

Layout Design Plan for PT. Golden Sweet Bakery Bread Factory

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Article Info

Article history:

Received February 20, 2025

Revised April 10, 2025

Accepted May 25, 2025

Keywords:

Facility Layout Design

Bakery Industry

Material Flow

Layout Efficiency

Systematic Layout Planning

ABSTRACT

Designing an effective factory facility layout is a critical step in establishing efficient manufacturing operations, particularly in the food industry. This study aims to develop a production facility layout design for PT Golden Sweet Bakery based on an analysis of organizational structure, bread production processes, and facility requirements. The research adopts a descriptive and applied approach, utilizing direct field observations, structured interviews, document analysis, and production flow mapping to identify spatial needs and functional relationships among production activities. The layout design is developed by applying industrial facility planning principles and food safety considerations, including the separation of clean and dirty zones, logical sequencing of production stages, and efficient placement of supporting facilities. The results indicate that the proposed layout supports a smoother production flow, reduces unnecessary material movement paths, and improves spatial organization while maintaining hygiene and worker safety. In addition, the layout provides flexibility to accommodate future expansion and operational changes. The proposed design serves as a structured foundation to support efficient, safe, and sustainable bakery production operations at PT Golden Sweet Bakery.

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1. INTRODUCTION

Today's industrial development has become so sophisticated that competition has become fierce. Companies seeking further business development also have this experience. All types of businesses are increasingly being asked to be more competitive in all areas, including customer service [1]. Customer service can be guaranteed by satisfying customers in terms of comfort [2]. Competition between restaurant owners is becoming increasingly common today. Therefore, in addition to ensuring high product quality, appropriate space requirements and design are also necessary.

Layout is a crucial aspect influencing the continuity of a company's production process. A proper and appropriate layout will shorten material transportation routes, minimize transportation costs, and streamline material flow [3]. It also prevents cross-contamination. This overall concept ensures that materials are transported through each facility in the shortest possible time. Facility layout is a crucial element in the operational activities of the manufacturing industry, including food industries such as bakeries [4]. An effectively designed layout can increase production efficiency, reduce waiting times, minimize material movement, and support a smooth process flow from raw materials to final products [5]. Therefore, optimal layout design plays a strategic role in increasing a company's productivity and competitiveness [6]. PT. Golden Sweet Bakery is a company engaged in the production of bread and cakes with increasing market demand. Along

with this growing demand, production process efficiency has become one of the company's main focuses. However, in its operations, several obstacles remain, such as inefficient production processes, the accumulation of raw materials in certain areas, and limited space that affects the smooth distribution of products. These problems indicate the need for evaluation and redesign of the current production facility layout. By designing a more systematic layout and in accordance with industrial engineering principles, it is hoped that the production process can run more smoothly, efficiently and ergonomically. The method used in designing this factory layout is a literature review method that compares previously conducted research and adjusts when necessary. This methodology minimizes material flow, identifies several other feasible alternatives, and establishes detailed procedures for designing the factory layout.

The objectives to be achieved in this research are to understand the layout system of facilities and good physical facilities so that service activities run smoothly, effectively and efficiently and to implement a redesign of the layout of facilities and physical facilities with the Systematic Layout Planning (SLP) method to maximize the use of space, and from this layout design is to minimize the total costs consisting of construction costs, material movement, production costs, maintenance and storage of goods. In other words, this design is used to optimize the relationship between operators, the flow of goods, the flow of information and the work procedures needed to create an effective and efficient business.

2. METHOD

This study employs a descriptive and applied approach to develop a layout design plan for PT. Golden Sweet Bakery Bread Factory. The research focuses on analyzing organizational structure, bread production processes, and facility layout arrangements to support efficient, safe, and sustainable factory operations. Data collection was conducted through direct field observations, structured interviews with company management and production personnel, and review of internal company documents, including production flow records, organizational charts, and facility specifications. An analysis of the company organizational structure was carried out to identify managerial responsibilities, interdepartmental relationships, and workflow coordination that influence spatial and functional requirements within the factory. The bread production process was examined by mapping each stage, starting from receiving raw material, storage, mixing, baking, cooling, packing, and distribution. This process analysis was used to determine equipment placement, material flow patterns, and potential bottlenecks within the production area. Facility layout design was developed by integrating the findings from organizational and process analyses with principles of industrial layout planning and food safety standards. The layout plan was evaluated based on criteria such as material handling efficiency, prevention of cross-contamination, worker safety, accessibility, and effective utilization of land area. The final layout design reflects an optimized arrangement of production, administrative, and supporting facilities that align with operational needs and organizational structure of PT. Golden Sweet Bakery Bread Factory.

3. RESULTS AND DISCUSSION

3.1. Company Organizational Structure

The organizational structure of PT. Golden Sweet Bakery Bread Factory is designed to support efficient production flow and effective managerial coordination in the layout design plan. Based on the organizational structure illustrated in Figure 1, the management system of PT. Golden Sweet Bakery Bread Factory is hierarchically arranged to ensure clear authority, effective coordination, and efficient workflow. The President Director and Vice Director occupy the highest levels of management, providing strategic direction and oversight, while the Finance, Research and Development, Marketing, Human Resources, and Production Managers translate strategic objectives into operational activities. This structure regulates communication flow and allocation of responsibilities, thereby supporting overall operational efficiency and managerial control.

At the functional level, each department is supported by clearly defined divisions that enhance specialization and performance. The Finance Manager oversees financial planning, budgeting, and administrative functions through the Administration and Finance Division, while the Research and Development Manager focuses on innovation, product improvement, and technological development. The Marketing Manager manages marketing, sales, and distribution strategies through the Distribution Division and the Marketing and Sales Division to ensure effective market reach. Human resource functions are managed by the Human Resources Manager, who is responsible for recruitment, training, and employee welfare, as well as supervising the Security and Sanitation Divisions to maintain a safe and clean working environment.

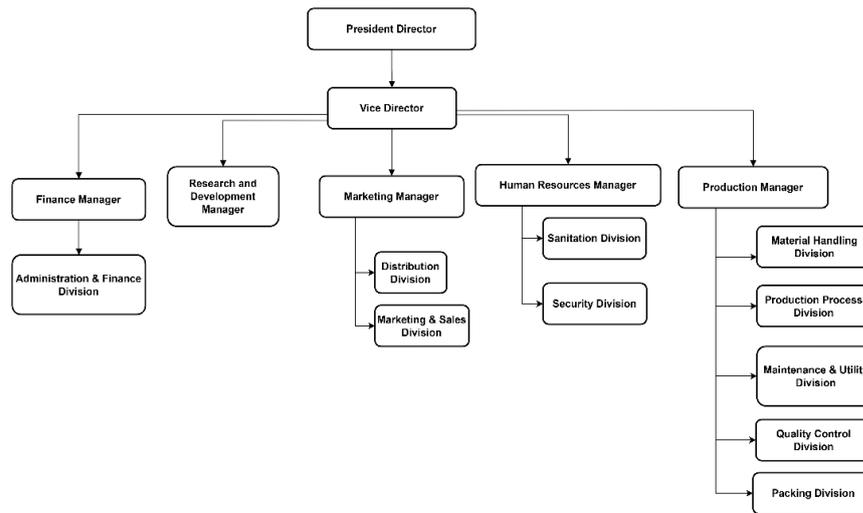


Figure 1. Organizational Structure

Production activities are organized to support a continuous and efficient manufacturing process. Under the supervision of the Production Manager, the Material Handling, Production Process, Maintenance and Utility, Quality Control, and Packing Divisions operate in an integrated manner to manage raw materials, ensure equipment reliability, maintain product quality, and prepare finished goods for distribution [7]. This clear division of labor minimizes operational overlaps, improves interdepartmental communication, and aligns spatial organization with functional relationships, thereby supporting the factory layout design plan and enhancing productivity and sustainable operational performance.

3.2. Bread Production Process at PT Golden Sweet Bakery

The production process is an activity carried out by individuals or groups to add or create services and goods where the process involves human labor, machines, equipment and materials to produce products that are useful for consumers [8]. The bread-making process at PT Golden Sweet Bakery consists of five main activities, namely mixing raw materials, the dough development process, molding the dough, baking, and finishing.

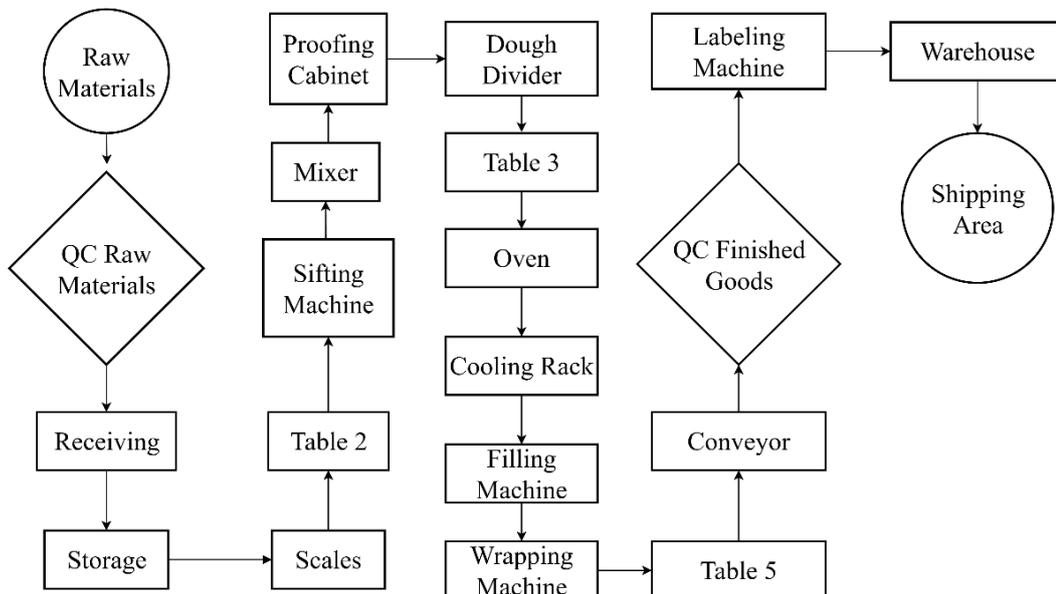


Figure 2. Production Process Flow

The production process begins with the receipt of raw materials, which then undergo a quality control stage to assess their quality. After passing quality control, the raw materials are received by the Receiving department, where they are stored in storage before being weighed on scales to ensure appropriate measurements are met. Next, the weighed raw materials will be further processed in Table 2, where they will

be filtered using a sifting machine to ensure the texture and quality meet applicable bread standards. The raw materials will then be fed into a mixer for mixing. The mixture (dough) will then be transferred to a proofing cabinet for fermentation or compaction. Once the proofing process is complete, the dough is transferred to the Dough Divider, where the formed dough is cut according to product specifications and requirements. This semi-finished product is then placed on Table 3 before being baked in the oven. After baking, the product is cooled on a cooling rack to maintain quality and texture before being packaged. The next stage is the filling process using a filling machine, followed by the wrapping process on a wrapping machine. Products that have been packaged according to applicable standards will be labeled on a labeling machine to ensure product identification and information complies with standards. The finished product will then undergo a final quality control (QC) process to ensure quality and suitability before being sold and received by consumers. Products that have passed the final QC stage are transferred to Table 5 via a conveyor before being stored in the warehouse. The products are then sent to the shipping area for distribution to customers. This production flow is designed to ensure efficiency at every stage, from raw material receipt to product distribution.

3.3. Facility layout design

Layout is the process of designing and arranging the physical layout of facilities such as equipment or machines, rooms, buildings, and land that functions to optimize the relationship between workers, methods, information flow, and the flow of materials needed to achieve company goals safely, economically, and efficiently[9]. The walls and floors of the production room must be made of strong, waterproof, smooth, and even cement [10]. This factory has a land area of 10 hectares with various facilities such as office, production space, and other supporting facilities are also considered. The layout of the production space and equipment must be good to produce an efficient layout and movement space and to prevent cross-contamination, especially for equipment that comes into direct contact with food ingredients. In the layout the office also has efficiency value, thus creating a high work productivity effect.

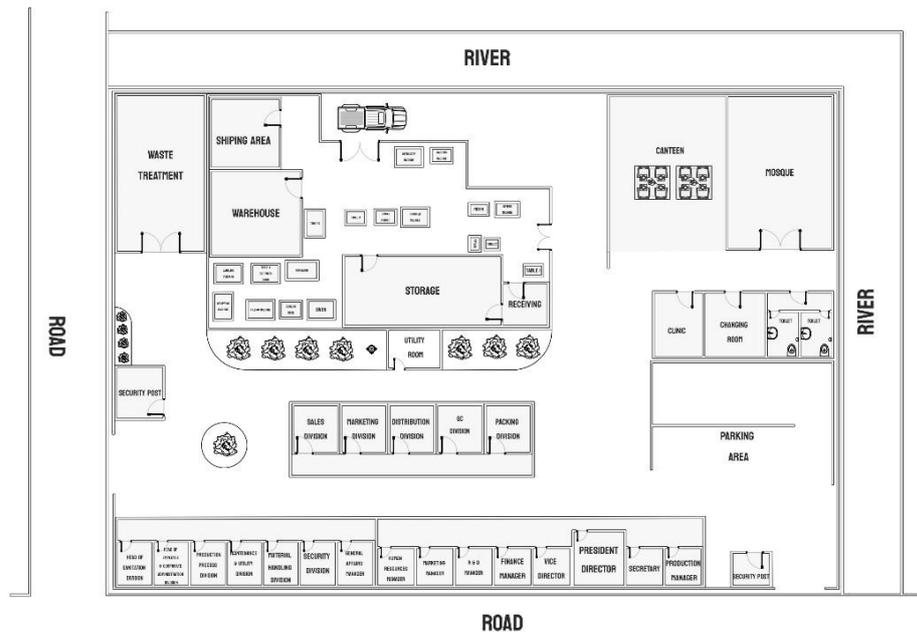


Figure 3. 2D Design of facility output

Based on the layout plan shown in Figure 3, the factory area is systematically zoned to support efficient material flow, employee movement, and operational safety. Production-related facilities such as receiving, storage, processing areas, packing, and the warehouse are arranged in a logical sequence to minimize backtracking and material handling distances, thereby improving production efficiency. Supporting facilities including waste treatment, utility rooms, and shipping areas are positioned separately from main production zones to reduce contamination risks and ensure compliance with food safety standards. In addition, administrative offices, canteen, clinic, mosque, and parking areas are strategically placed to provide accessibility for employees without interfering with production activities, reflecting an integrated layout design that balances operational efficiency, hygiene requirements, and worker comfort.



Figure 4. 3D design of facility output

Figure 4 illustrates the physical model (maket) of PT Golden Sweet Bakery, which represents an integrated production and facility layout designed to support efficient bakery operations, optimized material flow, and effective workplace organization. The layout reflects a systematic separation between production areas, storage, supporting facilities, and circulation paths, which is essential for maintaining hygiene, safety, and operational efficiency in food manufacturing. The central area of the layout represents the main production zone, where processing activities such as mixing, shaping, baking, and packaging are arranged in a linear and sequential manner. This configuration minimizes unnecessary material handling and backtracking, allowing raw materials to move smoothly from storage to processing and finally to finished goods handling. Clear zoning in the production area also supports compliance with food safety standards by reducing cross-contamination risks between raw and processed products. Supporting facilities, including raw material storage and equipment placement, are positioned adjacent to the production area. This proximity reduces transportation time and improves responsiveness during production. The arrangement of equipment and workstations within the production zone appears to follow ergonomic considerations, providing adequate space for operator movement and equipment maintenance. The presence of designated circulation paths and road access around the facility indicates careful planning of logistics and transportation. Vehicle access routes for loading and unloading are clearly separated from internal production spaces, enhancing safety and reducing interference between personnel and vehicle movement. Parking areas located at the front of the facility further support organized traffic flow for employees and visitors. Green areas and landscaping elements shown in the maket contribute to environmental comfort and workplace aesthetics. These areas can help reduce heat, improve air quality, and create a more pleasant working environment. Additionally, the inclusion of administrative and supporting rooms separated from the main production floor ensures that managerial and documentation activities do not disrupt production operations.

4. CONCLUSION

This study successfully developed a production facility layout design for PT Golden Sweet Bakery by integrating organizational analysis, production process mapping, and facility planning principles. The proposed layout emphasizes logical sequencing of production activities, effective zoning between clean and non-clean areas, and appropriate placement of supporting facilities to enhance operational organization and food safety. Based on the design evaluation, the layout supports improved material flow patterns, clearer workspace organization, and safer movement for workers and equipment within the production area. In addition, the layout accommodates administrative and employee facilities without disrupting core production activities, thereby supporting effective management and communication. Although the study focuses on layout planning rather than quantitative optimization, the proposed design provides a flexible and practical framework that can support future expansion and improvements in production efficiency. Overall, this layout design can serve as a strategic reference for PT Golden Sweet Bakery in developing sustainable and well-structured manufacturing operations.

ACKNOWLEDGEMENTS

The authors would like to express their sincere gratitude to all parties who contributed to the completion of this research, with special appreciation extended to the Computer Laboratory for its support in conducting the simulations.

REFERENCES

- [1] C. Nwachukwu and H. M. Vu, "Service Innovation, Marketing Innovation and Customer Satisfaction: Moderating Role of Competitive Intensity," *Sage Open*, vol. 12, no. 2, Apr. 2022, doi: 10.1177/21582440221082146.
- [2] Z. Azzam, R. Salman, M. Allan, and S. Farsi, "Study on Customer Comfort as a Behavioral Construct Between Service Quality and Customer Satisfaction in Light of Digital Transformation. A Case of Jordan," 2023, pp. 34–47. doi: 10.1007/978-3-031-39158-3_4.
- [3] Q. Feng *et al.*, "Multi-level predictive maintenance of smart manufacturing systems driven by digital twin: A matheuristics approach," *J. Manuf. Syst.*, vol. 68, pp. 443–454, Jun. 2023, doi: 10.1016/j.jmsy.2023.05.004.
- [4] F. Febriani and F. Wurjaningrum, "Systematic Layout Planning to Improve Facility Layout in Small and Medium Food Enterprise," *Southeast Asian Bus. Rev.*, vol. 2, no. 2, pp. 111–117, Aug. 2024, doi: 10.20473/sabr.v2i2.60850.
- [5] G. Eswar Balachandar and C. Bhaskar Reddy, "Enhancing Manufacturing Efficiency: A Strategic Approach to Facility Layout Optimization," 2025, pp. 115–125. doi: 10.1007/978-981-96-4718-7_10.
- [6] H. Choi *et al.*, "Optimization of the Factory Layout and Production Flow Using Production-Simulation-Based Reinforcement Learning," *Machines*, vol. 12, no. 6, p. 390, Jun. 2024, doi: 10.3390/machines12060390.
- [7] S. Ramingwong, A. Sopadang, K. Y. Tippayawong, and J. Jintana, "Factory Logistics Improvement: A Case Study Analysis of Companies in Northern Thailand, 2022–2024," *Logistics*, vol. 8, no. 3, p. 88, Sep. 2024, doi: 10.3390/logistics8030088.
- [8] C. Zhang, Y. Zhao, T. Li, X. Zhang, and M. Adnoui, "Generic visual data mining-based framework for revealing abnormal operation patterns in building energy systems," *Autom. Constr.*, vol. 125, p. 103624, May 2021, doi: 10.1016/j.autcon.2021.103624.
- [9] S. Komesker, W. Motsch, J. Popper, A. Sidorenko, A. Wagner, and M. Ruskowski, "Enabling a Multi-Agent System for Resilient Production Flow in Modular Production Systems," *Procedia CIRP*, vol. 107, pp. 991–998, 2022, doi: 10.1016/j.procir.2022.05.097.
- [10] S. A. Elfatah, "Improving the performance of heavy industry concrete floors," *J. Build. Pathol. Rehabil.*, vol. 9, no. 1, p. 7, Jun. 2024, doi: 10.1007/s41024-023-00355-6.