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Abstract. The motivation for this study is to improve the organization of the spare parts storage area in the CGS unit. Previously, there was no system for controlling the entry and exit of stored goods, leading to disorganization. The researcher sought to address this issue by developing control documents and establishing a well-organized storage system for incoming and outgoing goods. The research methodology is based on the principles of Kaizen and PDCA and employs various tools, including stock card sheets, stock summary sheets, and SOP sheets. The researcher developed a spare parts document control system that effectively regulates goods' entry and exit in the CGS unit's storage area by implementing these tools. Overall, the researcher successfully developed a spare parts document control system that has significantly improved the organization of the CGS unit's spare parts storage area, proven by the decrease in the number of errors that occur by 80%. The system has ensured that the entry and exit of stored goods are managed and documented, leading to a better-organized storage area.

1 Introduction

Control activities, feedback, and improvement in manufacturing and service systems are a must to ensure the sustainability of the business operations being carried out. In manufacturing and service system operations, there will be a possibility of deficiencies or failures that must be managed by the company to produce an improvement in the operating system in the future. Improvements can be started with a small step that has a positive effect on the entire system and is conducted continuously.

One of the principles or methods used for improvements in manufacturing systems is the kaizen principle [1]. The principle of kaizen was first introduced by Taichi Ohno (1867–1930), who had served as Vice President of Toyota Motor Corporation. In the Kaizen principle, the emphasis is on continuous improvement, as opposed to innovation, which is a one-time improvement. Kaizen is an adaptation of industrial techniques from the Japanese state in the 20th century [2], where creativity is a basic thing. Kaizen can achieve its maximum level of performance at minimal or no cost, compared to innovations that require large investments in implementation. Kaizen is a way of thinking about and managing everything, from how we work to how a team works together [3]. So, kaizen is an improvement that is conducted continuously to improve a condition to achieve the desired improvement at a low cost in its implementation.

To effectively implement the principles of kaizen, several methods can be used, one of which is the PDCA method (Plan, Do, Check, and Act). The PDCA method is a method introduced by Walter Shewhart in 1930 and is called "Shewhart Cycles". It is a method that aims to produce an improvement that runs continuously over time, and this method focuses on the process rather than the results obtained [4]. Through this continuous cycle and quality control, the PDCA cycle has its own advantages that make many parties use it for continuous product quality improvement [5]. So, by using the PDCA method, the improvement of a system can be carried out continuously, involving all members of the organization. It aims to find solutions to existing problems jointly and sustainably.

The object of research in this research activity is PT. Denso Indonesia, which is in Cibitung, West Java. This company is engaged in automotive manufacturing and produces products in the form of spare parts for four-wheeled and two-wheeled vehicles. Since its establishment in 1975, PT Denso Indonesia has already established three production factories, one in Jakarta and two in Cibitung. One of the units or sub-divisions within PT Denso Indonesia that is the focus of this research is the Co-Generation System (CGS) area, which has been operating since 2019. In this area, there is a natural gas generator. Absorber engine, chiller, and other supporting machines in this work area, a unified system will be formed called the "co-generation system", which will be abbreviated as "CGS".

In the CGS system, there are machines that work and will require the replacement of spare parts that are replaced periodically to keep the engine in excellent condition and continue to operate smoothly. This is to prevent severe
damage to the machine. The researchers observed the conditions in the CGS area during the process of incoming and outgoing spare parts, where there was still no system in place to properly record and control owned spare parts. As a result, the workers' entry and exit of spare parts are not recorded in writing, and control of the spare parts owned is not properly monitored by superiors and other workers. This has an impact on the poor control system of spare parts owned in that area. In Figure 1, there are several types of errors made by workers that occurred within three months when the researchers made observations in the field. This happened due to workers' negligence in documenting incoming and outgoing spare parts.

The objective of conducting this research is to analyse and design the process of documenting the entry and exit of spare parts at the CGS unit of PT. Denso Indonesia has become more organized and can be managed than before. Continuous improvements such as kaizen, with one example in the form of improving the storage goods document control system, which requires the active participation of every worker to carry out this repair by following the work instructions made in the spare parts storage document control system SOP [9].

The resources that exist in every process, person, and machine can have two possibilities: producing added value or not producing added value, and therefore any improvements possible and requires a sizable budget. So that in this case, the creation of a control system for stored spare parts documents is part of a small improvement that has a positive impact on the system while using only a small budget or almost no budget at all [2].

Kaizen is an approach that can be used to produce continuous improvements based on creativity to produce positive changes to the system. Kaizen activities do not require large costs or budgets because these activities make improvements from small things that have quite a significant impact on the system. It is not like innovation, which requires other supporting means to make these innovations possible and requires a sizable budget. So that in this case, the creation of a control system for stored spare parts is part of a small improvement that has a positive impact on the system while using only a small budget or almost no budget at all [2].

Frequent mistakes made by workers prior to repairing CGS Area Spare Parts Document Control

Based on this background, it is necessary to conduct research related to the design of a document control system for the exit and entry of spare parts in the Co-Generation System (CGS) area. This study aims to obtain the design and improvement of the control system with respect to the condition of the entry and exit of spare parts in the CGS area, so that spare parts can be better organized, and this is also useful when conducting stock activities checks and other operational activities in the CGS area.

The objective of conducting this research is analysing and designing the process of documenting the entry and exit of spare parts at the CGS unit of PT. Denso Indonesia has become more organized and can be managed than before.

### 2 Literature Review

Inventory management activities are important things that must be done in an organization, and by considering several existing things, they become feasible. Of course, this can also be used to control stored spare parts with a system designed in such a way as to run a good inventory management system in the spare parts storage area [6].

Inventory management can also be defined as "a continuous planning, organizing, and controlling process of inventory with the aim of minimizing expenditure costs." The processes involved in inventory management include supply monitoring, storage, and accessibility of goods to ensure adequate supply without excess inventory. In this case, supply monitoring is the focus of this research, and the design of a document control system is the answer to the focus of the inventory management process [7].

Spare parts inventory management is becoming increasingly crucial, as the cost of spare parts constitutes a massive portion of a product's or machine's total cost. Failure to provide spare parts can result in significant financial losses for the owner or user of the item. In some industries, a manufacturer's ability to provide spare parts in after-sales services can improve customer satisfaction by reducing the time required to replace damaged spare parts. Therefore, it is crucial to pay close attention to spare parts inventory management to avoid any potential losses [8].

Kaizen is an approach that can be used to produce continuous improvements based on creativity to produce positive changes to the system. Kaizen activities do not require large costs or budgets because these activities make improvements from small things that have quite a significant impact on the system. It is not like innovation, which requires other supporting means to make these innovations possible and requires a sizable budget. So that in this case, the creation of a control system for stored spare parts documents is part of a small improvement that has a positive impact on the system while using only a small budget or almost no budget at all [2].

The difference between kaizen and innovation lies in the scale and objectives that each has. If the scale and goals of kaizen are small and simple, with the goal of gradually increasing improvements, Meanwhile, innovation has a larger and more complicated scale and has an improvement goal that makes a new standard that is better than before.

With the active role of each member, it has a major impact on the success of the kaizen improvement process and provides added value for everyone involved in the activity. Likewise with the repair of this document control system, which requires the active participation of every worker to carry out this repair by following the work instructions made in the spare parts storage document control system SOP [9].

Another goal of conducting kaizen activities is to make an organization excel at dealing with existing problems by seeking solutions to problems on an ongoing basis. In this case, the problem that the researchers faced was the absence of a document control system for storing spare parts in the CGS area [10].

Competition in the business world will get tougher from time to time, it is hoped that every company can reduce their operating costs by making improvements to the production system so that production costs can be reduced as low as possible, and this can happen through continuous improvements such as kaizen, with one example in the form of improving the storage goods control system, which is a small thing but if it is carried out continuously with other improvements, it will have a significant and beneficial impact in the future [11].
activity that does not generate added value can be classified as "muda." (Japanese word). A job is a series of value-adding activities that begin with raw materials and end with a finished product; a "muda job" is a task or job that has no added value [12].

A well-known researcher from the United States, namely William Edward Deming, has similar thoughts to the Japanese in that the management staff and all employees must be involved in the continuous improvement process. And he created fourteen principles, which later became the basis of the philosophy of quality in organizations and sustainable cycles such as PDCA (Plan, Do, Check, Act), and are called Deming wheels provident process. Thus, the PDCA method can also be applied to the repair of spare parts control systems that have been planned to use the four specific steps contained in the PDCA method [13].

Fig. 2. Illustration of the PDCA Cycle

Source: (Chua et al, 2017)

In figure 2, you can see an illustration of the PDCA concept, which has similarities with the "kaizen" concept that was explained earlier. The similarity lies in a cycle or process that is never interrupted at any stage but runs continuously. While what distinguishes between the concept of kaizen and the PDCA method is that the "kaizen" concept is not stated in detail regarding the number of steps or specific steps that must be taken to complete a "kaizen" or improvement to the end, but only in the form of conceptual steps that must be taken to complete "kaizen", that's all there is. Whereas in the PDCA method, the number of steps that must be carried out and specific steps to complete a repair have been determined to be as many as four steps consisting of plan, do, check, and act.

This applies to the spare parts storage document control system, which ensures that the use of spare parts in the process of a system is of good quality and effective according to the function it has. To maintain the good quality of these goods, one way is to control the use of spare parts regularly [14].

The PDCA cycle is a circle that never ends, and the process of repairing the spare parts document control system will not stop here. However, it will continue with other improvements related to this in the future [13].

The entire theoretical basis that has been described previously is then summarized in the state of the art (SOTA), which explains the reasons for using the theoretical basis in this journal as well as the differences in its application to other research journals that researchers write.

a. Integrated Inventory Management Control Framework, Authors: HR, Ganesha, and P. S. Aithal [15]. Year: 2020, India. The results of this study are used as the basis for the concept of managing inventory in a place by documenting goods using a system that is designed and run together with the workgroup team. In this study, the software system will record inventory movements but does not have to be used. So, in this study, the authors combined two recording methods the manual method and the software to overcome the limitations of existing technological means.

b. Continuous Improvement Through Kaizen in An Automotive Industry, Author: Rafie Zaidan Prayuda. Year: 2020, Indonesia. The research results in this journal are used as a reference in carrying out the application of the kaizen concept within companies, with a focus on the main kaizen concepts, the main kaizen systems, and field checks. The research method used is descriptive-qualitative, by collecting data using observation and documentation methods, the same as the author did. The author wants to show that the application of kaizen can be applied to any matter in the workplace with the active role of each member who helps the successful implementation of the kaizen.

c. Improving The Quality Control Process Using the PDCA Cycle, Authors: Anna Chojnacka Komorowska and Sebastian Kochaniec. Year: 2019, Poland. The results of research in this journal are about improving the quality of finished products by improving internal control using the PDCA cycle. The research method is by way of case studies accompanied by internal company documentation and data processed by intelligence and observation. The defective products produced are separated according to the type of defect for each item, then repaired with quality improvements at each workstation. Through improving the quality of products that occur, this is the purpose of doing this research. From here, the authors use the concept of improvement at workstations to overcome existing problems in the form of spare parts control documents that do not yet exist. As a result of this enhancement, the workstation will experience an increase in quality in terms of documentation and communication.

3 Methods

This study has the following research design, as shown in figure 3:

a. Field observation, at this stage, the researcher made direct observations in the field, at the company where the researcher worked to be able to find out the actual problems that occurred. From the results of
observations made in the CGS area where the researcher works, the researcher finds the topic of the problem that will be raised into a report of the final project. And the results of this observation become the background for the formulation of the problems in the final report.

b. formulation of the problem, based on the results of the observations that have been made, the researcher obtains a formulation of the problem that can be used to determine the objectives of carrying out this research activity. The main problem formulation in this study is the absence of a document control data system for spare parts stocks in the CGS area. And this is part of the step plan for the PDCA method used.

c. Goal Setting, the purpose of this research is to improve the condition of the spare parts document control system, which previously did not have a control system, to have a control system in the form of stock sheets and cards. By creating a document control system for spare parts in the CGS area, stock conditions for spare parts can be better controlled and recorded. This is also part of the "do" step of the PDCA method used.

d. Data collection, All the data collected by the researcher comes from the CGS area where the researcher works, with detailed data including the total stock of spare parts stored in the CGS area with a total of 131 spare parts items, which will then be used for further processing.

e. Data processing, If the required data collection includes all existing spare parts, there are a total of 131 spare part items. The following stage is data processing, in which data in the form of the number of spare parts stocks is processed by recording all existing spare parts stocks into the Ms. Excel data sheet. This is to record and compare the spare parts in the storage area with those stored in the Ms. Excel sheet, as well as part of the check step of the PDCA method. And the incoming and outgoing spare parts are written on the stock card sheet, complete with some information to assist the process of collecting spare parts stock data.

f. Results Discussion, if all data has been processed and completed, then the results of improvements are obtained in the CGS area spare parts stock control data system. In this stage, the next step is to review the results of the previous stage, namely, data processing. If the results of the review show that there are no deficiencies, then the next process can be carried out. The next process in this case is socialization and training activities for other workers with SOP made and with the aim of standardization, so that the improvements that have been made can run consistently and become standards in the future. This step is also part of one of the PDCA steps used, namely act.

g. Conclusions and recommendations, after all the steps have been carried out, at this stage the conclusion obtained is in the form of improving conditions in the spare parts stock control data in the CGS area. Suggestions for improvements proposed to companies are important to consider and make continuous improvements; suggestions received by researchers are also important to be used as evaluation material to provide improvements in other studies.

The researchers conducted their observations in the CGS area where the researcher works for the company from November 2022 to January 2023. During that time, the researcher conducts observations for three months to collect all data of spare parts and input the data to stock summary sheet in Microsoft excel. The solution for this report is creating a spare parts storage mechanism system using several tools such as stock card sheets, stock summary sheets, and SOP sheet. As a result, the spare parts storage area in the CGS unit becomes more well-organized. The focus of the observations that have been made is on the process of repairing control documents for the entry and exit of spare parts stored in the CGS area.

Fig. 3. Flowchart of this research
Table 1 lists the data on All Spare Parts in the CGS Area.

Table 1 Data on All Spare Parts in the CGS Area

<table>
<thead>
<tr>
<th>No</th>
<th>Part Name</th>
<th>Brand</th>
<th>Part No/ Type</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pre-chamber Gas Valve</td>
<td>JE</td>
<td>433894</td>
<td>Pcs</td>
</tr>
<tr>
<td>2</td>
<td>Sparkplug</td>
<td>JE</td>
<td>1214569</td>
<td>Pcs</td>
</tr>
<tr>
<td>3</td>
<td>Protective Cover</td>
<td>JE</td>
<td>211513</td>
<td>Pcs</td>
</tr>
<tr>
<td>4</td>
<td>Gasket</td>
<td>JE</td>
<td>280486</td>
<td>Pcs</td>
</tr>
<tr>
<td>5</td>
<td>O-Ring</td>
<td>JE</td>
<td>9015965</td>
<td>Pcs</td>
</tr>
<tr>
<td>6</td>
<td>Sealing Ring</td>
<td>JE</td>
<td>104713</td>
<td>Pcs</td>
</tr>
<tr>
<td>7</td>
<td>Transmitter Pulse</td>
<td>JE</td>
<td>502884</td>
<td>Pcs</td>
</tr>
<tr>
<td>8</td>
<td>Gasket</td>
<td>JE</td>
<td>100606</td>
<td>Pcs</td>
</tr>
<tr>
<td>9</td>
<td>Gasket</td>
<td>JE</td>
<td>379932</td>
<td>Pcs</td>
</tr>
<tr>
<td>10</td>
<td>Gasket</td>
<td>JE</td>
<td>398673</td>
<td>Pcs</td>
</tr>
<tr>
<td>11</td>
<td>Gasket</td>
<td>JE</td>
<td>101790</td>
<td>Pcs</td>
</tr>
<tr>
<td>12</td>
<td>O-Ring</td>
<td>JE</td>
<td>162817</td>
<td>Pcs</td>
</tr>
<tr>
<td>13</td>
<td>Thermo Couple Sensor</td>
<td>N/A</td>
<td>607323</td>
<td>Pcs</td>
</tr>
<tr>
<td>14</td>
<td>O-Ring</td>
<td>JE</td>
<td>376475</td>
<td>Pcs</td>
</tr>
<tr>
<td>15</td>
<td>Gasket</td>
<td>JE</td>
<td>103143</td>
<td>Pcs</td>
</tr>
<tr>
<td>16</td>
<td>Sealing Ring S/P</td>
<td>JE</td>
<td>102981</td>
<td>Pcs</td>
</tr>
<tr>
<td>17</td>
<td>Gasket Set</td>
<td>JE</td>
<td>206609</td>
<td>Pcs</td>
</tr>
<tr>
<td>18</td>
<td>Transmitter Pulse</td>
<td>JE</td>
<td>200673</td>
<td>Pcs</td>
</tr>
<tr>
<td>19</td>
<td>Temp. Gauge (Alarm Contact)</td>
<td>WIKA</td>
<td>DIN16196</td>
<td>Pcs</td>
</tr>
<tr>
<td>20</td>
<td>Temp. Gauge</td>
<td>N/A</td>
<td>0-120°C</td>
<td>Pcs</td>
</tr>
<tr>
<td>21</td>
<td>Temp. Gauge</td>
<td>N/A</td>
<td>4041682409</td>
<td>Pcs</td>
</tr>
<tr>
<td>22</td>
<td>Press Gauge Compound</td>
<td>Socer</td>
<td>509004</td>
<td>Pcs</td>
</tr>
</tbody>
</table>

**Numerical Results**

A satisfactory comparison of the storage conditions of spare parts before and after repair can be obtained. From the improvements that have been made, there has been an 80% decrease in the total number of errors made by the workers in the post-repair condition.

* = 24 errors have been removed so,
= (Total error is removed after improvement / Total error before improvement = x 100%)
= (24 / 30 = 0.8 x 100% = 80%)

This indicates that the repair has brought satisfactory results to the spare parts storage area at CGS. The errors that still occur are the result of gaps in the document control system that is run manually.

**Graphical Results**

Figure 4 shows how to identify problems with the CGS area spare parts storage system, the researchers used the fishbone diagram method to find the root of the problem. The results of problem identification using the fishbone diagram method can be seen in Figure 4. The root of the problem, from every aspect available, produces the main causal factors that lead to the root of the problem, namely, "There is no document control system for the entry and exit of spare parts."
### Table 2 Socialization schedule for all workers and socialization agenda

<table>
<thead>
<tr>
<th>NO</th>
<th>DATE</th>
<th>Item</th>
<th>Place</th>
<th>Participant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>November 14, 2022</td>
<td>Introduction of the spare parts control document repair system to all workers in the CGS area.</td>
<td>CGS Area</td>
<td>All Workers</td>
</tr>
<tr>
<td>2</td>
<td>November 15, 2022</td>
<td>Conduct a trial for the spare parts control document repair system for all workers in the CGS area.</td>
<td>CGS Area</td>
<td>All Workers</td>
</tr>
<tr>
<td>3</td>
<td>January 20, 2023</td>
<td>Discuss input and suggestions from all workers regarding the deficiencies of a system for repairing spare parts control documents that could be used as evaluation material.</td>
<td>CGS Area</td>
<td>All Workers</td>
</tr>
<tr>
<td>4</td>
<td>January 20, 2023</td>
<td>Determine the next improvement from the results of the evaluation discussion in the previous stage with all workers to be made into the next improvement in the future.</td>
<td>CGS Area</td>
<td>All Workers</td>
</tr>
</tbody>
</table>

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**Fig. 5.** Photo of Socialization and Giving Advice to Other Workers

In figure 6, the form of an SOP sheet it is explained how to fill in the stock card sheet with a good and correct for every worker who wants to store or use spare parts in the CGS area. This needs to be done to create standardization among workers who fill out stock card sheets. Also, to make it easier for new workers who will fill out stock sheets, this is the first time filling out the sheet. The last thing is to avoid errors in communication between workers.

Figure 7 is an example of a stock card sheet that is fully stocked by workers who collect and store spare parts in the CGS area. If the sheet is fully filled, the leader or supervisor will check and sign as proof that the check has been carried out. Furthermore, the manager will also do the same as the leader or supervisor did in the previous step. The last step is that the stock card sheet will be stored to serve as a documentation archive that may be needed in the future.

**Fig. 6.** SOP of the Stock Card Sheet Filling Process

From the results of the repairs that have been carried out in the form of spare parts document control in the CGS area in figure 8, a satisfactory comparison of the storage conditions of spare parts before and after repair can be obtained. From the improvements that have been made, there has been an 80% decrease in the total number of errors made by the workers in the post-repair condition. This indicates that the repair has brought satisfactory results to the spare parts storage area at CGS. The errors that still occur are the result of gaps in the document control system that is run manually. To re-run the cycle of kaizen and PDCA in producing continuous improvement, this gap will become the next improvement in the future.

**c. Discussion**

Findings in the form of errors made by workers were obtained by observing the storage of spare parts in the CGS unit during the observation period that the researcher conducted. Of the many errors made by the research workers, they recorded them and included them in the five types of errors that occurred at the...
spare parts storage area. After entering all types of errors into five categories, the researcher made a graph of the number of errors that occurred so that the reader could see a graph of the errors that were in the repository before the document control was repaired. And, after the repair, the researcher re-entered the number of errors that remained as a comparison between before and after the repair. Errors or mistakes that occur are mostly due to the absence of a documentation process, so workers often make mistakes in recording the stock of incoming and outgoing spare parts. This happens because workers may forget about the goods and the amount of goods stored or used if there is no documentation to record or use as evidence. Therefore, the document control process can help workers avoid mistakes in recording the spare parts used and stored.

Fig. 8. Results of Comparison of Several Errors Made by Workers Before and After Repairing Spare Parts Document Control

5 Conclusion

By analysing the process of documenting incoming and outgoing spare parts in the CGS area using the kaizen and PDCA methods with using several tools, such as stock card sheets, stock summary sheets, and standard operating procedures (SOP), the process of documenting spare parts can be more organized and managed than before. The result of the repair is a decrease in the number of errors made by workers before and after the repair. The decrease in the error rate achieved by workers after the repair is 80% (decrease of error / error before improvement = 24 / 30 = 0.8 x 100% = 80%), indicating that the document control system repair has successfully improved the storage of spare parts in the CGS unit to be more organized and better controlled. This was made possible thanks to the contribution of the Kaizen principle combined with the PDCA method in its implementation, which had a positive impact on the spare parts storage area.

References

13. M. Jagusiak-Kocik, PDCA cycle as a part of continuous improvement in the production company—a case study, Production engineering archives, 14, 19-22 (2017).