1. *Operations Engineering & Management*
2. *Facilities Engineering & Energy Management*
3. *Information Engineering*

DESIGN OF WAREHOUSE LAYOUT, INVENTORY SYSTEM, AND INFORMATION SYSTEM TO LOWER THE RISK OF OVERSTOCK IN A CIGARETTE DISTRIBUTION COMPANY

FINAL PROJECT

Submitted in Partial Fulfilment of the Requirements for the Degree of Bachelor of Engineering in Industrial Engineering



Fricilia Natalee Adesta

221412149

INTERNATIONAL INDUSTRIAL ENGINEERING PROGRAM (IUP)

DEPARTMENT OF INDUSTRIAL ENGINEERING

FACULTY OF INDUSTRIAL TECHNOLOGY

UNIVERSITAS ATMA JAYA YOGYAKARTA

YOGYAKARTA

2026

IDENTIFICATION PAGE

Final Project Titled:

Design of Warehouse Layout, Inventory System, And Information System To Lower The Risk of Overstock In A Cigarette Distribution Company

IE Body of Knowledge:

1. *Operations Engineering & Management*
2. *Facilities Engineering & Energy Management*
3. *Information Engineering*

Final Project Team:

No.	Name and Student ID	Program Studi	University	Description of Role in Design
1	Wildhelmus Tandioga	Industrial Engineering	UAJY	• Identify the root causes of overstock and collect data on the flow of goods. • Group goods based on movement rate using FSN (Fast, Slow, and Non-Moving). • Analyze storage space requirements based on stock levels, goods movement frequency, and warehouse capacity. • Determine storage location using dedicated storage so that each type of item has a designated storage area
2	Fricilia Natalee Adesta	Industrial Engineering	UAJY	• Identification of the implementation of inventory recording • Design of inventory receipt and issuance recording • Feasibility analysis of the recording module • Designing code in Visual Basic for Applications (VBA) • Testing of data entry using Excel • Implementation recording system

No.	Name and Student ID	Program Studi	University	Description of Role in Design
3	Seftianus Redi	Industrial Engineering	UAJY	• Identify data in performing calculations for ordering and warehouse capacity demand • Design regarding the number of raw material orders, raw material order timing, and raw material types • Feasibility analysis of the system that has been developed • Testing of the order quantity system • Implementation of an order quantity system

APPROVAL PAGE

HALAMAN PENGESAHAN

Tugas Akhir Berjudul

DESIGN OF WAREHOUSE LAYOUT, INVENTORY SYSTEM, AND INFORMATION SYSTEM TO LOWER THE RISK OF OVERSTOCK IN A CIGARETTE DISTRIBUTION COMPANY

yang disusun oleh

Fricilia Natalee Adesta

221412149

dinyatakan telah memenuhi syarat pada tanggal 29 Juli 2026

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Yogyakarta, 29 Juli 2026

Universitas Atma Jaya Yogyakarta

Teknologi Industri

Dekan

ttd.

Prof. Dr. Ir. Parama Kartika Dewa SP., S.T., M.T., IPU, ASEAN Eng.

Dokumen ini merupakan dokumen resmi UAJY yang tidak memerlukan tanda tangan karena dihasilkan secara elektronik oleh Sistem Bimbingan UAJY. UAJY bertanggung jawab penuh atas informasi yang tertera di dalam dokumen ini

COMPANY APPROVAL PAGE

Nomor : 007/ASM/OPS/XII/2025
Lampiran : -
Perihal : Pemberitahuan Rencana Penelitian

Kepada Yth.
Bapak Ir. Twin Yoshua R. Destyanto, S.T., M.Sc., Ph.D., IPM
Ketua Program Studi Teknik Industri UAJY

Dengan hormat,

Sehubungan dengan pelaksanaan kegiatan penelitian, bersama ini kami sampaikan bahwa mahasiswa Program Studi Teknik Industri Universitas Atma Jaya Yogyakarta yang tercantum di bawah ini akan melaksanakan penelitian di CV Andita Swarga Mahakarya.

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2	Seftianus Redi	220612133
3	Fricilia Natalee Adesta	221412149

Kegiatan penelitian tersebut dilaksanakan dalam rangka pemenuhan persyaratan akademik dan penyusunan tugas akhir mahasiswa. Penelitian ini akan dilaksanakan di lingkungan CV Andita Swarga Mahakarya sesuai dengan ketentuan dan prosedur yang berlaku.

Adapun pelaksanaan kegiatan penelitian direncanakan berlangsung pada tanggal 14 September 2025 – 14 Maret 2026.

Demikian surat pemberitahuan ini kami sampaikan untuk dapat diketahui dan dipergunakan sebagaimana mestinya. Atas perhatian serta kerja sama yang baik, kami ucapkan terima kasih.

Magelang, 19 Desember 2025

Hormat kami,
CV Andita Swarga Mahakarya



Lucia Darakartini Arvandita
Direktur Operasional

DECLARATION OF ORIGINALITY

We, the undersigned below:

1. Name : Wildhelmus Tandioga

   Student ID : 220612002

2. Name : Seftianus Redi

   Student ID : 220612133

3. Name : Fricilia Natalee Adesta

   Student ID : 221412149

We hereby declare that our final project titled ‘Design of Warehouse Layout, Inventory System, and Information System to Lower The Risk of Overstock in a Cigarette Distribution Company’, completed in 2025-2026, is our original work and does not contain plagiarism from any other source.

Should any inconsistency with this statement be discovered in the future, we are willing to be prosecuted and processed in accordance with applicable regulations, including the revocation of the degree awarded to us by Universitas Atma Jaya Yogyakarta.

We hereby make this statement in good faith and in all truthfulness.

Yogyakarta, 15 July 2026

The undersigned,



Wildhelmus Tandioga Seftianus Redi Fricilia Natalee Adesta

PREFACE

Praise and deepest gratitude to God Almighty for His blessings, guidance, and wisdom, which enabled the successful completion of this Final Project titled “Design of Warehouse Layout, Inventory System, And Information System To Lower The Risk of Overstock In A Cigarette Distribution Company”. This final project was prepared to fulfil part of the requirements for obtaining a Bachelor of Industrial Engineering degree from the Faculty of Industrial Technology at Universitas Atma Jaya Yogyakarta. The completion of this final project would not have been possible without the assistance, support, and guidance of various parties, including:

1. Dr. Ir. Parama Kartika Dewa, S.P., S.T., M.T., IPU, ASEAN Eng., as Dean of the Faculty of Industrial Technology.
2. Dr. Ir. Ign. Luddy Indra P., M.Sc., IPU, as Head of the Department of Industrial Engineering
3. Ir. Twin Yoshua Raharjo Destyanto, S.T., M.Sc., Ph.D., IPM, as Head of the study program of Industrial Engineering.
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11. Stakeholders involved at CV Andita Swarga Mahakarya, who assisted and supported the author in completing this research

12. All parties whose names can’t be listed individually who have contributed significantly to the preparation of this final project.

The author acknowledges that this final project is far from perfect and has many limitations. Therefore, the author welcomes constructive criticism and suggestions from readers to advance the research. May the results of this research contribute to the advancement of knowledge and serve as a blessing to many people.

In closing, the author hopes that all the hard work put into this final project is solely for the glory of God’s name.

Soli Deo Gloria

Yogyakarta, 15 July 2026

The Author,

Fricilia Natalee Adesta

DEDICATION PAGE

“I can do all things through Him who gives me strength”
(Philippians 4:13)

“Commit your work to the LORD, and your plans will be established”
(Proverbs 16:3)

“Wait for the LORD and keep His way, and He will exalt you to inherit the land; when the wicked are cut off, you will see it”
(Psalm 37:34)

Boundless praise and gratitude be to the presence of **Jesus Christ**, the Owner of Life, the Source of Wisdom, Knowledge, and True Strength. This Final Project is a tangible testament to His unfailing guidance, steadfast love, and endless grace. Every word, revision, and step leading up to the defense could never have been completed without the hands of God continuously guiding and upholding the author through every difficult time. With profound respect, love, and deep gratitude, this hard-earned Final Project is dedicated especially to:

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2. My Dearest Younger Siblings: Wesli, Ibeng, and Dede Hans, Our childhood memories are what I miss the most. Although we argued a lot back then, I am deeply grateful that we never had to wait to see each other—whenever I missed you, I could simply embrace you. Now, the four of us are separated by distance. To my younger siblings, I hope and am constantly striving so that your lives will be even better than your elder sister's. Grow as high as you can and bloom as beautifully as you can. If you ever fall, remember that you will always have "Icil" behind you, ready to support and lift you up. Icil is forever proud of all your achievements.

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ABSTRACT

CV Andita Swarga Mahakarya is a spice-flavoured cigarette processing company located in Magelang, Central Java, which produces four cigarette variants: Assikha Gold, Assikha Habbat, CK, and Tani Madjoe. However, the company faces a primary issue regarding a buildup of work-in-process inventory ranging from 25 to 75 cartons per week, which exceeds the actual storage capacity of the warehouse. This issue is triggered by three interrelated root causes: limited warehouse storage capacity, uncertainty in the timing and quantity of orders from the Malang factory, and a manual inventory system for tracking incoming and outgoing goods flow. To address these issues, an integrated solution was designed consisting of three proposed solution designs: a redesign of the fermentation warehouse layout with the addition of storage racks, a simulation-based inventory control system, and a digital inventory management information system based on Visual Basic for Applications (VBA) in Microsoft Excel.

The solution design process was conducted using the Design Thinking methodology, which consists of five stages: empathizing, defining, ideating, prototyping, and testing. In the inventory control system design solution, a continuous review system (Q-System) with a probabilistic inventory model and Monte Carlo simulation was applied to determine the optimal economic order quantity (Q) and reorder point (ROP). In the warehouse re-layout design solution, the fast, slow, non-moving (FSN) classification method and the dedicated storage policy are used to establish fixed storage areas based on product turnover rates. Meanwhile, the information system solution utilized the system development life cycle (SDLC) method to construct automation code for the Microsoft Excel Visual Basic for Applications (VBA)-based inventory tracking system.

The design results demonstrate that integrating all three proposed solution designs successfully met the designated Critical Success Factor (CSF) target, achieving a reduction in excess inventory of at least 15 cartons per week. For the inventory control solution, pre-simulation conditions showed an average overstock level of 28,20 bales with a total daily inventory cost of Rp 1.989.000, whereas post-simulation implementation significantly reduced average overstock to 9,97 bales and lowered the total daily inventory cost to Rp 1.800.025, yielding a daily cost saving of Rp 188.975 or 9.50%. For the re-layout solutions, pre-implementation capacity was limited to 200 cartons (800 bales) with random stockpiling outside the warehouse, whereas post-implementation with multi-tiered racks worth Rp 3.809.000 increased storage capacity to 260 cartons (1.385 bales) alongside a more organized material flow. For the information system solution, pre-implementation relied on manual ledgers prone to errors and data loss, whereas post-implementation produced an Excel VBA-based information system equipped with Role-Based Access Control, a real-time stock monitoring dashboard, ROP notifications, and automated sales invoice printing.

Keywords: Overstock, Continuous Review System, Monte Carlo Simulation, Dedicated Storage, Visual Basic for Applications (VBA)