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To cite this article: I Rizkya *et al* 2019 *IOP Conf. Ser.: Mater. Sci. Eng.* **505** 012018

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# 5S Implementation in Welding Workshop – a Lean Tool in Waste Minimization

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**Abstract.** This paper describes the application of 5S method in welding workshop and to highlight the significant contribution of 5S implementation to organizational progress both in terms of quality, productivity, work safety, and worker moral values. 5S is a work culture includes Seiri, Seiton, Seiso, Seiketsu, and Shitsuke. 5S is used to improve the quality of employees in handling their work activities. Welding workshop at small and medium scale (UKM) usually has a limited work area. Storage of irregular and unclear equipment and materials relates to increase search activity. The search activity allows for delay. The key to successful implementation of 5S is the organizational commitment and worker discipline in handling the 5S. The application of 5S in welding workshop requires a storage device in the form of a rack equipment by naming information or information items saved in it. With the implementation of 5S and the procurement of storage rack able to minimize the search activity of 18.75% and the use of space 11.20%.

## 1. Introduction

5S is a lean tool to eliminate or minimize waste. 5S is commonly used by industrial world especially manufacturing industry [1]. 5S is a methodology for improving the quality of organisation [2]. 5S is a system to reduction waste, productivity optimization and quality through maintaining and organizing work-place [3]. The 5S concept consists of Sort (seiri), Set in Order (seiton), Shine (seiso), Standardise (seiketsu) and Sustain (shitsuke). One of the 5s elements is Straighten (seiton) where the systemize workplace and worker discipline to organize its work area become an important factor to improve work efficiency. The 5S concept is a workplace use concept including tools, materials, documents, and others to create a systemise work environment and improve discipline work [4]. Implementation of 5S concept not only helps create a systemize and straighten working environment but also provides a safe and comfortable working environment [5]. Implementation 5S able to handle the problems of unwanted materials, improper space utilization, work environment, more time to search documents, equipment, and stationary [6].

5S is a determination to organize, straighten up, maintain steady conditions and maintain the habits necessary to do the job well. 5S is generally applied to medium to large scale industries. In manufacturing industries such as automotive company [7] and metal industry [8]. Research on 5S implementation has also been carried out in the lean healthcare field [9]. In addition, 5S is also implemented in a business organization. The study was conducted on one of the companies in Malaysia with a purpose to review the previous research about the advantage of 5S implementation and



organization efficiency. Accordingly 5S can help out the achievement of the organization objectives to continuous improvement in productivity and others performance [10].

However, there are still very few 5S applications implemented in small scale industries such as welding workshop. Problems usually happens in welding workshop is the habits of workers who unrestore and reorganize equipment already used in accordance with the original condition makes one of the inhibiting factors in the good work to make the efficiency time in doing less than the maximum work. This study focuses on the application of 5S in welding workshop, to simplify wasteful activities. Performance measures are used as a reference in measuring the success of 5S implementation is the reduction of tool and goods search time and space usage efficiency.

## 2. Methodology

This paper uses a quantitative evaluation method. Survey is one of research methods to collect data. Through the survey method, to get the data, researchers do not need to collect from all of entire the interest population. They only need to collect the data to see some elements of population. Questionnaire is used to get some information of the investigation goals. Questionnaire is an instrument that often used for researchers to collecting the data, because the quality of questionnaire will establish the on the whole value of the research [11]. To get some quality information for research purposes, a questionnaire was to build up.

The first step is observe the welding workshop located in Medan, North Sumatra. Observations were made to find the problems usually occur in workshop welding. The next step is data collection with two stages. First, interviews were conducted with welding workshop owners and workers to find deeper information about the problems usually happen. Interviews were also conducted to clarify the results of initial observations. The second data collection done by documentation study. This stage is done to facilitate the process of problem analysis. Documentation study is done by taking pictures related to work environment in welding workshop. The last step is data analysis which is done by clarifying the result of initial observation, interview, and documentation study. The results are used to develop the 5S implementation plan and determine the supporting equipment required for the 5S technique to be implemented.

## 3. Result and Discussion

### 3.1. Seiri (Sort)

Seiri (Sort), is sorting, transfer, and storage of goods are necessary or not required for production activities in the workplace. Implementation of Seiri is a sorting process by selecting which items are not used and will be disposed of or goods still be reused again. In welding workshop, the application of seiri is done by labeling the goods by grouping them into 2 parts, (1) unusable goods and (2) goods which is still be reused. Goods are not used anymore for example the residual goods of small welding unused again. These items are red tagged for the purpose of being destroyed or disposed immediately. When the rummage items in medium to large size is stored because it still be reused as raw material for future orders. Used goods are green tagged for the purpose of being stored in the proper storage.

The implementation of seiri (sort) is done gradually starting from (1) If there is any unnecessary things in the work-place which is causing mixing product and tools of must be separated. (2) If there are items that are not needed in a place then must be returned to the original place. (3) Ensuring the equipment is in place, the equipment on the production floor should also be in place where the equipment should be. (4) Provide Red Card on unnecessary items and Green Card on the items that are still needed. Seiri done by deciding the product or tool needed to finish the job efficiently and effectively. If the equipment or goods are considered as an important thing for the work then marked with "Green Card" and if no longer needed then marked with "Red Card". After all equipment or goods are marked, the next step is to remove equipment or items with the Red Card label.

### 3.2. *Seiton (Set in Order)*

Seiton (Set in Order), is a setting and marking activity for the required goods and placement of such items in a fixed and accessible location to support production activities. Implementation of Seiton in welding workshop following five rules. There are (1) the position of the place of goods must be obvious earlier where the goods should be placed, (2) all equipment must be separated based on frequency usage, (3) place all important things in an accessible area so that they are easy to carry, (4) small equipment must be placed in a certain position, and (5) safety equipment must be placed in the right location for emergency usage.

Everything needed to do the work should be placed for easy access. Everything used, every tool, every image used for the job must be a clear storage place. 5S to facilitate the process of searching tools or goods when needed. The ease of finding the tools or items needed is the first step to implement 5S. Storage of goods adapted to product groups such as supporting equipment, welding machines, main materials (such as long iron, iron pipe, plate, etc), support materials (such as electrode) or residual materials still be used.

### 3.3. *Seiso (Shine)*

Seiso (Shine), is an activity emphasizes the separation, clean up of the workplace from dust and others to maintain cleanliness and safety in the workplace. Following the rules of seiso, there are (1) clean all the main sources of unnecessary things. (2) Clean all machines every day. (3) Check all equipment, weekly equipment, and organize the equipment of cleaning is needed. (4) Make ensure the cleaning of shop floor and work floor. To implement this program, each section is not distinguished and all operators in the company are required to implement it. The activities required by all operators are sweeping the floor, cleaning the area around equipment and machines, and reporting unsafe conditions. The key to Seiso application is maintain the work area, process equipment, and all items used in a clean condition and products produced for the customers are also clean.

### 3.4. *Seiketsu (Standardise)*

Seiketsu (Standardise), is an activity to perform tasks such as sort, stabilize, shine applied and implemented consistently. Companies need apply 5S by all operators agreement, so the agreement becomes a legitimate rule, which is every operator must obey the regulation. Seiketsu is a system to maintain a standardization process. Seiketsu can be implemented in welding workshop by following the 3 steps. There are:

- (1) Provide strict instructions on cleanliness to all staff.
- (2) Maintain the checking progress habit in cleanliness.
- (3) Create an audit sheet to insure cleanliness.

### 3.5. *Shitsuke (Sustain)*

Shitsuke (Sustain), is a self-discipline of 5S, every operator respond as a company culture must be continuously carried out in work handling. Shitsuke is considered as the basis for continuous improvement. Owners of welding workshops and operators establish regular discussions at mutually time to discuss problems and find solutions together. Make the 5S philosophy as a way of life and the organization maintain the achievement has been achieved from the side of customer order completion or the increase of incoming order and completed on time. Implementation of shitsuke by following the steps (1) the leader must take responsibility for holding the 5S program and (2) Staffs ought to be eager totake up the 5S technique.

### 3.6. *Result of 5S Implementation*

Placement of goods done in groups, based on size, characteristics, and similarity of goods. So to get the total space usage become 30,98 m<sup>2</sup>. With the implementation of 5S is able to minimize the use of space by 11.20%. Other results with 5S implementation reduce equipment and goods search time by 18.75%. This result is related with the statement submitted that the application of 5S improve the utilization of

un-appropriate space obtained space utilization. 5S is also able to reduce more time search activity for documents, equipment, stationery, and the use of time becomes efficient [3]. Implementation of 5S could reducing waste in welding workshop [5, 12], there are unnecessary motion (seeking) and excessive space usage.

#### 4. Conclusion

Implementation of 5S is done by applying seiri, seiton, seiso, seiketsu, and shitsuke sustainably. Placement of goods done in groups, based on similarity of size, characteristics, goods and usage. Implementation of 5S is able to provide benefits to reduction of the total area used and minimize the searching activity. In the welding workshop, implementation of 5S is able to minimize the total area used up to 11.20%, that is 30.98 m<sup>2</sup>. 5S is also able to minimize the search activity of 18.75%.

#### Acknowledgement

This paper is entirely supported by Universitas Sumatera Utara. Author would like to thank all of participants who have a role in conducting of this study especially welding workshop as an object of this study.

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