Work Environment Analysis Using 5S (SEIRI, SEITON, SEISO, SEIKETSU, SHITSUKE) Assessment Method

Nismah Panjaitan¹*, Hasnida Binti Ab Samat², Dimas Alexander Siregar¹, Naila Sahfa Rizky³

¹Department of Industrial Engineering, Faculty of Engineering, Universitas Sumatera Utara, Medan, Indonesia
²School of Mechanical Engineering, Engineering Campus, Universiti Sains Malaysia, Pulau Pinang, Malaysia
³Faculty of Medicine, Universitas Sumatera Utara, Medan, Indonesia

Abstract. The working environment in a company specializing in Aluminum Scrap Processing, currently lacks organization and cleanliness. This hampers operational efficiency and poses safety risks. To address this issue, the 5S assessment method is employed across the charging, casting, and shipping stations. The 5S steps – Sort, Set in order, Shine, Standardize, and Sustain – are implemented to enhance cleanliness, organization, and efficiency. Through direct observation, it is anticipated that the application of the 5S method will lead to a more orderly, clean, and safe work environment. This, in turn, is expected to improve operational quality and product output.

*Corresponding author: nismah.panjaitan@usu.ac.id
1. Introduction

PT XYZ is a company engaged in the production or manufacturing of aluminum alloy in Indonesia. The company produces various types of aluminum alloys, which are often used in various industries such as automotive, construction, aviation, and many more. Further information about, such as history, products they produce, location, and latest news, may be found on the company website or in industry news sources.

The problem at is that a clean work environment has not been created and is not neatly arranged. This occurs due to several factors, namely operators are less aware of cleanliness, materials are scattered in the production area, equipment is not placed in the proper place, and there are no inspection activities after carrying out cleanliness. As a result of not creating a clean and well-organized work environment, operators have less freedom in their activities and lack of comfort for workers, thus affecting the efficiency of production time.

An overview of the three aluminum billet manufacturing work stations is as follows.

1.1 Charging station

The production process carried out at the charging station is melting the main material (Base Metal, Extrusion, Wire Rod and Wheel Rim) and Internal Scrap (Overflow, Butt Billet, Rejected Billet) to become liquid aluminum which can be seen in Figure 1.

1.2 Casting Station

The production process that occurs at the casting station is the mixing of the master alloy and liquid aluminum which is molded in the casting machine. The casting station can be seen in Figure 2.

1.3 Shipping Station

The production process that occurs at the shipping station is inspection of billet product defects and the homogenization process which aims to equalize the billet components by heating then cooling them to be cut from the original size of 6 meters to 5.8 meters and bundling them into 6 billets which are ready to be marketed. Shipping Station can be seen in Figure 3.

Fig 1. Charging station

Fig 2. Casting station

Fig 3. Shipping station
2. Research Method

Types of data to solve work environment problems using the 5S method require collecting primary data and secondary data.

1. Primary data
   In this case, the primary data needed is documentation regarding the environmental conditions of the factory and the 5S questionnaire.

2. Secondary Data
   The secondary data required includes information regarding the number of work stations and a description of the production process at .

To collect the necessary data, the method used involves direct observation and distributing survey questionnaires.

1. Observation/Field Observation
   Observations were carried out by carrying out documentation in the form of taking pictures depicting the working environment conditions at .

2. Survey
   The survey was carried out by giving questionnaires to a number of workers at . This questionnaire contains questions related to information regarding the work environment in the company.

   With this data collection method, it is hoped that we can obtain the information needed to analyze and solve work environment problems using the 5S method. Primary data from field observations and surveys will provide direct insight into the situation in the field, while secondary data will provide additional information regarding work stations and production processes in the factory.

3. Result and Discussion

   The 5S questionnaire is used to identify the steps that need to be taken in implementing the 5S method to increase the effectiveness and productivity of the work environment. Before carrying out an assessment using a checklist sheet, there are several steps that must be taken. The following are the 5S assessment steps implemented:

   1. Make direct observations of work environment conditions.
   2. Design the audit checklist sheet that will be used.
   3. Determine the respondents who will fill out the audit checklist sheet.
   4. Fill out a scoring sheet based on an assessment of work environment conditions.
   5. Recapitulate the scoring results for an overall evaluation.
   6. Provide suggestions for improvements based on the assessment results.

   The checklist sheet is designed with various questions that are in accordance with the 5S concept and adapted to conditions at . The 5S assessment score ranges from 0 = Not Compliant with the Criteria, 1 = Not Compliant with the Criteria, 2 = Fairly Compliant with the Criteria, 3 = Compliant with the Criteria, 4 = Very Compliant with the Criteria. If the initial assessment results are in the score range 0-30, then the condition is not satisfactory and the checklist needs to be filled in again. If the score is in the 31-50 range, it is below average, and it is necessary to review the aspect that received the lowest score. In the range of 51-70, it means the condition is average and needs to be strengthened in areas that are still weak. If the score is in the range of 71-90, then the condition is considered good and further improvements can be focused on certain areas that still need improvement.above average,
set the target higher and in the range of 91-100 which means very satisfactory, must be maintained. The 5R assessment criteria can be seen in Table 1.

<table>
<thead>
<tr>
<th>Score Range</th>
<th>Information</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30</td>
<td>Conditions are not satisfactory</td>
<td>It is necessary to refill the checklist</td>
</tr>
<tr>
<td>31-50</td>
<td>Below average</td>
<td>It is worth reviewing the aspects that get the lowest scores</td>
</tr>
<tr>
<td>51-70</td>
<td>Average</td>
<td>Need to make improvements to areas that are still weak</td>
</tr>
<tr>
<td>71-90</td>
<td>Good</td>
<td>Conditions are considered good and it would be good to set a higher target</td>
</tr>
<tr>
<td>91-100</td>
<td>Very good</td>
<td>Must be defended</td>
</tr>
</tbody>
</table>

Table 1. 5R Assessment Criteria

3.1. Charging Station
The total 5S assessment score from 10 respondents at the charging station was in the range of 31-50, which means that 5S implementation is below average and requires reviewing the checklist with the lowest value of the 5S assessment criteria. If depicted in a spider web diagram, the average results of respondents’ assessments of charging stations can be seen in Figure 5.

Fig 5. Spider web charging station

3.2. Casting Station
If depicted in a spider web diagram, the results of the average respondents’ assessment of the casting station can be seen in Figure 6.

Fig 6. Spider web casting station

3.3. Shipping Station
If depicted in a spider web diagram, the average results of respondents’ assessments of shipping stations can be seen in Figure 7.

Fig 7. Spider web shipping station

Based on the assessment results seen on the spider web diagram of the charging, casting, and shipping stations. So, the station that needs improvement is the casting station. This is because it has the lowest total assessment. For casting, it was found that the 5S aspect was not implemented well 5S audits

After recapping the questionnaire results from 3 production stations, namely the charging station, casting station and shipping station, the next stage is to carry out 5S audit calculations. An example of a series audit calculation is by adding up the average value from questions 1 to 5 based on the assessments of 10 respondents and then dividing by 5.
The table above shows that the lowest figure is at the Casting station with a weight of 1.6. If viewed based on the same approach at the casting station, the problem is in the 5th criterion, characterized by the absence of written procedures for the disposal or elimination of unnecessary items. This problem will cause the work environment at the Charging station to become untidy, because there are many items that are not needed and the production floor looks scattered. Things like this have the potential to cause accidents to workers.

1. **Seiton**

   the lowest figure is at the Casting station with a weight of 1.54. If we look at it based on the seiton approach at the casting station, the problem is in the 1st criterion, characterized by items that are not stored according to their classification. This problem causes a decrease in productivity and performance. When workers have to look for items that are not located in that location, time is wasted and other tasks are hampered. This can have a negative impact on work efficiency and cause frustration for team members or staff who depend on the item.

2. **Seiso**

   the lowest figure is at the Casting station with a weight of 1.7. If seen based on the seiso approach at the casting station, the problem is found in the 3rd criterion, marked by the absence of cleaning based on the checklist. When cleaning is always carried out based on checklist activities without paying attention to whether items have been stored correctly according to their classification, the cleaning process becomes less effective and has the potential to increase the time needed to complete the task. When items are not stored according to their classification, some areas may be neglected in the cleaning process because they are not included in the routine activity checklist. This results in a lot of dust, dirt or rubbish hidden in these areas which can accumulate and cause health problems.

3. **Seiketsu**

   the lowest number is at the casting station with a weight of 1.7. When viewed based on the seiketsu approach at the casting station, the problem is found in the 2nd criterion which is characterized by the absence of visual displays about 5S The absence of visual displays about 5S (Seiri, Seiton, Seiso, Seiketsu, and Shitsuke) causes a lack of understanding, awareness, and practical guidance for employees or team members about the importance and how to properly implement 5S. As a result, the 5S implementation process is hampered, the work environment tends to be disorganized and unclean, and the potential benefits of 5S in improving work efficiency, safety, and quality cannot be maximized. In addition, without visual displays as constant reminders, awareness of the importance of 5S can fade, and continuous improvement within the work area is hindered.

4. **Shitsuke**

   The lowest figure is at the casting station with a weight of 1.44. If we look at it based on the shitsuke approach at the casting station, the problem is in the 4th criterion which is characterized by workers not having discipline in implementing the previous 4S, where there are still workers who do not place cleaning and dry equipment in the disposal area.
4. Conclusion

Recommendations for improvement in the 5S assessment have been outlined for the Casting department. Under the 'Seiri' category, it is advised to establish written procedures or guidelines for the disposal of unnecessary items and promptly discard items that are no longer needed.

Moving on to the 'Seiton' category, clear labeling and signage should be employed to identify each storage location in accordance with their classification. This will facilitate easy retrieval and placement of items by all personnel. Additionally, an easily understandable classification system should be implemented, ensuring that items are categorized based on their type, size, or relevant categories aligning with the storage area's requirements and activities.

In conclusion, for the Casting department's improvement in the 5S assessment, recommendations have been provided across Seiri, Seiton, Seiso, Seiketsu, and Shitsuke categories. These include establishing written procedures for item disposal, employing clear labeling for storage, implementing a checklist-based cleaning system with recognition incentives, creating a visually appealing display for 5S principles, fostering continuous improvement through feedback mechanisms, emphasizing awareness and training on 5S benefits, and instilling a culture of discipline in daily practices. These measures aim to enhance organizational efficiency, cleanliness, and sustained adherence to 5S principles.

References