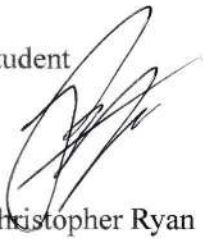


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STATEMENT BY THE AUTHOR

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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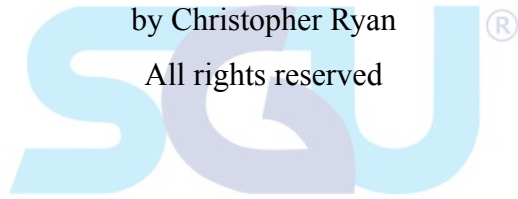
Manual rejection of defective products is labor-intensive, error-prone, and might cause unnecessary downtime in production lines. This project presents an automated rejection system with self-monitoring capabilities, controlled using a Siemens S7-1200 PLC and visualized using a TP700 Comfort HMI. The system uses a photoelectric sensor and encoder to measure product length, and a pneumatic actuator to reject defective items. It operates in real time, eliminates manual rejection, and records detailed data. Accuracy testing was performed using identical dimension cardboard boxes, compared against manual measurements using vernier callipers at various speeds. Precision was tested with 100 repeated measurements of the same length at low, medium, and high conveyor speeds. Results showed an accuracy of up to 98.91% at medium speed (~25 mm/s), while precision resulted up to 98.43%. However, statistical analysis found insufficient evidence to confirm speed as a significant factor. The system successfully eliminates manual rejection, reduces downtime, and enables convenient performance analysis via CSV data logging using OPC UA and Python.

Keywords: Rejection System, Pneumatic, PLC, TIA Portal, HMI, SCADA.

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DEDICATION

This thesis is dedicated to Landpack GmbH, Germany, hoping to improve their production efficiency by providing an automated rejection system for defective products. As well as to contribute to their growth, in gratitude for giving me internship opportunities and memorable experiences.

I also dedicate this thesis to my parents, who are always there to guide me. To my mentors and advisors, thank you for your guidance and wisdom that kept me on the right path. And to my friends, for always cheering me on and believing in me, even when I doubted myself.

This work is also dedicated to all those who strive for innovation and excellence in automation, inspiring advancements that shape the future.



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Firstly, I would like to thank God for the strength, wisdom, and perseverance to complete this thesis work. I will forever be thankful for everything You have done to help me reach this point.

I am deeply grateful that I have the best parents, who always supported and guided me throughout the course of this research.

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TABLE OF CONTENTS

	Page
STATEMENT BY THE AUTHOR.....	2
ABSTRACT.....	3
DEDICATION.....	5
ACKNOWLEDGEMENTS.....	6
TABLE OF CONTENTS.....	7
LIST OF FIGURES.....	9
LIST OF TABLES.....	11
CHAPTER 1 - INTRODUCTION.....	12
1.1 Background.....	12
1.2 Research Problems.....	13
1.3 Research Objectives.....	13
1.4 Significance of Study.....	13
1.5 Scope and Limitations.....	14
1.6 Thesis Structures.....	14
CHAPTER 2 - LITERATURE REVIEW.....	16
2.1 Introduction to Automated Rejection Systems.....	16
2.2 Rejection Systems.....	16
2.2.1 Pneumatic Rejection Systems.....	17
2.2.2 Mechanical Rejection Systems.....	19
2.2.3 Electrical Rejection Systems.....	20
2.2.4 Hybrid Rejection Systems.....	21
2.2.5 Comparison of Rejection Systems.....	21
2.3 Supervisory Control and Data Acquisition.....	23
2.3.1 Master Terminal Unit (MTU).....	23
2.3.1.1 Modbus, and PROFINET.....	23
2.3.2 Field Devices (RTUs, PLCs, and IEDs).....	24
2.3.3 Human Machine Interface (HMI).....	25
2.4 Safety of Industrial Machinery.....	26
CHAPTER 3 – RESEARCH METHODOLOGY.....	27
3.1 Research Framework.....	27
3.2 System Design.....	28
3.2.1 Design Justification.....	28
3.2.1.1 Components of Choice.....	29
3.2.2 Concept of the Overall System.....	32
3.2.3 Mechanical Design.....	33
3.2.3.1 Conveyor and Defect Detector.....	33

3.2.3.2 Pneumatic Cylinder Pusher.....	37
3.2.4 Electrical Design.....	39
3.2.5 Program Design.....	40
3.2.5.1 Human Machine Interface.....	41
3.3 Safety Considerations.....	41
CHAPTER 4 – RESULTS AND DISCUSSION.....	43
4.1 Components Level Results and Discussion.....	43
4.1.1 Mechanical Components.....	43
4.1.2 Electrical Components.....	44
4.2 System Level Result and Discussion.....	45
4.2.1 Accuracy of Defect Detection System.....	45
4.2.2 Precision of Defect Detection System.....	50
4.2.3 Validation Against Objectives.....	55
CHAPTER 5 – CONCLUSIONS AND RECOMMENDATIONS.....	57
5.1 Conclusions.....	57
5.2 Recommendations for future work.....	58
GLOSSARY.....	59
REFERENCES.....	60
CURRICULUM VITAE.....	64
APPENDIX A - RAW DATA.....	65
APPENDIX B - FINISHED SYSTEM BUILD.....	69
APPENDIX C - SOURCE CODE.....	72
APPENDIX D - BILL OF MATERIALS.....	81

LIST OF FIGURES

Figures	Page
Figure 2.1 NIKODAN Pneumatic Reject System.....	17
Figure 2.2 Swiper Bar Rejection Method.....	18
Figure 2.3 Drop Flap Rejector.....	19
Figure 2.4 Servo Based Rejection Systems.....	20
Figure 2.5 Simple SCADA architecture.....	25
Figure 3.1 Research Framework.....	27
Figure 3.2 Motor Sizing Calculation.....	30
Figure 3.3 Pneumatic Components Calculation.....	31
Figure 3.4 Basic Concept of the System.....	32
Figure 3.5 CAD of the Conveyor.....	33
Figure 3.6 Conveyor Tensioner.....	34
Figure 3.7 Conveyor Tensioner-Adjuster.....	34
Figure 3.8 Conveyor Tensioner-Holder.....	35
Figure 3.9 Conveyor Tensioner-Bolts.....	35
Figure 3.10 Defect Detection System.....	35
Figure 3.11 Encoder with Wheel.....	36
Figure 3.12 Drum Pulley.....	36
Figure 3.13 AC Motor.....	37
Figure 3.14 Pneumatic Cylinder Pusher System.....	37
Figure 3.15 Pneumatic Cylinder Pusher System Important Parts.....	38
Figure 3.16 Pneumatic Cylinder Stopper.....	38
Figure 3.17 Pusher.....	38
Figure 3.26 Program Flow Diagram.....	40
Figure 4.1 MA 20 x 125 Pneumatic Cylinder.....	42
Figure 4.2 Autonics BJ100-DDT-P Photoelectric Sensor.....	43
Figure 4.3 LPD3806-400BM-G5-24C Rotary Encoder.....	43
Figure 4.4 Q-Q Plot at High Speed.....	45
Figure 4.5 Q-Q Plot at Medium Speed.....	46
Figure 4.6 Q-Q Plot at Low Speed.....	47
Figure 4.7 Product Length Measurement at High Speed Graph.....	49
Figure 4.8 Skewness Graph at High Speed.....	50
Figure 4.9 Product Length Measurement at Medium Speed Graph.....	51

Figure 4.10 Skewness Graph at Medium Speed.....	52
Figure 4.11 Product Length Measurement at Low Speed Graph.....	52
Figure 4.12 Skewness Graph at Low Speed.....	53
Figure A-1 Raw Data for Accuracy Analysis at 3 Speeds.....	64
Figure A-2 Raw Data for Precision Analysis at High Speed.....	65
Figure A-3 Raw Data for Precision Analysis at Medium Speed.....	66
Figure A-4 Raw Data for Precision Analysis at Low Speed.....	67
Figure B-1 Finished System Build.....	68
Figure B-2 Top Right View of Finished System Build.....	68
Figure B-3 Top Left View of Finished System Build.....	69
Figure B-4 Main Screen of HMI.....	69
Figure B-5 Settings Screen of HMI.....	70
Figure C-1 Network 1, 2, and 3 of Ladder Program.....	71
Figure C-2 Network 4, and 5 of Ladder Program.....	72
Figure C-3 Network 6, and 7 of Ladder Program.....	73
Figure C-4 Network 8 of Ladder Program.....	74
Figure C-5 Network 9 of Ladder Program.....	75
Figure C-6 Network 10, 11, and 12 of Ladder Program.....	76
Figure C-7 Network 13, 14, and 15 of Ladder Program.....	77
Figure C-8 Network 16 of Ladder Program.....	78
Figure C-8 Network 17, and 18 of Ladder Program.....	78
Figure C-9 Data Logging.....	79

LIST OF TABLES

Tables	Page
Table 2.1 Comparison of Rejection Systems.....	22
Table 3.1 Failure Mode Analysis.....	41
Table 4.1 Automatic and Manual Measurements Comparison (mm).....	44
Table 4.2 High Speed Accuracy Analysis.....	45
Table 4.3 Medium Speed Accuracy Analysis.....	46
Table 4.4 Low Speed Accuracy Analysis.....	47
Table 4.5 Errors Ranking Table.....	48
Table 4.6 Accuracy Analysis.....	49
Table 4.7 High Speed Precision Analysis.....	50
Table 4.8 Medium Speed Precision Analysis.....	51
Table 4.9 Low Speed Precision Analysis.....	53
Table 4.10 Medium Speed Precision Analysis.....	54

