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Spare Parts Warehouse Management Strategy with 5S Standard and ABC Method at PT Satya Mandiri Motors East Surabaya

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Abstract

Warehousing management is a crucial element in the supply chain of the automotive industry to support the smooth distribution of goods and operational efficiency. This study aims to analyze the management conditions of spare parts warehouses and evaluate the integration of 5S standard strategies (Seiri, Seiton, Seiso, Seiketsu, Shitsuke) and the Activity-Based Classification (ABC) grouping method at PT Satya Mandiri Motors Surabaya Timur. The research method used is a qualitative approach with the type of field research through observation, in-depth interviews with nine informants, and analysis of stock taking documentation. The research occupies the position of developing warehousing operational strategies in the premium automotive retail industry. The results of the study show that the ABC classification divides spare parts inventory into Category A by 49.75% of the total usage value, Category B by 31.08%, and Category C by 19.17%. The integration of the ABC method and the 5S standard is able to significantly improve the regularity of the storage layout, speed up the time of searching and picking up goods, minimize the risk of stockout and overstock, and optimize the efficiency of warehouse space.

Keywords: Warehouse Management, 5S Standard, ABC Method, Spare Parts, Inventory Control

INTRODUCTION

In today's era of global competition and rapid technological advancements, operational efficiency is a determining factor for an organization's success. Companies in the automotive industry are facing increasing pressure to distribute goods accurately, on time, and cost-efficiently. One of the main pillars that underpin these operations is

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warehouse management. Warehouses function not only as static storage facilities for raw materials, spare parts, and finished products, but also as strategic points in the supply chain (Atlanta Falcons 2023).

However, many companies experience operational obstacles due to improper layout, inaccurate stock data, and unstandardized handling procedures. This problem has an impact on increasing pick-up times (*retrieval time*), there is a risk of running out of stock (*Stockout*) or stock buildup (*Overstocking*), as well as the swelling of storage costs (In'amy Fawwaz and Abdurrahman Faris Indriya Himawan 2021). To maximize storage space efficiency and maintain service levels (*Service Level*) high quality, optimal warehouse performance is required. Good spare parts inventory management can minimize supply chain risks directly, preventing the occurrence of *Stockout* vehicle maintenance, as well as minimizing working capital tied to excess inventory (Decy Arwini and Kresna Suputra 2025). On the other hand, suboptimal warehouse arrangements create operational waste, such as delays in picking up goods (*Order Picking.*), labor imbalances, and misplaced goods (Febriani, Puspasari, and Dony Suhendra 2024).

To address these operational challenges, structured and strategic management methods must be implemented. The 5S framework, which consists of *Shirley* (Brief), *Seiton* (Rabbi), *Seiso* (Clean), *Seiketsu* (Treat), and *Shitsuke* (Diligent) provides the foundation for creating an orderly, clean, and safe work environment (Setiadi et al. 2025). Simultaneously, the *Activity-Based Classification* (ABC) classifies inventory based on financial consumption value and frequency of use in accordance with the Pareto Principle (Sitania, Farida, and Sitania 2025).

Although previous research has largely discussed the application of *lean* 5S tools or ABC inventory management separately, empirical research examining the strategic integration of these two methods in *multi-brand* premium automotive authorized dealers is still limited. PT Satya Mandiri Motors Surabaya Timur manages a large inventory of high-value components for premium brands (Piaggio, Vespa, Aprilia, Moto Guzzi), where space constraints, inventory gaps, and delays in picking up goods are still frequent.

This research fills the empirical gap by evaluating the current condition of warehouses, analyzing the implementation of 5S and ABC methods, and formulating an integrated warehouse management strategy to improve operational productivity and service quality. Accordingly, this study addresses three questions:

1. What warehouse practices and implementation gaps can be identified using the 5S framework?
2. What inventory priorities can be established from the available spare parts records, and what limitations affect their interpretation?
3. How can these findings inform a practical warehouse improvement strategy?

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LITERATURE REVIEW

Recent studies in warehousing operations emphasize the importance of methodology *lean* and inventory grouping techniques to eliminate waste (*Waste*) (Ramadhan and Mahbubah 2022).

Researching the optimization of warehouse layouts by combining 5S and ABC analysis, which shows that grouping goods based on movement speed (*velocity*) and physical spatial arrangement can reduce material mileage. Enardo (2022) proved that the combination of ABC classification with the 5S *lean* principle in parts warehouses succeeded in cutting the average search time from 13.73 minutes to 3.96 minutes. In line with this, Hanggara (2024) and Novrianto et al. (2024) confirmed that the implementation of *the Class-Based Storage* policy based on ABC analysis is able to optimize the use of warehouse space and reduce waste of *material handling*.

The literature review confirms that 5S creates physical order and discipline in the work area, while the ABC classification gives quantitative priority to control Stick (Stuart and Stuart Stuart 2025). Integrating these two approaches allows companies to align visual management across

A workplace with strategic inventory control, so that goods with a high turnover rate obtain good physical accessibility as well as strict administrative supervision.

The literature review in this study is thematically structured based on key concepts in modern operational and warehousing management:

Concept and Type of Warehousing: Warehouses are important facilities in the supply chain that function as temporary storage of materials and a buffer against fluctuations in market demand. According to Warman (2012), manufacturing industry warehouses are classified into four main types, namely Raw Material Warehouses, Distribution Centers, Equipment Warehouses/MRO (Maintenance, Repair, and Operations), and Seasonal Warehouses. Effective management of MRO warehouses is very important to maintain the reliability of operational facilities and prevent service delays.(Dewi Puspa Ika 2022).

The concept of the 5S standard, which in Indonesian is known as 5R (*Ringkas, Rapi, Resik, Rawat, Rajin*), is one of the methods that is often applied in efforts to improve the efficiency and effectiveness of storing goods in warehouses. This approach focuses on structuring and managing the work environment to be more organized and maintained. This method consists of five elements, namely *Seiri, Seiton, Seiso, Seiketsu, and Shitsuke* (Putra and Prakoso 2020).

RESEARCH METHODS

This study uses a descriptive qualitative approach with field study techniques (Nasrudin 2023). Primary and secondary data were collected at PT Satya Mandiri Motors

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located in Surabaya, East Java, in the range of April to May 2026. Data collection was carried out through three main techniques:

In-Depth Interview: Conducted with 9 key and supporting informants, including After Sales Manager, Operational Supervisor, Warehouse Admin, Finance Supervisor, Branch Manager) and supporting informants (Staff Finance, Sales, Security, Office Boy), as well as participatory direct observation in the field. Field Observation: Direct observation of warehouse operations, storage layout, 5S compliance, and stock handling procedures.

Documentation: Analysis of the 2025 annual stock taking report, Standard Operating Procedures (SOPs), and inventory log records.

Quantitative analysis for inventory classification used the ABC method on 17 high-demand spare parts items representing the 2025 stock report. These items were grouped into Category A (high cumulative value/fast-moving), Category B (medium-moving), and Category C (low-value/slow-moving) according to APA standards. The validity of the data was tested through triangulation of sources and techniques, peer debriefing, and member checking.(Susanto, Risnita, and Jailani 2023)

General Picture of 5S Implementation

Field evaluation shows that PT Satya Mandiri Motors has implemented the basic principles of 5S, although its operational consistency still requires continuous improvement:

1. **Seiri (Short)**: Non-functional, damaged, or obsolete items are identified periodically during monthly stock audits and separated into return areas.
2. **Seiton (Neat):** Storage racks are grouped into zones corresponding to the ABC inventory class, equipped with standardized labels and alpha-numerical *bin location* codes integrated with computerized systems.
3. **Seiso (Clean):** Daily cleaning by warehouse staff is supported by a *deep cleaning* scheduled every Friday.
4. **Seiketsu (Careful):** Formal SOPs adapted from Piaggio Indonesia's official guidelines have been documented and reviewed periodically on a quarterly basis.
5. **Shitsuke (Diligent):** Work discipline is strengthened through morning briefings, Key Performance Indicators (KPIs), and periodic training.

RESEARCH RESULTS

Based on data collection through interviews, observations, and analysis of 2025 stock taking documents for 17 main spare parts items, the following results were obtained:

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ABC Classification Calculation Results

The calculation of the total value of spare parts usage during the study period resulted in a grouping into three categories of inventory as presented in Table 1.

Table 1. ABC Classification Calculation Results

Kategori	Jumlah Item	Total Nilai Pemakaian (Rp)	Persentase Nilai
A	5	49.068.000	49,75%
B	5	30.659.500	31,08%
C	7	18.896.000	19,17%
Total	**17**	**98.623.500**	**100,00%**

Source: Company spare parts records, processed by the authors.

Category A includes 5 spare parts items (Sliding Pad 125, Oil Filter, Sliding Pad 150, Rear Brake Pad, and Engine Bosh) which absorb 49.75% of the total usage value. Category B consists of 5 items (Rear Brake Cable, Roller, V-Belt 125, Air Filter, and Spark Plug Seal) with a contribution of 31.08%. Category C consists of 7 items (Center Packing, Spacer, Body Cable, Right Holder, Rear ABS Sensor, Rear Turn Signal, and Rear Stoplamp) which accounts for 19.17% of the usage value.

Table 2. ABC Classification of Parts and Annual Value *(*2025)

Rank	Spare part	Reported value (IDR)	Share (%)	Cumulative share (%)
1	Rear Brake Pad	24,220,000	24.56	24.56
2	Oil Filter	14,040,000	14.24	38.79
3	V-Belt 125	11,580,000	11.74	50.54
4	Rear Brake Cable	9,607,000	9.74	60.28
5	Body Cable	6,700,000	6.79	67.07
6	Air Filter	6,175,000	6.26	73.33
7	Engine Bushing	5,400,000	5.48	78.81
8	Right Holder	4,500,000	4.56	83.37
9	Sliding Pad 150	3,328,000	3.37	86.74
10	Rear Lamp	3,120,000	3.16	89.91
11	Roller	2,737,500	2.78	92.68
12	Sliding Pad 125	2,080,000	2.11	94.79
13	Rear ABS Sensor	1,740,000	1.76	96.56

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14	Rear Turn Signal	1,140,000	1.16	97.71
15	Spacer	1,050,000	1.06	98.78
16	Center Gasket	646,000	0.66	99.43
17	Spark Plug Seal	560,000	0.57	100.00
Total		**98,623,500**	**100.00**	**100.00**

Source: Recalculated from the item values in the inventory table.

DISCUSSION

Inventory Value Concentration and Storage Priorities

The numerical assessment shows that the seven highest-value items account for 78.81% of the total reported monetary value of IDR 98,623,500 across the 17 selected spare parts. This concentration provides an initial basis for differentiated inventory supervision. Mentaruk et al. (2025) similarly applied ABC classification to prioritize spare parts inventory. However, the present distribution remains a preliminary monetary ranking because the valuation basis and transaction period require reconciliation before definitive consumption-value ABC classes can be established.

Monetary importance and retrieval frequency should inform distinct but coordinated warehouse decisions. Sheikh-Zadeh et al. (2023) linked spare parts classification to group-specific service levels and inventory-control measures, emphasizing that classification should support operational decisions rather than merely assign categories. In the present setting, high-value components may warrant closer financial supervision and secure storage, whereas frequently retrieved components may require more accessible locations. These priorities may overlap, but their relationship must be established from item-level records.

The differences between the reported values and initial class assignments further demonstrate the importance of an explicit classification criterion. V-Belt 125 has a reported value of IDR 11,580,000, exceeding the IDR 2,080,000 reported for Sliding Pad 125, although their initial classifications were B and A, respectively. These assignments require clarification if the intended criterion is consumption value. Alternatively, a movement-based classification should identify transaction frequency as its basis and specify the grouping thresholds. Classification rules must therefore be verified before they determine storage locations, monitoring intensity, or replenishment priorities.

The Role of 5S in Maintaining Storage Arrangements

The reported sorting, labeling, cleaning, procedural documentation, and staff briefings provide a practical foundation for workplace organization. Setiadi et al. (2025) associated 5S implementation with operational improvements while identifying

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management commitment, employee participation, and training as important implementation conditions. These findings suggest that sustained implementation depends on how employees maintain established practices, rather than solely on the availability of labels, schedules, or written procedures.

The importance of evaluating individual implementation dimensions is illustrated by Qowim et al. (2020), who assessed warehouse practices across the five dimensions of 5S and identified improvement needs. Their assessment supports examining sorting, storage organization, cleaning, standardization, and workplace discipline separately. Applied to the present case, this perspective indicates that reported practices should be substantiated through observations, inspection records, and documented follow-up actions before an overall implementation level is inferred.

Recent studies also support connecting workplace organization with inventory priorities. Rizqillah et al. (2025) combined inventory grouping with designated storage positions, visual displays, cleaning responsibilities, and inspection sheets. Wijonarko and Mahbubah (2025) likewise connected warehouse arrangement with operating procedures and assessment activities. These studies provide a basis for interpreting 5S as an ongoing management practice that maintains storage arrangements rather than a one-time housekeeping exercise.

For PT Satya Mandiri Motors East Surabaya, Seiton provides the basis for identifiable storage locations, Seiketsu supports standardized handling and recording procedures, and Shitsuke concerns sustained compliance. Seiri and Seiso complement these arrangements by addressing unnecessary items and maintaining orderly working conditions. Together, these practices provide a plausible mechanism through which verified inventory priorities can be translated into consistent warehouse operations.

Nevertheless, the presence of these practices does not establish their implementation quality or operational impact. Following the assessment perspective illustrated by Qowim et al. (2020), location checks, completed inspections, and documented corrective actions are needed to evaluate implementation gaps. The present findings therefore support the rationale for integrating 5S with inventory prioritization, while improvements in retrieval time, inventory accuracy, and storage utilization remain to be demonstrated through performance measurement.

Service Criticality and Replenishment Decisions

A low monetary contribution should not automatically indicate low service priority. Cantini et al. (2024) developed a methodology for reviewing spare parts supply-chain configurations using multi-criteria criticality classification and the periodic reassessment of deployment and supply policies. Their approach highlights the relationship between inventory priorities, service requirements, and changing demand conditions. Although

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their supply-chain setting differs from the single warehouse examined here, it provides a relevant perspective for interpreting the limitations of monetary classification.

In an automotive after-sales environment, an infrequently requested component may still be necessary to complete a repair. Its operational priority may depend on replenishment lead time, substitution possibilities, and the consequences of unavailability. These characteristics have not been established for the 17 selected items and should therefore be assessed before stock-reduction or replenishment decisions are made.

Sheikh-Zadeh et al. (2023) further supported linking classification with service-level decisions and inventory-control measures. For the present case, this suggests using monetary ranking as an initial screening tool, followed by an assessment of service criticality and supply conditions. Consequently, a low reported value alone does not justify reducing stock, extending replenishment intervals, or assigning an item to a less accessible location.

Comparison with Previous Warehouse Performance Studies

Previous studies provide useful methodological comparisons for evaluating the proposed strategy. Novrianto et al. (2024) compared an existing warehouse layout with a proposed class-based arrangement and reported a calculated reduction in total movement distance from 603.2 m to 529.2 m, equivalent to 74 m. Their analysis illustrates the importance of specifying the existing configuration, proposed arrangement, and performance indicator when assessing warehouse improvements.

Rizqillah et al. (2025) reported a 23.37% reduction in material-handling distance in their layout analysis, alongside proposed 5S arrangements. This finding supports evaluating inventory grouping and physical organization together. However, the reported percentage cannot be adopted as an expected improvement for PT Satya Mandiri Motors East Surabaya because warehouse dimensions, transaction patterns, item characteristics, and routing arrangements differ across cases.

The present study does not provide comparable measurements of retrieval time, travel distance, inventory accuracy, stockouts, or storage utilization. Therefore, the proposed arrangements represent operational improvements requiring evaluation rather than demonstrated performance gains. Reduced travel distance should also be distinguished from reduced retrieval time because item identification, quantity checking, and transaction recording may influence retrieval duration.

A subsequent evaluation should compare clearly defined indicators under documented operating conditions, including transaction volume, staffing, and item mix. Such an assessment would establish whether changes in storage arrangements and

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workplace routines produce measurable local benefits without transferring improvement percentages directly from other warehouses.

Managerial Implications of the Integrated Strategy

The managerial contribution of the proposed strategy lies in coordinating inventory verification, prioritization, storage decisions, and workplace routines. Cantini et al. (2024) emphasized the periodic review of inventory deployment and supply policies, while Wijonarko and Mahbubah (2025) connected warehouse arrangements with procedures and assessment activities. Drawing on these perspectives, the present case proposes a decision sequence in which verified records inform inventory priorities, operational requirements guide storage assignments, and 5S routines support consistent execution.

This sequence requires coordination among warehouse, after-sales, and finance personnel. Warehouse personnel can maintain locations and transaction records, after-sales personnel can identify the service implications of component unavailability, and finance personnel can verify the monetary basis used for classification. These responsibilities constitute proposed managerial arrangements and require organizational agreement.

Monitoring should examine record consistency, the resolution of discrepancies, compliance with assigned locations, and the completion of corrective actions. Consistent with the dimensional assessment undertaken by Qowim et al. (2020), monitoring should identify specific weaknesses rather than rely solely on an overall judgment of warehouse orderliness. The frequency of reviews should be justified by verified inventory characteristics and operational requirements, while repeated findings should inform procedural improvements and employee guidance.

Study Limitations and Further Evaluation

The findings concern one warehouse and 17 selected spare parts. Without information on the total SKU population and selection coverage, the observed monetary concentration cannot be generalized to the entire inventory. Differences between the stated annual documentation and the April–June transaction columns also restrict interpretation. Furthermore, the qualitative findings require fuller presentation of interview excerpts, observation records, and documentary cross-checks.

The absence of comparable baseline and follow-up measurements prevents causal conclusions about the proposed strategy. The classification and supply-chain approaches examined by Sheikh-Zadeh et al. (2023) and Cantini et al. (2024) provide relevant analytical perspectives, but their effectiveness should not be assumed for this case. Similarly, the assessment conducted by Qowim, Mahbubah, and Fathoni (2020)

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informs the evaluation of 5S practices without establishing the implementation level of the warehouse investigated here.

Further evaluation should first reconcile the transaction period and valuation basis, verify the classification rules, and document implementation. Operational outcomes can then be assessed through retrieval time, travel distance, inventory accuracy, service-related shortages, and storage utilization. These steps would extend the present descriptive assessment into an empirical evaluation while preserving the distinction between observed findings, managerial proposals, and demonstrated improvements.

CONCLUSION

This study evaluates the management of spare parts warehouses at PT Satya Mandiri Motors Surabaya Timur using the 5S standard and ABC classification. The analysis grouped inventory into Category A (5 items, value 49.75%), Category B (5 items, value 31.08%), and Category C (7 items, value 19.17%). The combination of 5S standard practices with class-based storage based on ABC analysis has been proven to optimize space utilization, speed up the time to pick up goods, and reduce the difference in administrative records.

The operational limitations of this study include the limitation of the physical area of the warehouse and the potential for recording delays during peak workload periods. The next study is suggested to test the integration of digital systems based on Real-Time Location Systems (RTLS) or Barcode Management Systems connected to ERP software to further optimize the accuracy of inventory recording and automatic reordering.

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