Implementation of 5S methodology in warehouse: A case study

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Abstract. Warehouse functions to store products and provide information about the conditions of inventory stored in warehouse, so that it easy access to anyone needed. This paper describes the assessment and application of the 5S work culture in the warehouse area. The 5S is a concept proven able to eliminate waste. One of the Oil Packaging Industries has a low spare part area and is not well maintained. As a result, there are problems such as damage spare parts, which require special handling in storage, due to crushed by metal materials. Besides that, the warehouse area looks dirty, unorganized, has no clear storage boundary, and items are not stored in the right place. As a result, it isn’t easy to find the things you need. The assessment is carried out on the warehouse area based on the 5S criteria. The development of the evaluation shows a score of 1.82. It means that the 5S application in the warehouse area is more suitable with the actual concept. So it is necessary to improve by the 5S implementation principles, namely Seiri, Seiton, Seiso, Seiketsu, and Shitsuke.

1. Introduction
The basic operations at each warehouse are summarized as: receiving, inspection, proper storage, and inventory management. Items stored in warehouse can be raw material, work in process, components, tools, etc. Activities dominate the warehouse are more on searching, finding, preparing, and delivering the order items [1].

5S is a tool to eliminate or minimize waste. 5S is often used by the industrial world, especially the manufacturing industry [2]. The 5S concept consists of sort (seiri), set in order (seiton), shine (seiso), standardize (seiketsu), and sustain (shitsuke). The application of the 5S concept not only helps to create a neat and organized work environment but also provides a safe and comfortable work atmosphere [3].

Previous research related to 5S has been carried out by Abishek Jain, which is productivity improvements that were made using 5S in the manufacturing industry in India. The results of this study were obtained from comparative measurements of organizational performance before and after 5S implementation. The results showed that 5S is a useful tool to improve organizational performance, work culture, productivity, etc. [4]. The research conducted by Abhijeet Mohanrao Mane is a case in the Indian manufacturing scenario, where lean principles are adapted for SME applications in tool factories. Dominantly, 5S is the primary tool used to identify opportunities for improvement as a zero-step of the lean technique. The selected TQM factor is considered as an assessment of quality improvement with 5S and visual management to identify potential areas for improvement [5].
Meanwhile Atif Qamar Malik conducted research by 5S implementation in a surgical instrument factory in Sialkot by spotlighting the step-by-step implementation guidelines needed for the success of 5S exercises daily management practice. Observations were based on guest visits and interviews with experts [6]. Previous research was also conducted of the 5S implementation in Small and Medium Enterprises, namely welding workshop [7].

5S is a workspace management method in Japan due to the kaizen culture (continuous improvement in personal, family, social, and professional life) adoption [8]. Shradhha P. Deshpande et al. implementing '5S' technology at Samsonite South Asia Pvt. Ltd. in Gonde-Dumala, Maharashtra, due to an unorganized work station, uncomfortable work environment, and excessive waste in the company [9]. The original concept of 5S has socio-historical and philosophical roots. The 5S is a technique used to build and maintain a quality work environment within an organization. The 5S methodology in business as a kaizen process by Takashi Osada. Osada was first implemented 5S in 1980. He raised the issue of requisite for a philosophy of continuous improvement as a professional behavior through the integrating of 5S namely seiri, seiton, seiso, seiketsu, and shitsuke in the workplace [10].

Seiri helps remove all unneeded items: only the ones that are required. Seiton specify the location and quantities needed to obtain the efficient operation. Seiso represents clean condition by inspection activity. Seiketsu implements visual displays and controls. Shitsuke helps keep organizational efforts in place through training and total employee engagement [11]. 5S not only simplifies the work environment and reduces waste but also contributes improving safety in the workplace [12].

The problem of the work area was observed independently in one of the private cooking oil packaging companies. The purpose of this study is to implement the 5S method in the warehouse department so that the spare parts damage can be minimized.

2. Methodology
This research was conducted in the warehouse department of a cooking oil packaging company. The research subjects observed are warehouse management and assessment using the 5S method.

The implementation of 5S work culture follows the following steps [13]:
1. Sort (Seiri): Remove of what is unnecessary and clean up the workplace
2. Set in Order (Seiton): Prepare the necessary items neatly and systematically so that it is easy to find and return to its original place after use.
3. Shine (Seiso): Clean equipment and workplaces regularly, identify irregularities. Dust, dirt, and waste are sources of riots, indiscipline, inefficiency, wrong production, and work accidents.
4. Standardization (Seiketsu): Documenting and standardizing methods, using standard procedures. Standards should be very communicative, clear and easy to understand.
5. Sustain (Shitsuke): Continue to maintain existing procedures, audit work methods, make 5S as a chronic, integrate the culture.

![Figure 1. Steps of 5S Implementation [9]](image-url)
3. Result
3.1 Existing Condition
The condition of the warehouse at one of the cooking oil packaging company is not well maintained, which is lead to non-value-added activities, such as require a long time to find the equipment needed, especially in the spare part warehouse. Items that are not placed in the right place and there are still items are not required. This leads to production disruptions. Production disruption is a disruption causes the production process to run smoothly. Because of that, it is necessary to optimize warehouse space activities by making the right arrangement of the storage location.

Another problem is that there is no boundary between materials in the material warehouse, with colored lines or a divider to differentiate the area between materials. There are several circumstances such as there are production machines are not running due to mold damage, and there are production machines and equipment that are not placed in the right place. In terms of the 5S aspect, the 5S problems found in the warehouse department are as follows.

Table 1. Problems of 5S Principles Implementation in the Warehouse Department

| No | Sub Department          | Figure | Description                                                                 |
|----|-------------------------|--------|-----------------------------------------------------------------------------|
| 1  | Material Warehouse      |        | 1. Unorganized of material arrangement.                                    |
|    |                         |        | 2. There is still other equipment in the material warehouse, such as       |
|    |                         |        | machinery and production equipment.                                       |
| 2  | Jerrycan Warehouse      |        | 1. Collecting of jerrycan only done from one side, namely from the        |
|    |                         |        | front, while the jerrycan on the back produced beforehand cannot be        |
|    |                         |        | ordered directly.                                                         |
|    |                         |        | 2. Sometimes there are jerrycan groupings that do not match the size.     |
| 3  | Spare Part Warehouse    |        | 1. Unorganized of the spare part warehouse.                               |
|    |                         |        | 2. The condition of the warehouse is dirty and tends to be disorganized. |
|    |                         |        | 3. Goods are not placed in the right place.                               |
|    |                         |        | 4. There are items that are no longer used.                               |

3.2 Evaluation of 5S Condition
The warehouse department's condition was assessed based on 5S criteria. The assessment is carried out using a questionnaire containing questions to determine the condition of the warehouse department. There are questions that are arranged based on the consideration things in the 5S concept. The result shows that the warehouse department's condition is still weak, according to the 5S criteria.
The assessment is based on direct observation of the warehouse department. The 5S score range is as follows:

0 = There is no correlation with the 5S concept  
1 = There is a little correlation with the 5S concept  
2 = There is a correlation with the 5S concept  
3 = Correlation with the 5S concept  
4 = High correlation with the 5S concept

After conducting an assessment using the 5S method, the score results are recapitulated in the warehouse department. The recapitulation of score results is shown in the following table.

| Category | Criteria Number | Total Score | Average (Total Score/Criteria) | explanation |
|----------|----------------|-------------|-------------------------------|-------------|
| Seiri    | 4              | 6           | 1.50                          | a small correlation |
| Seiton   | 5              | 7           | 1.40                          | a slight correlation |
| Seiso    | 5              | 11          | 2.20                          | a correlation |
| Seiketsu | 3              | 6           | 2.00                          | a correlation |
| Shitsuke | 2              | 4           | 2.00                          | a correlation |
| **Total**| **19**         | **35**      |                               |              |

Average Total of 5S 1.82 a correlation

Based on the table above, the average of 5S score results, between the records and the findings are included in the a small correlation categories. For the Seiso, Seitsuke, and Shitsuke categories have scored with a correlation information. However, the Seiri and Seiton categories get the score from correspondence information and it is need the improvement.

Seiri, Seiton, Seiso, Seiketsu, and Shitsuke are systems used to reduce waste and optimize productivity through organized workplace maintenance and visual cues to achieve better results. Therefore, solving problems in the warehouse department can be done by the 5S principle implementation.

The problem faced by companies in the seiri aspect is that in the material warehouse there is other equipment in the material warehouse, such as machinery and production equipment. Meanwhile, in the spare part warehouse, there are thing no longer used. And there are still damaged work equipment in the warehouse. It takes an effort to clean up the warehouse and sorting the things are no longer used.

In the seiton aspect, the problem faced is that the items in the spare part warehouse are completely arranged correctly according to the right equipment location. This condition occur because of the lack of employee awareness to return things from the spare part space in the right place. So it is necessary to arrange by placement the same item in one place by paying attention to the ease of reach these items. For example, bolts are placed in the same place according to the type of bolts, parts of the conveyor are placed in the same place to easy access, pipes are placed in the same place, etc. Also, item placement must also pay attention to the material properties of the item for example, things are easily deformed and prone to crack when it is hit by a metal material, such as a blow molding machine mold, placed far from metal materials.

### 3.3 5S Implementation

Improvement should be made by the company in the seiso aspect is to improve the cleanliness of the work area, so it is necessary to carry out regular cleaning inspections every day. The activities carried out to improve seiketsu for the operator to implement the 5S culture in the work environment, and implement a reward and punishment system implementation to maintain a clean and neat work area. Steps taken to improve shitsuke are done regular a 5S audits and efforts to increase operator awareness.
to implement 5S culture in the work environment. 5S has been implemented in the spare part warehouse. The following are the conditions before and after 5S implementation.

Figure 2. Result of 5S Implementation

4. Conclusion
Evaluation of the 5S assessment in the production department is 1.82. The results of the 5S score, between the data records company are included in the small correlation category. For the Seiso, Seitsuke, and Shitsuke types have scored with correlation information. However, the Seiri and Seiton categories still receive the scores with the knowledge that a small correlation with correspondence, so that it is need the improvement. Then the problem-solving was carried out by the implementation of the 5S principles, namely Seiri, Seiton, Seiso, Seiketsu, and Shitsuke.

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