



Improving The Z-OHP Warehouse System using Plan, Do, Check, Action (PDCA) Method to Increase Warehouse Efficiency and Minimize Differences in Stock Opname

Saskia Kanisaa Puspanikan ¹, Virgantina ², Mumu Komaro ³, Dwi Novi Wulansari ⁴

^{1,2,3,4}Universitas Pendidikan Indonesia, Indonesia

Correspondence: E-mail: saskia.kanisaa@upi.edu

ABSTRACTS

PT XYZ is an automotive manufacturing company that produces precision spare parts for two- and four-wheeled vehicles in Indonesia. Out House Parts (OHP) is a production type involving activities outside the company. The Z-OHP is a product produced using OHP material with PT Z as the customer. This research uses unstructured interviews, field observations, and company data. This study applies the Plan-Do-Check-Action (PDCA) method to improve Z-OHP warehouse efficiency and reduce stock opname discrepancies. Using interviews, field observations, and company data, several improvements were implemented, including 5S, layout redesign, and SOPs. The 5S audit score increased from 43 to 81, material shortages were eliminated, FIFO was sustained, and discrepancies in stock opname decreased by 57.63%. These results highlight the benefits of PDCA-based continuous improvement for warehouse management; the material is well controlled, FIFO runs, and there is no material shortage. Implementing a Kanban system can minimize differences in stock opname and material supply efficiency to the assembly line.

ARTICLE INFO

Article History:

Submitted/Received 20 January 2024

First Revised 25 January 2024

Accepted 29 February 2024

Online Date 31 March 2024

Published Date 01 April 2024

Keyword:

5S,
FIFO,
Kanban,
Min-Max Stock,
PDCA

1. INTRODUCTION

The rapid advancement of the industrial sector has led to increasingly intense competition among companies. In order to meet customer demands, companies must remain responsive in both service delivery and product availability (Suwandi et al, 2023). Product availability is closely related to how a company manages inventory in its storage warehouses and supplies materials for production processes in a timely and accurate manner. Therefore, effective inventory management is crucial to ensuring smooth production operations, which in turn enhances customer loyalty and increases company profitability.

Warehouses play a vital role in manufacturing companies (Makatengkeng et al., 2019). Ensuring alignment between actual inventory and records in the System Application and Product in Data Processing (SAP) enables timely material supply and smooth inventory cycles, minimizing shortages (Putri & Pamungkas, 2020).

As a company specializing in the production of precision spare parts for two- and four-wheeled vehicles, PT XYZ is committed to continuous improvement (kaizen) across all operational aspects to enhance customer satisfaction and deliver high-quality products and services. One of the production types implemented at PT XYZ is the Out House Parts (OHP) system, which involves outsourcing production activities to external parties or subcontractors. Z-OHP is a specific type of OHP material produced by PT XYZ for its client, PT Z. These materials are stored in the Z-OHP warehouse, alongside production support tools and materials such as cleaning cloths, plastic packaging, cardboard boxes, grinding stones, and others.

The storage structure in the Z-OHP warehouse lacks clear guidelines and standards, leading to disorganized and careless storage practices by personnel. As a result, the warehouse environment is disorderly, unclean, and materials are often mixed together. During the March–April 2023 period, the warehouse received a 5S audit score of 43 points—the lowest among all clusters. Additionally, materials are stored in a stacked system, where assembly operators tend to retrieve items only from the top, leaving those at the bottom unused for long periods. The material supply system from the Z-OHP warehouse to the assembly line is also unregulated in terms of quantity per retrieval, requiring operators to manually count the materials and record them on paper forms.

This manual process of retrieval, counting, and recording creates risks of uncontrolled material quality and quantity due to potential counting errors, material loss, or quality degradation from being stored unused at the bottom of stacks. The stacking system complicates inventory control, resulting in material shortages and significant discrepancies in stock opname.

This study aims to evaluate and implement improvements using the Plan-Do-Check-Action (PDCA) method to enhance warehouse efficiency and minimize stock opname discrepancies in the Z-OHP warehouse. The PDCA approach is applied through the Quality Control Circle (QCC) method, which consists of 8 steps and 7 tools. This method addresses issues from the perspectives of quality, cost, delivery, safety, morale, productivity, and environment (QCDSMPE), identifies root causes, evaluates solutions based on cost-effectiveness and implementation difficulty, and culminates in standardization and follow-up plans.

2. METHODS

According to the Kamus Besar Bahasa Indonesia (KBBI), efficiency is defined as the ability to carry out tasks accurately and effectively without wasting time, effort, or resources. Warehouse efficiency refers to an approach aimed at optimizing warehouse operations through best practices and solutions that improve productivity and reduce operational costs. Inefficient warehouse systems can result in order errors, delivery delays, customer dissatisfaction, and ultimately reduced company profits (SFC, 2023).

2.1. Plan Do Check Action (PDCA)

As noted by Isniah et al. (2020), the PDCA (Plan-Do-Check-Action) method is a quality management system widely applied in both manufacturing and service sectors. It serves as a framework for continuous, forward-looking, flexible, logical, and practical improvement processes. The implementation of kaizen through PDCA is structured into eight steps known as the Quality Control Circle (QCC). QCC is a system of quality control utilizing 8 steps and 7 tools designed for sustainable, ongoing improvement (Khamaludin & Respati, 2019; Nasution, Yulianto, & Ikhsan, 2018). The steps in the QCC (Quality Control Circle) PDCA method are as follows:

1. **Plan:** Define the theme, analyze the current condition, set targets, and perform cause-and-effect analysis.
2. **Do:** Develop and implement improvement plans.
3. **Check:** Evaluate the results.
4. **Action:** Standardize and establish follow-up plans.

The seven tools employed in the QCC PDCA method include: the checklist, histogram, Pareto diagram, scatter diagram, stratification diagram, cause-and-effect diagram, and control chart.

Stock Opname (STO) is the process by which a company counts, verifies, and records all its material inventory at a specific point in time (Jeremi & Herwanto, 2021). The primary objective of stock opname is to ensure that inventory records in the system match the actual physical quantities in the warehouse. It also serves as a control mechanism to prevent operational costs from exceeding established limits and enables accurate future inventory planning.

2.2. 5S Concepts

The 5S concept, a methodology originating from Japan, aims to create a well-organized, efficient, and safe working environment. According to (Devani & Fitra 2016 ; Gaspersz 2001), the 5S steps are:

1. Seiri (Sort): Eliminate unnecessary items from the workplace.
2. Seiton (Set in order): Arrange necessary items neatly and logically for easy access.
3. Seiso (Shine): Regularly clean the workplace to maintain hygiene and prevent dirt accumulation.
4. Seiketsu (Standardize): Standardize work processes to maintain cleanliness and order.
5. Shitsuke (Sustain): Instill self-discipline and habitually follow the 5S rules.

2.3. Stock Opname

Min-Max Stock is an inventory management technique that controls the minimum and maximum number of products stored in a warehouse. This method aims to maintain a balance between customer needs and storage costs (Alvianto, et al., 2020).

1. Determining Safety Stock
2. Determining Minimum Inventory
min stock = 1 day material requirement x minimum number of working days(1)
3. Determining Maximum Inventory
max stock= 1 day material requirement x maximum number of working days(2)
4. Reorder Point
Q = max – min(3)
Define
Q: reorder level, max is the maximum inventory, min is the minimum inventory.

First in First Out (FIFO) is an inventory management strategy that prioritizes the use of goods based on the order of arrival. Goods that enter the warehouse will be the first to be used or sold. The goal is to prevent inventory from being stored too long in the warehouse, which can result in damage or expiration ([Jacobus & Sumarauw, 2018](#)).

2.4. Kanban

Kanban is an inventory management tool commonly used in production and inventory management to control the flow of materials and components efficiently. Kanban is a tool to achieve Just-in-Time (JIT) production in the form of a card that provides information about the need for additional inventory ([Thadeus & Octavia, 2018](#)). Kanban functions to determine the type and quantity of products that must be produced in the process. Retrieval Kanban is a type of Kanban that determines the type and quantity of products that need to be taken from the previous process by the next process ([Sinambela, 2020](#)).

2.5. Research Methods

The research data used in this study are primary data, including unstructured interviews and direct observation, as well as secondary data in the form of company data documentation such as inventory reports, stock opname data, Z-OHP stock monitoring data, shipping monitoring data, and Z-OHP transfer posting data. This study applied the PDCA method to analyze warehouse efficiency issues. The steps included problem identification, setting research objectives, designing improvement actions (5S, min–max stock, Kanban), implementing them in the Z-OHP warehouse, and evaluating outcomes. Data were collected through direct observation, interviews with warehouse operators, and company documents such as inventory reports and stock opname records.

3. RESULTS AND DISCUSSION

This research uses the PDCA method which begins with determining the theme, determining the objectives, evaluating the results, and standardizing.

3.1. Determining the Theme

The initial assessment revealed multiple issues affecting the performance of the Z-OHP warehouse across quality, cost, delivery, safety, morale, productivity, and environmental dimensions. From a quality perspective, materials stored in stacking systems often remained

unused at the bottom of piles, resulting in deterioration over time and material shortages. In terms of cost, weak stock control led to the risk of excess inventory. Delivery performance was also compromised, as the irregular storage layout made it difficult to locate materials quickly, increasing the likelihood of delays. Safety hazards emerged from high and unstable stacks of goods that posed risks to warehouse operators. Worker morale was negatively impacted by time-consuming activities such as searching, counting, and recording materials, which were exacerbated by disorganized storage practices. Productivity suffered for similar reasons, as locating goods became inefficient and hampered overall performance. Finally, the warehouse environment was poorly maintained; the accumulation of materials was unmanaged, leading to non-compliance with the 5S standards of workplace organization.

3.2. Actual Conditions

Analysis of existing conditions by presenting problem findings in the improvement area.

3.3. Achieving Target

- a. Specific: Improve Z-OHP warehouse efficiency and minimize Z-OHP stock opname differences.
- b. Measurable: The 5R audit score in the Z-OHP warehouse increased to 81 points and No Z-OHP materials experienced shortages.
- c. Achievable: Overcome the problem of Z-OHP warehouse storage efficiency, Overcome the problem of Z-OHP material storage efficiency, Overcome the problem of Z-OHP material supply efficiency to the assembly line.
- d. Relevant: The objectives of this project are in line with the strategic objectives of PT XYZ, namely to "improve the effectiveness and efficiency of the process" and "implement cultural programs across clusters.
- e. Time-Bound Goals: 5R improvements are carried out before the 5R audit period of May and June 2023, Improvements to reduce stock opname differences are carried out before the 2023 stock opname activity

3.4. Cause and Effect Analysis

Cause and Effect Analysis is conducted using the 5 Whys.

3.5. Creating an Improvement Plan

In determining the improvement idea from the root cause obtained, PT XYZ needs to consider the improvement solution in terms of cost, effectiveness, and level of difficulty as a comparison in finding the best solution using the stratification method. The improvement plan and assessment standards.

3.6. Improving and evaluation

a. Implementing 5S, Creating Layout and SOP for Z-OHP Warehouse

Performance changes from the improvements that have been made, namely the 5S audit score of the Z-OHP Warehouse became 81 points in the May-June 2023 period. The Z-OHP Warehouse is organized and neat; has a clear layout; materials are stored according to the layout; ventilation, walls and floors are clean; efficient storage and retrieval of materials; equipped with a 5S checklist that must be filled in periodically so that 5S is maintained; and equipped with an SOP as a form of guidance in storing in the Z-OHP Warehouse as seen in Figure 1. However, there are still workers/operators who place goods/materials that do not

match the layout which has the potential to reduce the 5S audit score. So, it is necessary to carry out further socialization and supervision.

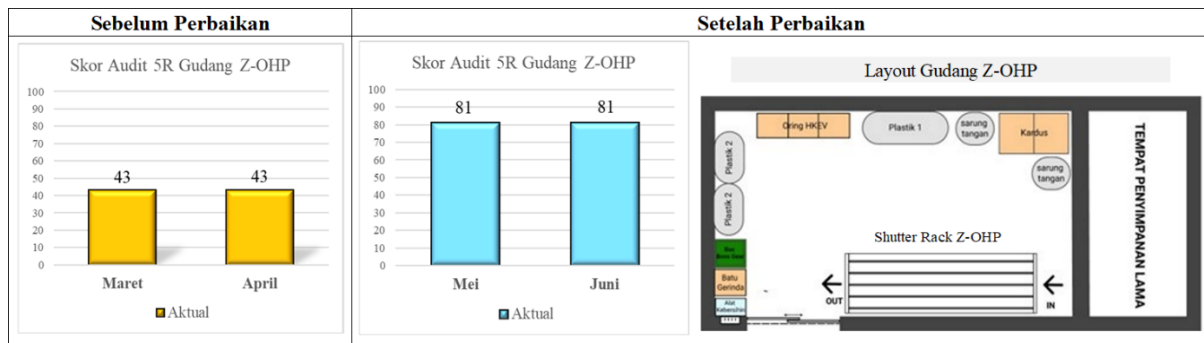


Figure 1. Improvements in Z-OHP warehouse after implementing 5S, layout redesign, and SOPs.

b. Determining Min-Max Stock Standards and Procurement of Shutter Rack Z-OHP

Performance changes from the improvements made are the efficiency of the storage process, searching, and taking Z-OHP materials; The person in charge of the Z-OHP Warehouse can easily find out information and conditions of Z-OHP stock; Z-OHP stock is well controlled; There is no material shortage; The FIFO system can run well; Visualization of the min-max of Z-OHP materials as shown in Figure 2.



Figure 2. 6 Results of Improvement from Min-max Stock and Shutter Rack Implementation.

Performance changes from the improvements made are the efficiency of the storage process, searching, and taking Z-OHP materials; The person in charge of the Z-OHP Warehouse can easily find out information and conditions of Z-OHP stock; Z-OHP stock is well controlled; There is no material shortage; The FIFO system can run well; Visualization of the min-max of Z-OHP materials as shown in Figure 2.

c. Implementation of Kanban System at Z-OHP

Improvements were evaluated to understand the process that occurs during the implementation of Kanban at the Z-OHP Warehouse. The implementation of Kanban in the company has obstacles so that the implementation process cannot run well. The main obstacle in the Kanban distribution process is the indiscipline of warehouse and assembly operators as Kanban implementers. In fact, the work instructions stipulate that the use of Kanban only moves kanban from the white kanban post to the black kanban post when taking materials for the assembly process. However, some operators do not. In addition, warehouse

operators must also be disciplined in calculating the number of Kanbans, inputting the number of Kanbans into the system, and returning the Kanban cards in the morning (8 am) before the Z assembly line operates. This indiscipline can cause Kanban implementers to find differences between what is recorded in the system and what should be. To overcome this problem, the steps that need to be taken are to provide information to operators regarding the work instructions made and explain the possible consequences if this behavior is repeated. Performance changes due to improvements that have been made, namely the Z-OHP warehouse PIC becomes easier to input Z-OHP assembly requirements data without potential errors; Assy operators do not need to calculate assembly material requirements manually and do not need to fill out assy material requirements forms (time efficiency); efficiency of the material supply process to the assembly line and material input to the system; and minimizing the difference in stock opname on Z-OHP as seen in Figure 3.

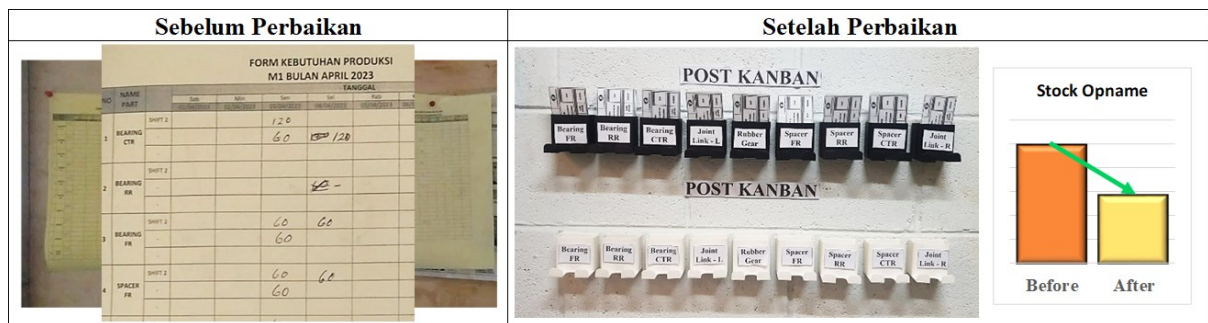


Figure 3. Improvement Results from Kanban Implementation

The results of improvements based on the QCDSMPE aspects are as follows:

- Quality: Monitoring the amount, age and condition of Z-OHP stock with a storage system using the shutter and min-max methods so that no material is piled up (expired) and the FIFO system runs efficiently.
- Cost: Easy to control Z-OHP stock, and inventory is well controlled.
- Delivery: Smooth delivery.
- Safety: There is no potential danger because the goods are placed correctly.
- Morale: The process becomes efficient, and work enthusiasm increases.
- Productivity: Increases productivity.
- Environment: 5R Z-OHP warehouse is maintained.

4. CONCLUSION

Based on the results of the research and discussion that has been carried out using the Plan, Do, Check, Action (PDCA) system with the 8-step 7-tool Quality Control Circle (QCC) method, an improvement plan was obtained, namely by implementing 5S, creating a layout and SOP for the Z-OHP warehouse; setting min-max stock standards and procuring Z-OHP shutter racks; and implementing a kanban system at Z-OHP. The results obtained are storage efficiency in the Z-OHP warehouse, an increase in the 5R audit score in the OHP warehouse from 43 points in the March-April 2023 period to 81 points in the May-June 2023 period, efficiency of taking and storing Z-OHP materials, the FIFO system can run efficiently, Efficiency of Z-OHP material supply to the assembly line, and a decrease in the Z-OHP stock opname gap with an average decrease of 57.63%.

7. REFERENCES

- Alvianto, I. B., Budiasih, E., & Pamoso, A. (2020). Analisis Penentuan Reorder Point untuk Prediksi dan Optimasi Suku Cadang pada Mesin X di PT XYZ Menggunakan Metode Realliability Centered Spares (RCS) dan MIn-Max Stock. *e-Proceeding of Engineering*, 7(2), 5233-5241.
- Devani, V., & Fitra, A. (2016). Analisis Penerapan Konsep 5S di Bagian Proses Maintenance PT. Traktor Nusantara. *Jurnal Teknik Industri*, 2(2), 112-119.
- Gaspersz, Vincent. (2001). *Metode Analisis Untuk Peningkatan Kualitas*. Cetakan Pertama, Jakarta: PT. Gramedia Pustaka Utama.
- Isniah, S., Purba, H. H., & Debora, F. (2020). Plan Do Check Action (PDCA) method: literature review and research issues. *Jurnal Sistem dan Manajemen Industri*, 4(1), 72-81.
- Jacobus, S. I., & Sumarauw, J. S. (2018). Analisis Sistem Manajemen Pergudangan pada CV. Pasific Indah Manado. *Jurnal EMBA*, 6(4), 2278-2287.
- Jeremi, M. V., & Herwanto, D. (2021). Analisis Implementasi Stock Opname Internal pada Manajemen Pergudangan Perusahaan (Studi Kasus:PT. Granitoguna Building Ceramics). *Serambi Engineering*, 6(1), 1616-1623.
- Khamaludin, & Respati, A. P. (2019). Implementasi Metode QCC untuk Menurunkan Jumlah Sisa Sampel Pengujian Compound. *Jurnal Optimasi Sistem Industri*, 18(2), 176-185.
- Makatengkeng, C., Jan, A. B., & Sumarauw, J. S. (2019). Analisis Sistem Manajemen Pergudangan pada PT. Timur Laut Jaya Manado. *Jurnal EMBA*, 7(4), 5912-5933.
- Nasution, A. Y., Yulianto, S., & Ikhsan, N. (2018). Implementasi Metode Quality Control Circle Untuk Peningkatan Kapasitas Produksi Propeller Shaft di PT XYZ. *Jurnal Mesin Teknologi*, 12(1), 33-39.
- Novianto, P. F., Safaruddin, & Furwanto, E. (2022). Analisis Persediaan Bahan Baku Pozzolan pada PT Semen Baturaja. *Journal of International Management*, 1(1), 55-62.
- Putri, H. S., & Pamungkas, S. A. (2020). Perbaikan Selisih Stock Gudang SMT PT SDI pada Sistem ERP Microsoft Dynamics AX Menggunakan Metode Fishbone. *Jurnal Jaring SainTek*, 2(2), 25-33.
- SFC. (2023, Desember 28). Apa Itu Efisiensi Gudang dan Cara Meningkatkan. Diambil kembali dari sendfromchina: https://www-sendfromchina-com.translate.google/NewsCenter/what-is-warehouse-efficiency.html?_x_tr_sl=en&_x_tr_tl=id&_x_tr_hl=id&_x_tr_pto=tc
- Sinambela, Y. (2020). Analisis Kebutuhan Kartu Kanban Pada Proses Perakitan Produk X. *Jurnal Ilmiah Fakultas Teknik Universitas Quality*, 4(2), 41-48.
- Suwandi, E., Xuan, T. L., Zidane, Saputra, T. A., & Hendri. (2023). Analisa Penerapan Manajemen Operasional Pada Perusahaan Danone Indonesia. *Jurnal Mirai Management*, 8(2), 188-195.
- Thadeus, H., & Octavia, T. (2018). Penerapan Kanban pada Sistem Inventori PT FSCM Manufacturing Indonesia. *Jurnal Titra*, 6(2), 115-122.