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Improvement of Spare Part Arrangement with Class Based Storage Method and 5s Method in Spare Part Room PT. Wahana Sun Solo (Indomobil Nissan Datsun Solo Baru)

Faros Sambada[1], Kurniawan Sigit Wahyudi[1], Zainal Arifin[1]*

[1]Department of Mechanical and Automotive Engineering, Faculty of Vocational, Universitas Negeri Yogyakarta, Kampus Wates, 55652, Indonesia

*Corresponding author: zainal_arifin@uny.ac.id

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ABSTRACT

The aims of the improvements made in the spare part room at PT. Wahana Sun Solo were to: (1) organize the spare parts storage area based on specifications; and (2) increase effectiveness and work efficiency in locating spare parts while creating a work area that adheres to the 5S method standards set by Nissan Motor Indonesia (NMI). The improvements in the spare part room were implemented through several processes: identifying the spare part room layout, redesigning the storage system using a class-based method, updating labels, and designing the improvement of the 5S method. Testing was conducted by performing a time study and a partman movement study focused on locating three sample spare parts: brake pads, air filters, and fan belts. An assessment index was conducted using an evaluation sheet after the improvements were made. The class-based storage method improvement created a more organized arrangement of spare parts according to types. Updates to labeling and enhancements to the 5S method significantly improved the partman's effectiveness and efficiency. Testing demonstrated that the time required to locate brake pad samples resulted in an efficiency increase of 144%, improvement of 218% for air filters, and improvement of 182% for fan belts. Observations showed that, on average, the partman's search required 5 fewer steps for brake pads, 7 fewer steps for air filters, and 5 fewer steps for fan belts compared to the pre-improvement process. In addition, the observation on the movements involved in locating spare parts resulted in reduced movements by at least two movements. The assessment sheet completed after the improvement yielded an assessment index of 91.2%.

1. Introduction

The development of the automotive world in Indonesia is one of the fastest growing sectors. The number of automotive products in the market continues to grow along with industry development. With the increasing number of cars owned by the public, the automotive sector is growing rapidly. Especially in the car sector, where there are various brands, models, types, colors, and specifications. According to [1], the Ministry of Industry states that in 2022 the automotive sector grew by 10.64 percent, exceeding economic growth of 5.01 percent and world automotive growth of 3.1 percent.

The growth of the automotive sector in Indonesia, which grew by 10.64 percent, requires companies to adopt improvement measures due to intense competition in all industrial domains to improve product or service quality. Service companies such as repair shops must improve employee performance and company management to achieve work efficiency and

effectiveness. Service quality consists of physical evidence, service reliability, service readiness, assurance, and empathy [2].

Automotive companies engaged in 3S (sales, service, and spare parts) must continuously improve service quality to increase customer satisfaction. Companies in the automotive industry compete fiercely with each other to increase customer satisfaction [3]. In spare part services, good warehousing management is needed to improve partman performance in carrying out their duties and responsibilities. The effectiveness of material handling in the warehouse can be improved through good warehousing management [4].

Warehousing management is the spearhead of the supply chain [5]. It serves to store production results before distribution. Warehousing management's main objective is to organize all procedures of delivery, receiving, storage, transportation, and selection. Therefore, warehousing management is vital to a company's sustainability.

PT Wahana Sun Solo (Indomobil Nissan Datsun Solo Baru) is a branch of PT Nissan Motor Indonesia, established in 2001. PT Wahana Sun Solo operates in sales, services, and spare parts. Warehouse operations play an important role in spare part services. Receiving, storing, and distributing spare parts to customers and technicians are crucial activities. Operational speed is influenced by warehousing management, storage methods, spare part location information, and good environmental habits. A proper and structured storage system will speed up access and shorten product search time [6].

Operational issues at PT Wahana Sun Solo include improper storage methods, missing part labels, and a lack of part location codes. These issues cause partman to search for spare parts inefficiently. To address these problems, the spare part layout needs to be reorganized using the class-based storage method, part labels and location codes should be updated according to the Dealer Management System (DMS), and the 5S method should be implemented properly. Improving the layout and updating labels and codes according to the DMS is complex but necessary to resolve these issues. The class-based storage method groups items by type, dimension, or other similarities [7].

By applying the class-based storage method, updating part labels and location codes, and improving the 5S method, the partman's work in distributing spare parts can become more effective and efficient. This improvement is influenced by the organization of spare parts according to their type and the labeling system based on the DMS. A work area applying the 5S method will further enhance operational efficiency.

2. Methodology

This research was conducted in the spare part room of PT Wahana Sun Solo (Indomobil Nissan Datsun Solo Baru) which is located at Jl. Palem Raya, Dusun III, Lanngenharjo, Kec. Grogol, Kab. Sukoharjo, Central Java 57552. This research was conducted in conjunction with industrial practice activities starting from April 1 to November 30, 2023. The methodology of the research shown in Fig 1.

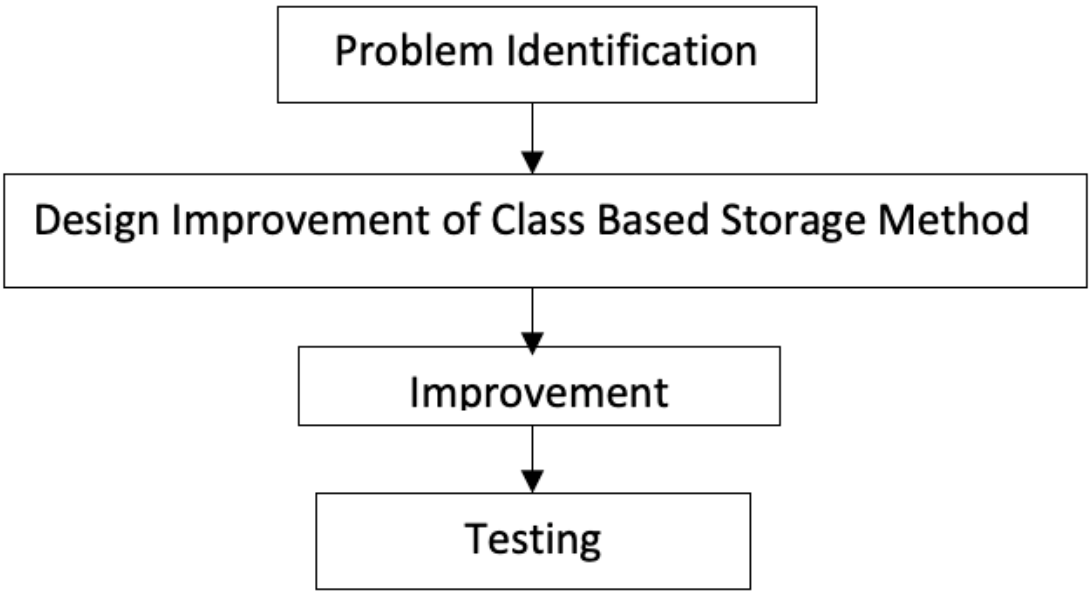

Figure 1. Methodology of the research

The object of research used by the author is the spare part room which includes room conditions, spare part storage, and partman performance in carrying out the spare part search process. The data collection method used in this research is by observing the spare part room to identify the condition of the room. Furthermore, testing time studies and motion studies before and after improvement to find out how much difference in time and movement made by partman in searching for spare parts. Steps Finally, data collection is done by testing the assessment sheet to measure the assessment index after improvement.

Time study is a work measurement method carried out by recording samples of worker performance and then using it as a standard [8]. The work measurement method carried out by the author is by measuring the time it takes partman to find spare part samples before and after improvement.

After obtaining data on the average partman time in searching for spare part samples before and after improvement, then to get the results of the partman efficiency level in the spare part search process, namely by using the efficiency formula according to Heizer & Render, (2004) [9] as can be seen in Equation 1.

$$Efficiency = \frac{Standard\ hours\ earned}{Actual\ hours\ used} x\ 100\% \quad (1)$$

Motion studies are studies that examine various work-related behavior to assess work performance [10]. It is expected that this study can reduce or eliminate ineffective processes, thereby increasing productivity andreducing the time spent on completing a job [11]. In this motion study method carried out by the author, namely by observing the movement of the partman in the spare part search process and observing how many steps the part man takes in the spare part search process before and after the improvement.

After obtaining the results of observing the movements and steps taken by the part man in the spare part search process before and after the improvement, the next step is to compare the total number of movements and steps. If the number of movements and steps after the improvement is less than before the improvement, then it can be concluded that the

improvement made by the author can increase the work effectiveness of the partman in carrying out the spare part search process

Data collection with an assessment sheet is also used in testing after improvements are made to the spare part room. this test is by collecting data with a written assessment sheet in the form of answers to statements written in the form of answers to statements addressed to partman as respondents. This testing procedure involves measuring people's opinions, attitudes, and perceptions of the results after the improvement.

After getting the results of the assessment, then calculate the total score of the assessment sheet for each respondent, the maximum score of the assessment sheet, and the measurement of the assessment index after improvement. Measurement of the assessment sheet index after improvement can be measured by the index formula according to Sapoetra, 2015) [12] as follows Equation 2.

$$Index = \frac{Score\ Total}{Y} x\ 100\% \quad (2)$$

Where :

Y = Highest score x number of respondents

3. Result and Discussion

3.1 Improvement of spare part arrangement with class based storage method

The arrangement of spare parts using the class-based storage method in the spare parts room of PT Wahana Sun Solo is an arrangement of goods by dividing storage into several parts or placing goods based on the similarity of types into certain groups. This storage method is designed to be more flexible in finding goods. Each storage area is filled with groups of items that have the same type or size. Previously, the spare part room arrangement lacked a good storage method, so it was necessary to improve the spare part arrangement with the class-based storage method according to the company's situation.

In improving the class-based storage method in the spare part room by grouping spare parts with the same type and item into predetermined storage areas. The storage area is a storage location where spare parts are placed. The spare part storage location is divided based on the similarity of the type of spare part and then placed in the aisle where there is a storage rack. Spare part storage on the shelves is also divided at each level depending on the amount of stock of a spare part and grouped by spare part number. In addition, spare part storage also pays attention to the weight mass of the type of spare part to be stored on the shelf. Storage of spare parts that have a light mass, such as air filters, ac filters, and others are placed at the top level of the shelf, while spare parts that have a fairly heavy mass are placed in the middle towards the bottom. From various storage determinations in accordance with the class- based storage method according to Juliana & Handayani (2016) [7] the class-based storage method is the placement of materials or materials based on the similarity of a type of material or material into a group.

Improvement of the class-based storage method at PT Wahana Sun Solo in its implementation is also inseparable from the 5S method. This is mutually sustainable during the structuring process so that it can solve the problems that occur and the spare part room can implement a better storage method than before the improvement. Improvement of spare part arrangement with class-based storage method has been successfully carried out in accordance with the initial design and received a good assessment from the partman through the assessment sheet. In addition, the application of this method is in accordance with the

statement according to Ahmad Afif Fahruddin & Rahayu (2006) [13] that the class- based storage method allows greater flexibility in the way storage space is organized into sections.

Figure 2. Result of improvement layout.

3.2 Update of part number labels and location codes part

Update the part number label and part location code on the shelf in accordance with the Dealer Management System (DMS), namely relabeling the storage rack according to the spare parts stored during the class-based storage arrangement improvement and then updating the location code information for each spare part in the DMS. Updates by creating part number labels and part location code labels are made after the improvement because the labeling will adjust the results of the spare part storage layout on the storage rack. This labeling serves as a guide to where the spare parts are stored in each aisle, shelf, level, or storage row on the shelf.

The label update process has several steps in its implementation. First, data collection of spare parts by recording part numbers, part location codes, and spare part names. Second, label creation with the file format on Ms. Excel that has been created by Nissan Motor Indonesia to input spare part data that will be printed with part number labels and part location code labels. Third printing labels with light blue paper for part number labels and orange paper for part location code labels. Fourth, placing the labels on the shelves in accordance with the spare part arrangement improvements that have been made previously. The last step is to change the part location and move the spare part items in the DMS.

From several steps in updating labels on storage racks, this is done to solve problems that occur, such as part number labelling and part location codes that are not installed on spare part storage racks, part number labels on storage racks do not match the actual spare part number. In addition, the part location code label on the storage rack does not match the information in the Dealer Management System (DMS). So it is necessary to update the labeling on the storage rack and then readjust it in the DMS.

This label update increases the effectiveness and efficiency of the partman in searching for spare parts. This is because the labeling attached to the shelf matches the part location code information in the DMS. Before searching for spare parts, the partman will look at the location code on the DMS first and then search for the desired spare part. With this labeling update, the activity movement, steps, and partman time in the spare part search process will

be reduced so that it is faster to find the desired spare part. Thus, this label update is in accordance with the theory cited on the Cadre Technologies website "Warehouse Layout and Design: Tips for an Efficient and Optimized Operation", (2023) [14] that a well-defined warehouse layout in terms of labeling goods can improve operational efficiency, facilitate retrieval of goods, minimize search time, and prevent errors. In addition, labeling in the warehouse must also be done correctly so that in searching for goods it can be easily found [15]. Therefore, the increase in speed in finding spare parts is also influenced by labeling, which is in accordance with the theory above.

3.3 Improvement of 5S method

Improvement of the 5S method in the spare part room of PT Wahana Sun Solo is a form of improvement regarding the 5S method in the spare part room, especially in the spare part storage area. This 5S method improvement is interrelated in its implementation with improvements in spare arrangement and label updates. This is done in order to solve the problems that occur and to implement the 5S method in the spare part room as well as possible.

Figure 3. Result of improvement 5S method

The process of improving the 5S method in the spare part room includes the seiri step, which is sorting bin box storage media that can still be used and cannot be used. The seiton step is by arranging spare parts then labeling them accordingly on the DMS and modifying the bin box as a storage medium. Seiso is by cleaning the storage rack area and collecting data on cleaning tools and cleaning procedures in the spare parts room. Seiketsu is by carrying out and implementing the previous stages of sorting, organizing, and cleaning in the spare parts room area. Shitsuke is by diligently checking the state of the spare part room has carried out the previous stages or not and filling in the audition form in the form of photos that match the actual state of the spare part room.

From several processes that have been carried out in the improvement of the 5S method, it is in accordance with the definition of the 5S method, which is a systematic approach to organizing work areas, in accordance with regulations and standards, and maintaining discipline to do a good job tailored to the company's circumstances with the ultimate goal of getting the best benefits from the workplace. By implementing 5S, order time, productivity, and quality standards can be improved. This supports the theory that companies can improve their business by applying 5S principles [16]. From the process to the results of the 5S improvement method, it can be seen that after the improvement is much better than before the improvement and can increase the productivity, effectiveness, and efficiency of the partman. This is because the improvements in each element of the 5S method can be applied properly. Therefore, this is in accordance with the theory which states that increased productivity can also be caused by a more efficient environment in the workplace [17].

3.4 Testing of Improvement

3.4.1 Time Study

Tests with time studies in the process of finding spare parts by partmen before and after the improvement stated that the process of searching for spare parts from partman searching to finding and then preparing spare parts at the mechanic's part counter had a faster time after the improvement than before. The difference in the speed of time in the spare part search process is influenced by the lack of proper application of the storage method and the 5S method so that spare parts do not have grouping by type or part item in a fixed storage area according to the labeling attached to the storage rack. In addition, there are problems with part number and part location labels that do not exist or are no longer in accordance with the stored parts, plus the labeling does not match the part location information on the Dealer Management System (DMS). Thus, when the partman searches for spare parts, he does not have the exact location of the spare parts.

Table 1. Comparison of Time Study

Type of Work	Average Time Before Improvement	Average Time After Improvement	Efficiency Level
Search spare parts brake pads	23 seconds	16 seconds	144%
Search spare parts Air filter	24 seconds	11 seconds	218%
Search belt fan spare parts	20 seconds	11 seconds	182%

The spare parts are stored, but only armed with memories that sometimes forget where the spare parts are stored, plus the location of the spare part storage sometimes changes

because it lacks a fixed storage location according to the labeling on the shelf and on the DMS. Therefore, after making improvements to the spare part room area, especially the storage area, the study of the time duration of the spare part search process by the partman is faster than before, resulting in a good level of efficiency. A comparison of the average time in the spare part search process before and after the improvement as well as the efficiency level is presented in Table 1.

3.4.2 Motion Study

This observation is done by observing what movements the partman makes before searching for spare parts until finding spare parts and placing them on the part counter so that the spare parts are taken by the technician. The results of these observations are shown in the Table 2.

Table 2. Comparison of motion study

Description	Number of Partman Moves
Before Improvement	8 movements
After Improvement	6 movements

The table above shows that part man movements before improvement in the spare part room are more than after improvement, with a ratio of 8 movements and 6 movements. Part man movements before improvement are likely to increase due to repetition of movements 3, 4, and 5 in the table of observations of part man movements in the spare part search process above. This is because the part man during the spare part search process does not know the exact location of the spare part according to the part location information in the DMS. In the spare part search process, the part man does not immediately find the desired item and often repeats the previous movement to find the item. The shorter number of movements after this improvement is due to the storage of spare parts on the storage rack there is part number and part location labelling according to what spare parts are stored and according to the information on the Dealer Management System (DMS), so that the part man in searching for spare parts can simply read the part location information on the DMS for the spare part to be searched, then search for it so that it is faster to find. Therefore, it is concluded that after the improvement, it can increase the effectiveness and efficiency of partman work in carrying out the spare part search process.

Observations that have been made by the author are by observing and calculating the number of part man steps in the process of searching for several spare parts used as samples in this test. The samples used in this test are brake lining spare parts, air filters, and fan belts. Of the three types of spare parts, each is taken as much as 5 samples of the number of steps required in the search process, then calculated the average number of steps for each type of spare part sampled. The results of the test by observing the steps in the spare part search process are shown in Table 3.

Table 3. The comparison of number of step

Item	Average Number of Steps	
	Before Improvement	After Improvement
Brake Pads	20 steps	15 steps
Air Liter	19 steps	12 steps
Belf Fan	17 steps	12 steps

The table above can be seen that the average number of steps before improvement is more than after improvement. This is also related to the observation of the movements made

by the partman, the more movements made will affect the number of steps required and vice versa. In addition, the shorter average number of steps is also due to the storage of spare parts labeled with part number and part location on the storage rack in accordance with the information in the DMS, so that the search process is faster to find the desired spare part. That way, the steps to perform the spare part search process are shorter than before the improvement and cut unnecessary steps in the process. Similarly, it will increase the effectiveness and efficiency of partman work in carrying out the spare part search process. This motion study test is in accordance with the statement from the theory that states that this study is expected to reduce or eliminate ineffective processes, thereby increasing productivity and reducing the time spent on completing a job [11].

3.4.3 Assessment Sheet

Testing with this assessment sheet is used to measure the assessment index after improvement in the spare part room. The results of the assessment index measurement after improvement are measured by the formula, then produce an assessment index of 91.2% which means that the assessment after improvement in the spare part room gets a good assessment. The good assessment index is obtained from the average results of the assessment sheet on each respondent also getting good score results. This is because the improvement of spare part arrangement with the class-based storage method and the 5S method in the spare part room has been carried out in accordance with the initial plan that the author discussed with the partman. In addition, this improvement brings changes in storage methods and 5Smethods that are better than before, plus seen from the test results that after the improvement get good time study and motion study results so as to increase the effectiveness and efficiency of partman work in searching for spare parts.

4. Conclusion

Based on the research entitled "Improvement of Spare part Arrangement with Class Based Storage Method and 5S Method in Spare part Room PT. Wahana Sun Solo (Indomobil Nissan Datsun Solo Baru)" can be concluded with the following:

1. Improvement in the arrangement of spare parts with the class-based storage method is an improved layout with a storage policy by placing materials or materials based on the similarity of a type of material and material into a group. By placing similartypes or items of spare parts into a predetermined storage rack area, it will make it easier for the partman to carry out the distribution process, especially in the process of finding spare parts for spare part needs by technicians. In addition, this improvement provides a neat and well-organized arrangement of spare parts according to their grouping.
2. Renewal of labels in accordance with the Dealer Management System (DMS) and improvement of the 5S method in the spare parts room.
    a. Updating the part number and part location labels on the storage rack in accordance with the part location information in the DMS makes it easier for the partman to find spare parts. This is because the spare part storage on the shelf has a label that is adjusted to what spare part is stored. In addition, changing the part location code information in the DMS that matches the actual spare part storage location is a factor in the smooth process of finding spare parts quickly. Thus, updating the labels in accordance with the DMS can increase the effectiveness and efficiency of the partman in searching for spare parts.

b. Improvement of the 5S method in the spare parts room has an impact on the effectiveness and efficiency of partman work. It is proven that the time taken by the partman in the process of searching for samples of brake lining spare parts results in an efficiency level of 144%, air filters 218%, and belt fans 182%. In the motion study test, the difference in the number of steps taken by the partman in the process of searching for brake lining spare part samples resulted in an average difference of 5 steps, air filter spare parts averaged a difference of 7 steps, and belt fan spare parts a difference of 5 steps. In addition, observation of partman movements in the spare part search process can shorten the movement by 2 movements or even more. In addition, the assessment sheet after the improvement received an assessment index of 91.2%, which means that the assessment sheet received a good assessment. Thus, this improvement has a better impact and can increase the effectiveness and efficiency of partman work in the spare parts room.

Conflict of interest

The authors declare no conflict of interest.

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